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December, 1944

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VOLCANOLOGICAL OBSERVATIONS IN EAST AFRICA.

II.—KILIMANJARO: KIBO'S FUMAROLIC ACTIVITY IN 1942-43.

BY J. J. RICHARD.

Contents.

1. Introduction.
2. The Caldera of Kibo and its Eruption Cone in the Past, according to the Literature.
3. Kibo's Fumarolic Activity in 1942-43.
4. Conclusion.
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1. INTRODUCTION.

Kibo, the highest, the youngest and best preserved volcanic cone of Kilimanjaro (Fig. 1) of which Shira and Mawensi (Fig. 2) represent the older main vents, contains, sunk in its white shining glaciers, a two-kilometre-wide caldera caused by subsidence, inside which is a secondary eruption cone, with its own small crater.

While in the past, attempts to conquer the summit of Kibo, Kaiser Wilhelm Point, about 5,950 m. high (Klute's figure) were numerous, mountaineers rarely tried to descend into the caldera and visit the crater. Mostertz (1930), in his list of ascents of Kibo, records, since H. Meyer with L. Purtscheller first reached the top in 1889, up to 1928, 47, of which 15 were successful, but does not mention any visit to the crater itself. The amount of energy and the time required to climb the highest point, form the main reasons for this apparent forgetfulness.

From the summit, only a faint black line, situated in the northern part of the caldera, the crater rim, about 500 m. wide and the northern upward inner slopes, are seen above a rather flatshaped broad cone, just below the great northern ice barrier or eastern extension leading to the Credner, Drygalski and Penck glaciers (Fig. 3 and map).

Until recently, Kibo was considered extinct.

Three short expeditions to the caldera of Kibo were carried out by the author. The first, on August 29th, 1942, made together with a friend, Mr. A. Cooke, his son and Flying-Officer B. Hawson, led to the top, Kaiser Wilhelm Point, and the south and south-east parts of the caldera. The afternoon of the 9th of October, 1942, was spent in examining its eastern side. After a cold night under a rockshelter near Gilman's Point (Fig. 4) together with guides, Thoma and Johane, the next day was employed in investigating the central and northern part of the caldera, and a descent into the northern crater was made. On the 1st of February, 1943, a second short visit was made to the crater, while my companions, Dr. L. Stevens and Lieut. P. C. Spink, were making for the summit. These two last visits to the crater gave me a clear demonstration that this East African volcano was dormant rather than extinct.

While expounding in the following pages on the theme of Kibo's activity, only where essential and in so far as the caldera and the crater are concerned, the long list of literature on Kilimanjaro will be mentioned.*

*A complete list of literature of Kilimanjaro, up to 1932, is to be found in C. Gillman's compilation in *The Ice Cap*, No. 1 (1932), pages 67-71.

In this connexion, I am especially grateful to Mr. C. Gillman. When in Dar es Salaam, in February, 1943, I had the privilege of consulting his extensive library, failing which a narrative on the history of Kibo could not have been written.

2. THE CALDERA OF KIBO AND ITS ERUPTION CONE IN THE PAST, ACCORDING TO THE LITERATURE.

On turning to the literature on Kibo of the last fifty-four years to find instances of early activity of the crater one discovers little information. This lack of references is due mainly to the fact that efforts to reach the crater in the past were often frustrated, as they are sometimes today, by the bad state of the ice and snow. Other adverse factors are the meteorological difficulties encountered, in the form of blizzards, and the climatic and physiological troubles of high altitudes, namely, mountain sickness or physical exhaustion. In addition to the time required for investigations, a definite kind of ill fate attended many attempts to conquer Kibo's true crater in the past.

H. Meyer's earliest statements, contained in three letters to Professor Ratzel, 9th October (pp. 15-17), 25th October (pp. 20-21), and 5th December, 1889, published in Petermann's *Mitteilungen*, Vol. 36 (1890), do not contain any specific indications as to whether or not the central cone, which is first mentioned on page 16, was still active. In his first letter of the 9th of October, one finds the earliest mention of its existence. The upper half was then free from snow, while the lower was armoured with a strong ice belt. A sketch, *Tafel 2*, of the cone shows a small crater on its top. H. Meyer, on his second exploration of Kilimanjaro when he reached the summit with E. Purtscheller on the 5th October, 1889, and named it *Kaiser Wilhelm Spitze*, attempted a little later on the 18th, to visit the central cone. After reaching the breach in the ice, called later H. Meyer Notch, he and Purtscheller started on their way across the caldera. In *Across East African Glaciers*, (English edition, 1890, p. 83), the attempt is commented on as follows: ". . . everything seemed to promise such easy progress that Purtscheller gave it as his opinion that we should reach the cone at the bottom in an hour . . . A little experience of the 'nieve Penitente' surface of the ice ahead soon caused us to modify our sanguine expectations . . . we became involved in a chaos of ruts and rents and jagged points amid which it was nearly impossible to find a footing . . . , the brittle crust gave way beneath us and we found ourselves up to the armpits struggling to extricate ourselves from the jaws of the crevasses." On page 184, H. Meyer mentions fissured ice-sheets lying between them and the brown lavas and ashes of the central parasitic cone. In his second letter to Professor Ratzel (*loc. cit.* p. 20), H. Meyer came to the conclusion that the plan was irrealisable.

On the question of activity, H. Meyer (1891, p. 307) states: "the activity of Kilimanjaro is now a thing of the past, there is no trace even of fumaroles." In his magistral work, *Kilimanjaro*, (German edition, 1900), after his fourth ascent to Kibo nine years later, H. Meyer is more definite still. On page 144, he writes: "In 1889, I was dubious as to whether a relic of volcanic life still animated the crater of Kibo, now, I could see plainly that there was nothing in the cauldron to indicate formation of steam, nowhere were there visible hot springs, fumaroles, solfatares or mofettes. In addition the ice-layers on the eruption cone itself show that this holds no remnants of heat. The volcano is to be considered as completely extinct." In another reference to the cone on page 317 of the same work it is stated: "the eruption cone has produced outflows of lava,

flat and broad, apparently without forming a crater." In another of his works, H. Meyer (1909, p. 228) wrote: "since the extinction of the volcanic fire, which took place in the early diluvial, the mountain has known no further great volcanic catastrophe," while on page 335 of *Kilimanjaro* 1900, we find: "The last eruptions took place at 4,400 m. on the west where the 'Lenthügel' are found. These eruptions occurred in late Pleistocene times"

The statement (1900, p. 352) that in 1889, mighty ice-masses from the northern side reached over and across the eruption cone together with the two other statements, on pages 144 and 317 (see above), are somewhat in contradiction with H. Meyer's earlier statements of 1889, and the sketch mentioned. In a panorama (19th October, 1889), as seen from slightly south of the East Notch, the central cone is free of ice and its rim is indicated by the mention of two angles, 312° and 334° giving its extreme points (roughly west and east). The northern glacier is at an angle of 345° i.e., 11° distant. It is difficult to believe that these figures were merely imagination. Mention was made above of H. Meyer's earliest references to the central cone. In *Across East African Glaciers*, page 155, there appears a plate executed by E. T. Compton after a photograph by H. Meyer in which "the main features of the mountain scenery are reproduced with remarkable fidelity" (H. Meyer, Preface, p. XII). This plate shows the upper parts of the cone free of ice. In another reference to the cone, *ibid.*, page 183, it says: "The ice-sheet stretched in a compact mass to the foot of the small central cone." The only explanation, and this is quite to the credit of H. Meyer's integrity, is that from the lower point (H. Meyer Notch) where he stood nine years later, and from where the crater cannot be distinguished (Fig. 6), H. Meyer came to doubt whether his presumptions of 1889 were correct. From the summit and from the south rim of the caldera the outlines of the cone and crater, when covered with snow, are not always clearly seen even today (see Fig. 2).

Dr. C. Uhlig on September 30th, 1901, and again in 1904, with Dr. Fr. Jaeger (who made a further attempt with E. Oehler in 1906-07), explored the north and south parts of Kibo as well as the western, so-called, "Great Barranco." They reached Johannes Notch and continued about 200 yards beyond it to the south, but were forced to abandon an attempt to reach the top by the jagged ice and soft snow in which they sank up to their knees. Exhaustion and lack of time did the rest.

And so, with more or less successful attempts, the story of Kibo continues.

In 1912, E. Oehler and Fr. Klute, proceeding from the west *via* the Drygalski Glacier, reached the north-west edge of Kibo, but they were too exhausted to climb to the summit, and returned by the Great Barranco to their camp under Penck Glacier.

In their publications neither Uhlig (1904) nor Oehler (1915) give new information about the true crater.

Jaeger (1909, p. 135) mentions the "ashcone" in the caldera, and on page 169, expresses the view that "it is not impossible that in addition to solar action, volcanic heat from the crater has led to the strong melting of the former glacier, which possibly, to a variable depth, covered the whole bottom of the caldera." While H. Meyer and C. Uhlig failed to discern the smallest trace of volcanic activity, "the absence of this," says Jaeger, "does not exclude the possibility that there may still be some internal heat escaping from the crater." It is difficult, however, to decide what factors in the first instance, have contributed to the deficiency of the ice in the caldera, a fact which seems at variance with the favourable altitude and orographic conditions.

Klute (1920, p. 70) mentioning the caldera, writes: "no crater exists," and on page 86: "The eruption cone with its faded-out configuration, shows no crater opening and is but a ridge stretching approximately N.E.-S.W." This statement is confirmed by Klute and Oehler's map, in which no crater is indicated on the summit of the central cone. See also Reck (1922, pp. 201 and 204). Thus we see that most of the early authors are unanimous in declaring Kibo as being extinct and deny even the existence of a crater. After a break between 1914 and 1921 a new period of explorations of Kilimanjaro was opened when in the latter year C. Gillman in company with P. Nason reached Johannes Notch. C. Gillman (1923) pointed to the great regression of the ice cap since former investigations, and brought up a boiling point thermometer and determined the altitude of Johannes Notch (at the foot of the then protruding rock) as 5,880 m. This figure, used later for the determination of the height of the summit of Kibo, gives for the latter a height of 5,965 m. (19,570 ft.). See *Ice Cap*, p. 102, footnote.

Mostertz (*ibid.*, p. 304) referring to the holes in the horizontally stratified ice (1/3/1927) of the caldera bottom, expressed the view that melting might be due to local persistence of post-volcanic activity.

Nillson, who took the first panoramic photograph from Kaiser Wilhelm Point, showing clearly the eruption cone (13/1/1928) in a pamphlet (1929) and in his thesis (1932), was mainly concerned with the quaternary glaciations and their correlation with pluvial epochs. He refers to the recent retreat of the glaciers of Kibo in general, and mentions on page 76, without entering into details, volcanic activity in the dry period of the Gamblian.

Dr. Reusch, after reaching the summit of Kibo on the 26/9/1926, climbed it twice again in the following year and has, up to now, some forty ascents of Kilimanjaro to his credit. We owe to him the discovery of the crater on the central cone on the 17th of July, 1927. Mr. C. Gillman handed to me an unpublished paper bearing on this discovery, and having been given permission to make use of it I reproduce here the following comment:—

"In a letter written by H. Meyer on 1/3/1929, shortly before his death, to the Rev. R. Reusch of Marangu—in reply to the latter's announcement that he had discovered a crater in the central cone I find this remarkable confession: 'Enclosed you will find my sketch of the crater. I have inserted on it the ash cone which at the time was inaccessible to me owing to the magnitude of the covering ice-masses. I have made this sketch in 1889 (obviously a copy of the one in Pet. Mitt., C.G.). I was greatly interested to hear that you have discovered a crater on the same. This seems to be much larger than one might have anticipated. I suspected its existence but was very doubtful whether it existed (*sic!* C.G.). You will recognise it as a quite small hole on my sketch. *It was, however, a mere assumption of mine that it existed.* Your news confirms that my assumption was correct and throws fresh light on the origin of this mountain.'

"These statements make it clear," writes C. Gillman, "that Professor Meyer cannot be credited with the discovery of the 'pit'."

Two years later, on the 5/1/1929, N. Rice reached the top of Kibo and we owe to him, in addition to a panorama taken from the summit, the first correct 1:10,000 map of the caldera of Kibo, with the true position and aspect of the eruption cone and crater (1932). The survey, I understand from a letter written to me by Dr. Reusch, was undertaken in 1932. Mr. Rice reached the central cone and built a beacon on its top. In a letter N. R. Rice states that, at the time of his visit, he did not notice any steam jets or fumes in the crater.

W. Mittelholzer (1930) flew over the crater. Some splendid airviews are reproduced in his book, the first photographs of Kibo crater from the air.

C. Fluckiger, according to a verbal communication of C. Gillman, visited the eruption cone in December, 1932. He has not, however, published an account of his findings.

W. Geilinger (1936) in a clear *exposé* on the retreat of the glaciers and the changes at Kibo since Fr. Jaeger's time, wrote on page 16: "certainly no traces of still existing volcanic activity have been observed." His last ascent of Kibo took place on the 23rd of February, 1934, when he reached Kaiser Wilhelm Point.

Shortly before, however, W. H. Tilman, according to a note in the Kibo hut-book, reported his visit to the north crater, on August the 21st, 1933, where he "noticed sulphur fumes discharging from the outer rim on the south side." The Rev. R. Reusch, who read this statement on the 6th September, 1933, replied: "I was surprised to read in Mr. Tilman's record that he had seen sulphur fumes in the northern part of the crater. I looked for these today but could not find any traces of them. I am afraid Mr. Tilman must have mistaken a certain kind of whirling, little clouds resembling smoke for the sulphur fumes."

Dr. P. Julien (Dutch Itoeri Expedition) writes in the Kibo hut-book on the 11th of October, 1933, that he saw no smoke but only clouds in the crater.

W. H. Tilman in his book, published in 1937, stated on page 41, that Kilimanjaro is an extinct volcano and on page 48: "on top of Kilimanjaro is a great flat-bottomed crater possibly a mile across at its longest diameter, filled up with ice and snow." On page 175, Tilman wrote further: "I walked across to the north side of the crater to inspect a secondary and very perfectly formed crater. At the top the diameter was about 400 yards across, at the bottom 200 yards." In contradiction to these statements he said on page 48: "sulphurous fumes rose from the lip and pieces of sulphur lay about . . ."

While nothing shows that Dr. Julien "walked over" to the true crater, it is certain that Dr. Reusch, who knew the crater well, noticed nothing unusual at the place mentioned in the hut-book by Tilman. Does this mean that in a short space of time alternating phases of rest and activity of the crater have taken place? Insufficient evidence of this is available, for the reports are too vague.

The above quotations from the literature show that during the last fifty-three years (between 1937 and 1942 no data are yet available), there has been little or no evidence of activity of Kibo.

Incidentally, some points in one of the ancient legends of the Wachagga, related by Dr. B. Gutmann (1909, p. 2), and mentioned in a slightly different way by Dundas (1924) and by Dr. R. Reusch (1928), suggest that the Wachagga based their tradition on volcanic activity in past ages. In primitive countries, legends *after appropriate interpretation*, have often proved to contain some truth. The legend, mentioned here as a curiosity, says in short that Mawensi, Kibo's elder brother, twice borrowed embers from Kibo's hearth, thereby disturbing the latter in its occupation of stamping dried bananas (possibly an allusion to rumbling noises from the then active Kibo, R.). Each time, the fire went out on the way to Mawensi (possible reference to the last lava streams rolling down at night on Kibo's eastern flank, or the glowing fire of the then, perhaps, active, red hills situated roughly between Kibo and Mawensi, as viewed from below by people, who did not venture far into these high, hostile regions). The third

time, Kibo in an access of great fury, gave Mawensi a shattering blow with its heavy pestle (doubtless an allusion to the eruption cloud which often takes the form of such an implement: subsequently, this cloud could have enveloped both mountains, while a great eruption with earthquakes from which Mawensi's crumbling edifice emerged in a still more shattered and jagged condition, developed*).

So much for evidence in the past.

3. KIBO'S FUMAROLIC ACTIVITY IN 1942-43.

In a letter to the editor of the *East African Standard* of the 17th July, 1942, P. J. Sinclair of Moshi suggested on the basis of reports received by mountaineers who had climbed Kilimanjaro recently "that Kilimanjaro is not altogether extinct, but still retains a modicum of activity in the crater proper . . ." "A very unpleasant and nauseous smell had been noticed when a descent was made into the crater, and an intermittent steamjet noticed in a fissure about 30 feet under the top of the inner slope of the crater . . ."

This statement was made after A. J. Firmin's visit to the northern crater on the 1st of July, 1942, on which occasion some very good panoramic photographs were taken which were on display in November, 1942, in the Coryndon Museum, Nairobi.

These interesting facts decided my first visit to Kibo. On August 28th, 1942, following so many others, I had the privilege of reaching the highest point along the south-east and south ridge, Kaiser Wilhelm Point, which, apart from the immediate view of the caldera, is devoid of interest. On the way up, shortly after having passed Stella Point, a familiar noise, which seemed to come from the steep caldera wall under H. Meyer Point (Fig. 5) and recalled distinctly the typical hissing noise of steam fumaroles, made me investigate this part of the caldera. Soon it was plain that the noise of a strong wind moving round from south to east along the caldera wall, running through holes and against rocks, was the cause of this phenomenon. When descending from Kaiser Wilhelm Point into the caldera bottom about 600 feet below, the absence of any fumaroles in this part of the caldera which I crossed from south to east became unmistakably clear. Passing near the so-called "Ice Dome" or "Eisburg" (Ice Castle) of the old German maps, it was evident to me that this block of residual ice had suffered from further intensive melting since Geilinger's visit in 1935 (Geilinger, 1936, p. 18). It was greatly reduced in size, most of the lower, eastern part as well as the western part having vanished. Two small, isolated fragments of ice on the east and a series of ice-needles in the west, indicated the places where these parts of the glacier ended, only seven years ago (Figs. 4 and 6).

Elsewhere in the caldera the damage done by time was less evident as freshly fallen snow, frozen hard, still covered the ground. Denudation on the low side of the south-east caldera wall had become somewhat greater and marked erosion had occurred on the eastern ridge of the northern ice barrier, near the most northerly notch.

These changes which had developed since 1935 seemed to me to have been due principally to meteorological causes, that is to say: a predominance of solar radiation and sublimation over precipitation during recent years. As mentioned above, no signs of volcanic activity were found anywhere.

*The genealogical tables of Chagga chieftaincy (Eva Stuart Watt and Dundas) and the principal events of Chagga history show that they have not occupied the slopes of Kilimanjaro for more than 300 to 400 years.

It was 1 p.m., when Johannes Notch was reached again. Porters who were supposed to bring up a sleeping bag and food failed to reach Gillman's Point and it was considered inadvisable to spend the night without shelter in these icy regions. The temperature, which during the morning was round about 32° F., fell quickly to 5° F. below freezing point as soon as the clouds gathered. Time being too short for a crossing to the northern eruption cone, further exploration had to be put off to a later date.

A little more than a month later, on October 9th, I climbed the toilsome screes above Kibo hut once more (Fig. 7) with three willing porters marching in front this time, instead of behind.

The lava outcrops on both sides of the scree consist of trachydolerite, and are subject today predominantly to strong erosion through frost, as can be seen by the neatly separated crystals of anorthoclase lying about. It seems, when examining a rock sample, that the melting water infiltrating between the phenocrysts and the matrix functions as a wedge when re-freezing takes place. It is possible also that owing to differences in hardness and elasticity, the glassy or obsidian-like matrix of some of the rocks, and the phenocrysts, respond in different ways to the repeated changes of temperature and in this way the peculiar disintegration is facilitated. Where the slopes are sufficiently steep, the loose material of the screes seems to move slowly down through the alternate freezing and melting of water and snow.*

No distinct striae, similar to those exposed so beautifully one hour above Peter's hut at about 13,000 feet (Fig. 8), were noticed on neighbouring lava streams. They have probably disappeared through weathering. The whole of the eastern flank of Kibo was once covered with glaciers; a number of boulders, resembling erratic blocks are scattered widely on the saddle-plateau (Figs. 9 and 10). Glacial valleys and ancient moraines have been altered by subsequent desert erosion. In the past struggles between the ice and fire of Kibo and the mud-flows which must have occurred along its flanks have contributed, together with the erosion products of Mawensi, the ejecta from the fairly recent red hills south-west of Kibo, and the still downhill-creeping stone-wastes, to fill up the once much deeper valley between the two mountains.

Johannes Notch was reached in four and a half hours, and a camping place found under some overhanging rocks beneath Gillman's Point (Fig. 4).

There is no doubt that the cauldron or caldera of Kibo has been caused by subsidence. Klute's argument (Klute, 1920, pp. 69-70) that the lavas of the outer slopes could not have flowed upwards from the lower level of the actual cauldron is clear and needs no confirmation. During a great eruption, which may have left a mass defect in the reservoir of magma, possibly due to an exhaustive emission, the formerly higher top sank and disappeared. If the caldera had been formed by the mountain top blowing up (this is how certain authors explain the formation of calderas), thick layers of debris would be found on the actual caldera rim or in its neighbourhood, and this is not the case on Kibo.

The caldera has sunk somewhat in the northern quadrant of the former summit. Its rim is highest in the south and east, lowest in the west where the great barrance is found. The caldera bottom is uneven, the lowest parts are in the east and south, the highest in the north-west quadrant where the eruption cone is situated. The lower parts are not flat but show an irregular surface, the results of the latest eruptions.

*A petrographical description of the rocks of Kibo did not materialize owing to the difficulty of obtaining the necessary slides and chemical analyses and has been postponed.

It occurred to me on the afternoon of the 9th October, 1942, when examining some of the holes and depressions south-west of Johannes Notch mentioned by Mostertz (Figs. 4 and 6), that some of the deepest holes may be remnants of old secondary ephemeral craterlets, partly filled with debris of later eruptions and by subsequent erosion.

Ancient fissures may have re-opened or new ones appeared under the influence of greater activity of tectonic or magmatic origin. Such fissures may have initiated the formation of cavities in the past or assisted in the unequal melting of the ice through the heat that escaped from them. Manifestations of this kind, however, were *definitely absent* in October, 1942* When situated on impervious ground, these hollows contained frozen pools, but over porous layers the melting water was absorbed during the day before re-freezing of the surface took place in the evening.

Local wind currents and snowdrifts, related to the irregularities of the caldera rim and its inner topography, have also, to some extent, contributed to the variable thickness of snow and ice deposits. On both visits, October, 1942, and February, 1943, while the prevailing breeze blew from the north-east, it appeared to come from the west. Snow gauges or better, "Mougin" totalisators as used in the Swiss Alps, put up at different points across the caldera could give indications as to the precipitation on the higher parts of Kibo.†

The thermic influence of the bare, dark and heat absorbant spots, once these have appeared, as emphasised by Jaeger and Geilinger, cannot be underrated. They form a strong melting agent, for their radiations have an important effect on the surrounding ice.

On the night of the 9th to 10th October, the temperature went down to 22° F. Not so much hardship was caused by cold as by the fact that on account of the high altitude very little food, only glucose and water, could be kept down. On the 10th, an early start was made in the direction of the northern crater. The snow-fields in the caldera, which a month before were level and provided easy walking, had undergone a great change and nearly the same fate as had overtaken H. Meyer befell me. The frozen and brittle slabs of ice, 1 to 2 inches broad and separated by $\frac{1}{2}$ to 1 foot wide and in many places 3 feet deep, S.-N. ruts, the "Nieve penitente" (Fig. 12), made the going very difficult. To avoid wedging, a zigzag course was taken, first to the west, then to the east and north, choosing when possible the few bare places. After three hours of tortuous steering in the direction of the crater, which is only three-quarters of a mile away, without (unfortunately) encountering any melting due to volcanic activity, the cone was reached at last.

The east and north-east side of the half-bare surface of the outer slope of the cone was curiously marked with terrace-like undulations, more or less parallel with the contour lines. Stones had collected to form irregular alignments or garlands, while between, in the depressions, only fine material was found. These reticulated figures are due probably to the alternate pushing and contracting of freezing and defreezing whereby separation of the material according to size takes place. They are different

*Stress is laid upon this point because of some misleading statements of Huxley in a letter of 28th December, 1942, in the *London Times*, reproduced also in the *Illustrated News* of 16th January, 1943, where a photograph taken near Johannes Notch is described as being one of the crater which obviously was never visited.

†These instruments being unavailable at the time, on the second ascent after having consulted Group-Captain A. Walter, B.E.A.M.S., Nairobi, I took up and installed four ordinary totalisators at respectively 7,200, 9,200, 12,500 and about 16,000 feet (Kibo hut) (Fig. 11) to obtain a general idea of the precipitation on Kilimanjaro's southern flank.

from the "polygonal" figures of the saddle plateau, described by O. Fluckiger (1934, p. 358); but due to similar causes and are known from arctic countries.

The last, somewhat steeper, outer slope on the south-east side was slowly traversed in a mood of scepticism as to what the crater would reveal. However, the reward for the past struggle was immediate as soon as the top (about 400 feet higher than Leopard Point according to my aneroid) of the outer crater rim was reached.

The crater practically free of snow lay before me in all its splendour (Fig. 13).

The first and highest rim, on which I stood, was circular in shape, and gave a clear view of the second semi-complete ring-wall from south to north-west, and the third, central, inner rim encircling the crater pit: a morphology in strict conformity with the gradually-diminishing activity of Kibo. Close by, on the side of the first inner slope, four solfataras were sending noiseless fumes into the air. A sulfurous smell hung about.

The first inner slope in its eastern part consists mainly of fine material, scoriae, lapilli and ashes with but a few volcanic bombs. No figures, as noticed on the outer slope of the cone, occur here. After descending to the first level, soft, warm spots with some sulphur deposits were passed (Fig. 14) near a lava stream of prismatic structure (Fig. 15). Leaving on the left the second wall which stretches from the south and turns to the north-north-west, indicating a shifting of the eruption point to the north-east not long before the last eruption, I climbed a small slope which led to the inner pit or vent. This orifice, a nearly-perfect, round funnel about 300 feet wide and 200 feet deep showed in its northern upper part, remnants of lava from one of the last eruptions. From this lava-mass a "gendarme" or lava pinnacle about 30 to 50 feet high (Figs. 16 and 17) protruded on the crater-side.

The last eruption, of Strombolian type, consisted of explosions scattering the solidified lava which at intervals filled the crater, possibly forming lava lakes, followed by subsidence due to receding of the magmatic column, as is shown by the regular, horizontal strata of lava about 10 to 15 feet thick which form part of the inner walls of the pit. Similar layers of lava alternating with tuffs are visible in the first ring-wall on the west side, the north side and near the eastern fumaroles. The young eruption cone, as well as Kibo itself, built up alternatively of clastic ejecta due to explosions and lavas, but predominantly of the latter, is a cone of the mixed type or typical *strato Volcan* (Sketch 1).

Though it is perhaps possible with some difficulty to descend into the pit from the east side, this aspect does not present so much interest as the bottom, which consisting of loose material, can be seen clearly from the rim.

The whole titanic landscape is one of striking freshness. It is possible that the caldera was once covered by an icecap but it is doubtful if it has spread over the whole crater since the last eruption. An ice-cover would, only up to a certain point, have played a protective role on the configuration; it would, also, by its movements have worn down the slopes by abrasion. No sharp rims of soft material could have resisted its obliterating influence. The lava peak in the crater, obviously a body injected between older lavas and owing its growth to subsequent erosion of the surrounding lavas, would have been torn away to the depth of the crater if grinding ice-masses had descended along the slope behind it.

The abrupt ending of the northern ice-wall, the gaps and chunks in the neighbourhood of the crater, the horizontally-banded ice, may arouse

the suspicion that the ice melted *a posteriori* (Jaeger, p. 169); the sudden drop of the frontal part of the glaciers, however, is the criterion on Kibo. This drop is due to the combined actions of the strong solar radiation, of the bare rock in front of the glaciers, and of the protective snow-cover at their apex (Jaeger, p. 185). Fig. 18 shows these features as they occur along the northern ice-wall from beneath which Fig. 19 was taken.

As for the crater, we can only point out that no evidence that ice has covered the whole of it exists today. Nowhere is alteration caused by ice visible. This leads one to suppose (all the more easily now that the potential activity of the crater has been demonstrated) that, ever since the last eruptions, the cone has been under the influence of a high geothermic gradient, preventing, at least over the greater part of it, persistence of ice or snow. Naturally, the effect of the sun and the sheltered position of the crater are additional, contributory factors.

The fumaroles.—The four eastern fumaroles, already mentioned (Sketch 2♂) were found in curiously shaped, semi-elliptical, dark, damp spots. The fumes consisted mainly of steam with some SO₂, and issued from several small fissures in the old underlying lava. They showed a temperature from north to south of 85°, 102°, 94° and 83° C. respectively. Firmin assured me, and his photographs prove, that in July, they were absent.

The small steam-jet seen by Firmin in July, somewhat to the right of the pinnacle's foot, was still active in October, when thin vapour was seen escaping from a fissure.

The soft, warm spots mentioned as present at the bottom of the first slope, where crystalline sulphur was found, showed a temperature only 55° C.

Two other fumaroles were seen on the north side, one, a few hundred feet to the left of a small lava peak on the highest ridge, the other near its bottom.

Yellow, sulphur deposits, in which temperatures varying between 55° and 60° C., were found occurred to the west along the second ring-wall as well as to the south along the same wall. This sulphur was deposited several years ago, as it is to be seen just above some snow in Mittelholzer's photograph No. 119 taken in 1930.

No gases of suffocating character such as CO₂ or H₂S, which often accompany the low temperatures of volcanoes in the solfataras stage, were noticed. There was some suspicion that CO₂ might have been responsible for the dizziness felt when measuring temperatures in the lower part of the first rim; but its presence could not be confirmed by a candle test, and the indisposition was probably caused by fatigue and altitude. This gas, which has caught unawares not only people ignorant of its existence, but also experienced surveyors working on volcanoes in Java and elsewhere should never be overlooked. It appears now here, now there, sometimes in well-known places where it has not been found before, but usually in depressions, ravines and at the bottom of craters where it may reach heights, varying up to several metres.

On the 2nd February, 1943, on a second but shorter visit to the crater *via* Leopard Point (Fig. 20), the caldera was found practically free from neveglacier and provided an easy crossing. Instead of a few fumaroles working in different parts of the crater there were whole groups of them. On the inner, south flank, from the second terrace to the top, two-thirds of the slope was alive with fumes (Sketch 2). Four main groups of fumaroles consisting mostly of small solfatares could be discerned. They are called here 6, 7, 8 and 9, while from west to north on the second rim another two groups occurred: 10 and 11 (see Sketch No. 2♂).

In addition to the main fumaroles mentioned above, the southern groups contained a quantity of additional, smaller areas, where emanations of steam and sulphurous fumes escaped from various and variable small cracks. The temperatures usually were about 60° C.

Groups 10 and 11 on the second rim were more or less in a line, and situated near or in older sulphur deposits.

The fumaroles 1-5, of my previous visit were still there. Nowhere in the crater could really-high temperatures be found.

So we see, that a definite increase of thermal activity took place between October, 1942, and February, 1943, the activity being more marked along the limits of the older crater walls. This indicates that, after the lava plug of the central chimney had cooled off to a certain depth, the gases found an easier outlet at its periphery along the boundary lines of the former craters. It is not impossible that further fumaroles occur in the older, semi-buried, south and west ring-walls, which I did not visit.

4. CONCLUSION.

When the existence of older solfataras (as proved by the south and west, second rim, sulphur deposits), is taken into account the slight activity of Kibo in 1942-43, does not enable one to decide whether this activity indicates a reawakening of Kibo, or is merely an aftermath, a final post-volcanic convulsion. Only future observations will show which interpretation is correct.

H. Meyer (1900, p. 335-338) wrote the following on Kibo: "occurrences of intratelluric events of dying volcanism in relation to small hearths of second or third order and their remnants of magma, will find enough internal spaces and refrain from breaking through to the surface." H. Meyer thus circumscribed the life of Kibo to the occurrence of an injection of magma of long ago.

The problem is, however, not merely in relation to a local magma intrusion in the past, and the reactions deriving from its evolution and crystallisation processes. According to Krenkel's (1922) volcano-tectonic map, Kibo lies not far from the centre of the eastern negative zone of gravity anomaly, uncompensated isostatically (-100). Ultimate isostatic adjustments may still play a role in the future, the dominant feature is, however, Kilimanjaro's situation on a tectonic zone of weakness and faulting. Roughly situated on a line east-west *via* "dormant" Meru, Mondul, Burko and Essimngor, it lies at a right angle to the north-south stretching Great Western Rift which, in its depression north of lake Manyara bears the volcanoes: Gelei, Kerimasi, Kitumbene and active Oldonyo Lengai.

Apart from the more ancient tectonic features: Tschatschame scarp to the south, Pangani rift in the south-west, which are formations due to similar causes as the younger Great Rift Valley, several secondary younger fault-fissures or fracture lines radiate from Kilimanjaro's east-west axis, marked by subsidiary outlets or epigones—south-east and south the volcanic subgroups of the so-called Rombo and Kirua-Kilema zones, etc. They all point to the complicated tectonics of this region.

Thus, the life of Kibo, though characterised by a certain amount of individuality, is primarily and foremost contingent on the behaviour of the great earth movements and tectonic disturbances of which ultimately volcanoes are one of the outer manifestations. The fate of Kibo and a departure from its customary attitude depend on what is happening deep in the earth's events. Taphrogenic manifestations, dislocations or readjustments due to tangential crustal tension resulting in volcanism, can however, occur elsewhere.

In the last three months of 1942, according to Group-Captain A. Walter, Chief Meteorological Officer, Nairobi, the seismograph at Entebbe registered more tremors of local origin than in the last three years. In the Masai District, not far from Mondul, seismic unrest followed by landslides causing dustclouds occurred at intervals from November, 1942, to January, 1943. It is not possible that the events on Kibo are remotely connected with the increase of seismic disturbances.

The effects of an eruption of Kibo, without going so far as to predict in the near future such an occurrence for which indications such as premonitory volcanic tremors, sharp rise in fumarolic temperatures, etc., are still absent, are largely dependent on several factors: character and strength of the eruption, position of the vents (either in the old crater or situated on the flank of the main cone) as well as other features such as the presence of glaciers, the morphology of the surroundings, the river systems, etc., on which we shall not insist here.

The solution of some of these problems will be found in the further close study of the bewildering features, only partly disclosed, of the Great Mountain.

NAKURU,
23rd July, 1943.

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Fig. 16. Upper part of the



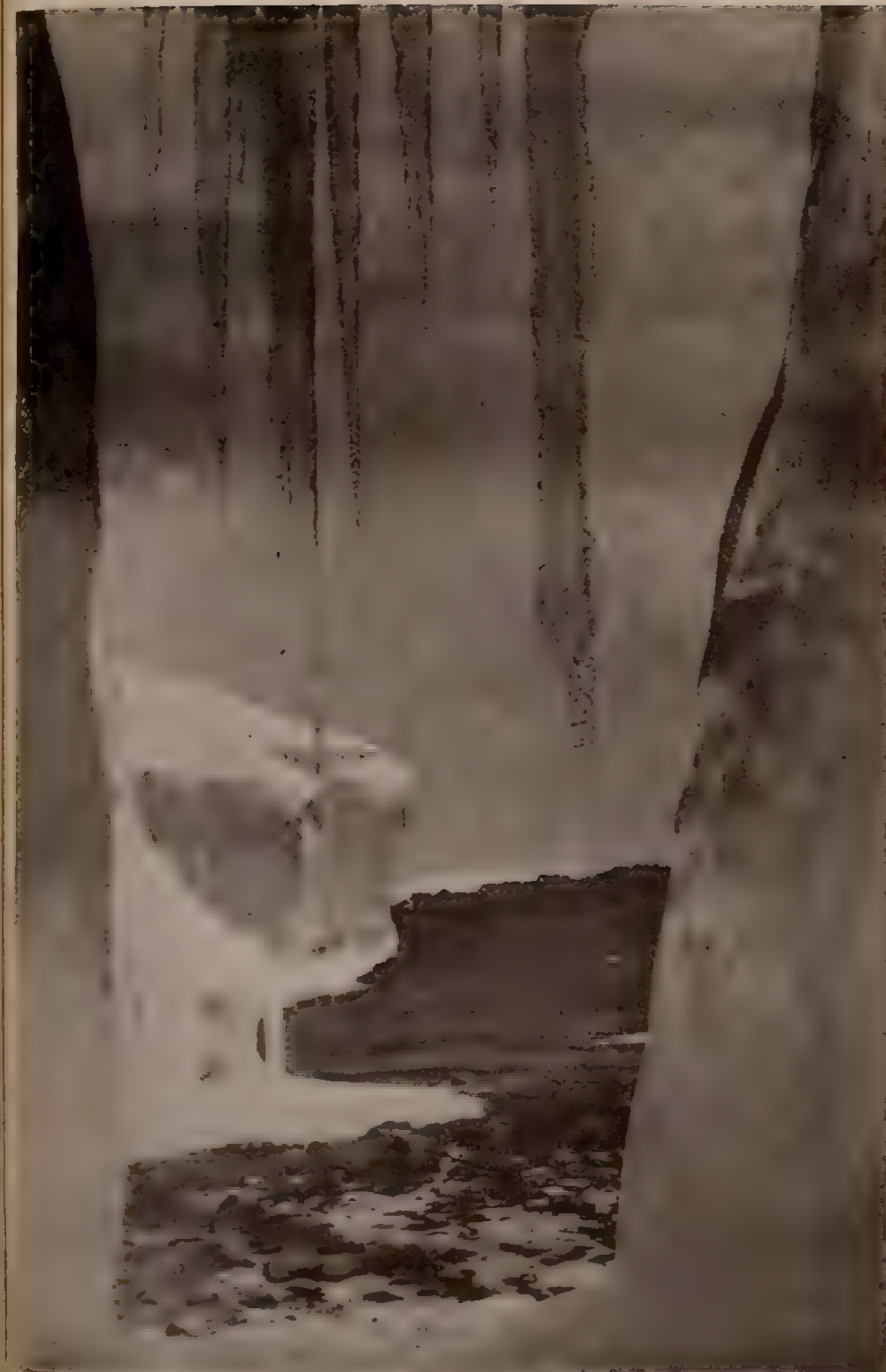


Fig. 19. Ice formations on Kibo along the Northern Ice Wall.



Fig. 16. Upper part of the inner crater taken from the south with protruding lava "gendarme" in the middle.
10 October, 1942.



Fig. 18. Kibo Crater.
1 February, 1943.



Fig. 14. Sulphur deposits, fumarole No. 3.
10 October, 1942.



Fig. 15. Prismatic lava, first floor.
10 October, 1942.



January, 1943.



Fig. 3. Panorama from





Fig. 4. The Caldera of Kibo from under Gillman's Point. K.W.P. on the left. Ice dome in middle. 9 October, 1943.



Fig. 5. Rock and ice formations on the Caldera edge near H. Meyer Point. 29 August, 1942.



Fig. 1a. Kibo the morning after a snowstorm, from saddle. Camp place Spink and author. 30 January, 1943.

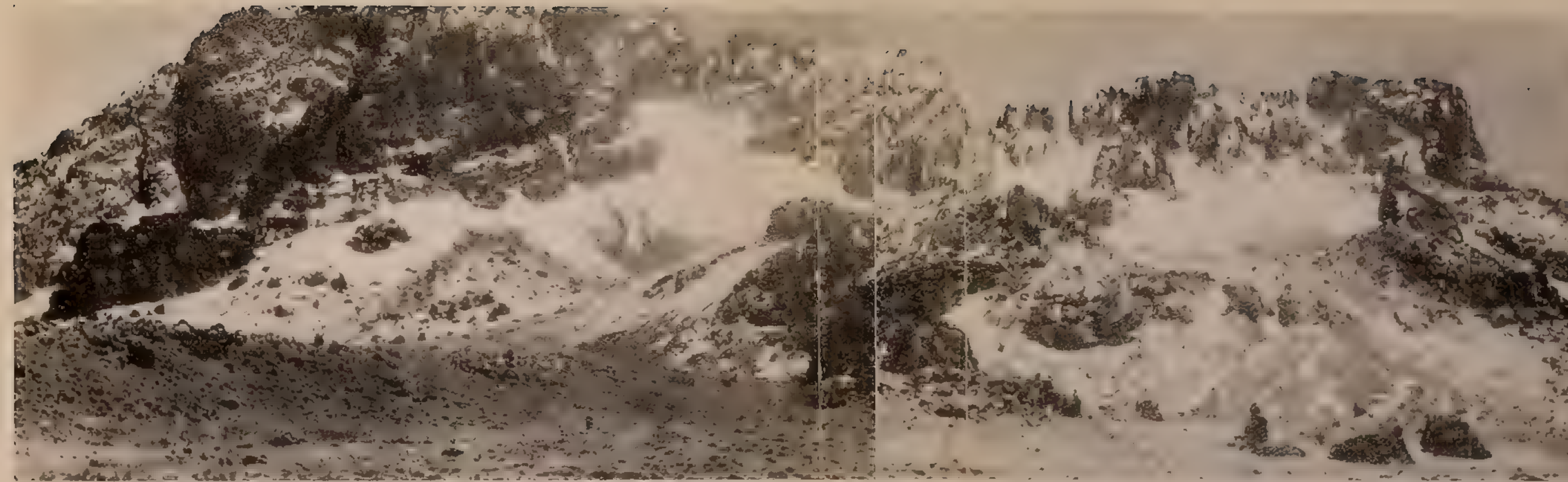


Fig. 2. The massif of Mawenzi from the saddle.

31 January, 1943.

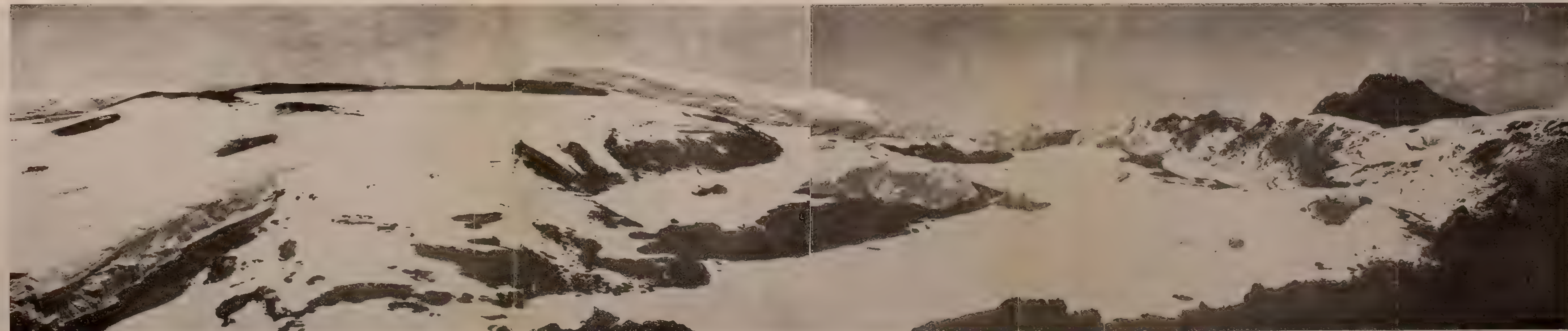
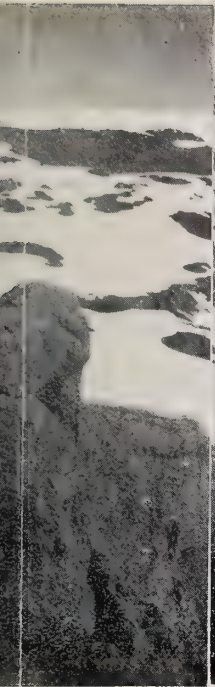


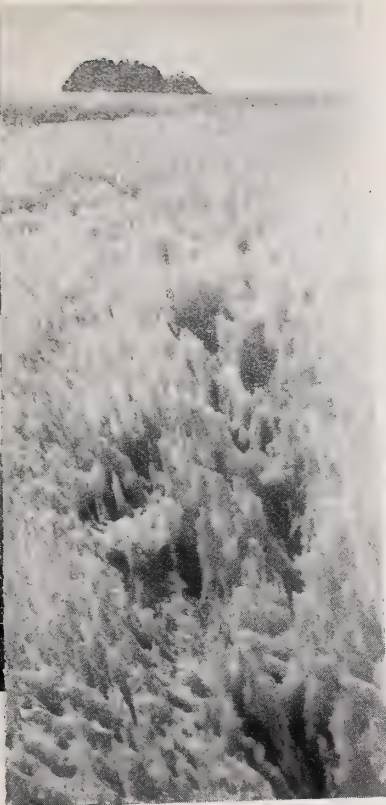
Fig. 3. Panorama from the summit of Kibo. On the left the active cone with (as a black line) the true centre of Kibo. 29 August, 1942.



Fig. 1. Kibo from near Peters Hut, 12,500 feet.
7 October, 1942.



Eruption dome in



2. Nieve Penitente.
10 October, 1942.

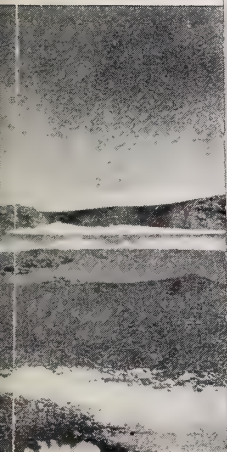


Fig. 13. The crater





Fig. 9. Boulders on saddle plateau.
8 October, 1942, and 31 January, 1943.



Fig. 6. View of the Caldera near Gillman's Point. Ice dome on the left. Eruption dome in the middle (crater not visible) northern ice barrier to the right ending in the most northerly notch.
29 August, 1942.



Fig. 12. Nieve Penitente.
10 October, 1942.



Fig. 11. The "Totalisator" near Kibo Hut at about 14,500 feet altitude, Dr. Stevens (right) and the writer.
31 January, 1943.

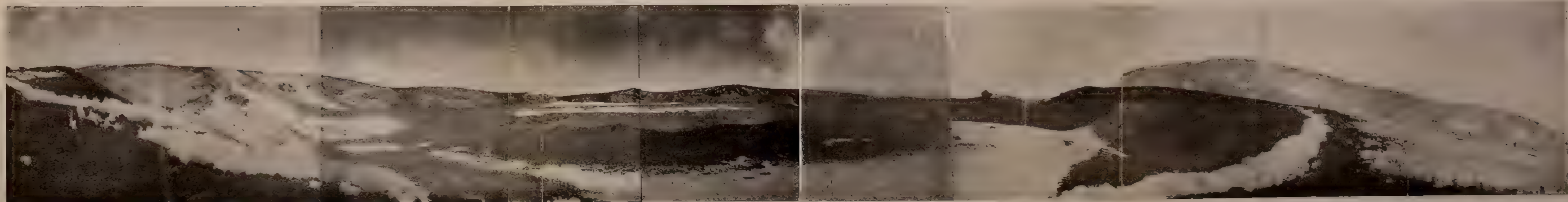


Fig. 13. The crater of Kibo. Fumaroles of Group No. 2 are visible on the inner flank to the right.
10 October, 1942.



Fig. 7. Porters on the scree above Kibo Hut.
9 October, 1942.



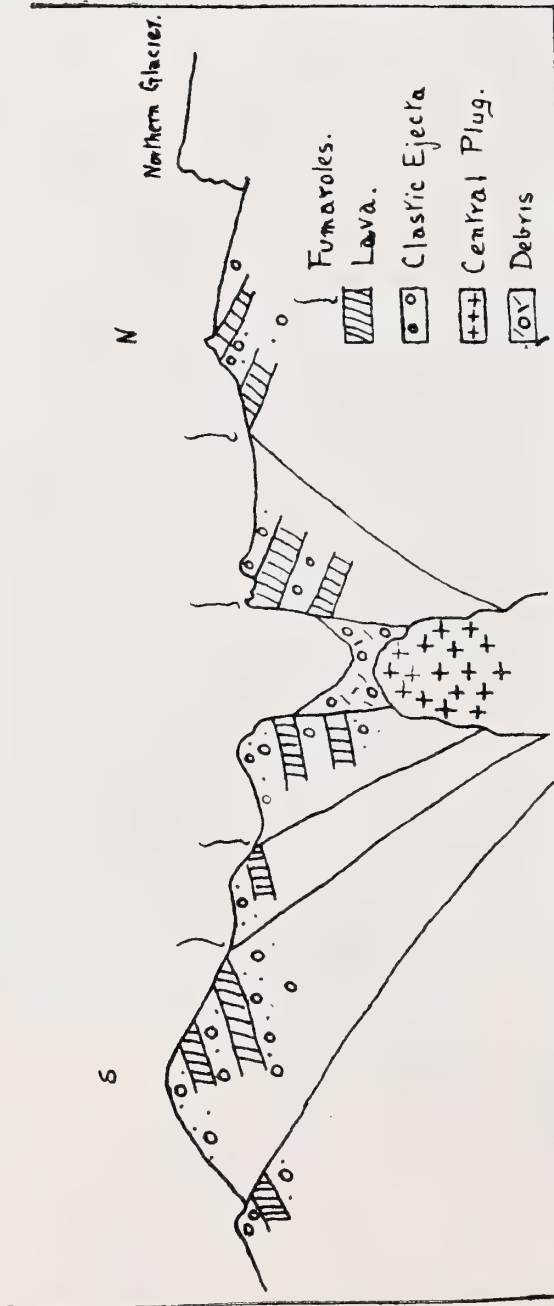
Fig. 8. Glacial striae at about 13,000 feet altitude.
8th October, 1942.



Fig. 20. Icicles from an ice cave on the Northern Ice Wall.



Fig. 21. Dr. Reusch's Leopard after which the notch is named.
10 October, 1942.



Sketch 1. Schematic profile S.-N. of the eruption cone of Kibo. Scale about 1,5,000.



MIOCENE SEDIMENTS IN SOUTH TURKANA.

By F. DIXEY.

From the work of C. Aramburg, V. E. Fuchs and others sediments yielding a Miocene fauna are well-known from North Turkana, while the Turkana Grits of the Lokitaung Gorge, believed to be part of the same series, have yielded fossil wood (*Dryoxylon*) considered to be of Oligo-Miocene age.

In South Turkana, A. M. Champion has recorded a small area of Turkana Grits a few miles east and north-east of Loperot, which lies about 60 miles south-south-east of Lodwar. On a recent geological map these are shown as resting on the Basement Complex along the eastern side, and elsewhere as surrounded by volcanic rocks, here mainly basic. In this area the Grits form white-sided tabular hills possibly 200 to 300 feet in height; they are not capped by lavas, but between this outcrop and Loperot ridge there are lower hills of similar appearance, but interbedded with lavas, while Lodwar ridge itself contains, at the foot, two 6-foot beds of white, mauve, and red more or less ashy grits interbedded with basalt and tuffs. Lodwar ridge is about 200 feet high and consists mainly of basalt. It would therefore appear, in view of the general gentle westerly dip of the sediments and lavas of this area, that the main Turkana Grits series is also dipping in this direction and is interbedded with lavas at the top.

The object of this note is to record the existence of a considerable area of interbedded lavas and sediments south of Loperot which have yielded a Miocene fauna, as identified by Dr. L. S. B. Leakey. These beds form an extension of the Loperot ridge group; they are well-exposed in the vicinity of the road running south from Loperot for a distance of eight miles or more, and over a width of several miles on either side of the road.

The country comprises a flat more or less sandy plain, with patches of volcanic rubble, on which appear low hills a few score feet high and river bluffs exposing alternating lavas and sediments, all showing a just perceptible westerly dip. These conditions extend to a few miles west of the road, where the group passes under the main volcanic escarpment that runs for many miles in a general southerly direction. From the road the sediments of the ridges and the scarp foot are easily picked out by their common bright red colouring, and similar beds extend eastwards also along the southern foot of Loperot ridge.

At a point six miles south of the foot of Loperot ridge the road crosses a stream course overlooked by a striking red bluff about 30 feet high. This consists of faintly-bedded, locally current-bedded, fine-grained sediments ranging from mudstones to marls and fine to medium sands; the colours range from pale grey to pink and red. These beds yield innumerable tortoise scutes and some mammalian remains.

A mile or two northwards of this point along the road, and a mile to the west, across a flat lava rubble plain, there are low hills, up to 200 feet in height, standing out about a mile from the foot of the main escarpment, which is upwards of 500 feet in height. The constituent sediments yield numerous scutes at several points, but around the foot of the highest of these hills they yield also numerous mammalian remains including *Dinotherium Hobleyi*. The hill referred to consists of 140 feet of apparently unbedded, or but faintly bedded, pink, reddish, pale green or grey sandy clays passing to clays at the top, where they are capped by about 50 feet of basalt.

Passing under the lavas at the foot of the main escarpment, about a mile farther west, is a 15-foot band of red very coarse to pebbly friable sandstone followed by 10 feet of hard pale-grey to white thick-bedded, current-bedded, coarse sandstone with sub-angular pebbles closely resembling typical Turkana Grit, except that in the latter the pebbles are usually well-rounded.

There are doubtless numerous other localities yielding additional mammalian and other remains, and there is every reason to believe that this area would well repay systematic examination.



FURTHER NOTES ON THE EARLY STAGES OF HETEROCERA
BRED IN THE NAKURU DISTRICT.

SERIES IV.

By A. L. H. TOWNSEND.

It will be seen that among the species dealt with in these notes are included a number whose larvae feed on grasses. From a series of failures and successes with such species, I have come to the conclusion that two conditions are necessary if they are to be reared successfully from the egg. First, they must be supplied—in their first instar at least, and often in their second—with the dead, withered trash that lies on the ground among the grass-roots. Up to the present, the only exception to this rule that I know is to be found in those moths (e.g., *Spodoptera mauritia*: see Vol. XVI of this *Journal*, p. 214) whose ova are laid on trees or bushes, whence the newly-hatched larvae descend at once to the grass. These larvae will make their first meal of the growing grass, and are not interested in the withered stuff. The second condition is that the food supplied must be damp, or even wet—a condition which is, of course, often fatal to young larvae feeding, in captivity, on other pabula.

SYNTOMIDAE.

Syntomis chrysozona Hmps. n.

FOODPLANT.

Grasses: but will eat *Silene macrostolon*.

OVA.

Pearly, pinkish: laid in deep piles under grassheads, or sometimes on the stem, lower down.

LARVA.

The young larvae lie hid among the dead leaves, grass-trash, etc., on the ground. They feed on this trash, eating it to shreds, and will not touch the green grass. They are very shy: but can sometimes be seen feeding in the late afternoon. When older, they can be found at night high up on the grass stems; but they drop instantly at the approach of a lamp. They live, when not feeding, among the stems close to the ground, and are very difficult to extract, as they burrow right down very quickly. When they have been detected, the best way to obtain them is to dig up the plant of grass, and invert it over a sheet of paper: when the larvae will drop out—often 10 or 15 from a single plant. When young, the larva is black, with a rubbery-looking skin covered with very short dark fur. When full-fed, it is over 1 inch long, tapered to both ends, with dark grey skin, lighter below lateral area and on ventral surface. Narrow raised transverse bands—wide apart when the larva moves—are clothed in rosettes of short, feathery, grey hairs: and there is a double line of "clumps" of shorter, woolly, black fur on dorsum. Head small, red, hairy. Legs brown; claspers pale transparent grey.

PUPA.

Is in a very flimsy silk-and-earth cell, deep down among the grass-stems, almost under ground-level. It is slender, red-brown except on

dorsum, where it is black. Very short fine down on dorsal and lateral areas; and on the ventral side of the last few segments. Spiracles black. A bunch of small hooklets on terminal segment. Duration of pupal stage about thirty-five days.

Thyretes negus Wallengr.

FOODPLANT,
Grasses.

OVA.

Laid on a grass leaf, in a patch containing a couple of hundred. They are spherical, very small, covered with a greyish bloom which very easily washes off, leaving the ova pearly white. They hatch in about five or six days.

LARVA.

Very much like that of the preceding species: but the fur is brown rather than grey, and the head is black, not red.

PUPA.

In a very flimsy cocoon among dead grass. It is very dark brown, with rings of more or less oval yellow ring-spots on abdominal segments, and a line of very small raised dark excrescences on each side of the dorsum. The whole pupa, except wingcases, etc., is covered with short golden-brown down. A large bunch of very short hooks on terminal segment. Duration of pupal stage about a fortnight.

Metarctia rufescens Wlk.

FOODPLANT.

The natural food of this larva is presumably, as with many other *Syntomids*, the trash that lies among the roots of grass. It will feed up successfully on this. But it is very often found in cupboards, posho-stores, and such places: and I find that it will always leave the grass-trash provided, for bran or maize-meal; while I have reared several imagines from half-grown larvae that were supplied with nothing but the mixture of torn and shredded sacks, scraps of bran, etc., from the floor of a rat-infested posho-store.

LARVA.

The larva grows to the length of $1\frac{3}{4}$ inches, and, the thoracic segments being very extensile, can stretch itself out to a good deal longer when walking. Skin grey-brown, covered with a sparse growth of very long, silky, brown hairs, lighter at tips. Head black, large, very shiny.

PUPA.

In a very loose flimsy grey cocoon, at ground-level between two or three grass-stems, or half under a clod of earth; among loose bran on the floor; in the fold of a sack; or spun in the corner of the walls of a store. It is black, stout, very brightly polished. Terminal segment a blunt dome, with a bunch of separate hooks at the end.

ARCTIIDAE.

Estigmene multivittata Roths.

FOODPLANT.
Grasses.

OVA.

The small, spherical, smooth, cream-coloured ova are laid in small patches on the leaves of grass.

LARVA.

When young, the larvae feed on the grass-trash on the ground. Later, they eat the grass itself. When full-fed, the larva is about $1\frac{1}{4}$ inches long, dense black, with transverse rings of many tubercles which emit rosettes of long fur. On the dorsal area this fur is black: on lateral and sub-lateral areas it is bright tawny. The tubercles are grey: but the colour of the fur springing from them makes the dorsal ones appear bluish-white, the lower ones yellowish. Short tawny forward-pointing fur makes a collar round the head, which is large, black, shiny. Spiracles white, legs brown, claspers pale brown. The larva stands with the head held down and to one side. It falls very readily.

PUPA.

Is in a thin silken cocoon on or near the ground surface. Dark brown, thickset. Terminal segment very flat; having in the centre a small group of short stalks, each ending in a sort of rosette of minute diverging points. Duration of pupal stage very variable—from two to eleven months.

Estigmene tenuistrigata Hmps.

FOODPLANT.
Grasses.

LARVA.

When young, feeds exclusively on the grass-trash on the ground. In early-life it is slender, much indented between segments, scantily furred. Very dark grey-brown, with rings of prominent, closely-set tubercles. The pairs of tubercles astride of dorsal line are smaller than the rest. These tubercles emit grey hairs, not very long. There is a paler dorsal thread-line, and a small dark plate on segment 2. Head black. Legs dark brown. Claspers lighter brown. When full-fed, the larva is $1\frac{1}{2}$ inches long, or more. There are whitish dorsal and latero-dorsal lines. Spiracles white. Fur scanty; grey mixed with a good deal of tawny. The larva has a tremendous turn of speed.

PUPA.

Is in a small cocoon of grey silk, spun among the trash on the ground. It is short, stout, dark red: girth at centre greater than that of thoracics. Terminal segment much flattened. At its centre are two short, round processes, covered with minute bristles; and around them stand a few separate stalks, with small flat heads. Duration of pupal stage very variable—from one to eight months.

Sommeria (Digama) aganais Fl̄dr.

FOODPLANT.

Carissa edulis.

LARVA.

Ground-colour when young, grey: when full-fed, dark purplish brown. A conspicuous greenish-white lateral stripe, or wrinkle, expands into broad patches on segments 5, 6, 7 and on the last two segments. On 6 and 7 there is a narrow pinkish dorsal area astride of a black central thread-line. Segment 5 is much swollen dorsally. Each segment has four orange-red dorsal warts, or tubercles, arranged in two pairs: the front pair nearer the dorsal line than the hind pair. On segment 5 these tubercles are larger, especially the two nearer the centre. On the thoracic segments the tubercles rise from an orange-red swelling on each side of the dorsal line. All the warts, and others in the lateral area, emit single bristles. The body tapers considerably from segment 5 to head, and from segment 6 to anal end. Ventral area green. Head small, black. Legs pale yellowish, claspers reddish. The larva sits on upper side of a leaf, with head and thoracics bent sharply to one side.

PUPA.

Is in a very thin web in a partly rolled leaf. It is brown, with a bunch of fairly long hooks on the dorsal edge of the terminal segment. Duration of pupal stage about six weeks.

LASIOCAMPIDAE.

Bombycopsis conspersa Auriv.

FOODPLANT,

Hypoestes verticillaria.

OVA.

Nearly spherical, dirty white, with either a pale greenish or a faint reddish tinge: splashed and spotted with greenish (or reddish) markings. A nearly black micropylar spot. Laid in clumps of from ten to twenty on stems of foodplant. Much subject to parasitisation by a small fly.

LARVA.

When about half-fed the larva is about $1\frac{1}{8}$ inches long. Dorsal area black with a pale crossbar behind the centre of each segment. This area is separated from the dark grey lateral area by a narrow stripe consisting of an ochreous line with reddish patches in it, a black space, and below this a pale grey wavy line. A row of short white tufts point upwards from this stripe: and a thin white fringe, springing from it, lies close to the body between the tufts. Below the stripe each segment has a small ochreous tubercle with black centre. These are more pronounced on the thoracics. Lateral area dark grey with much tawny fur, so arranged that the black skin shows through in diagonal stripes. Very hairy leg-lappets, and hairy sub-lateral tubercles on segments 5, 6, 11 and 12. The bases of the claspers also emit tufts of long greyish hairs mixed with tawny. On segment 3 and 4 transverse dorsal folds show dark orange-red slips when the larva is extended. Claspers ochreous, with a black streak before and behind. Ventral surface black with two yellow stripes, and yellow crossbars

between segments. Seen from above, the effect of the pale transverse bars and white latero-dorsal tufts is to make an apparent dorsal pattern of broad-arrows. Head velvety black, with a fringe of whitish hair pointing forward over it from segment 2. The above description holds good for the full-fed larva, except that the lateral stripe is a wide ochreous line with two thin wavy yellow lines below it, and that the slips on thorax are darker: almost crimson. The length of the full-grown larva is up to 2½ inches.

PUPA.

In a curled leaf, or between two leaves. Dark brown, wing-cases black. Yellow at segment-joints. Except the wing-cases, the whole pupa is covered with a fairly dense crop of short yellow-tawny hairs. Terminal segment short, with two patches of the tawny hair, and a large semi-circular patch of many short brown hooks on the dorsal side. Duration of pupal stage variable—from fourteen days.

Taragama sodalium Auriv.

FOODPLANT.

Acacia abyssinica.

LARVA.

When full-fed, is 3 inches long. Stout, rather flattened below. Ground colour buff, with complicated dorsal pattern of reddish-brown marks, almost shield-shaped, having a grey outer edge. At the widest part of each shield is a pair of small grey latero-dorsal tubercles, and a smaller pair behind them on each segment. On segment 12, two grey hairy dorsal tubercles rise from a common base, and on 13, are two smaller separate ones. The two dorsal slits on the thoracic segments have blue-black extensile cushions, the second one having behind it a prominent central tuft of blond hair. The leg-lappets carry hair of a more reddish colour. The lateral area has a pattern of black and red-brown lines, very difficult to describe. At the forward and hinder ends it approximates to a XX formation. All segments have sub-lateral tufts of blond hair. Ventral surface reddish-buff, with a black central line of irregular width. Head dark grey, woolly, with black markings.

PUPA.

Is in a long spindle-shaped cocoon of harsh greyish silk, on twig or trunk. Duration of pupal stage is about twenty days.

Gonometa postica Wlkr.

FOODPLANT.

Black Wattle and *Acacia* sp. var.

OVA.

Smooth, spherical, dead white except for a grey micropylar spot.

LARVA.

When full-fed, this heavily-furred larva may reach a length of 5 inches. It is stout and rather flattened; and the fur, which except round the head and on segment 2, points downwards and backwards, has a "combed" appearance, with a wide parting running along the dorsum. In this parting

is a narrow black, grey-edged stripe. Six broad-arrows, their points forward, form part of transverse black bands; but these are almost hidden in the fur, which is a mixture of grey, brown, and silvery-white; the brown hairs having sometimes a slightly pinkish tinge. The general effect is dark grey. On each side of the dorsal line stand diverging tufts of coarse blue-black hair; those on the thoracic segments being larger than the others. The dorsal fur on thoracics is tawny, mixed with blue-black. The head is very hairy, with tufts of long chalky-looking plumes projecting round it from segment 2. Similar but smaller sub-lateral tufts occur on all segments. Legs and claspers are hidden in thick grey tufts. Spiracles ochreous, in black patches, with a whiteish tuft behind each. Legs red, claspers black. Round the anal claspers are bunches of short white plumes.

PUPA.

Is in a tough oval cocoon on stem or trunk. The cocoon is brownish or greyish, dusted thickly with white, and with a few irregularly placed black tufts. It is covered with short black and brown urticating hairs. A very small cocoon for so colossal a larva. The pupa is black, horny. Terminal segment ends in a short dome, its end covered with short, reddish spiky bristles. Duration of pupal stage is three or four months.

Olyra sublineata Wlkr.

FOODPLANT.

Various grasses. In the first two instars, the larvae feed only on the grass-trash on the ground, and will not touch the green grass.

OVA.

Roughly spherical: bright red-brown. Laid in small batches on the stalks. Hatch after about ten days.

LARVA.

The young larva is black, tapering slightly from front to back. A double, wavy, "old-gold" dorsal line encloses white spottings. Nine orange lateral spots, the central five larger, are joined by a faint wavy yellow line. Lateral area dark grey, with a black patch surrounding each of the orange spots. Grey lateral fur. Thin dark pencils on segment 2.

When full-fed, it is over 2 inches long, stout, tapered front to back, not very furry except in lateral and sub-lateral areas. Black: with a dorsal stripe consisting of a double wavy old-gold line enclosing two uneven, very pale, narrow yellow lines. This stripe runs the whole length of body, ending in a point between anal claspers. Dorsal fur scanty, yellowish. The interrupted old-gold latero-dorsal line has nine small but conspicuous white spots: seven above it, and the front two (on segments 3 and 4) below it. Below this line, the black colour merges into a pinkish-grey lateral stripe, beneath which are the white spiracles, with a wavy irregular gold line below them. This area is clothed in fine but dense down-pointing grey fur. Head blue-black, hairy, with a thin hair-pencil pointing slightly forward on each side of it from segment 2. Mouth parts yellow. Legs bright red. Claspers black with a pale streak. Ventral area dark grey, with a chain of white central dashes.

PUPA.

Is in a long oval cocoon among grass heads. Duration of pupal stage is from two to four months.

Pseudolyra divisa Auriv.

FOODPLANT.

Grasses: many species.

LARVA.

When full-fed, is $2\frac{1}{2}$ inches long, tapering considerably from head to anal end. Ground-colour greenish yellow, much speckled with black. Short pale bristles all over the body, particularly round head. Four conspicuous white longitudinal stripes, latero-dorsal and lateral. The latter are much wrinkled. Below the latero-dorsal stripes the black irroration is denser, and just above the lateral ones are vestiges of short black diagonals, the first three being more conspicuous. Below the lateral wrinkle is a good deal of whitish fur, pointing downwards. When the larva moves, a sort of double vertical fold, brownish, appears on each segment above the lateral wrinkle. Ventral surface greenish, much wrinkled. Black spots on either side of the second and third pairs of legs, and a black transverse line on the front part of segment 2. Three whitish transverse marks before, behind, and in the middle of the ventral claspers.

The larva sits head-downwards in the grass, and becomes very active after rain, when it dashes about drinking up an astonishing quantity of raindrops on the grass.

PUPA.

Subterranean. Duration of pupal stage is two months.

LYMANTRIIDAE.

Laelia entricha Collenette.

FOODPLANT.

Grasses.

OVA.

Laid in single rows, from $\frac{1}{4}$ to $1\frac{1}{2}$ inches long: or sometimes three or four rows are laid one on top of another, each row shorter than the one below it. The ova are joined together, and are rectangular, but have the upper corners rounded off. Colour, pale, dull straw. Hatch about the fifth day.

LARVA.

The young larvae eat the grass-trash on the ground. Later they feed on the grass itself. The half-fed larva is black, thinly covered with pale tawny fur. Conspicuous bluish-white lateral patches, the central ones having a yellow stain in their hinder half. Segment 5 has a thin reddish dorsal tuft. Sub-lateral stripe grey, with a pinkish edge. Spiracles white, in a black line with short yellowish inclined lines along its upper edge. Head black, with many yellow metallic spots. Ventral surface black: legs red-brown: claspers red.

In the final instar, it is over 1 inch long. It has now four wide, compact dorsal brush-tufts of a dark tawny colour. Just below the spiracles is a reddish line. Thick grey fur all over body, rising from fairly large oval tubercles, which, on the thoracics and segment 12, form transverse rings. On segments 10 and 11 are central studs, translucent white, like crystals.

PUPA.

Is in a large, almost transparent oval cocoon on a grass stem. The pupa is dark brown: eye- and antenna-sheaths very prominent: small tufts of greyish hair on head, and sparse fur on abdomen. On the dorsal side of the terminal segment is a long, tapered, wrinkled shank, ending in a bunch of very many very short hooklets. Duration of pupal stage is from eight days to three weeks.

Laelia xyleutes Hmps. n.

FOODPLANT.

Various grasses: seem to prefer "Watergrass," (*Cyperus* sp.).

OVA.

Spherical, grey. Scattered loose: but each one coated with anal fur.

LARVA.

During the first two instars, the larvae lie hid in the grass-trash on ground-surface, and eat it to shreds. They will not touch the green grass. They are uniform greyish-ochreous, and very difficult to see on their food. The full-fed larva is $1\frac{1}{3}$ inches long. Segments 5 and 6 are of greater girth than the rest. The four dorsal brush-tufts are brown-topped, white-sided. In front of them the dorsal area has complicated markings of black and gold, with a black thread-line in the centre. Behind the brush-tufts the centre of dorsum is orange-golden; there being an amphora-shaped patch of this colour on each segment except the last two, with a transverse linear golden mark in front of each segment-division. Inconspicuous dorsal studs on 10 and 11, the same gold colour as the patch from which they rise. On the last two segments the orange colour is divided by a central black thread-line. Lateral area dark grey, with a lateral stripe consisting of two interrupted lines: the upper being a series of slightly oblique orange dashes, and the lower of scarlet ones. Below this—and the ventral area—grey. Rings of grey tubercles emit long but scanty hairs, grey mixed with black. Thin black pencils on segment 2. Legs red, claspers pinkish, head black.

PUPA.

Dark brown, showing yellow at segment-divisions. All segments are slightly hairy: the head, and dorsal area of thoracics particularly so. Terminal segment ends in a long thin tapered shank, with a bunch of very small hooklets at its extremity. Duration of pupal stage about fifteen days.

Dasychira georgiana Fawc.

FOODPLANT.

Acacia.

LARVA.

When full-fed is $1\frac{1}{3}$ inches long, hairy. Dorsal area rusty red, with four converging tufts of yellowish-white hairs having a few smoky grey hairs in front of and behind them. The first tuft has more of these than the other tufts. Thoracic segments covered with rather long, thin yellowish-white hair. Head bright red. A conspicuous white lateral stripe of irregular width has a wide black area below it. Rings of large yellowish

tubercles emit yellow-white hairs. A thin upright smoky-grey tuft on segment 11. Yellow latero-dorsal lines on all segments behind the fourth dorsal tuft. On segment 10, the four dorsal tubercles combine to form a rectangular greenish-yellow patch. Across this, two diagonal lines of the rusty-red ground colour, meeting at its hinder edge, form a sort of broad-arrow. Just inside the point of this arrow-head is a central greenish-yellow stud. The dorsal tubercles on segment 12 are black. A yellow triangular plate on 13.

PUPA.

In a very flimsy and transparent web, chiefly composed of the yellowish larval hairs, among leaves. It is green at first; later yellow, with the sheaths of legs and antennae vivid black. The wing-venation near the hind margins is also delicately outlined in black. Whole pupa covered with fairly long, blond hair, thick on dorsal side, thinner on ventral. On ventral side of terminal segment is a dark brown excrescence, somewhat globular in shape; and on the dorsal side a long, wrinkled, tapering shank, with a bunch of short hooks at its end. Duration of pupal stage is from ten to fifteen days.

Euproctis torrida Dist.

FOODPLANTS.

Very many: including Castor-oil (*Ricinus communis*), Lantana, sp. var., Acacia sp. var., Peppertree (*Schinus molle*), Sodom-apple (*Solanum incanum*), etc. Imagines from larvae fed on *Ricinus* and Lantana are invariably larger than those from other foods.

OVA.

Are laid in a long patch, covered with grey anal fur, on twigs or leaves. In the case of acacia, they are almost always at the extreme tip of a branch.

LARVA.

When young, is smoky grey, with a double black tuft on segments 5 and 6, and very conspicuous orange studs on 10 and 11. When full-fed, it is $1\frac{1}{2}$ inches long, stout, black and white. The dorsal area is, for the most part, covered with greyish-white fur, which forms a backward-pointing fringe across each segment. Behind (and therefore under) these fringes the skin appears black, naked. The fur, however, on segment 2, and round the head, is dark brown, and points forward; and that on the last two segments is the same colour. Segments 5 and 6 carry a square black patch, with four upright black tufts; and there is another tuft on segment 12. On 10 and 11 are two orange dorsal studs, in black patches. Lateral hair darker grey than dorsal. Red marks in lateral area of all segments. Head black with yellow mouth-parts. Legs and claspers red-brown; claspers yellow-tipped. Ventral surface black, with many yellow markings.

PUPA.

In a rather flimsy cocoon on stem of foodplant. It is darkish-brown, with rather sparse tawny fur. Terminal segment has a long tapering shank, with a bunch of short red hooklets; and there are others on long thread-like stalks springing from round the base of the shank. Duration of pupal stage varies: from five weeks. The hairs of both larva and cocoon are highly urticating.

Stilpnaroma venosa Hering.

FOODPLANT.

Acacia (various species).

LARVA.

One and a half inches long, hairy, fairly stout. Dark brown, with a pinkish dorsal area, and black latero-dorsal lines. On each of these lines, on the segment in front of the first ventral claspers, stands a small black tuft: and there are two very small blue-black tufts on segment 12. Very inconspicuous dorsal studs, yellowish, on 10 and 11. Double rings of oval blue-black tubercles on each segment emit short bristly hairs, mostly grey. These tubercles, on the last segment, are very large and conspicuous. Fur is longer in the lateral area, and round head and anal claspers. Head dark red, with black patches. Ventral surface crimson: legs crimson: claspers crimson with a dark streak.

PUPA.

In a slight web among leaves. It is yellow, polished, with black segment-divisions, black venation, and rings of conspicuous black spots on all segments. Slight downy fur, thicker on dorsal surface, rises from these spots. Cremaster is a long stout shank on the dorsal side of the terminal segment. This shank is fluted and wrinkled, and terminates in a large bunch of small hooklets. Duration of pupal stage is about three weeks.

NOCTUIDAE.

Achaea finita Guen.

FOODPLANTS.

Castor-oil (*Ricinus communis*), and many other plants.

LARVA.

When full-fed, is $2\frac{1}{2}$ inches long, but can extend itself to nearly 3 inches. Ground-colour, yellowish drab, with a slight greenish tinge. Thickly powdered with minute brown markings. Rather stout, tapering in front. Divisions between segments somewhat wrinkled, yellow. Head small, yellow; clypeus brown. Antennae prominent. Two small yellow dorsal tubercles on segment 11, which is slightly humped. A red lateral line becomes indistinct and disappears on the hinder segments. Ventral area greenish, with a black patch between legs, and conspicuous black circles between ventral claspers, and one in front of anal claspers. Legs brown. Ventral claspers three pairs complete, one pair rudimentary. The larva feeds by night.

PUPA.

In a rolled leaf, inside which is a close silk cell. It is purplish brown, covered with a grey bloom. Terminal segment fluted, and with a small bunch of hooks at the tip. Duration of pupal stage about six weeks.

Heliothis armigera.

FOODPLANTS.

Almost any low-growing plant. It is frequently found in the buds of *Antirrhinum*.

LARVA.

One and one-third inches, stout, smooth. Ground-colour may be greenish yellow, or reddish ochreous, with dorsal and lateral stripes consisting of very many fine dark lines. A slight anal hump. Strongly indented between segments. Spiracles black-ringed, the ochreous stripe in which they are situated having whitish top and bottom edges. Area below this is pale ochreous or greenish, mottled with brown. Ventral surface paler. Small but prominent dark warts, emitting short pale bristles, form an irregular transverse ring on each segment. The dorsal pair, in front of the anal hump, are conspicuous, black. Head ground-colour, with a faint white Δ : clypeus black.

PUPA.

Underground, in a very flimsy cell. Red-brown, shiny, rather slender. Cremaster of two long parallel spikes.

Anomis flava Fabric.

FOODPLANTS.

Abutilon indicum, and cultivated Hollyhock.

LARVA.

One and one-eighth to one and one-quarter inches. Slender, bright green, rather transparent. Smooth, except for a few bristles. The dorsal vessel shows darker green, with a central line of faint white dots. Latero-dorsal lines of white dots and short linear marks. Immediately below this dotted line is a dull, cloudy, whitish line; and on its lower edge a line of white dots. A similar, but fainter dotted sublateral line. Transverse rings, two per segment, of small black warts, white-ringed, emit single short pale bristles. Head very pale green, with a few bristles. Legs and claspers pale, transparent: ventral claspers three pairs, but first pair very small. Ventral surface pale green without markings. The larva lies straight out, or with the forepart half-looped, on underside of leaf. Wriggles furiously, and falls without a thread when disturbed.

PUPA.

Is spun in a tightly curled leaf. It is brown, slender, smooth. The terminal segment is fluted and wrinkled, prolonged on the dorsal side into a narrow ridge which carries four stout spikes—the central pair longer than the others. From the same ridge spring a few slender hooks. Duration of pupal stage from fifteen days. May be much prolonged.

Odontestera albivitta.

FOODPLANTS.

Very many, mostly low growing: but I have found it on *Clematis grata* and *Gymna scandens*.

LARVA.

When full-fed, is $1\frac{1}{4}$ inches long, stout, smooth. Dorsal and latero-dorsal area dark greenish brown, mottled with indefinite blackish markings of almost hieroglyphic form. Lateral area almost black, with a stripe of yellowish green. Below this stripe, light green. Ventral area also light green. Head large, transparent yellow: legs and claspers green.

PUPA.

Is in a strong subterranean cell. Duration of pupal stage may be six months or more.

GEOMETRIDAE.

Rhodesia alboviridata Saalm.

FOODPLANT.

Carissa edulis.

LARVA.

When young, is very slender: claret-colour, with green sub-lateral and ventral area. When full-fed is $1\frac{3}{8}$ inches long, fairly slender, slightly tapered from back to front. Colour pale apple-green, with a pinkish flush. The whole body is finely powdered with minute white raised spots. Head deeply bifid, the tips of the sharply pointed lobes claret-colour. A pair of small spikes, similarly coloured, on segment 2. An indistinct reddish-brown dorsal line, powdered with white, has six conspicuous dark purplish-red marks, one at the rear end of each of the six central segments. A pale claret triangle, prolonged almost to a spike, over anal claspers: ventral claspers claret, with a blackish streak. Spiracles black, in a very faint whitish line. The larva is very sluggish: when seriously disturbed it falls without a thread, and stays bend into a slight curve on the ground for a long time.

PUPA.

Is spun in a very few threads between two leaves, or in one curled leaf. Pale greenish brown; abdomen paler, spotted with sparse, small, roughly circular brown spots: those on dorsal side are arranged in pairs astride the narrow brown dorsal line, and emit single dark bristles. Spiracles dark brown. Tip of antenna- and leg-sheath just detached from main case. Terminal segment prolonged on dorsal edge, very narrow in lateral aspect; broad—almost spatulate—in dorsal and ventral aspects; wrinkled longitudinally, with eight separate dark hooks at its extremity. Duration of pupal stage about twenty-one days.

Tephрина deerraria Wlkr.

FOODPLANTS.

Acacia and Black Wattle.

OVA.

Very small, spherical, bluish grey: laid in a sort of fringe at the points of leaflets.

LARVA.

Is exceedingly variable. The following is an attempt to describe it. Length when full-fed is $1\frac{1}{4}$ inches. Ground colour almost any shade of green, brown, or grey: sometimes brick-red: sometimes almost white. All these colours may be found in individuals of a single batch. There are usually six white lateral "splashes," with short black lines below them. These lines are more noticeable when larva is "looped." The dorsal area contains, on the central segments, three, four, or sometimes five square dark marks, occasionally white-edged: and between each two of these a pair of roughly oval marks outlined in black. Conspicuous white and black "eyebrow" marks on head. In a heavily-marked specimen the body has many dark longitudinal lines: but these are often entirely absent. A pair of very tiny reddish tubercles over anal claspers. Ventral area has a white central line for the first few segments: sometimes for its whole

length. The most constant feature is the black lateral lines: but the square dorsal marks are usually discernible. In those specimens whose ground-colour is white, the lateral dashes are the only markings, and the larva has a very curious pallid appearance.

PUPA.

Is brown, with green wing-sheaths, and is in a flimsy cell just under ground surface. Duration of pupal stage about twenty days.

Hemerophila obtusata Warr.

FOODPLANTS.

Peppertree, (*Schinus molle*) and *Tinnea aethiopica*.

OVA.

Bright, rather bluish green, in small groups on the underside of a leaf. In shape like a maize-cob, and covered with regular rows of slight excrescences like the seeds of the cob. On the third day they turn claret-colour, and about two days before hatching they turn silvery grey. Hatch about the twenty-fifth day.

LARVA.

When full-fed, is $1\frac{1}{4}$ to $1\frac{3}{8}$ inches long. Ground-colour variable—different shades of ochreous: perhaps the most common is clay-colour. Fairly smooth: a few short, dark, scattered bristles. Head square: a dark brown patch on the crown of each lobe. A complicated smoky-brown dorsal pattern, including a double interrupted dark stripe, darker on segments 5 and 6, and on 10 and 11. On 7, 8 and 9 a lateral patch of the same colour, with three ochreous swellings around the spiracles. A dark patch between ventral and anal claspers. Ventral surface ground-colour, thickly spotted in black and ochreous: white between claspers. Legs rather long: the base of the third pair much swollen.

PUPA.

Is in a thin cocoon of silk and earth just below ground surface. It is brown, polished, anal end almost black. The terminal segment has a long conical shank on dorsal side, ending in two stout hooks. A few shorter and more slender hooks originate further up the shank. Duration of pupal stage is about one month.

Xenimpia erosa Warr.

FOODPLANT.

Castor-oil (*Ricinus communis*).

LARVA.

When full-fed, is $1\frac{1}{3}$ inches long. Stout, but tapers considerably to front. A complicated mixture of browns. Head very small: very dark brown with an ochreous spot on each lobe. Two extensile latero-dorsal tubercles, Indian-club shape, on segment 6. In front of them a small very dark dorsal patch: in front of that a bright ochreous dorsal mark, triangular in shape, darker edged, with two small warts on its hinder edge. The segment behind that with the "clubs" has two smaller dark tubercles, and latero-ventral swellings: and the next segment a still smaller pair of tubercles. There are various other swellings (particularly in the neighbourhood of the claspers) and various small warts scattered about the body.

Behind the dorsal tubercles the body is lighter in colour, greyish laterally, with dark grey latero-dorsal lines of irregular width. A greyish-ochreous lateral stain extends down the front of the ventral pair of claspers. Legs black: the third pair springing from a swollen, fleshy base.

PUPA.

Is in a small cocoon of thick silk, spun up in a leaf. Duration of pupal stage is about five weeks.

Note.—This larva, particularly in its early stages, can be very easily mistaken for that of *Coenina aurivena*.

Lithina subcurvaria Mabilie.

FOODPLANT.

Acacia (*A. abyssinica* and *xanthophloea*).

LARVA.

About 1 inch long, much indented between segments, which appearance is accentuated by the markings. Ground-colour apple-green, with a yellowish tinge in dorsal area. Latero-dorsal lines conspicuous white, as if enamelled: interrupted. Above these lines is a yellowish stain on all segments: and, on all but the thoracics, a central double dark dash. Yellowish-white diagonal markings with a red or brown linear spot above, and another below each at its hinder end. The latter spot is yellow behind. The upper spots enclose the spiracles. A red-brown stain on the front side of the ventral claspers. A few colourless bristles scattered over the body. Head green, with red-brown cheeks. Ventral surface ground-colour, with a yellow central line and three brown cross-marks.

PUPA.

Subterranean. Brown, rather slender for its length. Viewed from the anal end, the terminal segment shows a number of regularly spaced radial ribs, or flutings. On the dorsal side is a long, slender cone, ending in a very long narrow shank with two short diverging prongs at the end. There is a slight groove down the centre of this shank, as if it consisted of two long spikes close together: but I have never seen them separate.

Scopula (Emmiltis) bigeminata form *fumosaria* Swh.

FOODPLANTS.

Lantana and *Silene macrostolon*.

LARVA.

Length when full-fed, $1\frac{1}{2}$ inches. Ground colour light drab, with darker dorsal and latero-dorsal lines; the latter interrupted. Three conspicuous dark brown lateral spots on the central segments. Sub-lateral area dark grey: ventral, ground-colour with darker spots, and very narrow wavy pale grey lines. A few short pale bristles scattered over the body. Larva is rather slender for its length, and tapers from back to front. It stands extended straight out from claspers, without a thread.

PUPA.

Is subterranean. Duration of pupal stage is one month.

Neocleora tulbaghata Feld.

FOODPLANTS,

Carissa edulis, *Clerodendron myricoides*.

LARVA.

When full-fed, is $1\frac{1}{3}$ inches long. Fairly stout, reddish drab, with wavy lines and other markings of darker colour. There are twin latero-dorsal tubercles on segment 6, darker than the ground-colour. Faint rectangular dorsal patches, redder than the ground-colour, on most segments. The lateral wrinkle is of the same colour as these patches. A dark semi-circular patch on head. Ventral area with a pale central line. Skin smooth: but with a few short, dark, scattered bristles.

PUPA.

Spun in a slight web between leaves. Duration of pupal stage is about three weeks.

Lophorrhacia rubricorpus Prout.

FOODPLANT.

Maerua hochnellii (Kik. *muthigeo*).

LARVA.

One and three-eighths inches long, fairly stout, very slightly tapered from back to front. Smooth: dark sage green: paler below lateral wrinkle, which is yellow with very slight, interrupted, red lower edge, especially on first two and last two segments. On the final segment it forms the edge of a long, narrow triangular anal plate. Very indistinct, wavy, double latero-dorsal lines, dark red-brown. Head paler green than ground-colour, bifid to one-quarter of its length: lobes pointed, tipped with red.

PUPA.

Between two leaves drawn together with a few threads. No cocoon. Drab, very finely spotted with black. Last three abdominal segments very dark brown. Dorsal area covered with very fine short stubble. There is a transverse ring of small black spots on each segment, and dark cloudy marks on the lateral part of abdominal segments. Wing-cases darker than ground-colour: the veins closely spotted with dark brown. Terminal segment drawn out into a very long central shank, flattened in lateral aspect, with a small bunch of hooks at its extremity, and a single hook on each edge of the shank, about one-third up from the tip. Duration of pupal stage is one month.

Chlorerythra rubriplaga Warr.

FOODPLANT.

Acacia xanthophloea.

OVA.

In shape a long cylinder, with one end domed, and the other hollowed out. Pale green, slightly iridescent, finely reticulated. Laid on the edges of leaves. Hatch in about nine days.

LARVA.

Slender; rather snake-like, with large, square head. Length when full-fed is $1\frac{1}{8}$ inches. Bright velvety green above: paler below. A series of white diagonal lines form Vs, with their points forwards on the ventral surface. At the lateral line, every second one of these lines changes direc-

tion, and continues diagonally forward to the centre of the dorsum. The alternate lines stop at the lateral line. From here to the dorsal area the colour of the diagonals is yellow, and there is a pink spot at each end. In the lateral area they have a black lower edge, and in the dorsal area a black upper one. A faint interrupted yellow lateral line, and a still fainter double dorsal one. On the thoracic segments a pink diagonal from the lateral line is continued as a yellow ridge across the front of segment 2, forming a sort of collar. A pink line edges the triangular anal plate. A few short scattered bristles. The peculiar shape of the markings gives the larva the appearance, from above, of being very deeply indented between segments.

PUPA.

Is slung in a very flimsy web between leaves. It is very slender: wing-cases green, dorsum brown-ochreous, with a white central line on thorax. Conspicuous white lateral ridge. Ventral surface greenish-brown. Head prolonged into a bifid "beak," with four hooklets. Terminal segment has a broad flattened shank on the dorsal side, with two stout hooklets and a few smaller ones. Duration of pupal stage is about sixteen days.

Thalassodes digressa Prout.

FOODPLANT.

Castor-oil (*Ricinus communis*).

LARVA.

When full-fed is from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long. Apple green, with faint red transverse lines at segment-divisions. These lines thicken into red maculae on the dorsal line, which is faintly marked in red, more distinctly at the ends. Head deeply bifid, the tips of lobes reddish. Legs red. A reddish anal triangular plate. Claspers green. Skin smooth. Larva tapers slightly from head to anus.

PUPA.

In a curled leaf. It is bright green, paler towards end of abdomen. Terminal segment has a long and very sharply pointed cone on the dorsal side, very much wrinkled, with many fine hooklets arranged on both of its sides. from point to base of the cone. Duration of pupal stage is about sixteen days.

Comibaena leucospilata Prout.

FOODPLANT.

Acacia sp. var., and *Lantana* sp.

LARVA.

When full-fed is about 1 inch long. It is difficult to describe, for it is thickly dressed in scraps of leaves, bark, etc., and only its head is visible. This is yellow, with two pale lines on the epicrania. Its position of rest is that of "looping," so that all the bits of leaves project in all directions.

PUPA.

Is spun up in a few threads among leaves. The larval system of decorations still form an effective disguise, for the larval skin is not completely thrown off. Duration of pupal stage is one month.

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The following are supplementary notes on some species previously dealt with in this *Journal*:—

Coenina aurivena. 13, 127.

OVA.

Butter-yellow, roughly cylindrical, but slightly domed at ends. Length = $\times 2$ cross-diameter. Covered with small depressions in irregular longitudinal rows. On leaves.

Metarctia flavicineta. 13, 169.

OVA.

In shape a wide, short cone, with rounded apex. Very pale green, with finely granulated surface. Scattered loose in grass.

Tathorrhyncus homogyna. 13, 176.

OVA.

Almost spherical, but with a deep micropylar hollow. Pinkish-brown: many raised "meridian" ribs, some simple, some branched. Surface between ribs finely reticulated. On leaves and twigs.

Psalis pennatula. 16, 200.

OVA.

Short barrel-shape, with deep micropylar hollow at top. Shiny yellowish-brown. Finely granulated surface. Laid around grass-stem in patches about $\frac{3}{4}$ inch long.

Omphalucha extorris. 16, 216.

OVA.

Viewed from above, present an ellipse, whose length = $1\frac{1}{2}$ times its width. ($\approx 2\frac{1}{2}$ times height, as seen from the side.) Purplish-red. In centre of upper surface is a slight depression, with reticulated surface. The rest of the ovum is thickly covered with white raised dots arranged some singly, some in pairs. Laid in small batches on twigs.

LARVA.

The young larva is black, with four half-rings of white spots on the central segments.

NOTES ON THE SEA-BIRDS OF BRAVA.

BY M. E. W. NORTH, M.B.O.U

I.—INTRODUCTION.

The town of Brava is on the south-east coast of ex-Italian Somaliland, mid-way between Mogadishu and Kismayu. The coast off Brava is by no means rich in islands suitable for sea-birds, but four are utilized. A description of these islands, working south-west, follows:—

- (1) *Chilani*.—This adjoins the coast, from which it can be reached on foot at low tide, by means of a reef. It is a conical, grass-covered islet, perhaps sixty yards in diameter, crowned by a beacon, with small cliffs on three sides. Roseate Terns (*S. dougalli*) nest here.
- (2) *Maginnis*.—A mile south-west of Brava, the beach curves out to a low spit, where a mosque is situated. This is Mosque Point, a favourite resting-place for terns. A couple of hundred yards from the point, there is a string of coral boulders on a base that dries out at low tide, called Maginnis. Sooty Gulls (*L. hemprichii*) and Roseate Terns nest on the tops of these boulders.
- (3) *Mnara*.—An islet three miles south-west from Brava, similar in size and shape to Chilani, accessible at low tide. An ancient watch-tower is built on the summit. Sooty Gulls nest on outlying boulders.
- (4) *El Bakr*.—An islet ten miles south-west of Brava, covered with rough undergrowth and grass. It adjoins a sandy point, from which it can be reached at low tide. A special visit was made to this island on August 10, which proved disappointing, since there were no resident sea-birds. A few terns' egg-shells were, however, found in the undergrowth. They measure 47×28 , 47×29 , 38×28 and $40 \times ?$ mm. (the latter fragmentary). I do not see much point in guessing at their identity, beyond saying that they may belong to the White-cheeked Tern (*S. repressa*), or to the Roseate, or possibly to the Bridled (*S. anaethetus*), a species not seen by me at Brava, but which breeds on the Kiunga islands.

A list of species follows, arranged according to status:—

A.—Resident and breeding.

Larus hemprichii Sooty Gull. A few breed on Maginnis and Mnara.

Sterna dougalli Roseate Tern. A few breed on Chilani and Maginnis, but most birds are passage migrants.

Sterna albifrons saundersi. Indian Little Tern. A small colony was found nesting on the sandhills of the mainland, three miles south-west of Brava. This is the first breeding record for the whole east coast of Africa.

B.—Passage migrants in breeding plumage.

Sterna repressa White-cheeked Tern.

Sterna bengalensis Lesser Crested Tern.

Sterna bergii Swift Tern.

C.—Visitors in non-breeding, immature plumage.

Sterna hirundo Common Tern.

As regards the period of observation, I was at Brava from 25/3/41 till 21/6/41, while in charge of the district; then I was transferred. However, thanks to Brigadier D. H. Wickham, I was able to return here for six days' local leave from 8/8/41 to 13/8/41, thereby obtaining much additional information.

With reference to the resident species, a few pairs of Sooty Gulls and Roseate Terns try to nest on the islands, but rarely succeed, as these are easily accessible and close to the town, and the eggs are collected as soon as laid. The Little Terns stand a much better chance by breeding inland. The Brava people call the Sooty Gull "Mikodo," and the terns, "Sahali"

The geographical position of Brava will, I think, explain the number and diversity of its passage migrants. Along the whole thousand-mile stretch of coast between Cape Gardafui and Kismayu, there is hardly a single sea-bird island, except for a number of insignificant off-shore rocks and islets, such as at Brava. Between Kismayu and Lamu, however, there is the Kiunga Archipelago, a chain of islands which provides easily the greatest breeding haunt for sea-birds in East Africa. I am positive that the numerous migrants seen in breeding plumage at Brava in June, were on their way to the Kiungas. The trend of the Somali coast is south-westerly, rather than southerly; hence, many of the passage migrants returning from their winter quarters in the northern part of the Indian Ocean, can be expected to strike the shore well to the north of Brava, subsequently "coasting" south-west to their breeding haunts. The position of Brava can, therefore, be described as a Kiunga outpost, passed by many birds, colonized by few.

The Kiunga Islands are very little known. The only ornithologist to have explored them seems to be Jackson, in 1906, and even he did not go in person, but sent his collector, Baraka. A full account of Baraka's discoveries, and of the islands themselves, is given in Jackson's book. Sooty Gull, Roseate Tern, White-cheeked Tern, Bridled Tern (*S. anaethetus*) and Noddy Tern (*Anous stolidus*) were all found breeding, also Sooty Tern (*S. fuscata*), according to an incidental reference on page 427. Swift and Lesser Crested Terns are thought likely, but not yet proved, to breed on some of the outer islands. These are difficult of access, not merely owing to their steep, coral sides, but because the breeding season is from July onwards, when the south-west monsoon is blowing hard, and the sea is at its roughest. Baraka's exploration of the Kiungas took place nearly forty years ago, so it is about time the place was re-visited.

The presence of non-breeding Common Terns at Brava, is of interest for two reasons—first, since it confirms Jackson's Kenya records, which seem to have been regarded as a little doubtful, and secondly, because one would not have expected to see this species in June, it being usually regarded as a winter visitor.

On 27/10/41, I was able to visit the mouth of the river Juba, where I saw two interesting species, details of which are incorporated in this paper. They were—

Larus fuscus Lesser Black-backed Gull. Not recorded from the coast of Kenya.

Hydroprogne caspia Caspian Tern. A rare visitor.

The following abbreviations are used in references to literature:—

"Jackson" for Jackson and Selater, "Birds of Kenya and Uganda," 1938.

"Archer" for Archer and Godman, "Birds of British Somaliland," 1937.

"Sclater" for Sclater, "Systema Avium Aethiopicarum," 1924.

"Witherby" for Witherby, "Handbook of British Birds," 1938-41.

Alexander's "Birds of the Ocean" was unfortunately not available

In addition to Jackson's observations for Kenya, and Archer's for the Gulf of Aden, the following papers on sea-birds are important:—

"Ornithology of the East African Islands" by R. E. Moreau, *Ibis*, January, 1940. Deals with the nesting colonies of Kenya, Tanganyika and Zanzibar.

"Ornithology of the Seychelles Islands" by D. Vesey-Fitzgerald, *Ibis*, October, 1941. Covers not only the Seychelles proper, but also the related island-groups lying south-westwards (Adalbra, Providence, etc.).

I was able to collect only a limited number of eggs and specimens, nearly all of which are at the Coryndon Museum.

II.—DETAILED NOTES.

Larus fuscus Linn. Lesser Black-backed Gull.

Not seen at Brava, but on 27/10/41, I saw a single specimen at the mouth of the river Juba, resting on a sandbank with a mixed flock of terns. Back and upper-wings dark; rest of body white. Judging by Sclater, the bird may have belonged to the eastern race—*taiemyrensis*—which winters on the coast of Somaliland. Apparently there is no coastal record for Kenya, though the form *fuscus* is common on the inland lakes (Jackson).

Larus hemprichii (Bruch). Sooty Gull.

A resident and breeding species, called "Mikodo." In April, a few adults and immatures could usually be seen resting on the shore at Mosque Point, in company with terns (Swift and Lesser Crested). When a Swift Tern came sailing in, gorged with fish, two or three gulls rose and gave chase to it. The tern dashed away out to sea, twisting, turning and screaming, with the gulls in hot pursuit, showing themselves every whit as fast as their victim, itself a noted flier. Eventually the tern would disgorge its fish, which the gulls appropriated. Only once did I see a tern elude the gulls successfully. There was the normal chase, which the gulls, as usual, seemed to be winning, when suddenly the tern flew back to the flock at Mosque Point, landed among the other terns, and merely threatened the gulls with open bill; and the latter, for some reason, did not care to persist in their attack. The Sooty Gull is normally a scavenger; Brava is the only place where I have seen it parasitizing other species, and even here, I think that its main source of food-supply is carrion (fish remains, etc).

For an illustrated description of this species, see North, "A Field Guide to the Scavenging Birds of Kenya," in this *Journal* for January, 1942.

On 11/8/41, I visited the rocks of Maginnis, and found two nests. These were in small depressions on the flat summits of coral boulders. One was almost unlined; the other had a lining of feathers, pieces of grass and small stones. Each contained one fresh egg (almost certainly an incomplete clutch) measuring 52.5×41.0 and 53.0×40.8 mm. respectively. I spotted one gull incubating from Mosque Point; the other rose from its nest as we reached the island. The birds were very tame; they frequently landed on the summit of a large boulder only ten yards from one of the

nests, uttering their gentle, mewling cry. It was here that the illustrations in the "Field Guide" were taken. On 13/8/41, I found two empty nests on outlying boulders of Mnara. In view of the number of small boys at Brava who like eggs, I should be surprised if this species rears any young locally.

The nest-sites are identical with those described by Jackson for the Kiunga Islands; off the British Somali coast, however, nests are placed under the shelter of bushes (Archer). The Brava eggs are very similar to those figured in Archer (Plate 20), but are more lightly marked, and "stumpier." They are now in the Coryndon Museum. Jackson gives the full clutch as 2 to 3 eggs.

It appears that, apart from Brava, only four breeding haunts of this species are on record—one in the Persian Gulf, one in the Red Sea, and one in the Gulf of Aden (all given by Archer); and lastly, one off the east coast of Africa—in the Kiungas—given by Jackson.

Hydroprogne caspia (Pallas). Caspian Tern.

Not seen at Brava. On 27/10/41, at the mouth of the Juba, I saw a party of about eight, which were conspicuous for their large size, short tails, and huge, red bills. Crown black, back grey, underparts white, legs black. Some Swift Terns, standing near by, were dwarfed by the Caspians. When the latter arose, they uttered a hoarse, squalling, gull-like call. According to Jackson, this species visits the coast of Kenya between October and March, but is rare.

Sterna hirundo Linn. Common Tern.

The shore at Mosque Point was a favourite resting place for terns; a large flock, consisting of several species, could usually be found there. These would normally rise when a walking person came within eighty yards or so. A seated person seemed, however, to be less suspected, so I found that a good way of approaching the birds was to sit down as soon as they showed signs of alarm, then to reduce the distance by crawling, still in a sitting position, using hands and feet, feet foremost. By means of this peculiar means of progression, I managed, on June 5, to approach within forty yards of a mixed flock, which was then studied with a telescope. The sight identification of terns requires intensive observation; the exact colour of the bill and legs are, for instance, essential features, and to decide whether the legs of a certain bird are, say, jet black or black with a trace of red, can be no joke. Comparative size is also important; the fact that one tern is seen to have rather shorter legs than a neighbour, may well show that the two belong to different species. It will thus be clear that the fact that the flock is a *mixed* one, is an invaluable aid to the recognition of its individual members. The inter-identification of what can be called the "Common Tern group" is more exacting than any. Here in East Africa, we have three members—the Common, Roseate and White-cheeked. Often it is hardly possible to distinguish these by visual methods alone; one must collect a bird for scrutiny. Nevertheless, a preliminary sight-investigation often goes a long way towards proving what the subsequent collection finally confirms.

At Mosque Point on June 5, there seemed to be four species present—Swift, Lesser Crested, Roseate and Common. The first two can easily be distinguished by size and other features, and are, therefore, the usual basis for comparisons. After provisionally identifying a number of Roseates (Q.V.), I then noted a single "very similar bird, but with legs perhaps a little shorter, and dark blackish red; colour more greyish above; black

breeding cap; bill black, with red base." This bird, which had white underparts like the Roseates, was probably a Common; if so, what it was doing here in June, and in this plumage, requires explanation.

At the same time, there were a number of terns, again about Roseate size, but with "shorter legs, heavier bill and heavier build; white forehead, dark crown, black bill, dark bar along wing-shoulder, grey upper-parts." At the time, these defeated me completely, and I could not collect any, being then without the necessary implements. But in August, there were still a few about, and on the 12th, I shot and skinned an example which has proved to be a Common Tern in immature, non-breeding plumage. The bird was approximately as described above, but a close examination showed that it had the "bill dark brown, almost black; eye dark; legs brown with a slight pink tinge." The sex could not be ascertained. Measurements (in mm.) are: culmen, from feathering, 38; tarsus, 21; wing; 254; tail, 102 (much abraded and with streamers absent, hence shorter than normal). The upper-parts were grey, but with a white neck-collar, which, at the time, made me think that the bird might be a Bridled, so I neglected to examine the wing and tail features which distinguish the Common from its near relatives. The skin is, however, at the Coryndon Museum, and Dr. Leakey, who has kindly examined it at my request, reports that the outer web of the outer tail feather is dusky, not white as in the Roseate, and that in the inner web of the outer, (second) primary, the white does *not* reach the tip. (In the Roseate and White-cheeked, it does.) The grey mantle of this bird should, of course, have prevented me from confusing it with a Bridled, in which the mantle is sooty. From this evidence, I am satisfied that not only the bird in question, but also those seen on June 5, are immature Common Terns. They strongly resemble the "first winter female" illustrated in Witherby, Vol. V, Plate 129.

There is nothing to show that this species breeds in East Africa; on the contrary, it is a palaeartic nester, which migrates south in winter. In Africa, it is found along the west coast, also "perhaps on the east coast as well" (distributional note in Jackson, page 426, presumably by Sclater). A field note just below, however, clearly by Jackson himself, states that at Kanamai on the Kenya coast "it was not uncommon in September, 1902." But from observations, presumably by Sclater, that follow, it seems that owing both to lack of specimens and of confirmation by subsequent workers, this record of Jackson's has not been fully accepted. Perhaps, in the light of the present notes, it may be decided that the required confirmation has been obtained. Jackson's record is, however, for September, while the bulk of the birds seen by me arrived at an unexpected time—May-June. Beyond pointing this out, I suspend comment, pending the collection of further material.

Sterna dougallii Montagu. Roseate Tern.

When I arrived at Brava in March, 1941, none of the Common Tern group were to be seen. But towards the end of May, many graceful, slender birds of this type, with shortish wings and long tails with streamers, arrived in full breeding plumage. These were identified as Roseates (reasons follow). For some days in the early part of June, Maginnis rocks were a wonderful sight, with hundreds of Roseates concentrated here. One large boulder, in particular, was often white with resting birds, while many others hovered overhead, screaming. This concourse had a formal aspect, being, perhaps, a joyful celebration of the return to the breeding rocks after many months spent elsewhere. It may be that communal displays of this nature are the rule when the terns arrive from migration.

By mid-July, my successor at Brava told me that most of the terns had gone; clearly, therefore, Maginnis was no more than a halting place on the way to their breeding quarters. Notes were not made on the line of migration, but I have no doubt that the objective was the Kiunga Archipelago. If so, it may be asked, why should the birds display at Maginnis? In reply, it may be suggested that on account of the lack of islands along the Somali coast, Maginnis may have been the first Kiunga-like islet that the birds encountered, and was greeted accordingly.

A certain number of birds remained to breed at Brava, although, owing to the too-great accessibility of the islands, most, if not all, of the eggs were taken as soon as laid. Roseates were seen on Chilani from the time of their arrival in May, and on June 16, I found a number of small scrapes which must have belonged to this species, since only they flew scolding overhead. Each scrape had a neat lining of grasses, and was hollowed out of the middle of a grass-tuft about 6 inches high, thus obtaining shelter from wind and cover from view. On the 16th, I found one fresh egg, with dark blotches on a buffy-brown ground, strongly resembling eggs of the Common Tern seen in England. On the 20th, the day before I left Brava, there were no more eggs, so I took this one, but unfortunately broke it before it could be measured. When I returned in August, no birds were breeding on any of the islands, clearly having been "robbed off." A few empty tuft-nests, similar to those at Chilani, were found on Maginnis. A number of birds, still in black-capped breeding plumage, were about on the beaches.

As regards identification, birds were carefully scrutinized on June 5, together with Common Terns. The Roseates were noted as having "bill black, without a trace of red; legs pink. Black crown, pale grey above, white below." On August 12, I shot a typical bird in breeding plumage on the sands near Mnara. (Skin at Coryndon Museum). Details are as follows: Bill, 1.5 mm. of tip brown, remainder bright red; eye dark; legs coral red. A female. Culmen from feathers, 38 mm.; tarsus, 21; wing, 223 (abraded); tail, 154; one streamer broken off. Outer web of remaining streamer almost white. In inner web of outer primary, white does not reach tip, but this is probably due to abrasion. Black crown; under-parts white, with faint, rosy wash. There were eggs in the ovary, the largest of which was 5 mm. across. I think that this must have been one of the birds that was prevented from breeding.

It should be noted that in June, the bills were all black, but in August, they were red with dark tips.

Roseate Terns were found breeding on the Kiungas by Jackson's collector, Baraka, in August, 1906, also, quite recently, by Mr. P. Lees on Kisite Island, off the coast between Mombasa and Tanga (see R. E. Moreau, *Ibis*, January, 1940, page 53).

Sterna repressa Hartert. White-cheeked Tern.

None were seen at Brava until June 7, when a huge flock, all in breeding plumage, was found at Mosque Point. The birds were no doubt on passage towards their Kiunga nesting islands, where Jackson says that they breed in great numbers. In August, a few, still in breeding plumage, were about, but I have no evidence that they nest locally, unless the eggshells 38 and 40 mm. in length, found at El Bakr, belong to them.

This species is the third member of the Common Tern group that is found on the East African coast. When in breeding plumage, it is easy to distinguish from the Common and Roseate, since its under-parts are grey, not white as in the two other species. This feature cannot fail to

strike the eye, no matter whether the bird is in flight or at rest. In winter plumage, the under-parts are stated to become white, which would greatly increase the difficulty of identification. The bird has the same reddish bill and feet as the Common and Roseate, but the legs are shorter, and the body of a standing bird, therefore, looks nearer to the ground. This is a useful comparative feature in a mixed flock.

Sterna bengalensis Lesson. Lesser Crested Tern.

On April 11, about forty birds were present at Mosque Point, together with Swift Terns and Hemprich's Gulls, and they were still here when I left in June. In August, a few remained. Those seen up to June were in full breeding plumage, with an all-black crown. They are easy to distinguish from the nearly-related and rather similar Swift Tern, as follows:—

Feature.	Lesser Crested Tern.	Swift Tern.
Size	Smaller	Larger.
Bill	Orange	Pale yellow.
Upper-parts	Paler	Darker.
Forehead	Black in breeding season.	White in breeding season.

The Lesser Crested Tern cannot be confused with the Common Tern group, on account of its larger size, orange bill and black legs.

Although this tern is "found distributed along the East African coast, there is no record to date of its breeding anywhere in the Indian Ocean, not even in the Lamu Archipelago" (Archer). The fact that birds were seen in breeding plumage in June at Brava, however, makes it appear probable that they subsequently went to the Lamu Archipelago (i.e., the Kiungas) to nest.

Sterna bergii Licht. Swift Tern.

This fine tern is (except for the Caspian) easily the largest found in these waters. Its field characters have been given with those of the Lesser Crested, while an account of the parasitic attentions that it receives from Hemprich's Gull, has been described under that species.

About thirty individuals in breeding plumage were noted in a mixed flock at Mosque Point on April 11. During May, pairs of these birds could be seen at dusk, chasing each other across the sky with hoarse calls and impressive swoops and dives. Such displays were clearly connected with breeding, but by June 21, when I left, nothing more had happened, and when I returned in August, the only birds to be seen were non-breeding individuals with speckled crowns. There is thus no proof of breeding at Brava, but it is more than probable that the Kiungas are utilized.

Sterna albifrons saundersi Hume. Indian Little Tern.

On June 2, I saw this species for the first time, the birds having no doubt just arrived from migration. By the 5th, there were a number distributed in pairs along the beach, between Mosque Point and Mnara. They are easy to recognize, being much smaller than the Common Tern group; in addition, they have a white forehead (even in breeding plumage), and the bill is yellow, with a black tip.

On June 11, I happened to be near Mnara, crossing a plain which lies between the coast and the sandhills. Suddenly, a Little Tern arrived from the direction of the sea, flew steadily inland towards the sandhills, and

disappeared. When a maritime bird like a tern behaves in this way, there is only one likely explanation—that it is breeding. So, on the 13th, I investigated this clue by watching and following the birds, and eventually discovered their nesting ground. This was in an extremely desolate locality on the lower slopes of the sandhills, about a hundred feet above sea-level, and at least a mile from the sea. Above, the great, white sandhills, devoid of all vegetation, rose to a height of 400 feet; below, there was a short drop to the maritime plain. The breeding ground consisted of hard, stony, red sand, with loose horse-shoe drifts of white sand, about 3 feet high, superimposed. These drifts were formed by the south-west monsoon, which, at this time of year, blew unceasingly, creating a perennial sand-storm near ground level. There was hardly any vegetation, except for a few large, isolated bushes, and some tough growths that barely showed above the ground. A more uncongenial-looking breeding locality would be hard to imagine, yet the birds were undoubtedly safer here than if they had been on the much-exploited islands.

I saw about fifteen individuals, but others were no doubt away fishing. Birds kept going off towards the sea, then returning with fish, and chasing each other in pairs, uttering their staccato, double-noted call, "Kitik," and finally landing among the drifts. Clearly, they were going to breed.

Shortly afterwards, I was transferred from Brava, and sent to a station inland. This was all the more unfortunate, because Archer's and Jackson's books inferred that the Little Tern had never been discovered breeding anywhere on the east coast of Africa. Nests of the British form, *S. a. albifrons*, that I had seen in England, were always on beaches near high-tide mark; it was, therefore, curious that the Brava birds should be breeding so far from the sea. However, Archer, quoting Stuart Baker, showed that the Indian form, *S. a. saundersi*, had been frequently found nesting "on sandhills . . . often some way inland." Could the Brava birds, therefore, be *S. a. saundersi*? My leave, in August, enabled me to settle the question.

During a preliminary visit on August 8, I found the birds breeding in a loose, extended colony, the members of which were very wild and vociferous, mobbing me as I approached, and refusing to settle on their nests while I remained in the vicinity. I succeeded in locating one chick only. On the 9th, I took out a party from Brava to help me to search, and we were rewarded by finding no less than six nests with eggs. Five had two eggs each (two clutches fresh, three slightly incubated), and the sixth had one egg (hard set). All were in unlined scrapes in the hard red sand, some of them between the "claws" of the horse-shoe drifts; others in open spaces; one among short vegetation. None were *on* the drifts, which were unsuitable for the purpose. Although the birds were not watched on to any of the nests, I have no doubt about their identification, as only this species was seen here.

I noted that the sheltered beach and lagoon between Mosque Point and Mnara was a favourite resting and fishing place for the birds. Many were seen flying inland from here; in fact, this seemed to be their normal route between the sea and the breeding colony, although it was quite two miles long. At this beach, on August 12-13, I shot and skinned three specimens. These are undoubtedly *S. a. saundersi*. They have the rump and upper tail-coverts grey, like the back, and the three outer primaries with black shafts. They were in full breeding plumage.

The nestling seen on the 8th was only cursorily examined. It was pale and mottled above, and had a dark bill and flesh-coloured legs.

Eleven eggs taken measure (in mm.) 30.4—35.9 × 22.3—24.1; average, 32.6 × 23.5. They have a stone-coloured ground, overlaid with spots, scrawls and blotches of dark brown, with underlying patches of grey.

All these eggs were blown successfully, then I left them to drain on sawdust in my bedroom, and went to bed, unwisely leaving them unprotected on a table. While I was asleep, some animal (almost certainly a cat) crept in, jumped on to the table, carefully turned over each egg, inserted a claw into the blow-hole, and ripped it open, no doubt expecting nourishment inside. It then departed with one of the three skins, which was covered with arsenic, and may thus have succeeded in doing what I would joyfully have done, if I had awakened in time! The eggs were opened with such skill, that they are not entirely spoilt as scientific specimens, but I have now learnt, at some cost, not to leave these out at night.

The two remaining skins, with most of the eggs, are at the Coryndon Museum. One skin and some of the eggs are to be sent to the British Museum after the war.

On August 10, when between Brava and El Bakr (and some miles away from the first colony) I saw a Little Tern flying inland. This shows that there may be other colonies at intervals along the coast, besides the one already located at Brava.

The breeding habits of *S. a. saundersi* at Karachi (described by Stuart Baker, quoted in Archer) seem very similar to those of the Brava birds. It may be, however, that the Brava eggs resemble those of the British race, *albifrons*, rather than those of the Indian-taken *saundersi*, but the point can only be settled by direct comparison.

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DUCK AND GEESE OF THE ETHIOPIAN REGION.

BY HUGH WOODMAN, M.B.O.U.

The Ethiopian Region is an arbitrary avifaunal area of Africa which reaches from the Cape in the south to the Tropic of Cancer, just south of Assuan in Egypt, in the north. These notes mainly concern the migratory and resident members of the family *anatidae* as they occur in Ethiopia proper within that region, i.e., Abyssinia. Although it lies beyond the strictly geographical borders of Kenya and Uganda, the same species are being described as are familiar in the East African list (with three exceptions), and the little that is added to our knowledge of their occurrence and movements there is closely inter-related with what has been written of East African birds (notably by Jackson; and van Someren in Nos. 38, 39, 47 and 48 of this *Journal*). As far as resident duck are concerned it broadens our records of distribution and where migrant duck are described it is a part of the mosaic which goes to make up the full story.

Abyssinia marks the southernmost limit of the Common Pochard (*Aythya ferina ferina* L.) which was recorded for the first time in 1941 in lat. 12.40 N.; and until recently was believed to be the southernmost goal of Gadwall (*Anas strepera* L.) but there are now a number of records of this rare visitor in Kenya. It also marks the northernmost records of the African Pochard (*Aythya erythrophthalma* Wild.) found up to the same latitude. Jackson, quoting Lynes, states that it is known as far as Kordofan in the Sudan, but Lynes mentions no such record, and it is not known in the Sudan list from skins although it is believed to occur there. The Maccoa (*Erismatura maccoa* Eyton.), White-backed Duck (*Thalassornis leuconotus leuconotus* Eyton.) and Cape Teal (*Anas capensis* Gmel.) are known up to lat. 8.50 N., and the Black River-Duck (*Anas sparsa* Eyton.) to lat. 10.0, but the latter probably occurs up to lat. 13.0.

The only members of the family which occur in Abyssinia but do not also occur in East Africa are the Common Pochard, Bluewing Goose (*Cyanochen cyanopterus* Rüpp.) and the Black Spurwing (*Plectropterus gambensis niger* P. Scl.). The Yellowbill is not the same as the Kenya subspecies but *Anas undulata rüppelli* Blyth. This, however, intergrades with the East African form and is, therefore, not listed as a duck not occurring in East Africa.

There is no authentic record of Mallard (*Anas p. platyrhyncha* L.) or South African Shoveller (*Spatula capeusis* Eyton.) in Abyssinia, although the former has been rumoured to occur more than once but never supported by a skin.

For detailed description of individual drakes, ducks and immature and eclipse plumages I would refer the reader to van Someren's account in the back numbers of this *Journal*, referred to above (May, 1930, and October, 1932) and the detail, still the most classical existing of Reichenow's "Die Vögel Afrikas."

PREVIOUS RECORDS.

Bird observations have been made for over a century by travellers in various parts of Abyssinia, and a number of collections have been made since Rüppell's in 1822. All, however, have been remarkably meagre and incomplete on the subject of the *anatidae*. With the exception of Marquis S. Patrizzi's collection made during the Italian occupation, which obtained

skins of 85% of the duck and geese that occur, but which was incomplete as regards sexes and immature and eclipse plumages, there were no adequate notes on the family at all. Since the dislodgement of the Italians I have had occasion to add considerably to both notes and skins, though not unfortunately being able to include the Southern Lake region. We still know extremely little of the nidification habits of the moults and movements of resident species.

The following have been some of the most important ornithological expeditions to Abyssinia:—

James Bruce's notes	1775.	
Petrus Forskäl	1790.	
Ehrenberg and Hemprich	1820.	Eritrea and Danakil regions.
Ferret and Galinier	1840.	Northern Ethiopia.
von Heuglin	1869.	
Antinori	1876.	
von Erlanger	} 1905-15.	
Oscar Neumann		
von Zedlitz (Simien region).		
Friedman on the Frick collection	1930.	Arussi, Lake Abaye, Omo, etc.
Cheesman	1935.	Gojjam.
Haig and Thesiger	1934.	Aussa.
Patrizzii	1936-40.	General.
Benson	1941-42.	Negelli-Yavello.

In Abyssinia, all the resident duck of the entire Ethiopian Region occur except—

Hartlaub's (*Pteronetta hartlaubi* Cassin) of South-West Sudan and North Congo to West Africa.

South African Shoveller (*Spatula capinsis*) of South Africa. There is one record of Horsburgh's in East Africa, but no skin or locality record.

South African Sheldrake (*Casarca cana* Gmel.) of South Africa.

All the European visiting migrants come as far as Abyssinia except—

Ruddy Sheldrake (*Casarca ferruginea* Pall.) of Northern Sudan.

Mallard of Northern Sudan.

White Fronted Goose (*Anser albifrons albifrons* Scop.).

I have skins of twenty different species of duck which are now known to occur in Abyssinia, nine of them palaeartic visitors and eleven residents. There are also four geese.

GEOPHYSICAL CONDITIONS AND INCIDENCE OF DUCK.

The best duck feeding-grounds of Abyssinia are:—

- (1) The high plateau which consists of vast rolling plains of short grass and undulating land bordered by ranges of high mountains or ravines and gorges 3,000 to 4,000 ft. deep. These plateaus are intersected by narrow winding streams only a few feet across but in which there are scattered pools. The altitude averages 8,000 to 9,000 ft. Permanent marshes are small and scarce at this altitude,

but during the rains the whole countryside is waterlogged. The landscape is almost treeless save for small groups of eucalyptus on the tops of the low hills, often marking churches, and around the peasants' huts. There is no cover along the streams except in the natural drop of the ground or in cuttings made by the water. The country is full of stock, mainly horses, cattle and goats.

A big plateau 100 miles across lies north-west of Addis Ababa reaching to the Blue Nile gorge, which is nearly 6,000 ft. deep. The whole Gojjam in the west is a plateau and mountain country, some 150 miles across. Another more waterless plateau lies north-east of Addis. The pools on these streams are beloved by all the European visiting duck and a few of the residents, in the following order:

Wigeon	} Abundant.
Shoveller	...	...
Yellowbill	...	...
Garganey	} Common.
Common Teal	...	...
Pintail	} Fairly common.
Tufted	...	...
Gadwall	...	...
African Teal	} Rare.
Pink-billed Teal	...	...
Common Pochard	} Very rare.
White-eyed Pochard.	...	...

- (2) The marshes and shallow water pans of the Awash river basin, from 7,000 ft. south-west of Addis down to 4,000 ft. east of Addis. On these are found at 7,000 ft. Shoveller, Wigeon, Pintail, Teal, Garganey, Yellowbill, African Teal, Pinkbill (not common), African Pochard (during wettest months only) and Fulvous Tree Duck (occasional seasons). At 6,000 ft. and lower, Fulvous and White-faced Tree Duck become abundant, Teal, Wigeon and Pintail become rarer. The Knob-billed Comb Duck is fairly common. Yellowbill are seldom seen.
- (3) Lakes such as Akaki reservoir, 7,000 ft. near Addis; Haik and Ashangi, (8,000 ft.) to the north, Zwai, Abayata, etc., (6,000 ft.) to the south; Tana (southern end) in the Gojjam. On Lake Haik, I have seen all the resident duck at the same time (except White-eyed Pochard). These included Common Pochard but only one resident duck, the African Pochard. Although the lake's edge was black with duck there was no other bird life on the water except Coot. The northern lakes are deep and free of reeds, except in small patches along the water's edge. From the southern Rift lakes have been recorded, Dwarf Goose, Pintail, African Teal, Wigeon and White Eyed Pochard (Patritzi).
- (4) The deep crater lakes 30 miles south-east of Addis, at about 6,000 ft. one of which is green, and is the haunt of several Maccoa. Here also are found the Cape Teal and White-backed Duck.
- (5) The waters of the low country inland from Assab. Major Kenyon Slaney has reported these to carry a dense duck population.

RESIDENT AFRICAN DUCK.

As mentioned above, these are eleven in number and are all familiar in East Africa. Notes will be found in Jackson and van Someren.

Arismatura maccoa Eyton. Maccoa Duck.

So far only recorded from two localities in Abyssinia: the Green Lake at Bishoftu (Ada), thirty-five miles south-east of Addis Ababa, at about 6,500 ft.; and lake Aramaya, a shallow lake near Harar at 6,000 feet.

On the former they are believed to be present all the year round, and do not flight across to other lakes only seven miles away. The sides of this crater are some 300 ft. deep descending precipitously to a narrow beach. The water is bright green and is full of algae and minute plant life unlike the other crater lakes which stand in a group seven miles distant. One side of the lake which is about one mile across, is thick with reeds and overhung with foliage. The surface is clear and there are no water lilies.

Maccoa are found scattered all over this and are pairing by June, and certainly breeding there, although they have not been visited at the actual time of nesting. There is no sign of moult from April to June, and I have not been able to get access to the lake in other months. In Abyssinia, they are an entirely lake-inhabiting, and very localized, duck.

Thalassornis leuconotus leuconotus Eyton. White-backed Duck.

This is always present on the crater lake mentioned above and until 1943, this was its only recorded locality in Abyssinia. I found a large number fighting over a shallow lake at a duck shoot in April, 1943. This lake was only four or five feet deep and about fifteen miles south of Maggio. One end of the lake was overgrown with reeds and vegetation. When we were wading waist deep among scattered leafless reeds, providing little cover, these duck were disturbed and came fighting across, usually singly, and at from twenty to thirty feet above the water. Other duck at the same shoot were Fulvous, White-faced Tree Duck, Garganey and Pintail. They looked not unlike Garganey, which were also inclined to fly singly and at much the same height, but darker in marking and, when going away, the white stern was a conspicuous feature. It was noted that in flight they seemed nearly as fast as Garganey. From van Someren's description it seems in Kenya they do not often get under way well above the water like this, but when they do they are definitely fast fliers. Another interesting point was that they were in the open stick-like reeds, bordered by wide expanses of open water, and a long way from the floating water lilies and vegetation at the far end of the lake. They certainly breed on the crater lake although there are no records. They have not been found in the low country, although in Kenya, they are known down to sea-level. Skins of birds taken in April and August, are without sign of moult.

A low whistle reminiscent of, but of a different character to that of Wigeon was heard when taking off the water.

Aythya erythrophthalma (Wied.). African Pochard.

On the high plateau north-west of Addis Ababa described above, which is frequented by all the migrants during the season, and by Yellowbill, these duck have not been found. On the other hand, in similar conditions, but on more marshy country, they are common throughout the winter, and present throughout the rains near Dessie, 250 miles to the north. They are also common on Lakes Haik and Ashangi. They are found during the

summer (wet) months on marshes south-west and south-east of Addis, but seldom turn up there in the dry season. They seem, therefore, to be rather local in distribution and to move about the country at different seasons. They, very probably, breed during the rains on the 6,000 to 7,000 ft. marshes south of Addis, but unfortunately no data have as yet been obtained. It is interesting to note that none of the paler buff "bleached" birds, such as have been collected from the lakes of East Africa, has been taken in Abyssinia, and this possibly supports the contention that it is contact with the soda lakes that causes this marking in certain Kenya specimens.

The African Pochard is a lake and marsh bird and is not fond of rivers and stream pools. I have watched scores of them on Lake Haik where as a strong diving duck they are seen in company with Tufted and keep furthest off shore in company with Wigeon, leaving the Shoveller, Garganey, Pintail and Teal to feed in the mud and shallows of the water's edge.

The bright ruby eye of the drake can be observed a good fifty yards away with glasses.

They can be described as the second-commonest resident duck, but are nothing like so abundant as Yellowbill, and seem to be nowhere as common or widely distributed as in East Africa.

Anas undulata ruppelli Blyth. Abyssinian Yellowbill.

This is the commonest duck in Abyssinia, and differs only slightly from the Common Yellowbill. The former has a rich blue wing speculum, with a greenish sheen in certain angles of light, whereas the latter's is green, changing to a purply blue in different angles of light and the underparts are lighter. It seems to prefer the higher altitudes and is commonest from 7,000 ft. upwards, on rivers and marshes. I have seldom seen it below 6,500 ft.

It is not usually its habit to frequent lakes or wide pans of open water, and it appears to be a river and marsh bird throughout the high plateau. They tend to keep rather to themselves when other duck are about, their taste in food approximating to that of the Shovellers' which are often their nearest neighbours. When fighting in flocks they are not often to be seen mixed with other duck. I have no record of nest and eggs.

They fly fairly fast but are often very tame.

Anas sparsa Eyton. Black River-Duck.

Notes apply as for the East African residents. As far as is known they do not occur below 8,000 ft. They are usually single or in pairs on the narrow plateau streams, where they choose the rapids and stretches winding through small ravines, upon which they depend for their cover, as there are no forest trees or generous undergrowths such as are familiar in Kenya. I have once seen three Black Duck and a few Yellowbill on a small pan of open water on the plains, in June, miles from the nearest cover. During the heavy rains it is probable they venture like this further afield from their usual habitat.

Anas capensis Gmel. Cape Wigeon.

This is a rare duck throughout the Ethiopian region and is somewhat mysterious in its local migrations. Although recorded at one time or another from all the Rift lakes of Kenya, it is only known to be plentiful in Abyssinia, i.e., the Green Bishoftu lake, frequented as aforementioned by Maccoa and White-backed Duck. Here I have seen it in parties up to

ten in number scattered over the lake, in April, 1942, and June, 1943. It is almost certainly resident there. There are also records of it from Lake Aramaya and Lake Abbe (Tosci) in November and February, and Metahara (Patritzi) in February.

A bird was taken at the latter place on the same day that one was collected by Prof. Tosci on lake Abbe 120 miles away. It is not known whether a migration was taking place across this line at that time, but it is a possibility. There are records in Abyssinia, therefore, from November to July (and almost certainly resides in at least one locality throughout the year) and in Kenya from June to February (van Someren). Again it makes occasional appearances in Darfur in April and July (Lynes) where it has also been found breeding. More records are badly needed to throw light on its movements about the continent, and on its breeding localities.

It appears to be the most migratory of all the African residents.

In the field, it is a pale grey duck, has a Teal-like appearance, and flies well for short distances if flushed, but is probably slower than the other Teal. In life, the bill is a wonderful semi-transparent flesh pink, of the delicacy of egg-shell china, and with a black base. The speculum is green with a black, followed by a white, margin in both sexes. The drake and duck appear, in the field, identical.

There has been a little confusion about its English designation due to use of the names "Pink-billed Teal" and "Cape Wigeon." The former is only applicable to *Anas erythrorhynca*,—the Red-billed or Pink-billed Teal, which also has a bill of remarkable colouration, quite different from that of *Anas capensis*, and most aptly described as "Unripe plum."

When seen on this Bishoftu (Ada) Lake they invariably keep to the deep water and may be in twos and threes, or parties up to seven or ten, swimming slowly in a long line. I have only once disturbed them on shore in the day time and on this occasion, as they took off in the distance, they bore a remote resemblance to Garganey. They are actually very distinct, in their pale greyness, from both Garganey and Pink-bill.

Anas punctata Burchell. Hottentot Teal.

This little Teal, the smallest of them all, is known from Nigeria to the Cape. Its furthest limit in Abyssinia is sixty miles north of Addis, at 9,000 ft. where its occurrence is rare, only two authentic specimens being obtained in two long seasons of duck-shooting. Along the marshes and lake edges further south it is to be found in small parties five to seven in number, and in habit exactly as described by van Someren (*ibid.*, No. 38). It is met with on Akaki reservoir, Tafki marshes (uncommon), Boli lake, Lake Zwai, and probably in the waters of the lower country to the east of Addis Ababa. When seen on the water in some sheltered and reedy lake corner the sunlight throws up vividly the sheen on their dark green backs, which is almost metallic in quality, and quite unlike any other Teal.

Anas erythrorhynca Gmel. Pink-billed Teal.

This Teal is common in East Africa, where it occurs in flocks of forty at times. Stray birds have been recorded as far north as the southern Sudan. In Central Abyssinia, it is rare, and I have not seen records of it from the southern Rift lakes, although it must occasionally turn up there. My records are:—

Tafki marshes, 7,000 ft. 9/11/41.

Stream, 9,000 ft., 80 kilometres north-west of Addis; one in a bag of ninety duck.

Akaki reservoir, 6,000 ft. 10/2/43. (Whalley.)

The Italian collection had one skin only from Tafki. Abyssinia, therefore, appears to be too far north for its liking, as it is everywhere an uncommon duck. Cheesman, in 1934, made an interesting record of a marsh in the mountains, thirty miles west of Addis and 10,000 ft. up, which carried considerable numbers of Pink-bill and where he believed they bred. This is the only known locality where breeding may take place, and it has never been visited since. The pinkish-cinnamon wing speculum and the reddish unripe-plum colour of the bill are unmistakable field characters.

Dendrocygne viduala (Linn.). White-faced Duck.

Dendrocygne fulva (Gmel.). Fulvous Tree-duck.

These ducks are well-known throughout Africa. In Abyssinia, they do not occur north of Addis, except on inland coastal waters. Fulvous Tree-duck has been seen as high as Tafki-swamp one season. Below the altitude of 7,000 ft. both kinds become abundant on the open shallow lakes and swamps. On Boli lake they number hundreds. Fulvous are somewhat less common than White-faced.

Sarkidiornis melenonotus (Pennam). Knob-nosed Duck.

This is also universally known. In Abyssinia, it is commonest south of Addis, and has only once been recorded at Salulta,—9,000 ft. to the north-west

PALAEARCTIC VISITING DUCK.

Of these there are nine, eight of which are known in East Africa, though two are rare there, viz., White-eyed Pochard and Gadwall.

Aythya nyroca nyroca (Güld.). White-eyed Pochard.

This is a rare winter visitor to East Africa. van Someren has the only definitely known Kenya skin, taken on Naivasha in 1925. In the Sudan, it is uncommon. The Khartoum Museum has two skins from Dongola. In Central Abyssinia, it is exceedingly rare. I obtained a female on 22/3/42, on a marsh near Dessie at 8,000 ft. at about lat. 12-0, and there was one not definitely confirmed from Tafki on 6/12/41. In Southern Abyssinia, it is more common. The Italian collection had three drakes and two ducks from lakes Zwai and Aramaya. It seems, therefore, to occur in "pockets" on its way south, and probably leaves the Nile valley somewhere in the Northern Sudan, coming down the east side of Abyssinia until it reaches the Rift lake region.

The duck can easily be confused with the female Tufted.

Aythya ferina (Linn.). Common Pochard.

This is not of much interest to East Africa, so far south as which it is not very likely to stray. In Egypt, it is one of the commonest winter visitors. In the Northern Sudan, it is well-known but not common. In Abyssinia, it was not believed to occur until a female was shot on 11/1/42, on a stream on the high plateau, eighty-five kilometres north-west of Addis Ababa. On Lake Haik, lt. 12.30 N., I watched a party of some score mixed with nine different species of duck, and took a skin to prove the identification. The drakes were then in their full plumage. Again on Lake Ashangi, lat. 13.50 N., on 3/5/42, I saw a number mixed with Wigeon, Tufted and African Pochard. As this is a very large lake, about twelve miles in length, it is probable there were several others. The drake is a very handsome bird, and on the water looks at first sight remarkably like the Wigeon.

Both have a chestnut brown head and neck and both are grey on the back and have black rumps. The Pochard, however, has no conspicuous cream patch on the forehead and is black on the lower chest.

Since the Mallard is always expected to be found in East Africa (there being Sharpe's record of one said to have been shot, though unsupported by a skin, at Marsabit in 1930), it may be just as likely that Pochard will also turn up. A Mallard skin is said to have been obtained at Aden (Barnes). This record of Pochard, therefore, is further south than any proved record of Mallard, and it may be worth watching closely parties of Wigeon to be certain that the Common Pochard does not occasionally appear in Kenya.

Aythya fuligula (Linn.). Tufted Duck.

These are quite common on the high plateau between December and April. They are among the latest arrivals. My first record of the season was November 29th. They have usually left by early May, but I have one record as late as 12th June.

They have not been shot below the 8,000 ft. plateau streams and I have not seen them south of Addis. The Italian collection had no specimens. They are numerous on Lake Haik and it has been observed that they feed further out from the shore than most other duck by day, mixing mostly with African Pochard. They seem to remain later in East Africa than others though arriving about the same time. They are as fast as Teal and Pintail, and as good as Teal for the table.

Spatula clypeata (Linn.). Shoveller.

This is the commonest winter migrant duck but is rivalled closely by Wigeon in the high country. It is familiar on all waters from 9,000 ft. downwards, and in the low lying country inland from Assab.

Earliest arrivals were October 18th, 1941, at Salulta, 9,000 ft., twelve out of eighteen duck being Shoveller. There were none present there a week before.

On 18/10/42, at Tafki, Shoveller had arrived with a few Garganey. A drake in full plumage was occasionally observed by the end of February; the full rich green of the head was sometimes not complete until April. The bulk of them depart during May.

Moults.—This duck and Pintail are the only migrants proved occasionally to commence a full moult and remain throughout the summer in the highlands of Abyssinia. Although suspected, I could not prove that certain Shoveller lagged behind for the whole year, until July, 1943. We had a record of Shoveller shot on Akaki Reservoir as late as 13th of June, and again on 27/6/43, beyond Salulta (Whalley), but these were strong fliers still in good feather.

On 11/7/43, visiting the Green Lake, Bishoftu, I found a number of Shoveller,—some commencing moult of wing primaries, although fairly strong fliers, and others in such an advanced state of moult that they could barely take off the water. Between these extremes there seemed to be all degrees of plumage-shedding and the interesting fact was definitely established that a small percentage of Shoveller stay in the country throughout the year.

Anas cracca Linn. Common Teal.

First recorded arrivals were November 8th. They appear to be among the earliest visitors to leave. From Lake Ashangi they had gone by the 3rd of May. Major Whalley, however, obtained one as late as 27/6/43, on the high plateau. They are nowhere abundant. Of a mixed bag of duck I never saw more than 15% Common Teal. The drakes are mostly in full plumage by March. The earliest note was January 11.

They afford some of the best sport of all duck, being small and fast. They were noticed to be more gregarious than most duck and, instead of fighting on their own, were often in company with Pintail and Shoveller. It is possible that Teal may be the most inclined of wild duck to depart from nature's strict rules and occasionally to cohabit with their migratory confrères. At all events not only is their company with these species quite usual, but the existence of hybrid offspring is not unknown. In fact of the only four records I can trace of wild duck hybrids the Common Teal has been involved in three.

Hybrid Records:

Teal Drake X Shoveller Duck. On W. H. Payn's home pond, Suffolk, 1942.

Teal Drake X Mallard Duck. Edinburgh, on ornamental water, about 1906, (verbal communication, van Someren).

Teal X Pintail. *Vide* Meinertzhagen's "Birds of Egypt," coloured plate of specimen found in the Nile delta.

White-eyed Pochard Drake X Tufted Duck. On Lord Grey's Northumberland bird reserve recorded in his "Charm of Birds."

In eclipse the differentiation of Teal from Garganey is not easy until the skins are handled and the points studied. A note on this is given below.

Anas querquedula Linn. Garganey.

Earliest arrivals, 11th October, Salulta, 9,000 ft. Several reach Egypt in August, so that it is surprising that they have not been found earlier in Abyssinia.

Skins have been taken in the Sudan in September, although Cheesman has seen large flocks still fighting south over Khartoum in December.

With Shoveller they are the earliest arrivals in Abyssinia. Most of them have left by the beginning of May. Major Whalley saw an undoubted small party on the wing but did not obtain a skin, as late as 27th June. They are always present where migratory duck are to be found, from the high plateau to 5,000 ft., but never very common. They may very slightly exceed the Common Teal in number.

Anas penelope Linn. Wigeon.

Kenya is too far south for them to appear except as a somewhat uncommon visitor but Wigeon come to the central highlands of Abyssinia by the thousand and, at the height of the season, exceed all other migrants, including the Shoveller, and are second only to Yellowbill in abundance. They frequent Lakes Haik and Ashangi, the marshes around Dessie, and the plateaus of the Gojjam and Fiché. South of Addis and below 7,000 ft. they are not common, and there are no records of them from southern Abyssinia. The first recorded arrival was at Tafki, on 9/11/41, and Dessie 3/11/42. They reach their maximum numbers in January and begin to go north at the end of March. On Quoram lake in March, they are the commonest duck. On this lake on 25/3/42, I counted ninety-one Wigeon scattered on this water with a few Shoveller and Pintail. The latest date one was shot was 21/6/42, in company with Yellowbill, African Pochard and Teal and not in moult—an unusually late date. The drakes are mostly in full plumage in January.

Anas strepera Linn. Gadwall.

Gadwall were believed not to occur in East Africa up to the time of W. L. Sclater's revision of Sir Frederick Jackson's bird records, but since that date it has made a few appearances (*vide* this *Journal*, Vols. 16, 223,

and 17, 127, 1942-43) and a skin is now set up in the duck group of the Coryndon Museum (albeit, if a trivial criticism is permissible, the bill of this specimen has been painted a too bright and too uniformly yellow colour which catches the eye and is unlike the dull and spotted appearance seen in real life). Nevertheless, the Gadwall is a very rare visitor to Kenya and the few recently recorded have been sufficiently of a phenomenon to report.

In Abyssinia, Gadwall were also believed to be rare, and there was no example in the Italian collection. It has, however, been shown by records of duck shoots in the last two seasons that, on the high plateau, they are fairly common. From January to April, they are not much fewer in number than the Pintail. Out of mixed duck bags obtained in January, Gadwall have numbered as follows:—

Total duck.				Gadwall.
54	...	...	...	2
84	...	...	...	5
84	...	...	...	8
83	...	...	...	1

All these were from the high plateau river-pools at 9,000 ft.

I have only one record from a lower altitude: the Awash river, 6,000 ft., on 15/3/42. The earliest arrival was noted on 29th of November, and the last taken were 22nd of March, but they certainly remain later than that.

Drakes were in full plumage by February, and their rich chocolate-brown vermiculations were a most handsome feature. In eclipse they are not unlike female Pintail. The female of both species being very much alike in the field. This is the only duck, other than Pintail, which has a longish neck and a rather pointed tail. In flight they are impossible to distinguish. It is probable that Gadwall have sometimes been mistaken for Pintail by sportsmen. Apart from the confusion between Garganey and Common Teal, in eclipse, immature and moult plumage they are about the best known "catch" in differentiating duck. The same thing may have happened in Kenya. It is also quite possible that these migrants have taken a fancy for venturing further south to fresh feeding-grounds in recent years, as may be the case with the Common Pochard mentioned above. They are as fast fliers as Pintail and equally good eating.

Dafila acuta Linn. Pintail.

This duck is widely distributed, but nowhere very common, from 9,000 ft. down to the 6,000 ft. marshes and lower. It is a river, lake and marsh bird. van Someren reports that in Uganda, the bulk arrive in October. In Abyssinia, the first record so far, is 8th of November, and they seem to arrive in large numbers in early January. The drakes occasionally don their full magnificent black, white and grey plumage in December, but some are not complete even in March. The bulk of them leave in April-May. My last actual record of a normal-plumaged bird was April 25th.

The interesting fact about Pintail is that they have been known since von Heuglin's time, 1869, to leave a few behind for the summer. Cheesman found one in the Gojjam (1935). I have three records: on 30/6/42, I found a female in moult and flying weakly at Tafki. A drake was brought to me by a native boy, in full moult, and only able to run, on 11/10/42, at Salulta. Both these birds were going to spend or had spent the year in

Ethiopia. A drake was brought to me by Major Whalley on 27/6/43, from a 9,000 ft. stream beyond Salulta, with old and faded primaries. He was preparing to moult and remain for the summer.

The only migrants known to moult and remain in Abyssinia throughout the year, therefore, are Pintail and Shoveller.

MIGRANT PALAEARCTIC VISITORS' ARRIVAL DATES AND DATES
LAST SEEN BEFORE DEPARTURE.

Species.	First arrival records.	Last seen.
White-eyed Pochard. ...	Not known ...	Not known.
Tufted	29th November ...	3rd May. One exceptional, 12/6/43.
Common Pochard ...	Not known ...	Probably early May.
Shoveller	18th October ...	12th June, lake, 27th June, stream. Found in moult during July.
Common Teal	8th November ...	Mostly by end of May. One record, 27th June.
Garganey	11th October ...	19th April. Many remain to May.
Wigeon	3rd November ...	26th June. Mostly in May.
Gadwall	29th November ...	Not known. Probably early.
Pintail	8th November ...	Mostly in May. Found in moult, June and July.

GEESE.

The four geese of Abyssinia are:—

- | | |
|---------------|---------------|
| (1) Bluewing. | (3) Dwarf. |
| (2) Spurwing. | (4) Egyptian. |

Cyanochen cyanopterus (Rüpp.). Blue-winged Goose.

Quoting from notes sent to the *Ibis*, 1943: "This goose is peculiar to the highlands of Abyssinia and is common from 8,000 feet upwards, north-west of Addis Ababa. As Cheesman has noted they do not occur below this altitude. They are sometimes in company with Egyptian Geese but never with Spurwing, which do not come so high. They are invariably near the streams of the open grass land; not usually at stretches of open water or lakes.

"The gander and goose appear identical in the field except that the former is a little larger. Parties up to twenty-five in number are not uncommon. Seventy is the biggest number I have seen. Patrizzi reports flocks of over a hundred in the Arussi (Chilalo) at over 12,000 ft.

"Parties put out sentinels to keep watch as is the custom of other geese, but unless they have been shot at before they will allow human beings to approach too close for their safety, being accustomed to Abyssinian farmers frequently passing. They are not regarded as food by the native and, therefore, are not molested by them.

"They are probably the easiest goose in the world to shoot, and perhaps the only variety that is really easy. Shooting parties I have been with usually put an arbitrary restriction on shooting them. Their flesh is much superior to that of the Egyptian or Spurwing Goose."

The field appearance is a general battleship grey without any contrasting colouring of the head and neck, though a little darker on the back. The wings are blue-grey and the legs and feet also grey. Their weight and size are roughly as with the Egyptian Goose. They breed most commonly in July and August, and the nest could be found if the water-logged country side was explored during the height of the rains, and some way from the roads. I have seen goslings in down in early November. Young have been brought into Addis Ababa by native salesmen in October, but unfortunately not seen by any ornithologist

Plectropterus gambensis subsp. Black Spurwing.

Horsbrugh has described four varieties of Spurwing Goose, with variation in the amount of white on the chest and neck, as one goes north from South Africa to the Zambesi. The form *Niger* P.L.Scl. is the blackest of these. But the Abyssinian sub-species, which is the only variety frequenting the Awash river and marshes within seventy miles of Addis Ababa, is the blackest Spurwing known. There is no white on the chin, head or lower chest, which are pure black. The lower abdomen and patch on the wing only are white. The Italians called this bird *Plectropterus gambensis salvadori*, a name not at present accepted by the British Museum. The matter will no doubt be settled when skins are taken to London after the war.

It is very common on all suitable waters below 7,000 ft. and south of Addis Ababa. I have seen flocks of hundreds in the open fields and around an adjoining marsh, south of Moggio. In the field they are a noticeably blacker bird than the ordinary Spurwing, and when seen through reeds, often appear to be a completely black goose. In habit they are like any other Spurwing and just as wary.

Alopochen aegypticus (Linn.). Egyptian Goose.

This bird is too well-known to require description here. It occurs from sea-level to 9,000 ft., where it accompanies the Blue Goose, and may occur even higher.

Nettapus auritus (Bodd.). Dwarf Goose.

Local, and as far as we know not common in Abyssinia. As in East Africa, it occurs on certain waters only, and as far as is known at present its favourite localities are:—

- (a) The Akaki Reservoir, 7,000 ft., (Whalley).
- (b) Awash Swamps near Moggio, 6,000 ft.
- (c) Lake Zwai (Patrizzi).
- (d) Lake Tana (Cheesman).

I have no personal records of it at all.

Duck are not an easy family to tell with certainty in the field before one has had opportunity of handling each species, and seen the varying plumages of both sexes in all stages. The following table is an attempt to aid the bird-watcher by emphasizing the most constant features differentiating those species which are most alike. The commonest pitfalls in my experience are:—

- (1) The Garganey and Common Teal in eclipse plumage,—both drake and duck.
- (2) The female Gadwall and female Pintail.
- (3) The White-eyed Pochard and female Tufted.
- (4) The Common Pochard and Wigeon.

The drakes of all the palaeartic visitors in full plumage are unmistakable. The Shoveller female is also unmistakable by the spatulate bill.

The following residents, where the drake and duck are nearly identical, will also cause no difficulty.

White-Backed.	Knob-nosed Duck.
Yellowbill.	White-faced Tree-Duck.
Black Duck.	Fulvous Tree-Duck.

The last species which is similar in shape, habit and, to a lesser degree, note to the commoner White-faced Duck has no white cheeks, is fulvous rufus on the under-parts, and has no white on the sides of the body.

The Maccoa and African Pochard drakes are easy. The females are slightly similar in colouring. Both are brown, but the Maccoa is smaller, has a very thick neck and large bill, has white on the neck, and is entirely different in habit of flight from the Pochard (*vide supra*).

GENUS ANAS.

Essential distinctive features between—

HOTTENTOT TEAL.	COMMON TEAL.	GARGANEY.	PINK-BILLED TEAL.	CAPE WIGEON.
Dark top to head strongly demarcated from the pale buff of cheeks and lores.	No contrast in head markings, in eclipse ♂ and ♀.	Pale stripe above the eye always just distinguishable, all seasons.	Bill, during life, reddish “unripe plum.”	Bill egg-shell pink. Paler grey in general colouring.
Dark bottle-green on back and wings. No true speculum.	Wing speculum green, bordered above and below by BLACK in both sexes, though small in ♀ and immature birds.	Speculum green with WHITE border, and no black in both sexes.	Speculum cinnamon pink. Sexes alike.	Speculum green with white edges.

GENUS NYROCA.

Distinctive features of females:—

WHITE-EYED POCHARD.	AFRICAN POCHARD.	TUFTED.
General colour: chestnut and dark brown.	General colour: brown. Larger.	General colour: blackish brown. Slight tuft to crown feathers.
Breast brown; abdomen whitish.	No white on breast.	Breast and abdomen pale brown.
Iris light brown.	Iris brown.	Iris yellow.
Head and neck dark chestnut.	Head and neck brown with white chin, and some white on sides of neck.	Head and neck greyish black.
Wing speculum: narrow white.	No white wing speculum.	Wing speculum: narrow, white.
Brown.	<i>Drakes.</i>	
Iris white.	Deep purple chestnut.	Obvious black and white bird with a tuft.
White under tail coverts.	Iris, ruby red.	Iris bright yellow.
	Brown under tail coverts.	

General brown and dusky markings slightly similar in both species.

Neck longer. Tail pointed.

Bill and legs GREY.

General shape similar. Neck not quite so long.
Bill and legs DULL YELLOW, the former usually with faint large greyish spots.

PINTAIL FEMALE.

WIGEON.

Drakes in full plumage:—

Head and neck richer brown, with no patch on forehead.
Under-parts BLACK.
On the water "sits" lower, and dives.

Head and neck cinnamon-chestnut, with broad cream patch on forehead.
Under-parts WHITE.
Non diving.

GAZETEER OF LOCALITIES MENTIONED.

Ada=Village with four nearby crater lakes, at about 7,000 ft., and averaging thirty miles south-east of Addis Ababa.

Akaki=Reservoir lake, about 7,000 ft., twenty miles south of Addis.

Aramaya=Lake near Harar, of shallow water, 6,000 ft.

Arussi=Group of high forested mountains, 100 miles south of Addis.

Ashangi=Lake 400 miles north of Addis, about 8,000 ft.

Awash=River winding across Abyssinia, within thirty-five miles when south of Addis, and finally disappearing in the Aussa Sultanate to the north-east.

Bishoftu=See Ada.

Boli=Shallow lake, fifteen miles south of Moggio.

Dessie=Town, 240 miles north of Addis.

Dongola=Town and part of the Northern Province, Sudan.

Fiché=Town on high plateau, sixty-five miles north-west of Addis Ababa.

Gojjam=Abyssinian province, west of the Blue Nile.

Moggio=Town, about forty-five miles east of Addis.

Quoram=Village and temporary lake (during the rains), about 360 miles north of Addis, about 9,500 ft.

Salulta=Plains, 9,000 ft., 15 miles north-west of Addis.

Tafki=On Awash Marshes, thirty miles south-west of Addis.

Tana=Lake in the Gojjam, 6,000 ft.

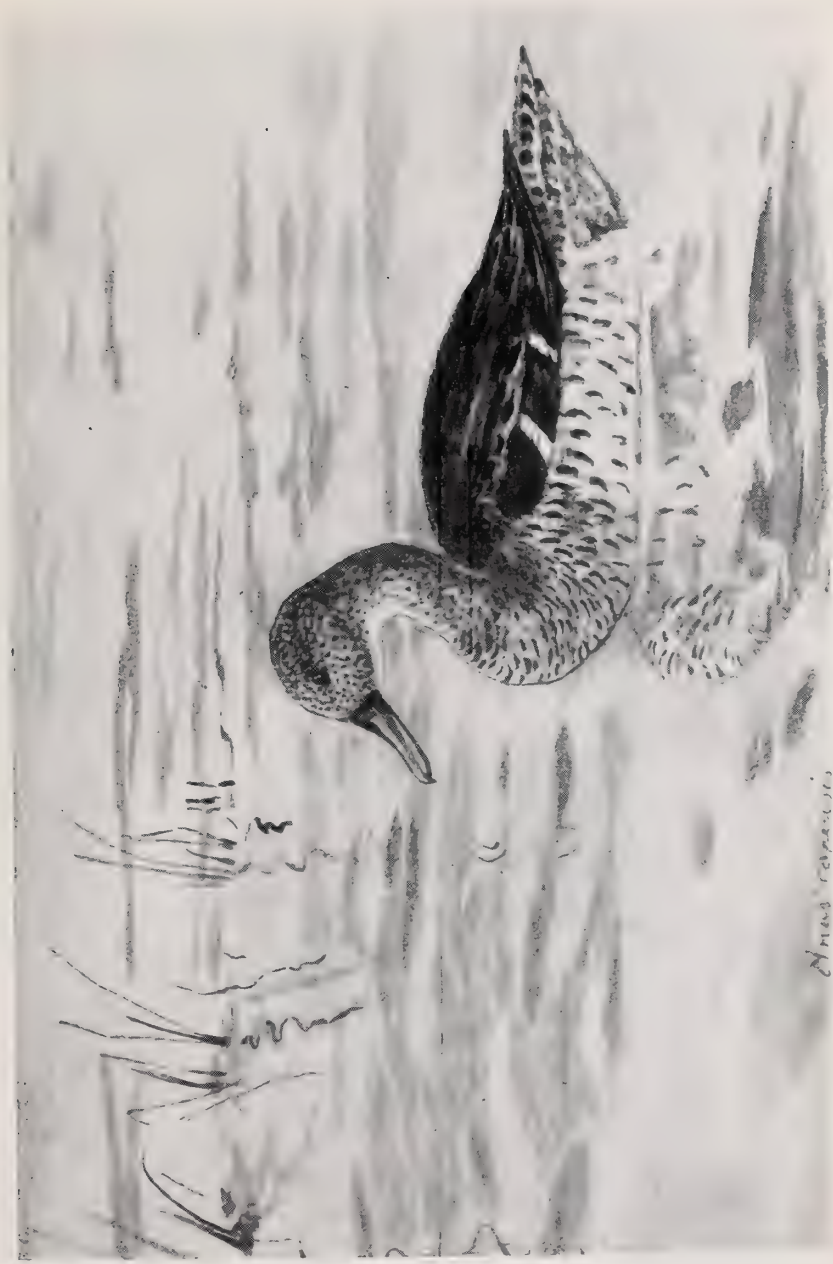
Zwai=Southern lake, about 100 miles south of Addis, 6,500 ft.



Aythya erythrothalma Weid. The African Pochard. After the original painting from life by Patrizzi.



Aythya ferina ferina Linn. The Common Pochard. From a photograph of a specimen taken in 1942.



Anas capensis Gmel. The Cape Wigeon. After the painting from life by Patrizzi.



A CONTRIBUTION TO THE STUDY OF THE FAUNA OF
UKERWE ISLAND, VICTORIA NYANZA.
(Col.: Curculionidae; Apioninae.)

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Very little has been published on the Coleopterous fauna of this interesting island near the Tanganyika shores of Victoria Nyanza. The Apioninae listed below, amounting to twenty-three species, are all due to the collecting of Father P. A. Conrads, S.J. The specimens lack dates of capture. The collection includes three new species of *Apion* (including all subgenera), one new species of *Piezotrachelus*, and a new genus, *Lepanomus*, also known to me from South Africa. Of the twenty-three species listed only two species named and one un-named unique female belong to *Piezotrachelus*, a genus including a very large number of species from Tropical Africa. The large preponderance of species belonging to *Apion*, in the restricted sense, is unusual and it will be interesting to discover if this preponderance is actual within the area, and if so what conditions account for it. Of the previously described species I have indicated the known distribution, whether published or unpublished.

1. *Apion consimile* Wagn. (*Apion russeolum* Mshl. in coll. nec Wagn.).
Thirty-six specimens.

Tropical Africa from Sierra Leone to Zanzibar and south to the Cape.

2. *Apion mimosae* Htm. 7♂♂, 3♀♀.

Described from Tanganyika; known also from Natal.

3. *Apion* sp. near *triviale* Fhs. 2♀♀

4. ***Apion brunneorufum*** n.sp.

Apion spadiceum Wagn. Stett. Ent. Zeit., 69, 1908: 66 (*ex parte*),
(Eritrea).

Extremely similar to *Apion spadiceum* Wagn. from South Africa, with which it has hitherto been confused, of very much the same size, the rostrum less unequal between the sexes, stouter, particularly so in the female; the pronotum less distinctly punctured, the punctures shallower, the colour generally darker in mature specimens. The only clear external character is the proportionally shorter, broader scales which are less distinctly bilinear on the interstitial costae (unilinear in both species on the sutural margin), particularly on the external interstriae. As in *spadiceum* the four hind tibiae of the male have a strong interno-apical spur. The aedeagus is quite distinct, being abruptly attenuated to the apex in *brunneorufum* whereas in *spadiceum* the apex is produced into a parallel-sided curved blunt termination.

Length: 1.78 to 2.34 mm. (*sine rostro*).

AFRICA: Tanganyika Territory; Victoria Nyanza, Ukerewe Island, (P. A. Conrads leg.), 27♂♂, 33♀♀. Abyssinia; Mt. Chillalo, forest circa 9,000 ft., 12.xi.1926, (H. Scott coll.), 1♀, (*A. spadiceum* Wagn., det. J. Balfour-Browne, 1942). ARABIA: Yemen, (Millingen, Fry coll.), 1♂, 3♀♀, (*A. spadiceum* Wagn., det. Wagner). West Aden Protectorate; Jebel Harir, circa 5,200 ft., 29.x.1937, (British Museum Expedition to South-West Arabia, 1937-38). Yemen; Wadi Thabad, north face of Jebel Sabir, 5,900 to 6,000 ft., 25-26-xii-1937; Usafira, one mile north of Ta'izz, circa 4,600 ft., 13.xii.1937; Ta'izz, lower slopes of Jebel Sabir, circa 4,600 ft., 15.xii.1937; Jebel Sumara, circa 9,200 ft., 2-i-1938, (British Museum Expedition to South-West Arabia,

1937-38), 8♂♂, 7♀♀. INDIA: Madras; North Salem District: Jawalagiri, 9.iii.1930; Ayur, 9.i.1931; Daverbetta, 25.iii.1930; Denkanikota (N. C. Chatterjee coll.), 25.iii.1930, (in collection of Forest Research Institute, Dehra Dun), 3♂♂, 2♀♀.

The type male and allotype female are selected from the Tanganyika series.

The occurrence of this species in South India is rather surprising, but there is no possibility of a mistake in the labelling and if not a natural endemic species it has presumably been introduced. The southern limit of this species in Africa is not known, nor is the northern limit of *spadiceum* Wagn. Apart from the specimens mentioned below, the only records of "*spadiceum*" I know are in Marshall (J. East Africa Uganda Nat. Hist. Soc., 15 (1, 2), 1940, 56) from the Chyulu Hills, Kenya. I have not seen these specimens, but I have little doubt that they will prove to be *brunneorufum*.

Apion spadiceum Wagn. Stett. Ent. Zeit., 69, 1908: 66 (*ex parte*), (South Africa).

The present species is not included in the fauna of Ukerewe Island, but as it was described it has proved to be a composite species and accordingly some observations seem called for in view of the description of *brunneorufum* above.

Spadiceum was described from six specimens, one male and two females from the Cape: Dunbrody, (coll. Hartmann), and two males and one female from Eritrea: Adi Ugri and Keren, (Mancini, coll. Solari). It is there stated that the Eritrean specimens only differ from those from the Cape in the slightly less distinct pronotal punctuation and the darker colour. From this it is to be deduced that the type is from Dunbrody.

In the British Museum, there are two males from Natal: Malvern, October, 1897, (G. A. K. Marshall coll.), and one female from Cape of Good Hope: Table Mountain, (W. Bevins coll.) all identified as *spadiceum* by Wagner. There are also one male and three females from Arabia: Yemen, (Millingen, Fry, coll.) also identified by Wagner himself as *spadiceum*. The Arabian specimens seemed to be nearer the description of the Eritrean specimens and a dissection showed that the aedeagus was distinct from that of the Cape specimens. Consequently, doubt was thrown on the conspecificity of the Cape and Eritrean material. I have, therefore, studied all the available material additional to the above, as follows: Cape: Dunbrody, 1♂, 1♀, (Father O'Neil, S.J., in Marshall collection). These specimens are topotypes. There are also twelve specimens in Marshall's collection from Natal: Malvern, Verulam, Eastcourt and Uitenhage all determined by Wagner. In the British Museum, there are two males from Natal: Malvern, October, 1897, (G. A. K. Marshall coll.), one female, Cape of Good Hope: Table Mountain, (W. Bevins coll.), five males and five females, South Africa: Pondoland, Fort St. John, April, June, and July, 1923, March, 1924, (R. E. Turner coll.), two females, Zululand: Eshowe, May and June, 1926, (R. E. Turner coll.), South Zululand: Gingindhlovu, April, May, June, and July, 1926, (R. E. Turner coll.) and all the material detailed under *rufobrunneum* sp.nov. above. Males of all the material listed above have shown that the aedeagus is identical with that of the topotype male from Dunbrody only in material from South Africa, Natal and Zululand. This area, therefore, constitutes the area of distribution of *spadiceum* and all northern material is *brunneorufum*.

5. *Apion aethiopicum* Wagn. 7♂♂, 4♀♀.

Described from material from Bulawayo, Southern Rhodesia, not recorded from elsewhere, but the above material is undoubtedly conspecific with the types in the British Museum.

6. *Apion ukerewense* sp.nov.

Male. *Derm* black, not very shining, with a clothing of fine greyish-white and golden hairs that become broader and more scale-like on the venter. Scutellum elongate, triangular with paired basal processes.

Head one-quarter wider than long (2.2:1.5), eyes moderately prominent, frons with a parallel, shallow longitudinal impression on either side of the middle line, surface finely microreticulate, temples linear; frons half the width of the base of the rostrum; beneath the eyes a patch of long greyish-white scales. *Rostrum* barely longer than the head and pronotum together, stout, curved, cylindrical but with a slight dilation at the antennal insertion; the base, to the antennal insertion finely microreticulate, thence to the apex smooth and shining; dorsally finely and somewhat obsoletely punctured, laterally and ventrally with punctures impressed in distinct longitudinal furrows with a porrect scale arising from each puncture; basilateral sulci distinct; the space between the eye and the antennal insertion equal to the diameter of the eye. *Antennae* piceous, slender; the scape long, as long as the first five segments of the funicle taken together; basal segment of the funicle one-third the length of the scape, twice as wide as long, twice as long as the second segment of the funicle; third to seventh segments of the funicle progressively shorter and broader. *Pronotum* broader than long, widest at the base, a little less than one-third narrower at apex than at base, subapical constriction moderately distinct; dorsal outline very slightly convex; surface densely but evenly and obsoletely punctured, the punctures separated by about their diameters; the entire surface, including the punctures, microreticulate; a sharply impressed median dorsal sub-basal longitudinal fovea. *Scutellum* elongate triangular with paired basal protuberance and upturned pointed apex. *Elytra* ovate, sides moderately rounded; humeral callus distinct; dorsal outline moderately convex; striae sharply and distinctly impressed, distinctly catenulate punctate; striae 1 and 2 uniting with 9 at apex; interstriae flat, as wide as the striae, obsoletely rugose, obsoletely biseriolate-punctate on the disc; the clothing on the basal and apical thirds of the dorsum and the entire length of the sides of greyish-white hairs, on the discal third of golden-reddish hairs mixed with a few greyish-white ones. *Venter*: the procoxae anteriorly and the mesosternal episterns moderately densely clothed with whitish scales; metasternum and first and second sternites evenly, but not closely, punctured. *Legs* short and rather stout, the four hind tibiae with stout interno-apical spine; the claws long, with short but distinct basal tooth.

Length: 2.18 to 2.71 mm. (*sine rostro*).

TANGANYIKA TERRITORY: Victoria Nyanza, Ukerewe Island (P. A. Conrads leg.), 2♂♂.

This species is a member of the *tanganum*-group, and of the *armipes* sub-group, typified by the elongate armed scutellum and short basal tooth of the claws. It is near *aethiopicum* Wagn. in appearance, but the rostrum is distinctly longer in the male of that species, the elytral striae are sharply impressed and the interstriae are flat. It also comes close to *brunneorufum* m., described above, but is quite black and the clothing appears sparser.

7. *Apion armipes* Wagn. 1♂, 2♀♀.

Described from Malvern, Natal. Also recorded from West Africa: Gambia.

8. *Apion grandaevum* Wagn. 1♂, 2♀♀.

Described from Chirinda Forest, Rhodesia, and from Umtali, Natal.

9. *Apion abimva* Burg. 1♀.
From the Belgian Congo and Kenya: Chyulu Hills.
10. *Apion tanganum* Htm. 2♂♂.
Described from Tanga, Tanganyika. I have not seen the types, but the two specimens answer the description of Hartmann in all respects.
11. *Apion considerandum* Fhs. 3♂♂, 2♀♀.
Tropical Africa from the Gambia to Zanzibar and Abyssinia and south to the Cape. These specimens are of the typical form.
12. *Apion* ? *nigritulum* Wagn. 1♀.
Described from Natal: Frere. In the absence of males I am not certain of the identification of this species but it agrees well with the type of Wagner in the British Museum.
13. *Apion griseopilosum* Wagn. 5♂♂, 3♀♀.
Described from Natal: Verulam, and from Dunga (? patria), the present series agrees well with Wagner's types in the British Museum.
14. *Apion* sp. 1♀.
15. *Apion* sp. (c.f. *geminum* Wagn.). 1♀.
In the absence of males identification of the specimen is doubtful, but it is close to, if not identical with *geminum* Wagn.
16. *Conapion schoutedianum* Burg. 1♀.
Recently described from the Congo. There is a specimen in the British Museum from Uganda: Bugwezi. Both individuals have been compared with a co-type of Burgeon's.
17. *Conapion admirabile* Wagn. Six specimens (det. Marshall).
Described from Angola and also known from Uganda.
18. ***Conapion conradsi*** sp.nov.
♂♀. *Derm* black, dull, distinctly shagrinata, almost glabrous, only a short, sparse, barely discernible whitish pubescence which gives a somewhat dusty appearance to the insect. Of the *constrictum*-group, and very closely related to *dives* J.B.-B., [Ann. Mag. Nat. Hist., (Ser. xi), 9, 1942; 808] from Abyssinia.
Head a little wider than long (1.3:1.0), eyes moderately prominent, the frons about half as wide as the base of the rostrum, with a shallow longitudinal impression on either side of the middle line which is weakly arched, distinctly microreticulate; temples short, about one-third the diameter of the eye, microreticulate. *Rostrum* of the male as long as head and pronotum taken together, of the female distinctly longer, slightly attenuate to the apex, coarsely microreticulate to the apex, weakly curved; basi-lateral sulci distinct but shallow; the space between the eye and the antennal insertion one-third longer than the diameter of the eye. *Antennae* rufo-piceous to piceous, slender, inserted at one-third from the base of the rostrum; scape short, not longer than the basal segment of the funicle which is one and a half times longer than wide and twice as long as the second segment; antennae of the male shorter than those of the female. *Pronotum* cylindrical, little longer than wide; sub-basal constriction obsolete, sub-apical constriction moderately distinct; dorsal outline almost flat; evenly but very shallowly punctured, sides quite obsoletely so;

distinctly microreticulate. *Scutellum* small, flat, short triangular, as long as wide at the base. *Elytra* oval, sides well-rounded, widest at middle; humeral callus distinct; striae distinctly impressed on the disc, obsoletely towards the sides, the catenulate punctures distinct on the discal striae, obsolete towards the sides; striae 1 and 2 uniting with 9 at the apex; intervals weakly convex, rather obsoletely microreticulate. *Venter*: metasternum impunctate, microreticulate; first and second sternites with a few coarse but shallow punctures laterally; fifth sternite of the female flat, impunctate, obsoletely microreticulate. *Legs* long and slender, hind femora not quite reaching the apex of the elytra; basal segment of the hind tarsus as long as the second and third segments taken together.

Length: 1.65 to 2.02 mm. (*sine rostro*).

TANGANYIKA TERRITORY: Victoria Nyanza, Ukerewe Island, (*P. A. Conrads leg.*). Nine specimens

This little species is very close to *dives* J.B.-B., but the elytral convexity in the antero-posterior plane is more evenly pronounced, so that the posterior declivity is steeper; the sub-basal pronotal constriction is obsolete; the rostrum is longer and the aedeagus is more evenly curved from base to apex although very similar to that of *dives*.

19. *Pseudopiezotrachelus sparsum* Fst. Two specimens.

Tropical Africa from Senegal to Zanzibar.

20. *Piezotrachelus varium* Wagn. Sixteen specimens.

East Africa from the Sudan south to Portuguese East Africa.

21. *Piezotrachelus* sp. (near *cylindrirostre* Wagn.). Two specimens.

This species is extremely close to *cylindrirostre*, but is not, I think, conspecific therewith.

22. *Piezotrachelus* sp. 1♀.

23. **Lepanomus** gen.nov.

Head broad, eyes lateral and convex. *Rostrum* short and stout, broad, shorter than the pronotum; scrobes wide and deep, the sides diverging, the lower side directed ventrally, the upper directed to the lower margin of the eye, the ventral sides meeting below the rostrum as a well-marked transverse ridge or step. *Antennae* longer than the rostrum, 11-segmented, the funicular segments of nearly the same width throughout; club elongate fusiform, loosely segmented, the basal segment short, not longer than the second segment. *Scutellum* very small but distinct. *Elytra* elongate-oval, with nine deep and regular striae. *Legs* short and stout; the third tarsal segment deeply cleft nearly to the base.

Genotype: **Lepanomus crinalis** sp.nov.

This new genus is very distinct from all hitherto described in the Apioninae, but it appears to be most nearly related to *Aplemonus* (the name proposed being an anagram thereof). It is readily distinguished by the nearly parallel-sided form, the unusual form of scrobe, the loose antennal club and the lesser convexity of the elytra.

Lepanomus crinalis sp.nov.

♂♀. *Derm* piceous-brown, with a slight metallic lustre, a pale V-shaped flavescent mark directed anteriorly and a rounded flavous spot on the second interstria two-thirds from the base; a copious, but not dense,

clothing of moderately long whitish or golden hairs, those of the elytra set in a curious irregular pattern of small patches, the hairs irregularly disposed, not aligned posteriorly, the areas between the patches glabrous. The elytra interstriae with sparse, evenly placed and linearly disposed erect brownish setae, of uniform diameter from base to the blunt apex, slightly backwards curved, these setae set in strong punctures; underside with a sparse clothing of long white hairs; femora with white or grey setae of a similar character to those of the elytral interstriae.

Head twice as wide as long, the eyes prominent and strongly convex, temples short, ill-defined; frons one-third narrower than the base of the rostrum, with a strong median fovea and coarse punctures. *Rostrum* short and stout, shorter than the pronotum, rather flattened dorsoventrally, twice as long as wide at the base, more sparsely punctured near the apex, strongly, irregularly and densely punctured at the base, surface shining; the antennal scrobes deep, directed postero-ventrally where they form a distinct transverse carina or step. *Antennae* long and stout, inserted at two-fifths from the base of the rostrum, the scape short and stout, about one and one-half times longer than wide and barely longer than the basal segment of the funicle which is as long as, but no wider, than the second segment; segments three to seven progressively shorter; club elongate fusiform, loosely aggregated. *Pronotum* a little longer than wide, parallel-sided. dorsal outline nearly flat, fairly densely and rather strongly but irregularly punctured; evenly clothed with longish addressed irregularly disposed white hairs and with sparser brownish curved setae; at the base, just in front of the scutellum, with a strongly impressed elongate fovea. *Scutellum* very small, oval, rather variable in form but apparently with the anterior edge raised and finely nicked in the middle. *Elytra* elongate-oval, sides slightly rounded; dorsal outline moderately convex; humeral callus distinct; striae narrow but deeply impressed, the catenate punctures rather obsolete; interstriae flat at the base, convex on the disc, particularly the third which is almost costiform at the beginning of the declivous portion of the elytra; clothing as already described, but with a distinct tuft of whitish hairs at the base of the third interstria. In all the specimens the wide V-shaped discal band, extending from the suture to the fifth stria, is distinct; the other flavescent marks are variable. *Legs* short and stout, with numerous whitish blunt-ended setae, particularly on the femora; tarsi short and stout, the third segment deeply cleft almost to the base; tarsal claws with a small basal tooth. No sexual dimorphism other than that of the fifth sternite.

Length: 2.99 to 3.42 mm. (*sine rostro*).

TANGANYIKA TERRITORY: Victoria Nyanza, Ukerewe Island, (P. A. Conrads leg.). Five specimens.

NATAL: Umhali Beach, xii.1913, one specimen (G.A.K.M.). Malvern, ix.1897, one specimen (G.A.K.M.). In Marshall's collection.

SOUTH AFRICA: Pondoland, Port St. John, May 1-14, 1923, (R. E. Turner coll.). Eighteen specimens.

The type specimen has been selected from the series from Pondoland. There is some variation in the degree of impression of the thoracic punctuation and in the colour pattern, the punctuation of the southern specimens being finer and denser than the Tanganyika examples, but I do not think that there are any differences that can be called specific.

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MOUNT KENYA: A CONTRIBUTION TO THE BIOLOGY AND BIBLIOGRAPHY.

BY R. E. MOREAU.

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1. INTRODUCTION.

When recently I began to attempt some comparisons between Kilimanjaro and Mount Kenya, with especial reference to their biology, I quickly found that the information for Mount Kenya was excessively scrappy and uncoordinated. The solitary book devoted to the mountain (Dutton, 1930) makes no real attempt at a scientific description of the mountain as a whole and contains nothing for the zoologist. Like so many who have written about mountains, Dutton's attention was fixed upon the snow-peaks: the life-zones which intervene are little more than a nuisance. Half Vivienne de Wateville's book (1930) is devoted to Mount Kenya. She was vibrantly aware of the life around her on the upper slopes, but she is disappointingly and unnecessarily unspecific.

The present position is, so far as I can ascertain, that such information as exists about the biology of the mountain has not been collated and made accessible in any way. It is impossible to refer to any conspectus of its mammals or its birds. No climatic records exist above about 7,000 ft. (*teste* British East African Meteorological Service). No bibliography of the mountain has been published. The small amount of attention Mount Kenya has received in this *Journal* is altogether surprising: in fact nothing original at all about the mountain has been contributed since MacGregor Ross's four pages of notes over thirty years ago.

The present compilation has grown out of notes about the mammals and birds that I brought together for my own purposes. That I am able to include a certain amount of information not hitherto published is mainly thanks to Mr. Raymond Hook. He has put his unequalled knowledge of the Mount Kenya mammals at my disposal and also enabled me to see something of the upper slopes in June, 1943. On the principle that half a bibliography is better than none at all I append to this paper a list of the references I have come across. I most emphatically do not claim to have provided a complete bibliography. Several friends have been good enough to give me information and comments on my draft: I have especially to thank G. H. E. Hopkins, D. G. B. Leakey, D. G. MacInnes, R. W. Hayman (of the British Museum), the Kenya Game Department (Hugh Copley), and, for checking my statements about the vegetation, P. J. Greenway. Literature not available at Amani has been lent by G. H. E. Hopkins, the MacMillan Memorial Library and Natural History Society.

Such information as is available about the mountain is by no means evenly distributed around it. The early explorers, Teleki, Gregory and Mackinder, to whom so much honour is due, all attacked from the south-west. Most of the subsequently published references are based on journeys by the Chagoria route in the north-east. The development of pony-transport by Raymond Hook from Nanyuki, in the north-north-west, has led to an increasing number of ascents from that side in recent years (and there is even a wheel-track to 12,500 ft. further north still), but no published information has come from that quarter hitherto except for Meinertzhagen's paper on birds. It seems true that the whole south-eastern half of the mountain is excessively ill-documented. The reason is doubtless the greater width of the forest belt, the more difficult topography and the wetter climate, so feelingly described by Orde-Browne (1918). "Above the bamboo belt . . . this part of the mountain is at most times of the year more or less of a swamp" and "the gorges are deeper and rockier than on the west and north." However, a route from the Ragati had been opened by the Forest Department and by 1940 had been a good deal used. It is to be hoped that a proper description of this part of the mountain will be published.

As a background on which to set the mammals and birds it suffices to recall that on the west, Mount Kenya has a high-level connection (above 6,000 ft.) with the Aberdares and the rest of the (volcanic) Kenya Highlands. On the east it descends by very gradual slopes to the hot dry country of the Upper Tana, at less than 3,000 feet above sea-level. Its central snow-peaks rise about 2,000 ft. out of a relatively enormous base. The sub-alpine region above the timber line occupies nearly 300 square miles, about twenty-four of which are above 14,000 ft., as calculated from recent maps, and contains several small lakes. The forest itself covers about 600 square miles (Hutchins, 1909) in the form of a deep crescent, widest on the south-east, narrowing up the east and west sides on the mountain, until at the north end a treeless corridor connects the sub-alpine moorland with the open country that extends to the limitless Northern Frontier District.

It has been stated (Mearns *in* Roosevelt, 1910) that on the mountain mammals range up to 15,500 ft., frogs to at least 10,700 ft., chameleons to 11,000 ft., lizards to over 12,000 ft. Loveridge (*Bull. Mus. Comp. Zool. Harvard* 79 (9), 481-541, 1937), quotes Raymond Hook to the effect that lizards go as high as 15,000 ft., snakes to 13,000 ft. On further experience Hook (*in litt.*) reduces the altitudinal limit for snakes, which he states, are represented on the moorland only by *Vipera hindii*, to 12,000 ft., but extends the range of frogs to above that. Although, as Loveridge (*ibid.*, p. 501) remarks, Mount Kenya is "very little known from a herpetological point of view," the number of lower (cold-blooded) vertebrate species inhabiting the moorland is likely to be very small, both for physiological reasons and because the list he gives for all the East African alpine combined comprises only three species of lizard (skinks), one *Chamaeleon (bitaeniata)*, and one frog. Fish are represented at high altitudes on Mount Kenya only by brown trout, introduced in some of the moorland lakes and rivers above 10,000 ft.

2. VEGETATIONAL NOTES.

An important feature of the forest is the bamboo belt into which its upper edges everywhere merge. Naturally the levels of the vegetation zones and their specific composition vary somewhat with the aspect and climate. There is also some conflict of statement. According to Rammell

(in Watteville), on the Chagoria track bamboos begin at 7,500 ft., open moorlands at 9,000 ft. Jex-Blake (in Dutton) records bamboo on the same route up to 11,000 ft., but states that on the mountain generally it prevails from about 8,000 to 9,500 ft. Above Nanyuki, the bamboo does not begin till nearly 9,000 ft. and has at its upper edge a well-developed border of big *Hagenia* (*Brayera*) trees, which give place abruptly to moorland at about 10,500 ft. Probably there is a marked difference at the wet southern end of the mountain. Orde-Browne locates the bamboo belt there at 9,000 to 10,000 ft. and describes above that "a range of beautiful park-like country of coarse grass and heather with occasional clumps of fine wide-spreading trees." (This sounds like a description of the south-east of Kilimanjaro.)

Above the timber-line the moorland, which starts as a luxuriant heath well above head-height, extends for some four thousand feet, getting continually sparser and harsher. Jex-Blake's limit (in Dutton's book) of 14,000 ft. for phanerogams is evidently too low. Photographs in the references cited show plenty of vegetation, including, of course, Giant Groundsels (*Senecios*) and Giant Lobelias, up to at least 15,000 ft.; and Loring speaks of rodent-runs in the grass at that altitude. The Fries brothers (1922) quote 4,700 metres (15,400 ft.) as the limit of phanerogams, but Mackinder, who was so meticulous about his altitudes, records the highest flowering plant he saw, an everlasting, at no less than 16,500 ft.

Chapin (1933) has given a diagrammatic representation of the altitudinal zoning of vegetation on the east side of Mount Kenya, probably drawn largely on his personal observations on the Chagoria track. His version is: grass and scrub to about 5,800 ft.; then forest to 8,300 ft.; bamboos to 9,900 ft.; *Hagenia* to 10,500 ft.; "grassy slopes with heath bushes and proteas" to 13,500 ft. and in the upper-half of this Giant *Senecios*; Giant Lobelias and Giant *Senecios* 13,500 to 15,700 ft. In Appendix D of Roosevelt's book the timber-line is given at 13,000 ft. This must be read in conjunction with the later remark that bamboo and podo extend 8,500 to 10,700 ft., where the "true timber zone ends," though Giant Heath (up to 30 ft. high) persists to 13,000 ft.

Scientific botany certainly came late and slowly to the mountain. A few plants were described from the gatherings of the early explorers. Engler, in 1892, summarized the little then known. Hutchins (1907) described the forests from the forester's point of view. He was able to give hardly any specific names and he was then under serious misapprehensions. ("The Kenya Forest extends in a belt . . . eight miles broad entirely round the slopes of Mount Kenia." Above Embu "at about 8,500 feet the timber practically ceases. From here, up to the base of the cliffs and rocks of the snowy peak of Kenia, stretches a zone of dense, generally unbroken, bamboo.") Two years later his information was much more accurate. He recognized the existence of the gap on the north and gave the area of the "bare Alpine region" as 352 square miles (Hutchins, 1909), a figure not far divergent from that calculated from the latest maps. But he was still able to quote very few specific names. This being so, it is not surprising that when the Swedish Fries brothers botanized on the mountain in 1922, their collections yielded many "new" species. Apparently they published no general account of the flora of the mountain. Their results were included in a series of papers dealing with individual families. From these Engler (1925), with the help of Hutchins' description of the forests, pieced together a bald floristic account of the mountain. Dutton's book includes, as already mentioned, a floristic appendix by Jex-Blake but hardly a single specific name is mentioned therein. Wimbush's

contribution to the same book, like Rammell's to De Watteville's, is practically confined to the woody plants. It appears to be true that there have been no other published contributions on Mount Kenya plants for over twenty years except the few records by Chiovenda (1935). Certainly much material must be lying in herbaria, probably enough to allow a counterpart of the Elgon paper (*Kew Bull.*, 1933, 49-106) to be written. In the Coryndon Museum there are nearly one thousand specimens from Mount Kenya (P. R. O. Bally *in litt.*).

The Giant Lobelias and Giant Groundsels (*Senecios*) are by far the most striking features of the African sub-alpine moorlands and have caught the popular imagination. It may, therefore, be worth while to explain our present knowledge of the Kenya species, about which there has been some confusion. Five names have been applied to the Mount Kenya Giant Lobelias, seven to the Giant Groundsels. Actually there appear to be three species of the first and five of the second (Fries and Fries, 1922a and 1922b, Bruce, 1934). Gregory collected bits of a *Lobelia* and of a *Senecio*. Unfortunately at some stage the plant parts were mixed up: the *Lobelia* leaves were paired with the *Senecio* flowers and *vice versa*. As a result the descriptions written by Baker for his new species *Lobelia gregoriana* and *Senecio keniensis* were each composite, and no plants corresponding to them can be found in nature. There was nothing for it but to treat these names as inadmissible, as the Fries brothers did. The Giant Groundsels comprise:—

Senecio keniendron R.E. & T.C.E. Fries, on the open moorlands 11,000 to 15,400 ft. This is the species with the great columnar "trunk" appearing in the high-altitude photographs

S. battiscombei R.E. & T.C.E. Fries. A more slender species, very local, in sheltered places from the upper edge of the forest at least 11,500 ft. I collected it in the deeply cut Ontolili valley at 10,500 ft. The reference to *S. johnstonii* on page 190 of Dutton's book is evidently a mistake for this: *S. johnstonii* is confined to Kilimanjaro.

S. brassica R.E. & T.C.E. Fries, on part of which the description of *S. keniensis* Baker fil. was based. It is well-named the "cabbage *Senecio*" for it is the comparatively lowly plant, with silvery, woolly undersides to its great leaves, that grows so abundantly on the moorlands, from the timber-line to at least 12,000 ft., as to form huge pale patches on the mountain sides. There is a fine coloured photograph of the plant in Mackinder's paper (1900), noteworthy for its early date, if for no other reason.

All three species are figured in Fries and Fries (1922b.).

The Giant Lobelias are:—

L. giberroa Hemsl., the most widespread of all the Giant Lobelias, on mountains from South Tanganyika to Abyssinia: on Mount Kenya in open places in the forest from 7,000 ft. upwards.

L. aberdarica R.E. & T.C.E. Fries. Known from Elgon, Nandi, Mau, Aberdares as well as Mount Kenya, where it is recorded only from a swampy place in the forest at 7,000 ft.

L. bambuseti R.E. & T.C.E. Fries. An inhabitant of the upper part of the bamboo zone, recorded only from Mount Kenya and the Aberdares.

L. keniensis R.E. & T.C.E. Fries, known only from the Mount Kenya moorland. It was on the inflorescence of this plant that Baker wrote part of his description of *L. gregoriana*.

L. telekii Schweinfurth (synonym *L. fenniae* T.C.E. Fries). Also known from Elgon and the Aberdares. This is the species, so common on the Mount Kenya moorlands, that has the flowers deeply buried in a multitude of long narrow bracts.

It will be seen that only the last two species are inhabitants of the moorland. Meinertzhagen (1937) in referring to "the ostrich-plume *Lobelia*" as *keniensis* and the other as *telekii*, transposed the names. All the Mount Kenya species except *L. giberroa* are depicted by photographs in Fries and Fries (1922a).

3. THE MAMMALS.

Apart from descriptions of individual "new" forms, the greater part of the published information about the mammals of the mountain is due to the Americans. The early travellers obtained only a few specimens. In 1909-1912, Mearns and Loring collected well up on to the moorland in the Meru sector and Heller, approaching from the south-west, right to the edge of the snows. The altitude data and field-notes of Loring and Heller, especially on the small mammals, are of great value. Most of them appear in appendices to Roosevelt's book (1910). Subsequently Hollister (1919-1924) provided a most useful critical compendium of East African mammal specimens, from which more altitude data can be extracted. Lönnberg (1912) has recorded specimens collected in a short stay in 1911 round Meru Boma and in the forest above: but he spent only from 24th to 28th March in the main forest and his highest camp was at only 2,700 m. (8,800 ft.).

In the following list I have used the nomenclature of Allen's check-list,* except that where Ellerman† has other views I have followed him.

Especially with such a mountain as Kenya, which has its base on one side much nearer to sea-level than on the other, it is difficult to decide on the geographical or altitudinal limits significant for a faunistic study. Mearns regarded "the mountain proper as beginning at an altitude of 7,500 ft." (Roosevelt, 1910, p. 499.) Orographically, at any rate on the west side, this is about right. For the sake of completeness I have included species with type locality Mount Kenya even where their altitude is lower than this. But on the other hand, I have excluded essentially "plains" species, such as the zebra, even though they penetrate the glades on the north to 8,000 or 9,000 ft., unless they have been reported on the moorland itself.

SHREWS.

Crociodura allex alpina Heller (a Pygmy Shrew).

A moorland form ranging up to 13,700 ft. The typical subspecies came from Naivasha. Specimens from high on the Aberdares are intermediate between *allex* and *alpina* (Hollister).

Crociodura fumosa fumosa Thomas (Dusky Shrew).

The type locality is at about 8,000 ft. on the western slope of Mount Kenya. Not altogether a high-altitude species, because it has also been recorded in "rush swamps and sedgy places" of Athi, Sotik and Rift Valley. But one subspecies, *C.f. montis* Thomas, came from 12,500 ft. on Ruwenzori, and *C. alchemillae* Heller, which Allen sinks in *C.f. fumosa*, came from the summit of the Aberdares. Possibly then *C.f. fumosa* is an inhabitant of the Mount Kenya moorland.

*Allen G., M. A Check-list of African Mammals. *Bull. Mus. Comp. Zool. Harvard*, **83**, 1-763, 1938. (A list of names, type localities and synonymy: not, unfortunately, of geographical ranges.)

†Ellerman, J. R. *The Families and Genera of Rodents*, two volumes, London, 1941.

Crocidura turba zaodon Osgood.

Recorded by Lönnberg and Heller for Mount Kenya without altitude details. It is not typically a montane species but has been recorded as high as 11,000 ft. on the Aberdares (type locality of *C.t. provocax* Thomas, sunk by Allen in *C.t. zaodon*).

Crocidura occidentalis kijabae Allen.

A comparatively large, fierce and predacious shrew that has been taken on the upper edge of the Mount Kenya forest, 10,700 ft. (and on the Aberdares). This is the animal for which Heller and also Loring use the name *Crocidura nyansae*.

Sylvisorex granti mundus Osgood.

A forest shrew collected from 7,000 to 10,000 ft. Probably not distinguishable from *S.g. granti* Thomas of Ruwenzori (type locality 10,000 ft.).

Surdisorex polulus Hollister.

Apparently known only from Mount Kenya, 9,000 to 12,100 ft.

HORSESHOE BAT.

Rhinolophus geoffroyi keniensis Hollister.

Type locality Mount Kenya, 7,000 ft. A member of a very widespread species and probably not montane.

BUSH-BABY.

Galago crassicaudatus subsp. presumably *kikuyuensis* Lönnberg.

A forest species and subspecies not typically highland.

MONKEYS.

Colobus polykomos kikuyuensis Lönnberg.

Cercopithecus mitis kolbi Neumann, "Blue" or Sykes' Monkey (Guenon).

Both are highland subspecies of species inhabiting evergreen forest wherever it occurs, and both go up to at least 10,000 ft. on Mount Kenya. According to Allen, Matschie described both *Colobus caudatus thikae* and *C.c. laticeps* from "west slope of Mount Kenya" and both are synonyms of *C.p. kikuyuensis*.

Pure white colobus, which are apparently not albinos, occur in some numbers on Mount Kenya. There is one skin in the Coryndon Museum without data. D. G. B. Leakey (*in litt.*) mentions that he knew of "many specimens on the Thego River and on the Burguret. The white colobus are believed to form at least one troop of their own and to breed true.

STRIPED-WEASEL (Zorilla; "African Skunk").

Ictonyx striatus subsp.

Occurs on the moorland up to 12,000 ft. (Raymond Hook).

JACKAL.

Thos sp.

Jackals occasionally come up through the gap to the northern moorlands (Raymond Hook).

GENET.

Genetta tigrina stuhlmanni Matschie.

Has been collected at 8,500 ft. on the west side of Mount Kenya. This is a widespread and ecologically most adaptable species.

MUNGOOSE (Black-tipped).

Myonax sanguineus orestes (Heller).

West slope of Mount Kenya 8,500 ft. The species is very widespread, not montane.

SERVAL.

Felis serval hindei Wroughton.

Occasionally goes on to the northern moorlands (Raymond Hook).

LION.

Felis leo subsp.

Dower (1935) writes of a "remarkable subspecies of lion, not yet known to science, living the life of a leopard in the thick bamboo and hagenia forests of the 10,000 ft. levels." Regarded as unproven. No one has ever been able to collect a specimen. Pitman (*A Game Warden Takes Stock*, 1942), however writes: "There is no reason to discredit the probability of a small race of lion occurring permanently at high altitudes . . . My own ideas support the claim that a small mountain race does exist in Kenya . . . It is evidently scarce, wary and extremely elusive."

It may be noted that as a rule greater, not smaller, size characterizes high-altitude races of vertebrates ("Bergmann's Rule").

LEOPARD.

Felis pardus pardus Linnaeus.

Leopards occur all up the slopes and "travel frequently" as far as the edge of the snows. On the moorlands they live on the abundant small rodents, as proved by examination of their dung (Raymond Hook). Mackinder saw a leopard at 14,400 ft., Stoneham (1932) one, actually on snow.

HARE.

Lepus sp.

Raymond Hook has twice seen their dung at 11,000 ft., but never a living hare on the moorland. It is rather surprising that they should not be abundant residents. Those which occur might be either *Lepus capensis crawshayi* De Winton, which has been recorded from as near as "plains west of Mount Kenya" (Hollister), or *L. raineyi* Heller, the "long-eared, buff and black hare, with a distinct greyish rump," known from the Mount Kenya side of the Northern Guasa Nyiro to Marsabit.

PORCUPINE.

Hystrix galeata subsp.

I picked up a quill at 11,500 ft. on the moorland above Nanyuki. The porcupine can only be a rare straggler there, since Raymond Hook has never met one so high, although he knows that they occur in the bamboos.

SQUIRRELS:

Heliosciurus keniae (Neumann).

Type locality 8,000 ft. on Mount Kenya. Allen treats this as a subspecies of *H. rufobrachium*, Ellerman as a subspecies of *H. gambianus*. Both are characteristically West African and low-altitude forest species. Does not ascend far into the Mount Kenya forests (Raymond Hook).

Paraxerus ochraceus kahari (Heller).

A forest species apparently nowhere reaching high altitudes. Lönnberg calls the Mount Kenya animal *P. jacksoni* (De Winton), but it should doubtless bear the name *P.o. kahari*, which was subsequently described from "Meru Boma" and also collected at 7,000 ft. on the west side of Mount Kenya. Mackinder got the species at 8,000 ft.

TREE DORMOUSE.

Graphiurus (Claviglis) murinus raptor (Dollman).

8,500 to 11,000 ft. (from which altitude the type came). Allen and Loveridge [*Bull. Mus. Comp. Zool. Harvard*, 75 (2), 123, 1933] expressed the view that this is a subspecies not of *murinus*, but of *soleatus* Thomas and Wroughton of Ruwenzori, which on ecological grounds would be reasonable, but Hollister has recorded intergrades with *G.m. griseus* near Meru. Hopkins (*in litt.*) suggests that the explanation of these divergent views may be that *murinus*, *soleatus*, *raptor* and *griseus* all belong to one species.

MANED RAT (Crested Rat).

Lophiomys ibeanus hindei Thomas.

A forest mammal, not, apparently, collected above about 8,500 ft. Mount Kenya specimens have been identified as *ibeanus hindei*, described from the Aberdares, but if this is distinguishable at all from the typical *ibeanus* (type locality Mau), it is only on size of (cf. Hollister). *L. ibeanus* may well be conspecific with *L. imhausii* of Abyssinia (Ellerman).

It is worth emphasizing that, in the sense that it is not one of the family Muridae, this is not a "rat." Hollister records a statement that the animal is arboreal but thinks this is "probably a myth." Hollister's doubts were justified. According to Raymond Hook, "it is *not* arboreal. It lives in dead trees and walks about on the ground. It can climb well considering its non-athletic build." Ellerman (i, 635) thinks, from observations on captive specimens, that they are "the most perfect natural climbers," though slow-moving at all times.

THICKET RAT.

Grammonys (formerly *Thamnomys*) *gigas* (Dollman).

Type locality 9,000 ft. at "Solai, Mount Kenya." "Solai" may be the Olasurei marked as the spur on the north bank of the Rongai River (and hence not far from the West Kenya forest station) in the extreme top right-hand corner of the 1: 125,000 map (Nyeri sheet) South A-37/A II, 1913.

Hollister doubts whether the type represents more than an individual variation of *T. ibeanus ibeanus* Osgood (Molo, Naivasha, Aberdares). Ellerman accepts *G. gigas* as a species, without comment. The reason is, as R. W. Hayman has kindly informed me, that the British Museum possesses a second specimen from "Kasituka, west of Mt. Kenya" coll. J. L. Clarke. Raymond Hook identifies this as the Guaso Tuga, a stream just south-east of Nanyuki. The habitat of this animal remains uncertain, but from the localities it may well be forest.

RUFIOUS-NOSED RAT.

Oenomys hypoxanthus bacchante (Thomas).

Collected as high as 10,700 ft. on Mount Kenya and 11,000 ft. on Aberdares (Hollister). The reference by Heller (*in* Roosevelt, 1910) to the prevalence of *O.h. bacchante* in thorn country round Naivasha

is doubtless applicable really to *O.h. vallicola*, which he described four years later from that locality. *O. bacchante moerens* Thomas, from "Solai, west slope of Mount Kenya" is regarded by Hollister as a synonym of *O.h. bacchante*.

STRIPED GRASS-MOUSE.

Lemniscomys striatus massaicus (Pagenstecher).

Generally not montane but listed by Lönnberg for Mount Kenya, obtained by Heller at 7,000 ft., and actually ranging to 10,000 ft. (Raymond Hook).

FOUR-STRIPED GRASS-MOUSE.

Rhabdomys pumilio diminutus (Thomas).

A montane form of a species of immensely wide distribution often in dry country (e.g., Namaqualand), but ascending Mount Kenya to at least 10,700 ft. and the Aberdares to the top.

SHORT-HAIRED RAT ("White-footed Mouse").

Rattus (Praomys) tullbergi subsp.

In forest up to 10,700 ft. Heller recorded his field-notes under the subspecies *peromyscus* Heller (type locality Sotik). Hollister lists Heller's Mount Kenya specimens as *jacksoni* (De Winton), type locality Entebbe (probably erroneous—Hopkins *in litt.*). Lönnberg listed Mount Kenya specimens under the name *Praomys jacksoni*.

CLIMBING WOOD-MOUSE.

Rattus (Hylomyscus) denniae denniae (Thomas).

Collected by both Lönnberg and Loring, the former giving the habitat as mixed bamboo and forest at 2,700 m. (8,800 ft.).

PIGMY MICE.

Mus (Leggada) grata grata Thomas and Wroughton.

L.g. sungarae Heller from West Kenya forest station 7,500 ft. is a synonym. A grass mouse general throughout Kenya (Heller); probably not montane.

Mus (Leggada) triton triton (Thomas).

Another grass mouse listed by Lönnberg and by Hollister. The former got it above Meru as high as he did any collecting, viz., at about 8,800 ft.

HARSH-FURRED MOUSE.

Lophuromys aquilus aquilus True.

Collected by Mackinder, 8,000 to 10,000 ft. "Up to the timber line but not in deep forest nor in grassy plains" (Heller). The type locality is Kilimanjaro. Nevertheless, not a typically montane species, for it is abundant in Kampala (Hopkins *in litt.*). Other subspecies from Eigon and from Aberdares (*L.a. zena* Dollman) were thought by Hollister not to be separable, but Osgood (*Zool. Ser. Field Mus. Nat. Hist.*, 20, 243, 1936) and Ellerman both maintain *L.a. zena*. This leaves Kilimanjaro, Elgon and Mount Kenya all with the subspecies *aquilus*, but *zena* on the geographically intervening Aberdares. An unsatisfactory distribution which makes it unlikely that Ellerman's subspecific arrangement is final.

GIANT RAT.

Cricetomys gambianus kenyensis Osgood.

Type locality "south side of Mount Kenya." There seem to be no published records of these animals high up the mountain, but they are extremely common in the Upper Imenti forest, a few feet above Meru (D. G. B. Leakey *in litt.*), where they infest the camp.

(MOUSE).

Dendromus insignis percevali Heller.

Notwithstanding its name, not, according to Heller, a tree-mouse but frequenting *Otomys* runs in the grass, 7,500 to 14,200 ft. (Hollister).

GROOVE-TOOTHED RATS ("Veldt Rats" or "Vlei Rats").

Otomys orestes orestes Thomas.

Type locality, Teleki Valley at 13,000 ft. This is a most important inhabitant of the moorland, making runs in the rank grass which serve as highways for other small rodents and for shrews. Raymond Hook reports them so common round his 14,000 ft. camp that his dogs can live on them. Loring found them "numerous in the grass bordering the glacial lakes at 15,000 ft."

Otomys tropicalis tropicalis Thomas.

Apparently limited to Mount Kenya, where it has been collected, 7,500 to 13,700 ft., according to Hollister. This swamp-rat, as Hollister calls it, is the animal appearing in the Mackinder collection under the name *O. irroratus*. The much more widespread subspecies *O.t. elgonis* occupies, besides most of Uganda (Hopkins *in litt.*), the whole of the Aberdares, and extends to the western base of Mount Kenya (7,000 ft.).

MOLE-RATS.

Tachyoryctes rex Heller.

West Kenya forest station and also 8,500 to 11,000 ft. "In all the open grassy plots in the bamboo belt and open timber." The foregoing statements by Loring in Roosevelt's book are not in exact accord with the information Heller gives elsewhere,* viz.: "It inhabits a narrow zone at the upper edge of the bamboo forest where the moorland first makes its appearance. The species is not found immediately below this area in the bamboo or yew [*Podocarpus*] forests, but another species appears on the grassy plains at the base of the mountain." Raymond Hook regards the range of *T. rex* as typically moorland, 10,000 to 12,500 ft.

TREE HYRAX.

Dendrohyrax arboreus crawshayi (Thomas).

Type locality 10,000 ft. west slope of Mount Kenya. The most obvious mammal—by its nocturnal voice—in the forest belt.

LARGE-TOOTHED HYRAX (Rock Dassie).

Procavia johnstoni mackinderi Thomas.

A moorland subspecies (up to 15,500 ft., on the edge of the permanent snow) of a very widely distributed species often in hot dry country (e.g., Mwanza).

**Smithson Misc. Coll.*, 56 (9), 4, 1910.

ÉLEPHANT.

Loxodonta africana subsp.

Mackinder saw tracks up to 11,500 ft. "They do go right out on to the moors and up to 12,000 ft., but not to any extent" (Raymond Hook). "There is a broad elephant highway from above Timau to the top of the Kiringa River (South Kenya); then down the Kiringa River Ridge to the back of the Thiba River Camp and then just inside the forest line to the big salt licks by Chogoria. On the true mountain this path keeps in the sugar bush (*Protea*). This path is three feet wide and six inches deep below the surrounding soil-level, is at about 10,850 to 11,000 ft., and must have been used for years. There is another broad path joining up with this path on the moors right up between the Sagana and Ragati Rivers" (Copley *in litt.*).

GIANT FOREST HOG.

Hylchoerus meinertzhageni meinertzhageni Thomas.

It is curious that neither Hollister nor Roosevelt records this hog for the mountain. But Lydekker (1908) and Stigand (1913) have done so; Raymond Hook is familiar with them on the west side; and the Game Department regard them as "very common especially in the Ragati River and Sagana River headwaters," i.e., at the south end of the mountain. An account of the habits of the Giant Hog, which Raymond Hook is prepared to endorse from his own experience, appeared in *J. E. Afr. Nat. Hist. Soc.*, Vol. 3, No. 3, March, 1911, (C. W. Woodhouse). There seems no doubt that this animal is a browser, extremely fond of a single species of herb growing in the forest shade. A specimen sent by Raymond Hook has kindly been identified by the Conservator of Forests as *Mimulopsis thomsonii* C.B. Cl. (Kikuyu *sunguya* or *thunguya*). These hogs are sufficiently catholic in their tastes to raid the forest squatters' plots in the Ragati area, especially for sweet-potato tops (D. G. B. Leakey and H. Copley *in litt.*).

HARTEBEEST.

Alcelaphus buselaphus subsp.

Raymond Hook has found a skeleton on the northern moors at 13,000 ft. Evidently a rare straggler up through the northern gap.

HARVEY'S DUIKER.

Cephalophus harveyi harveyi Thomas.

A forest species not specially montane.

BLACK-FRONTED DUIKER.

Cephalophus nigrifrons hooki St. Leger.

A subspecies, known only from Mount Kenya and the Aberdares, of a rather widespread forest animal that has developed different forms on other mountain masses close to the Equator. On Mount Kenya it is "always in the bamboo or just above it, never away on the moors" (Raymond Hook).

COMMON DUIKER.

Sylvicapra grimmia altivallis Heller.

A moorland subspecies (described from the Aberdares) of an exceedingly widespread species. It ranges from 10,000 to 14,500 ft. on Mount Kenya (Raymond Hook). There is another subspecies, *S.g. lobeliarum* Lönnerberg, peculiar to the Elgon moorlands.

KLIPSPRINGER is mentioned by Chapin (1934) at about 10,500 ft., but Raymond Hook believes this is a misidentification of the preceding species (Duikerbok).

SUNI (DWARF ANTELOPE).

Nesotragus moschatus akeleyi Heller.

Type locality south-east slope of Mount Kenya at 7,000 ft. A widespread species of thick bush, probably nowhere really montane. Not seen on Mount Kenya by Raymond Hook above 8,000 ft., but recorded by Lönnberg to 8,800 ft.

STEINBUCK.

Raphicerus campestris neumanni Matschie.

Another rare straggler to the northern moors (Raymond Hook).

BONGO.

Boocercus eurycerus subsp.

A species apparently found only in and near bamboo; but less common in the Mount Kenya belt than in the Aberdares. However they are not rare at the south end of Mount Kenya (Game Department) and Raymond Hook has evidence that they occur on the west side. Subspecies probably *isaaci* Thomas (type locality Eldama Ravine).

ELAND.

Taurotragus oryx pattersonianus Lydekker.

The eland of Mount Kenya are regarded by the Game Department as this subspecies (which inhabits Kenya generally), and as moving up and down the mountain seasonally. According to Raymond Hook several herds are resident on the moorland.

BUSHBUCK.

Tragelaphus scriptus delamerei Pocock.

The type of *T. haywoodi brunneus* Matschie, regarded as a synonym, came from 7,400 ft. on West Kenya, Bushbuck go up as far as the upper edge of the timber, i.e., about 10,700 ft. (Raymond Hook).

BUFFALO.

Syncerus caffer caffer (Sparrman).

Mackinder found a skeleton at 14,200 ft., tracks at 14,500 ft.; Ross found a carcass at 14,500 ft. (Both these remains are marked on the map in Dutton's book.) It is evidently unusual for buffalo to reach such heights. Raymond Hook has not seen a living one above 12,000 ft. They work up from the upper edge of the forest following the new growth on the moorland after a burn.

BLACK RHINO.

Diceros bicornis bicornis (Linnaeus).

At any rate towards the north end of the mountain, where the forest is comparatively dry and open, rhinos frequent its upper edge (ca. 10,500 ft.) but Raymond Hook has never seen them more than half a mile out of the moorland. Also on the wetter south side D. G. B. Leakey "can vouch for rhino occurring on the lower edge of the moorland on the southern slopes between Kiringa and Sagana Rivers, above the bamboo belt."

4. THE BIRDS.

Mount Kenya was ornithologically practically unknown when Mackinder made his ascent and several new forms were described from specimens collected by his expedition. Moreover, he provided useful field-notes. Lönnberg about ten years later worked in the forest above Meru, apparently to about 8,800 ft., and reported his results in full. Mearns, Loring and Jackson obtained some specimens up as far as the moorland; those of the first two do not seem to have been listed, though Mearns described what he regarded as new forms; those of Jackson are presumably all included in his book (1938). In 1929, Bowen made an interesting collection in the forest round and above Meru, but unfortunately his account (1931) does not give altitudes. From "internal evidence" it seems probable that he, like Lönnberg, did not work above about 8,000 ft. Shortly afterwards Chapin made a brief trip by the Chagoria track to the moorland. He has written a spirited account (1934) containing valuable notes. The lists of van Someren (1922 and 1932) contain a number of records for "Kenia," understood to be Mount Kenya, though without more precise locality and without altitude.

The foregoing was the state of ornithological knowledge of Mount Kenya when Meinertzhagen and his party carried out three weeks' intensive collecting above Nanyuki at the beginning of 1936. Meinertzhagen's account (1937) is certainly the first consistent attempt to delineate the altitudinal zonation of the birds occurring on the mountain and he made notable additions to our knowledge of the moorland birds: but it will be seen from the foregoing paragraph that he hardly did justice to his predecessors in his statement (1937, p. 734): "Very little ornithological work has been done since that [Mackinder's] day to this on Mount Kenya."

Since Jackson's book was not published until 1938, it might be supposed that it would contain all the published records from the collectors named above and that the avifauna of Mount Kenya could be compiled by extracting the records for that locality from Jackson's book. But in fact, Meinertzhagen's records evidently became available too late for inclusion and many of Bowen's records of passerines have been omitted, apparently through inadvertence.

Some of these omissions are important from a zoo-geographical point of view because they give an incorrect view of the species' extension: and I take the opportunity of bringing the most notable of these cases to notice in List A. I would direct special attention to the first and the last.

List A.

Species.	Authority for Mount Kenya record.	Nearest localities cited by Jackson (1938).
<i>Buteo oreophilus</i>	Chapin	Eldoret.
<i>Pogoniulus bilineatus</i>	Bowen	Nairobi.
<i>Yungipicus obsoletus</i>	Bowen	Fort Hall.
<i>Alseonax minimus</i>	Bowen	Rumuruti; Machakos.
* <i>Chlorophoneus near rubiginosus</i> .	van Someren	(Omitted.)
<i>Lamprocolius corruscus</i>	Bowen	Jombeni Mountains.
<i>Estrilda atricapilla</i>	van Someren	Aberdares.
<i>Spermophaga ruficapilla</i>	Bowen	Kakamega.

In compiling the selected, montane, list, which is List C, I have followed the same principle as for the mammals, regarding the actual mountain as from about 7,000 ft. upwards and trying to select those

*Presumably a mutant of *C. nigryrons* Rehw.

species which are really members of the montane forest and moorland communities respectively. The montane forest may conveniently be divided into the upper zone, comprising the bamboo and *Hagenia*, i.e., from about 9,000 to 10,700 ft., and the lower zone, below the bamboos. Below this lower zone again there is, of course, extensive forest on the east side. But for the present purpose I exclude those species recorded in the foothill forest of Meru and Embu and not also in the main mountain forest. Those species which I have excluded pending further information comprise List B which follows:—

Accipiter melanoleucus A. Sm., *Astur badius sphenurus* Rupp., *Gymnogenys typicus* (A. Sm.), *Francolinus squamatus maranensis* Mearns, *Tympanistria tympanistria fraseri* Bp., *Bycanistes buccinator* Temm., *Bubo lacteus* (Temm.), *Telecanthura ussheri stictilaema* (Rchw.), *Colius striatus* subsp., *Apaloderma narina narina* Steph., *Buccanodon leucotis keniae* Bowen, *Pogoniulus bilineatus alius* Friedm., *Thripas namaquus namaquus* (Licht.), *Yungipicus obsoletus ingens* Hartert, *Dendropicus lafresnayi lepidus* (Cab. & Heine), *Anthus leucophrys goodsoni* Meinertz., *Anthus richardi lacuum* Meinertz., *Pycnonotus barbatus fayi* Mearns.,* *Phyllastrephus fischeri keniensis* Mearns (= *P.f. placidus* Shelley), *Chlorocichla flaviventris centralis* Rchw., *Stelgididylla gracilirostris percevali* (Neum.), *Stelgidocichla latirostris eugenia* (Rchw.), *Trochocercus bivittatus kikuyuensis* van Som., *Parisoma lugens jacksoni* Sharpe, *Batis molitor puella* Rchw., *Geokichla gurneyi chuka* van Som.,† *Erthropygia hartlaubi kenia* van Som., *Cossypha semirufa intercedens* Cab., *Alethe poliocephala akeleyae* Dearborn, *Apalis pulchra pulchra* Sharpe, *Apalis melanocephala nigrodorsalis* Granvik, *Sigmodus* (*Knestrometopon*) *scopifrons keniensis* van Som., *Lanius collaris humeralis* Stanley, *Parus albiventris albiventris* Shelley,‡ *Chlorophoneus nigrifrons nigrifrons* Rchw. (and mutants, *abbotti* Richmond, (?) *rubiginosus* subsp. — see van Som., 1932, p. 305), *Corvus capensis kordofanicus* Laubm.,§ *Stilbopsar kenricki* (Shelley), *Pholia sharpii* Jacks., *Nectarinia kilimensis kilimensis* Shelley, *Buphagus erythrorhynchus* Stanl.,§ *Cinnyris reichenowi reichenowi* Sharpe, *Cyanomitra verticalis viridisplendens* Rchw., *Phormoplectes insignis ornatus* Granvik, *Mandingoa nitidula chubbi* O.-Grant, *Coccopygia melanotis kilimensis* Neum., *Hypargus niveoguttatus* Peters, *Linurgus kilimensis keniensis* van Som.

From records on other East African mountains I should expect that on further experience several of the above birds would be found to qualify for inclusion in the list for the main mountain forest (List C below), especially *Pholia sharpii* and *Linurgus*.

In the main montane list (List C), which follows, I have not thought it necessary to cite an authority where the information given is derived without significant change from Meinertzhagen (1937) or Jackson (1938). In a few species personal observations made when E. G. Rowe and I followed Meinertzhagen's route in June, 1943, modify the altitude ranges he found: and such modifications are indicated by our initials, E.G.R. and R.E.M.

*Goes up to 8,200 ft., but I regard it as a bird of wooded, not forest country, that follows up the glades.

†Apparently only known from 7,000 ft., on the south-east side of the mountain. It is retained in this list pending further evidence of its altitudinal distribution.

‡Obtained by E.G.R. & R.E.M. just inside the forest edge at 8,200 ft., an unexpected record.

§Common round Nanyuki up to about 7,200 ft. (E.G.R. & R.E.M.). There seems to be no published record east of the Rift nearer than the Kapiti Plains.

§Perhaps the ox-pecker straggles to the moorland (Meinertzhagen).

STRAGGLERS.

It will, of course, be realized that, especially with creatures so potentially mobile as birds, observed altitude limits have no absolute validity. Utterly unexpected things may turn up right out of their normal zone. We had a startling example of this when we were camped at the lower edge of the moorland at about 10,700 ft. and on the same afternoon were visited there by a Hammerkop (*Scopus umbretta*) and a Crowned-Hornbill (*Lophoceros melanoleucus*). Another example has been provided by Raymond Hook, who recently saw a secretary bird (*Sagittarius serpentarius*) at 13,000 ft.—which is about as unlikely as the ostriches I have recorded elsewhere at 12,000 ft., on the top of Loolmalassin. Chapin's wryneck, *Lynx ruficollis*, on the moorland must be placed in the same category of astonishing wanderers.

The visits of itinerant water birds to the moorland lakes may not be unusual. Raymond Hook saw on one occasion five dabchicks (*Poliocephalus ruficollis*) on Lake Ellis, and has one record of a coot, presumably *Fulica cristata*, at about the same altitude.

Because most African species that do not belong to evergreen forest wander a lot, or even have definite migrations during the non-breeding season, I should expect that in the course of time many species would be added to the moorland list. By the same token many Palaeartic migrants may be expected to turn up there from time to time, though so far only one species has been recorded.

List C.

IBIS.

Lamprolaima olivacea akeleyorum Chapman.

Occurs throughout the forest but commonest perhaps in the uppermost part.

BLACK (MOUNTAIN) DUCK.

Anas sparsa leucostigma Rüppell.

Resident on the forest streams and at least visiting the moorland lakes, where they have been mentioned by most people who have written of the lakes, from Mackinder onwards.

LONG-CRESTED HAWK-EAGLE.

Lophaëtus occipitalis (Daud.).

To 8,500 ft.

CROWNED HAWK-EAGLE.

Stephanoaëtus coronatus (Linn.).

A true forest bird observed to about 8,600 ft. (E.G.R. & R.E.M.). It may well go much higher.

AUGUR BUZZARD.

Buteo rufofuscus augur (Rüpp.).

A common bird at all altitudes up to 16,000 ft. (Chapin). The birds ranging the moorland may actually nest in the trees on its lower edge, but there can be no doubt that this buzzard is a very important factor in the life (and death) of the small rodents above the timber line.

MOUNTAIN BUZZARD.

Buteo oreophilus Hart. & Neum.

A species about which very little has been written. Apparently not uncommon in the forest of the east side, where Chapin regarded them as specializing on chameleons. Raymond Hook describes a hunting pair as sailing along very slowly and majestically—just not stationary—about a hundred feet above the ground. Most of those he has seen have been over trees near the timber line, but others were over the moorland, up to about 11,500 ft., where there is plenty of bushy vegetation. Copley informs me that three were collected for the Coryndon Museum in the *Hagenia* at 10,500 ft.

LAMMERGEYER.

Gypaëtus barbatus.

Occasionally seen on the moorland north-west of the peaks by Raymond Hook as well as by Meinertzhagen. Conceivably a resident in very small numbers. The subspecies is presumably *meridionalis* Keys. & Blas.

JACKSON'S FRANCOLIN.

Francolinus jacksoni pollenorum Meinertzhagen. *Bull. Brit. Orn. Club*, 57, 67, 1937.

A subspecies confined to Mount Kenya forest belt where it is commonest in the upper part.

SHELLEY'S FRANCOLIN.

Francolinus shelleyi theresae Meinertzhagen. *Bull. Brit. Orn. Club*, 57, 68, 1937.

A subspecies confined to the Aberdares and to Mount Kenya up to 12,700 ft. It is typically a bird of the moorlands but evidently it moves down some distance through the northern gap in the Mount Kenya forest ring, as is shown by Jackson's record at 7,700 ft. there. [This appears in Jackson's book under the name *Francolinus elgonensis*, i.e., as a full species. Both earlier, in Sclater's *Systema Avium Aethiopicarum* (1930) and later, by Meinertzhagen (1937), *F. elgonensis* has been regarded as a subspecies of *F. shelleyi*.]

BUFF-SPOTTED PIGMY CRAKE.

Sarothrura elegans elegans (A.Sm.).

Probably a resident in the bamboos. The type of *S.e. loringi*, regarded as a synonym, came from the west side at 8,500 ft.

(PIGMY CRAKE).

Sarothrura lineata antonii Mad. & Neum.

Apparently a resident in swamps on the moorland up to at least 12,100 ft. [The altitude 14,000 ft. quoted by Jackson (i, 297, footnote) seems unwarranted.]

ETHIOPIAN SNIPE.

Capella nigripennis (Bp).

Possibly resident on the moorland, where it has been collected as high as 12,500 ft. (Mearns).

OLIVE PIGEON.

Columba arquatrix arquatrix Temm. & Knip.

Throughout the forest.

BRONZE-NAPED PIGEON.

Turturoena delegorguei sharpei Salvad.

A forest species perhaps not going into the upper belt.

LEMON DOVE.

Aplopelia larvata larvata (Temm. & Knip).

As for *Turturoena*.

HARTLAUB'S LOURIE.

Turacus hartlaubi (Fschr. & Rchw.).

Throughout the forest.

RED-HEADED PARROT.

Poicephalus gulielmi massaicus (Fschr. & Rchw.).

Flighting most conspicuously over the fringing forests below the main belt but actually ascending to the timber-line (Mearns).

GIANT KINGFISHER.

Megaceryle m. maxima Pallas.

No published record, but Copley (*in litt.*) reports them "at a good 8,000 to 9,000 ft." on the Thiba, Rupengazi, Kiringa, Gazita and Thingishu Rivers.

MOUNTAIN BEE-EATER.

Melittophagus lafresnayii oreobates Sharpe.

A forest species but apparently not in the uppermost belt.

SILVERY-CHEEKED HORNBILL.

Bycanistes cristatus (Rüpp.).

As preceding.

WHITE-HEADED WOOD-HOOPOE.

Phoeniculus bollei jacksoni (Sharpe).

As preceding, but up to at least 8,800 ft. (Lönningberg).

MACKINDER'S OWL.

Bubo capensis mackinderi Sharpe.

A resident on the moorland, where it is certainly an important member of the fauna. Meinertzhagen records their food as "small rodents": Mackinder regarded the rock-hyraxes as their staple.

In stating that this owl has "never been obtained away from the moorland of Mount Kenya" Meinertzhagen overlooked the specimen collected by Lynes six hundred miles to the south, in Iringa (*J. Orn.*, **82**, Sonderh., 1934). Since then it has been reported from three other localities in the Kenya Highlands (Leakey, *J. E. Afr. Nat. Hist. Soc.*, **17**, 284, 1943).

WOOD-OWL.

Ciccaba woodfordii subsp.

Until lately kept in the genus *Strix*. Lönningberg recorded it on the "east flank": it was noisy above Nanyuki at 8,300 ft. (E.G.R. & R.E.M.) and may go higher.

NIGHTJARS.

Caprimulgus pectoralis frenatus (Salvad.).

This is the bird hitherto known as *C. rufigena frenatus* (see *U.S. Nat. Mus. Bull.*, 153, p. 307 and *Bull. Brit. Orn. Club.*, **58**, 34, for name change). Obtained in the bamboos at 10,300 ft. Status uncertain.

Caprimulgus poliocephalus poliocephalus Rüpp.

Collected by Mackinder and by Hook up to 11,000 ft. Quite likely to be a resident on the lower edge of the moorland.
[*Caprimulgus keniensis* van Som., type locality "first camp north of Kenia," also quoted as "north of Mount Kenya," is probably not a montane bird.]

SWIFTS.

Alpine Swifts almost certainly breed up to 14,000 ft. and there may be another resident species as well (see Meinertzhagen, 1937, p. 745). The Alpine Swifts may be *M. melba africanus* (Temm.) as recorded by Jackson, but are more likely to be *M.m. striatus* Meinertz. (*Bull. Brit. Orn. Club*, 57, 69).

BAR-TAILED TROGON.

Heterotrogon vittatum vittatum (Shelley).

A forest bird apparently of the lower zone only. (*H.v. keniensis* Bowen regarded as a synonym.)

LITTLE GREEN BARBET.

Viridibucco simplex leucomystax (Sharpe).

Habitat as preceding.

SCALY-THROATED HONEY-GUIDE.

Indicator variegatus variegatus Lesson.

A forest bird collected up to at least 10,000 ft. Since this species is parasitic on woodpeckers and barbets either the individual taken at 10,000 ft. was merely a straggler from lower levels or one of its hosts nests at higher elevations than we know at present.

FINE-BANDED WOODPECKER.

Campethera taeniolaema hausburgi Sharpe.

Apparently the only woodpecker in the mountain forest and only in the lower zone of that.

SHARPE'S LONG-CLAW PIPIT.

Macronyx sharpei Jackson.

Occurs in small numbers on the moorlands up to at least 13,000 ft. (Raymond Hook), where it is probably resident (as well as on the grassland below the forest belt).

HILL-BABBLER.

Pseudoalcippe abyssinicus abyssinicus (Rüpp.).

A forest bird not recorded above the lower zone.

MOUSTACHED BULBUL.

Stelgidocichla latirostris eugenia Rchw.

Range as preceding.

GREY-THROATED GREENBUL.

Arizelocichla tephrolaema kikuyuensis (Sharpe).

Up through the forests to the timber-line.

PYGMY FLYCATCHER.

Aelseonax adustus (minimus) interpositus van Som.

Through the forest belt practically to the top. (This subspecies has been regarded as indistinguishable from *pumilus* Rchw. by Grant and Mackworth-Praed *Ibis*, 1940, page 327: Bowen recorded his specimens from the Meru forest as *A.m. murinus* Fschr. & Rchw.)

WHITE-EYED SLATY FLYCATCHER.

Dioptrornis fischeri fischeri Rchw.

Up to the timber-line, 10,700 ft. (E.G.R. & R.E.M.). Not a bird of deep forest.

WHITE-TAILED CRESTED FLYCATCHER.

Trochocercus albonotatus albonotatus Sharpe.

A bird of forest, up to timber-line.

MOUNTAIN YELLOW FLYCATCHER.

Chloropeta similis Richmond.

A bird of forest glades to at least 10,000 ft., but not apparently venturing into the open moorlands. It has usually been regarded in the past as a subspecies of *C. natalensis*, but this is incorrect. *C. similis* has only twelve tail-feathers; *C. natalensis* has fourteen (see Granvik, *Rev. Zool. Bot. Afr.*, **25**, 73, 1934; Macdonald, *Bull. Brit. Orn. Club*, **60**, 82, 1940).

OLIVE THRUSH.

Turdus olivaceus elgonensis (Sharpe).

Common in the forest up to 8,400 ft. (Meinertzhagen) and occurring to the timber line (E.G.R. & R.E.M.).

ORANGE THRUSH.

Geokichla piaggiae kilimensis Neum.

Also extending through the forest to its upper edge. (The type of *G.p. keniensis* Mearns, regarded as a synonym, came from 10,000 ft.)

HILL CHAT.

Pinarochroa sordida ernesti Sharpe.

From the upper edge of the timber to the upper edge of the moorland (at least 15,000 ft.). Raymond Hook found a nest with two eggs at the end of August.

ROBIN CHAT.

Cossypha caffra iolaema Rchw.

In glades up to at least 8,500 ft. (E.G.R. & R.E.M.) and it may go much higher, as it does on Aberdares (10,000 ft.).

STONE CHAT.

Saxicola torquata axillaris (Shelley).

In glades, apparently not up to the higher zone of the forest.

WHITE-STARRED BUSH-ROBIN.

Pogonocichla stellata guttifer Rchw. & Neum.

Inhabiting forest to the upper edge. The type of *P.s. keniensis* Mearns, regarded as a synonym by Grant and Mackworth Praed (*Bull. Brit. Orn. Club*, **61**, 20, 1941), came from 10,700 ft.

BROWN FLYCATCHER-WARBLER.

Seicercus umbrovirens mackenzianus Sharpe.

A bird of the forest to its upper edge.

"SCRUB-WARBLERS."

Sathrocercus cinnamomeus cinnamomeus (Rüpp.).

Ascending to practically the top of the forest belt: a species of rank vegetation but not deep forest.

Sathrocercus mariae mariae (Mad.).

As a rule a species of thick forest undergrowth. Meinertzhagen's remark (*Ibis*, 1937, 750) that his "discovery of this bird on Mount Kenya is interesting, for it was known previously only from Kili-manjaro" is due to a misapprehension. Under the name *Bradypterus altumi* it had already been recorded by van Someren from "Highlands of British East Africa, 8,000 to 10,000 ft., Molo District and Mount Kenia" (*Bull. Brit. Orn. Club*, 40, 22, 1919), and from "near Meru" (*Nov. Zool.*, 37, 373, 1932).

BROWN-HEADED FOREST WARBLER.

Apalis cinerea cinerea Sharpe.

A bird of the lower belt of the forest, mainly in the tree-tops.

WHITE-BROWED CROMBEC.

Sylvietta leucophrys leucophrys Sharpe.

A forest bird apparently not extending into the upper belt. The only record for Mount Kenya appears to be the type of *S.l. keniensis* Mearns (regarded as a synonym), which was obtained by him at 8,500 ft.

HIGHLAND GRASS-WARBLER.

Cisticola hunteri prinioides Neum.

A bird with an altitude range and adaptability that are hardly surpassed. It inhabits glades all through the forest belt and extends up across the moorland practically to the edge of the snows. In the forest above Nanyuki, I was surprised to see it not only in glades but also under big trees where the undergrowth was rank herbage.

BANDED SAND-MARTIN.

Riparia paludicola ducis Rchw.

Chapin recorded these on the moorland and Raymond Hook saw them "frequently" in twos and fours in August. There is as yet no evidence whether they breed at those high altitudes.

"Swallows" in the neighbourhood of the moorland tarns are mentioned by both Dutton and Watteville. Dutton speaks of swallows circling over Lake Michaelson (12,700 ft). Watteville found a cave "the home of the Hall Tarn Swallows, and the ledges were buried under old droppings and feathers" (p. 280). The place was evidently at about 14,000 ft. and much more likely to be used by Alpine Swifts than by any member of the Swallow family.

ROUGH-WING BANK-MARTIN.

Psalidoprocne holomelaena massaica Neum.

Not recorded as breeding above 7,100 ft., but foraging not only the forest glades at all altitudes but far out over the moorland to 13,500 ft. (Meinertzhagen). Owing to its dependence on *Usnea* (Beard Lichen) for nesting it is not likely to breed above the timber line.

PURPLE-THROATED CUCKOO-SHRIKE.

Campephaga quiscalina martini Jacks.

A forest bird, probably of the lower belt only. Meinertzhagen regarded his specimens as marking "a considerable eastward extension of the known range"; but the bird had already been recorded for both the Aberdares and Mount Kenya by van Someren.

GREY CUCKOO-SHRIKE.

Coracina caesia pura (Sharpe).

A forest species ranging to the timber line.

BOUBOU

Laniarius ferrugineus ambiguus Mad.

Noted by Meinertzhagen in February to about 8,300 ft., but heard repeatedly by Chapin and by E.G.R. & R.E.M. just inside the upper edge of the forest in June.

BLACK-TAILED ORIOLE.

Oriolus (monacha) percevali O.-Grant.

A forest bird recorded up to 8,500 ft.

WHITE-NECKED RAVEN.

Corvultur albicollis (Lath.).

Occasionally observed at all altitudes in the forest and well up on the moorland (12,000 ft.).

WALLER'S CHESTNUT-WING (Starling; Grackle).

Onychognathus walleri keniensis van Som.

A forest bird apparently not reaching the upper belt. The highest record is Lönnerberg's at 8,800 ft. Meinertzhagen recorded his Mount Kenya specimens as *O.w. elgonis*; but this is, he tells me, through his having overlooked van Someren's separation of the Mount Kenya subspecies.

SLENDER-BILLED CHESTNUT-WING.

Onychognathus tenuirostris raymondi Meinertz.

Mackinder found these interesting birds breeding in August, in the rocks in Höhnel Valley at about 12,000 ft. and Raymond Hook has seen them entering holes at similar elevations. Meinertzhagen recorded the birds only on the open rocky moorland above 13,000 ft. and regarded this form as "a true alpina bird, never coming down to tree-level."

Chapin's observations were at variance with this. He encountered them nearly to 15,000 ft., but found also that they "would perch awhile on high trees up and down the mountain. They seemed to 'commute' between the lower mountain forest where they could find fruit and the rocks up near 14,000 ft." E.G.R. & R.E.M. certainly saw a party of four on topmost *Hagenia* trees at sunset.

The question of how far these Mount Kenya birds travel, that is, to what extent their range is restricted and isolated, is of especial interest because Meinertzhagen described them as a separate subspecies, *raymondi*, distinct not only from Abyssinian birds, but also from those inhabiting the Aberdares moorlands. Moreover, Meinertzhagen's evidence was that while the Mount Kenya birds found their food on the moorlands, especially snails in the Giant Lobelias, the Aberdares birds fed on the olives of the forest. But Chapin's observations (1934) on the Mount Kenya birds would indicate that their feeding habits are not, at any rate consistently, at variance with those of the Aberdares birds.

A series of specimens from the Aberdares and Mount Kenya have recently been compared in the American Museum of Natural History. The conclusion is that birds from the two mountains cannot be distinguished and it is doubtful whether they merit a different name from the Abyssinian birds (J. P. Chapin *in litt.*).

WHITE-EYE.

Zosterops virens kikuyuensis Sharpe.

Through the forests practically to the timber-line, but apparently commonest in the upper belt.

SCARLET-TUFTED MALACHITE SUNBIRD.

Nectarinia johnstoni Shelley.

A true moorland bird, ranging as high as the Giant Groundsels and Lobelias on which it primarily depends. I did, however, see it feeding on Protea at 10,000 ft., above Timau, and Chapin made a similar observation on the east side of the mountain. Mearns made a specimen from 14,000 ft., the type of his *N.j. idius* but the consensus of opinion is that the Mount Kenya birds cannot be distinguished from those of Kilimanjaro.

Mackinder found nestlings in August.

MALACHITE SUNBIRD.

Nectarinia famosa aenigularis Sharpe.

Observed on the mountain only by Meinertzhagen and only between 10,000 to 10,500 ft.

TACAZZE SUNBIRD.

Nectarinia tacazze Stanl.

To at least 10,000 ft. (Mackinder; Chapin).

GOLDEN-WINGED SUNBIRD.

Drepanorhynchus reichenowi Fshr.

Up to the bamboos.

This species, like *N. famosa* and *N. tacazze*, is doubtless subject to seasonal movements which must be taken into account: but apparently none of these three sunbirds, though at home in the glades, ventures out on the moorland.

DOUBLE-COLLARED SUNBIRD.

Cinnyris mediocris keniensis Mearns.

Up to 10,000 ft. (Mackinder, Chapin). Jackson omits any mention of this form, described from Mount Kenya, and tacitly sinks it as a synonym of *C.m. mediocris* Shelley. van Someren (1932, 355) admits it and so does Meinertzhagen (1937, 754), but gives different reasons. Whether it is distinguishable or not, it seems from van Someren's remarks not to be confined to Mount Kenya.

OLIVE SUNBIRD.

Cyanomitra olivacea neglecta Neum.

A forest species not definitely recorded above 8,000 ft.

REICHENOW'S WEAVER.

Othyphantes reichenowi reichenowi Fshr.

A bird of forest edges, reaching the timber-line, where E.G.R. & R.E.M. saw nests as well as birds.

NEGRO FINCH.

Nigrita canicapilla diabolica Rchw. & Neum.

A bird of the forest undergrowth practically to the timber line. Meinertzhagen's record was not, as he thought, the first for the mountain: Bowen had reported it previously from above Meru.

CRIMSON WING.

Cryptospiza salvadorii ruwenzori W. Scl.

Another bird of the forest undergrowth. So far not recorded above 8,400 ft.

BLACK-HEADED WAXBILL.

Estrilda atricapilla subsp.

van Someren (1922) recorded *E.a. keniensis* Mearns, which was described from 8,500 ft. in the Aberdares, also for "Kenia." The birds are doubtfully distinguishable from *E.a. kandti* Rchw. of Kivu, and Chapin (1934) has applied this name to the Mount Kenya birds.

Meinertzhagen has recorded specimens of his from Mount Kenya and the Aberdares as *E. nonnula nonnula* Hartlaub, but Chapin, who has recently examined one of them, tells me that this is an erroneous identification.

YELLOW-CROWNED CANARY.

Serinus flavivertex flavivertex Blanf.

Meinertzhagen's statement is: "only met with at fairly high elevations on Kenya, where they were common in glades between 8,200 and 10,300 ft." This implies that they do not frequent the moorlands and was astonishing to me because on the great mountains of northern Tanganyika the species ascends to the limits of vegetation and beyond. Moreover, Orde-Browne (1918) almost certainly refers to this species when he mentions "a small shy bird somewhat resembling a canary, but with black patches" on the south-eastern moorland at 12,000 ft. I, therefore, asked Raymond Hook his experience and he writes: "In my opinion on both Kenya and Aberdares, they go as high as the Compositae go. I would have said that they ate practically every kind of Compositae seed, including Giant Groundsel."

STREAKY SEED-EATER.

Polioptila striolata striolata Rüpp.

A bird of scrub country with an astonishing altitudinal range, from about 5,000 ft. upwards. Meinertzhagen collected them up to 14,000 ft. on the moorland and it is of the greatest interest that he found birds from the higher elevations "slightly brighter and richer in colour" than those from the lower. Dr. Chapin, who has independently examined other specimens of this species from the Mount Kenya moorland notes (*in litt.*) that they have a stronger wash of yellow on the head and the throat than birds from elsewhere in the Kenya Highlands. In fact, in colour they closely resemble Kilimanjaro birds (not from such high altitudes as the Mount Kenya ones).

It is interesting to note that on the Mount Elgon moorland, the Seed-eaters have differentiated from those of the lower slopes, sufficiently, in fact, to be named *P.s. ugandae* by van Someren. But their trend of variation is different from that in the Mount Kenya moorland birds. *P.s. ugandae* have virtually no tinge of yellow about the face, but show a tendency towards the dull brown coloration of the Ruwenzori birds (*P.s. graueri*).

GROSBEAK SEED-EATER.

Polioptila burtoni albifrons Sharpe.

A forest bird not recorded above 8,400 ft.

CITRIL.

Spinus citrinelloides kikuyuensis Neum.

To the timber-line. Not a bird of deep forest.

5. THE MOORLAND COMMUNITY.

It is now possible, perhaps for the first time, to obtain a clear general view of the higher vertebrates of the upper slopes of Mount Kenya. Setting aside doubtful occurrences, probable occurrences, and stragglers, it can be said with confidence that the animals comprising the bulk of the fauna are those given in this and the next sections. In the birds, the species are practically all immediately allocable to moorland or forest-belt communities respectively. In the mammals, the distinction is not so clear-cut, because of those grass-haunting species which inhabit the upper forest glades and also extend into the moorland.

In the list that follows, those species reaching the upper, less bushy, half of the moorland are marked with an asterisk:—

Two shrews, *Crocidura allex alpina** and *Surdisorex polulus*.

Two mole-rats, *Otomys orestes orestes**, and *O.t. tropicalis*.

A "mouse" *Dendromys insignis percevali**.

A Groove-toothed Rat, *Tachyoryctes rex*.

The rock-hyrax, *Procavia johnstoni mackinderi**.

The duikerbok, *Sylvicapra grimmia altivallis**.

The eland, *Taurotragus oryx pattersonianus**.

Feeding wholly or partly upon the foregoing population, and especially the small rodents, there are the following:—

The leopard, *Felis pardus**.

The striped weasel, *Ictonyx striatus*.

An owl, *Bubo capensis mackinderi**.

Two buzzards, *Buteo rufofuscus augur** and perhaps also to some small extent *B. oreophilus*.

Other birds are:—

(a) Dependent on wet places, the snipe, *Capella nigripennis*, and the pigmy crakes *Sarothrura lineata antonii*.

(b) Dependent on rocks, the starling, *Onychognathus tenuirostris raymondi**, and the swift, *Apus melba* (? *striatus*)*

(c) Others: the francolin, *F. shelleyi theresae*; the chat, *Pinarochroa sordida ernesti**; the pipit, *Macronyx sharpei*; the warbler, *Cisticola hunteri priniioides**; the seed-eater, *Poliospiza striolata**; the canary, *Serinus flavivertex**; the sunbird *Nectarinia j. johnstoni**; and the raven *Corvultur albicollis*.

It may be added that the swifts probably find by no means all their food over the moorland, while on the other hand, two martins, *Psalidoprocne* and *Riparia*, forage through the moorland air in appreciable numbers, though probably resident lower down the mountain.

Meinertzhagen in his list of birds "breeding on the moorland of Mount Kenya" (*Ibis*, 1937, 734) distinguished by brackets those species which "have spread up the mountain from the plains and need not be considered." The distinction is not a satisfactory one. For example, he does not bracket *Macronyx sharpei*, which occurs below the forest belt at about 7,000 ft. at least on the west side of the mountain, and elsewhere in Kenya

below 8,000 ft.; nor *Francolinus shelleyi*, which as a species is not a high-altitude bird—it occurs as low as 4,000 ft. in Northern Tanganyika—although the Kenya localities for it are all so high; nor *Onychognathus tenuirostris*, which has been collected at Nairobi, Kyambu and Fort Hall (as well as at low altitudes in Tanganyika and Kivu).

On the whole it would seem most satisfactory to distinguish those species which, so far as we know, practically everywhere in their range nest above the timber line. By that criterion we should select three birds, the swift, *Apus melba*, the chat, *Pinarochroa*, and the sunbird, *Nectarinia johnstoni*, as truly alpine species. The rest of the thirteen birds that we regard as forming the resident moorland population, belong to more widely spread, opportunist, species that have the necessary tolerance of high altitude and low temperature. As discussed in section 7, some of them have succeeded in colonising the great heights without undergoing any perceptible change: others have not.

Applying the same criterion to the mammals of the moorland, it may be concluded that only two out of the eleven, both shrews, are truly alpine species. *Otomys orestes* would rank as a third but for the fact that *O.o. dollmani* Heller inhabits Mount Garguess at only 7,000 ft.

I doubt whether any attempt has been made to compare the vertebrate community of the African moorlands with those of similar country elsewhere. In their chapter on "Alpine Animals" Hesse, Allee and Schmidt (*Ecological Animal Geography*, 1937) make practically no mention of the African areas. A major difference between the African and the temperate-zone alpine is, of course, the absence of a winter in Africa. Hence the African alpine species have no need for the expedients of hibernation (among the mammals) or of migration (among the birds).

The high-altitude shrews and rats of Mount Kenya have their counterpart in the Alps: and the rock-hyrax is in many ways the counterpart of the marmot, though not, of course, a relative. The chamois and the other rock-hopping ungulates do not have their representative on Mount Kenya. It is rather surprising that the steinbuck or the klipspringer have not occupied the high altitudes. On the better vegetated sub-alpines and high moors of the temperate zones hares are altogether more common than they appear to be on Mount Kenya; and it may be that the duikerbok (*Sylvicapra*) helps to fill this ecological niche.

Among birds the chough, accentor, wall-creeper (*Tichodroma*), snow finch (*Montifringilla*), swift, lammergeier and a gallinaceous bird (e.g., Ptarmigan) may be expected in the alpine regions of the temperate zones. Meinertzhagen found at 9,800 ft. in Afghanistan also horned lark and rock-sparrow (*Ibis*, 1938, 484). On Mount Kenya there is the self-same species of swift and of lammergeyer (probably); *Onychognathus tenuirostris* may in some respects be taken as the ecological counterpart of the chough; against snow-finch, wall-creeper, lark, rock-sparrow and accentor we have only the *Cisticola*, the chat (*Pinarochroa*), the canary and the seed-eater (*Poliospiza*). But the African sunbird is, of course, a unique contribution.

The Kenya moorland gallinaceous bird belongs to the lower, bushy, zone and hence corresponds fairly to the grouse of the northern moors. The snipe has an even closer parallel. Our *Bubo c. mackinderi* is a noble off-set to the moorland owls of the north. The great and amazing gaps in the birds of the African moorlands are in the plovers, larks and pipits, the scanty *macronyx* being an insignificant element compared with the numerous *Anthus* of higher altitudes. The pipit population is, however, supplemented during the northern winter by some *Anthus rufogularis*, a species that, significantly, is a bird of the tundra.

It is surprising that the stonechat, which has shown such enterprise in extending its geographical range—even to the islands in the Indian Ocean—should not have been able to adapt itself to the Mount Kenya moorland. Also no falcon seems to have found it worth while to colonize this area.

6. THE FOREST BELT COMMUNITIES.

I use "forest belt" advisedly, rather than "forest" because a distinction can readily be drawn between those species which belong to the full deep forest, with or without bamboo, dependent, that is, on shade or on big trees, and those frequenting the glades and the forest edges. The species that appear to form the bulk of the fauna are given below, those ascending to the upper part being marked with an asterisk.

Mammals of full forest:—

- Shrew, *Sylvisorex granti**
- Bush-baby, *Galago crassicaudatus*.
- Two monkeys, *Cercopithecus mitis** and *Colobus polykomos**
- Two squirrels, *Heliosciurus* sp. and *Paraxerus ochraceus*.
- Dormouse, *Graphiurus murinus**
- Crested "rat," *Lophiomys ibeanus*.
- Tree-mouse, *Rattus (Hylomyscus) denniae**
- Rat, *Rattus tullbergi**
- Tree-hyrax, *Dendrohyrax arboreus**
- Giant forest-hog, *Hylochoerus meinertzhageni*.
- Two duikers, *Cephalophus harveyi* and *C. nigrifrons**
- Bongo, *Boocercus eurycerus**

This gives as the purely arboreal community one galago, two monkeys, two squirrels, one tree-mouse and one tree-hyrax, of which the galago and the two squirrels drop out before the upper zone of the forest.

Other mammals:—

- Three shrews, *Crociodura f. fumosa*, *C. occidentalis* and *C. turba zaodon**
- A mongoose, *Myonax sanguineus*.
- A genet, *Genetta tigrina*.
- The leopard, *Felis pardus**
- Six rats and mice, *Lemnicomys striatus**, *Lophuromys aquilus**, *Oenomys hypoxanthus**, *Rhabdomys pumilio** and *Mus (Leggada)* spp.
- The bush-buck*
- The rhino*
- The buffalo*
- The elephant*

The birds dependent on full forest:—

- Crowned Hawk-eagle, *Stephanoaëtus*.
- Francolin, *F. jacksoni pollenorum**
- Two pigeons, *Columba a. arquatrix** and *Turturoena*.
- (Ground) Dove, *Aplopelia l. larvata*.
- Lourie, *Turacus hartlaubi**
- Parrot, *Poicephalus gulielmi massaicus**
- Hornbill, *Bycanistes cristatus*.
- Wood-hoopoe, *Phoeniculus bollei jacksoni*.

Wood-owl, *Ciccaba woodfordii*.
 Trogon, *Heterotrogon v. vittatum*.
 Barbet, *Viridibucco simplex leucomystax*.
 Honey-guide, *Indicator v. variegatus**.
 Woodpecker, *Campethera taeniolaenia hausburgi*.
 Hill-babbler, *Pseudoalcippe a. abyssinicus*.
 Two bulbuls, *Stelgidocichla latirostris eugenia* and *Arizelocichla tephrolaema kikuyuensis**.
 Flycatcher, *Trochocerus a. albonotatus**.
 Two thrushes, *Turdus olivaceus elgonensis** and *Geokichla piaggiae kilimensis**.
 Bush-robin, *Pogonocichla stellata guttifer**.
 Four "warblers", *Seicercus umbrovirens mackenzianus**, *Sathrocercus m. mariae**, *Apalis c. cinerea* and *Sylvietta l. leucophrys*.
 Two cuckoo-shrikes, *Campephaga quiscalina martini* and *Coracina caesia pura**.
 Oriole, *Oriolus percevali*.
 Starling, *Onychognathus walleri keniensis*.
 White-eye, *Zosterops virens kikuyuensis**.
 Sunbird, *Cyanomitra olivacea neglecta*.
 Three small weavers, *Nigrita canicapilla diabolica**, *Cryptospiza salvadorii ruwenzori* and *Estrilda atricapilla*.
 "Seed-eater," *Poliospiza burtoni albifrons* subsp.

Other birds:—

Ibis, *Lampribus olivacea akeleyorum**.
 Duck, *Anas sparsa leucostigma**.
 Long-crested hawk-eagle, *Lophoaëtus*.
 Mountain Buzzard, *Buteo oreophilus*.
 Pygmy Crake, *Sarothrura e. elegans*.
 Bee-eater, *Melittophagus lafresnayi oreobates*.
 Kingfisher, *Megaceryle n. maxima*.
 Three flycatchers, *Aleonax adustus interpositus**, *Dioptornis f. fischeri** and *Chloropeta similis**.
 Two chats, *Cossypha caffra iolaema* and *Saxicola torquata axillaris*.
 Two "warblers," *Sathrocercus c. cinnamomeus** and *Cisticola hunteri prinioides**.
 Martin, *Psalidoprocne holomelaena massaica**.
 Boubou shrike, *Laniarius ferrugineus ambiguus**.
 Four sunbirds, of which three, *Drepanorhynchus* and *Nectarinia* spp., apparently come and go in the glades, while *Cinnyris mediocris keniensis** is probably more stationary.
 Weaver, *Othyphantes r. reichenowi**.

7. ENDEMISM AND VARIATION ON THE MOUNTAIN.

For this discussion it may be recalled that Mount Kenya stands at the north-eastern edge of the central Kenya Highlands, joined to them by a bridge of country above 6,500 ft. and of a nature that would not be expected to form a barrier to the dispersal of mountain forest animals. The moorland again, although separated in a direct line from the nearest country of that kind, on the Aberdares, by the forest belts on both Mount Kenya and the Aberdares, has its ecological isolation mitigated by the existence of the gap through the forest at its northern end. This gap certainly accounts for the appearance of more stragglers, both mammals

and birds, than would otherwise reach the moorland, and is a factor by which the residents on the moorland tend to be augmented in both individuals and species. The incursion of individuals through the gap from populations below would retard the development of a moorland population showing recognizable characters.

Endemism on the moorland.—Of the eleven species recognized in the preceding section as forming the bulk of the moorland population:—

Three, the eland, the leopard and the striped weasel belong; so far as is known, to relatively widespread forms.

One, the mouse *Dendromys insignis percevali*, is a subspecies shared by Mount Kenya with Mount Garguess (Urageess), and represented on the Aberdares by *D.i. elgonis*.

One, the duikerbok, *Sylvicapra grimmia altivallis*, is the subspecies of the Aberdares moorlands as well as Mount Kenya.

One, the shrew, *Crocidura allex alpina*, is regarded as typically present only on Mount Kenya: individuals from the Aberdares are intermediate between those from Mount Kenya and those from mountains further west (typical *C.a. allex*).

One, the rock-hyrax, *Procavia johnstoni mackinderi*, is a high-altitude subspecies, developed on Mount Kenya from a widespread species. It is curious that, so far as present information goes, no member of this species inhabits the moorland of the Aberdares.

Two, the rats *Otomys orestes orestes* and *Otomys tropicalis tropicalis*, are subspecies known only from Mount Kenya. The first species does not seem to occur on the Aberdares, where its place is taken by *O. thomasi squalus*; the second is represented on the Aberdares by the western form *O.t. elgonis*, which actually comes east practically to Nyeri.

Two, the mole-rat *Tachyoryctes rex*, and the shrew, *Surdisorex polulus*, are regarded as full species confined to Mount Kenya: but it is very noteworthy that each has a close counterpart, *T. audax* and *S. norae* respectively, confined to the Aberdares. It must be suspected that these four endemic species represent two pairs of subspecies. Hollister, while keeping *T. rex* and *T. audax* as species, remarks that they are "obviously closely related": Ellerman thinks that all the East African *Tachyoryctes* are of one species.

It is interesting to compare the degree of endemism in the resident moorland bird fauna.

Five, the buzzard *Buteo r. augur*, the snipe, the crane, the pipit and the grass-warbler, are subspecies at home at altitudes much lower than the moorland, presumably derived from those lower altitudes and showing no differences with altitude.

One, the owl, *Bubo c. mackinderi*, is a subspecies recently recorded in several localities from 5,500 ft. upwards in the Eastern Kenya Highlands and also from grassland at 7,000 ft. in South Tanganyika.

One, the seed-eater, *Polioptila striolata*, is regarded as belonging to a very widespread subspecies, but is showing a tendency to develop peculiarities on the heights of Mount Kenya—as the species already has, to an obvious degree, on Elgon.

One, the chat, *Pinarochroa sordida*, is a subspecies, occurring on several other moorlands, of a species everywhere alpine.

One, the sunbird, *Nectarinia johnstoni*, has been described as a distinct subspecies, but most ornithologists cannot recognize it. Not recorded from the Aberdares.

One, the swift, may be an endemic subspecies of a bird everywhere alpine.

One, the starling, belongs to a species, the variations of which are obscure, that breeds in many parts of eastern Africa from about 6,000 ft. upwards.

One, the francolin, may be a true endemic Mount Kenya subspecies, distinct from that on the Aberdares and derived from a species with a wide, though discontinuous, range at lower altitudes.

Comparing the endemism in the mammal and the bird fauna we find that among the eleven mammals we have, at the lowest assessment, five endemic species, at the highest, four endemic subspecies and two endemic species: among the birds there are apparently two endemic subspecies.

Endemism in the forest belt.—Among the mammals there is, apart from the doubtful *Grammomys gigas*, only a single form, the *Graphiurus*, which is at best an endemic subspecies intergrading with *G. murinus griseus* on the slopes of the mountain.

So far as is known, no species is represented by authentically different forms in the Mount Kenya and the Aberdares forests respectively.

Among the birds of the forest belt there is only one that, by balance of taxonomic opinion, has a claim to be regarded as an endemic subspecies, namely, the starling, *Onychognathus walleri keniensis*. van Someren described this on larger size and longer, stouter, bill and it has been admitted by Jackson (1938). It is unfortunate that no one seems to have recorded or discussed material of this species from the Aberdares. It may be found that the Mount Kenya form represents the culmination of a trend of variation ("cline") eastwards through the Aberdares. The likelihood of this is actually greater than in the established case of *Crocidura allex*, because the range of *O. walleri* through the Kenya Highlands is more continuous.

Summing up, it is clear that endemism in the mammal and the bird fauna of the forest-belt is low and indefinite, in contrast to the endemism in the moorland fauna: and that conclusion is in accord with the relatively slight ecological and geographical isolation of the forest-belt.

Variation.—In considering variation on the mountain it is necessary to keep those cases of differentiation which may be ascribable merely to geographical isolation separate from those in which it may be argued that the peculiar conditions of high altitudes may be the sole, or the main, factor.

Among the endemic birds of Mount Kenya, the Alpine swift (if further experience does prove it to be an endemic) and the francolin are best placed in the first category. For both of them the Mount Kenya moorland is a station that is isolated geographically but is not ecologically without parallel. The Mount Kenya subspecies of the starling, *Onychognathus walleri*, is likely, when more is known, to reveal itself as the end-point of a geographical cline, like the shrew, *Crocidura allex alpina*.

The one bird in which differentiation induced by high altitude seems to be taking place is *Polioptila striolata*: and it is the more surprising that there should be no other unequivocal case among the birds because on Kilimanjaro, within the same range of altitude, variation is very marked in the same species of *Cisticola* as that inhabiting Mount Kenya.

In the mammals, individually so much less mobile than the birds, there is more evidence of high altitude as a factor in evolution. The rock-hyrax can certainly be cited as an example, from both its circumstances

and its characters: so can the tree dormouse, *Graphiurus raptor*, if its intergradation with *griseus* towards the base of mountain be accepted. *Otomys tropicalis tropicalis* can also be included in this category with some confidence; since the widespread *O.t. elgonis* comes to 7,000 ft. at the western base of Mount Kenya, it would seem that only an active differentiation on the higher slopes can be responsible for the maintenance of the localized *O.t. tropicalis*.

It is tempting to claim the two endemic "species," *Tachyoryctes rex* and *Surdisorex polulus* as due to the evolutionary effects of high altitude but a true estimation could only be made following more conclusive work on their taxonomic relations.

8. SOME OF THE OUTSTANDING QUESTIONS.

It will be seen from the foregoing sections that when the scattered sources are collated a good deal of information is available about the fauna of Mount Kenya. Among the questions that merit investigation are the following:—

- (a) Does the fauna of the south-eastern segment of the mountain, about which hardly anything definite has been recorded above about 5,000 ft., differ appreciably from the comparatively well-known fauna of the northern, drier, half of the mountain?
- (b) What are the breeding-seasons, especially on the moorland? Mackinder found the moorland sunbird and grackle breeding in August. Raymond Hook, the moorland chat in the same month. If it is confirmed that the breeding-season is a restricted one, as from the available evidence it may be, what reason, climatic or other, can be suggested for this choice?
- (c) Are the forest and the moorland as devoid of bats as the absence of specific records appears to show?
- (d) What are the "Hall Tarn Swallows" that breed in the cave described by Watteville?
- (e) Do any of the birds move up and down the mountain with the seasons and should any of the species included in my List B (Section 4) be transferred to List C as truly inhabitants of the main forest belt above 7,000 ft.? (It is, of course clear, especially from the several cases in which E.G.R. & R.E.M. on the same route as Meinertzhagen found species a good deal higher than he did, that prolonged accumulation of records would be needed before these questions can be answered definitely.) Certain of the species in List B, e.g., *Pholia sharpii*, are almost certain to qualify for List C when more is known.
- (f) What is the status of the thicket rat *Thamnomys gigas*? If it is not merely an individual variation of *T. ibeanus* a series should be obtainable.
- (g) Do the two Orange Thrushes, *Geokichla gurneyi* and *Geokichla piaggiae*, occur together anywhere on Mount Kenya?
- (h) What is the status of several of the species that have been recorded from the moorland, especially the Lammergeyer, the White-necked Raven and the Snipe?
- (i) Does the gorgeous *Chlorophoneus dohertyi* not reach Mount Kenya? It is recorded from as far east as the Aberdares and Nyeri.

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*This reference is included mainly because the chapter on Mount Kenya was commended in a review in *Geog. J.*, **80**, 160. The opening of paragraph of the chapter is:—

“In the early days of Kenya's history a Government official stationed at Naivasha climbed to the top of the Aberdare Range and, looking out to the north-east over ninety miles of forest and plain, saw a lofty, snow-capped mountain. When he talked of this he was held to have been the victim of a particularly bad attack of malaria, but very soon Krapf, the German missionary, had walked through the Kikuyu country, armed only with an umbrella, and had made a nearer acquaintance with Mount Kenia.”

It is fair to say, however, that this level is not maintained consistently throughout the chapter.

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OCCASIONAL NOTES.

ELEPHANT ON MOUNT KENYA. During January, 1944, Mr. J. H. Greenaway and myself, while making a preliminary safari up Mount Kenya, found the remains of an elephant. The poor beast had suffered considerably at the hands of time, no doubt aided by vultures, and presented a sorry sight. The trunk had shrunk to a few inches in length, the ears had gone completely and only the hide was left stretched across the bones. In view of this we were, unfortunately, unable to estimate the age or sex of the animal. The location of this elephant is on the north-west side and between 15,000 and 15,300 ft. approximately. In the crevasses, where the wind has not blown the snow clear, you, will find snow even at midday. The elephant is lying on a scree supported by a large boulder. How the elephant met its end has already led to much speculation; but both Mr. Greenaway and myself believe that the left fore-leg was broken while trying to descend and, being unable to get up, the beast died of exposure. What the elephant was doing at that height, a great distance from any food, must remain a mystery.

M. P. TAFFE,

Kodaks Ltd., P.O. Box 28, Nairobi.

CENTIPEDE STINGS. It is years since I read Dr. Karl Peter's book of his Emin Pasha Relief Expedition and unfortunately it is not available for me to refer to again; but I still have vivid feelings of horror occasioned by his account of meeting with a centipede and the results. I do not remember his exact words; but he mentioned swelling and such excruciating pain that he feared blood-poisoning. Records of centipede stings are rare, even among Africans; but one has only to note the respect given to the larger ones to realize that the danger is well-known. This respect is only next in degree to that accorded to a snake.

What would the general medical practitioner do if confronted with a case? Treatment as for snake-bite presumably would *not* apply. Maybe an injection of morphia to relieve the pain would be the best; but is it?

On this question of treatment I was once stumped by a class of African schoolboys. Beyond saying "Rub on some Reckitt's Blue," which is (or was) fairly widely distributed throughout the reserves, but which I realized was very, very mild indeed, I could think of nothing else. As I always like to find out what the African does on various occasions, I returned the question to them. I gathered that in the case of the Luo, the person stung would walk up and down in the village and recite aloud all the names of his ancestors, laterals and co-laterals, as many as he could remember (and with many Luo these are a great number) until the pain subsided. Should he finish them all while the pain was still unbearable he must start again. With the Bantu Kavirondo, the stung person must run as fast as he can to the shores of Lake Victoria and drink some of its water. As those in agreement with this statement live to the north and east of Kakamega, the treatment would appear to be rather strenuous!

In both of these the basis of the "Cure" is to take the mind of the sufferer off the actual pain and, short of actual relief, I suppose this cannot be beaten.

The Wataita cut where they have been stung and rub in tobacco. If the centipede is a large one, the native medicine, called "Kinonga" (prepared by special men for snake-bite, from snake poison and some plant) is rubbed into the cuts over the sting—the same remedy as is used for snake-bite.

It would be interesting to know what "Cures" or treatment other tribes have discovered and also, the practical, scientific one.

R. L. HULL,
Taita.

PHOTOGRAPHS OF THE AFRICAN LAMMERGEIER, *GYPAETUS BARBATUS MERIDIONALIS*. This rare bird now appears to be confined to the high and remote mountain ranges of East Africa and Abyssinia. I saw it first at Dessie in Northern Abyssinia where it was common but confined to that one locality. A pair were observed near Gondar and I believe that I saw a bird near the Mussolini tunnels between Addis and Dessie. I was fortunate enough to catch sight of a pair in the Gorges Valley on Mount Kenya, at an altitude of 14,000 ft., in October, 1943; but they were too far away for study even through the 8-power Zeiss.

The bird has always interested me as a species which appears to be disappearing with the advance of civilization. My amazement can, therefore, be judged when in the company of two brother officers, I ascended* last December, and a magnificent lämmergeier flew past me across the crater as I put my head over the rim. To ensure that I was not mistaken I asked one of my companions to describe the bird and to sketch the tail. He drew the characteristic diamond outline. The bird did not see us at first and beat about (at this point I photographed it) at eye-level about 50 yards away before settling on a ledge. Its size was immense and its white head and light breast were conspicuous at all times. I observed a second bird on the ledge engaged in cleaning itself; but later it slipped away unobserved. A pair of augur buzzards got up at this moment and the relative size of the larger bird was staggering.

CAPT. J. R. T. POLLARD,
East Africa Command.

NESTING OF THE RED-THROATED ROCK-MARTIN, *PTYONOPROGNE R. RUFIGULA*. Our present house had been vacant for four months on our arrival in May, 1942. Our advent disturbed a pair of these martins which were nesting on a narrow bracket under the verandah eaves; but they continued to sit irregularly for over a month on the two eggs which had been laid. These eggs did not hatch.

A pair built again on the same bracket in April, 1943. The nest was shallow, cup-shaped, built of pellets of mud and lined with a little grass inside. Three eggs were laid, whitish with reddish-brown speckles. The last was laid on May 2nd and they hatched on May 21st.

The first flight of at least one of the youngsters was accidental as, on June 13th, a part of the nest side broke away and it fell out and flew into the house. My attention was first called to this by the excitement of the parents. During their absence I replaced the young one and it was amusing to hear their surprised twittering on their return to find it at home again. On June 16th again, one dropped out and flew around closely guarded by its parents. This had to stay out for the night.

The next day all three were taken out for their first real flight. Owing to the difficulty of reaching the nest, close under the eaves, the whole family thereafter had to roost in a partly-broken swallow's nest nearby.

It was about October or November that I first noticed that there were only three of the family left. In December, these three went to roost on the bracket of their original nest. Towards the end of January, 1944, only two were left (the third one, however, did try to return to roost with them on March 7th, but was driven away). These two, presumably the parents of last year, started to build a nest against the face of the wall on the verandah in early February. The work proceeded slowly and the nest was not completed until March 20th. The birds continued to roost on the

*The Editor thinks it advisable to omit the locality.—J.R.H.

bracket of their original nest until this nest was finished. Three eggs were laid and brooding began on March 24th or 25th. The eggs were hatched on April 12th. The rearing of these three young passed without incident and they took their first flight together on May 4th.

R. L. HULL,
Taita.

VERREAUX'S EAGLE BREEDING IN KENYA. While climbing on a rock cliff some 300 feet in height on April 2nd, 1944, Group-Captain Douglas Hamilton and I noticed a Verreaux's eagle building her nest about two-thirds of the way up the face. Our interest was aroused and we decided to find out if she had laid any eggs. We roped up at the foot of the rocks and after some very hard and difficult climbing reached the nest. It was in the final stages of completion and there were no eggs.

Six weeks later on May 14th, an opportunity occurred to visit the cliffs. On this occasion we approached the nest from above and found the eagle sitting. After roping up, we climbed down and secured two photographs, one of the bird on the nest and another showing the nest and two eggs. It was impossible to reach the nest from above and we had to make a detour. After some difficult climbing, I managed to reach the nest and take a photograph of the two eggs. The eggs were then lowered down the face of the cliff in a rucksack. At no time did the eagle show any signs of attacking; but she and her mate kept circling around and watching the proceedings from above.

On July 16th, the site was visited again and it was found that the pair of eagles had built a new nest a short distance from the first and that the hen was sitting on another pair of eggs. It is hoped to keep this nest under observation in order to determine the incubation period and the length of time that the young remain in the nest.

ARTHUR FIRMIN.
Nairobi.

The recent acquisition of the eggs of *Aquila verreauxi* forms an important addition to the Museum's egg collection and we are indebted to Mr. A. Firmin, who first located the nest and subsequently, after skilful climbing over an extremely difficult rock-face, secured them.

The nest consisted of a large pile of sticks and was situated on a ledge of rock, being partially supported by a small tree which projected from the ledge. Despite its large size the nest was not unduly conspicuous and a view into it from above could only be obtained with some difficulty.

The eggs measure 80×59.5 mm. and 75×59 mm. respectively. There is also a considerable difference in the markings. The larger egg is almost white with a faint greenish tinge and is marked with a few very small, pale mauve spots. The smaller egg is boldly spotted, particularly at the larger end, with two shades of reddish brown over a similar background and under-markings. The larger egg showed about 15% incubation whilst that of the smaller was appreciably less (about 7% to 8%). In spite of the low degree of incubation the parent bird sat very close and, when once dislodged, remained in the vicinity but showed no signs of aggression.

A number of bones found in a crevice of the rock, some forty feet below the nest, represented at least three specimens of rock hyrax (*Heterohyrax* sp.). The condition of these bones indicated that they had been exposed to the weather for some months. Moreover, their position precluded the possibility that the animals had died where the bones were found. This suggests that the rock hyrax may perhaps form the staple diet, at least of the nestling, and also that the nest must have been used during a previous season.

Jackson (1938. Birds of Kenya Colony and the Uganda Protectorate) records that he examined a specimen collected by the Roosevelt Expedition at Lukenia and he also describes having seen a pair on several occasions at Maungu. It is unlikely that these notes would have been included had there been any question of mis-identification and it is, therefore, surprising to find, elsewhere in the text, that "Verreaux's Eagle . . . has been somewhat doubtfully recorded from Kenya and Tanganyika." It is probable that the latter statement was added by the Editor who was, perhaps, unaware of the geographical positions of Lukenia and Maungu. It is clear, however, that this eagle does occur in several suitable localities and it is probably less uncommon in Kenya than was previously supposed.

L. S. B. LEAKEY,
Coryndon Museum.

FURTHER NOTES ON THE NESTING OF PARADISE FLY-CATCHERS AND ON PARASITISM BY KLAAS' CUCKOO. Since the publication of my original note (this *Journal*, 17, 285) further interesting observations have been made on what I presume to be the same pair of paradise flycatchers (*Tchitrea viridis suahelica*) breeding near the Coryndon Museum. From May, 1943, until now, June, 1944, these birds have gone on nesting almost uninterruptedly close to my house. During this time seven nests have been constructed, the one already described, another in August, one in November, one in January, one in April, and two in June. This is at a rate of approximately five nests a year. The nests were never more than a few yards from one another and sometimes very close together. Part of the material needed for the construction of a new nest was taken from the preceding ones. The periods of building and of sitting, the rearing of the young and the general behaviour have been similar in each case.

The parents were very aggressive to most of the local birds that ventured to approach the vicinity of the nest. I saw both of them pecking an East African goshawk (*Astur tachiro sparsimfasciatus*), striking boldly at its back and compelling it to fly away.

In the first four nests, the young were reared and flew away safely. In the fifth, in April however, no young flycatchers hatched; but, to my surprise, a young Klaas' cuckoo (*Lampromorpha klaasi*) appeared. The female fed it until it was able to fly and then immediately began to build a new nest assisted by the male. When this nest was finished she began to sit while the male persevered in feeding the young cuckoo. The new nest was, unfortunately, on a high branch and it was not possible to see inside. By the middle of June, however, another young Klaas' cuckoo could be seen from the ground. It was fed by both foster parents.

In spite of having been victimized twice, the male and female began to make another nest. At the time of writing the first Klaas' cuckoo has disappeared from the neighbourhood, the second is still sitting in the nest and being fed and the parents are building again in the same tree about two yards lower down.

Jackson states that this species builds twice a year during the periods March-June and October-January. Dr. van Someren has previously recorded eggs of *Lampromorpha klaasi* from the nests of the paradise flycatcher. I am not aware, however, of any record of such persistent nesting or repeated parasitism as that described above.

FERUCCIO MENEGHETTI,
Coryndon Museum.



Elephant on Mount Kenya.



African Lammergeier in flight.

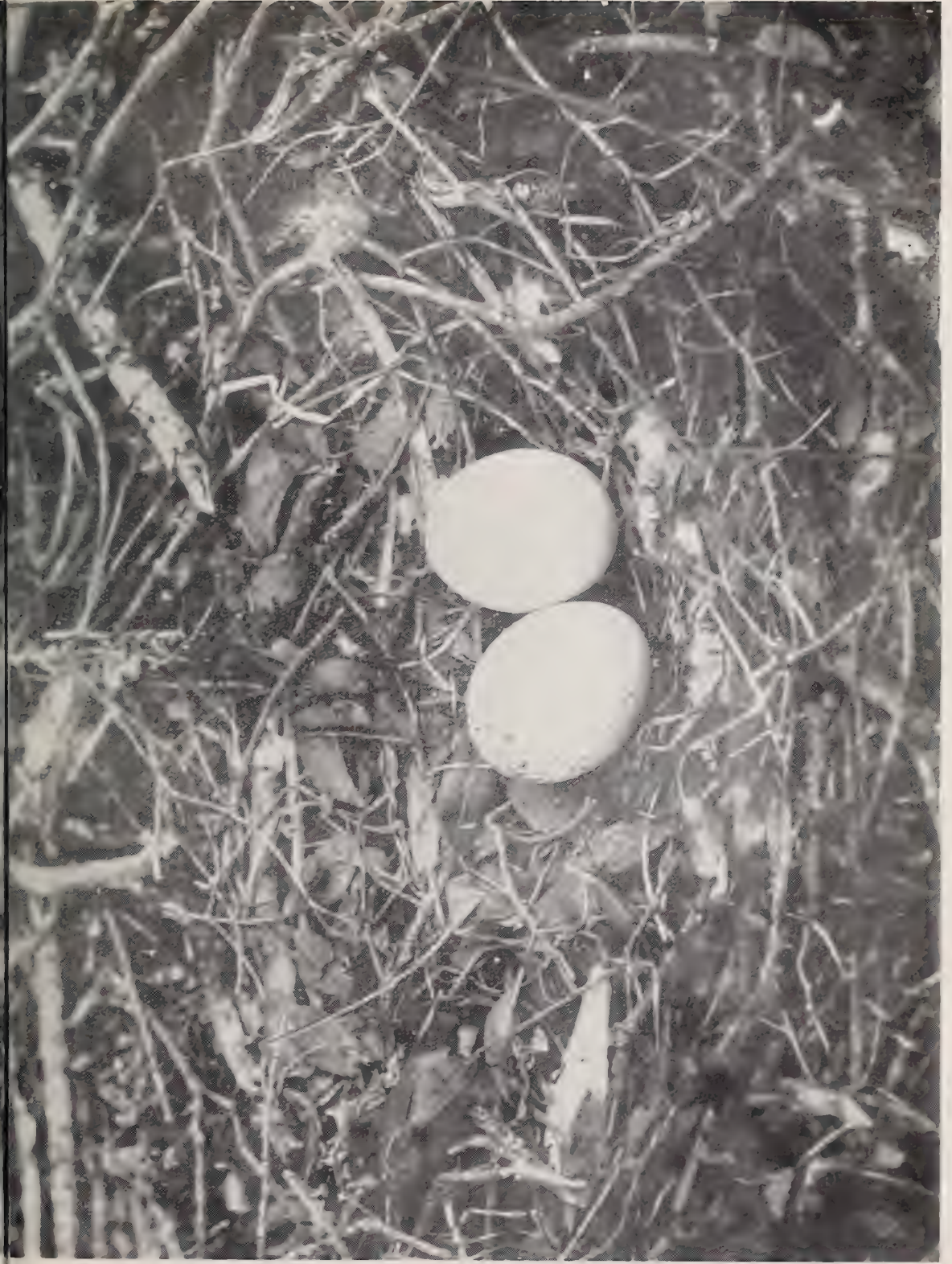
African Lammergeier in flight.

African Lammergeier in flight.

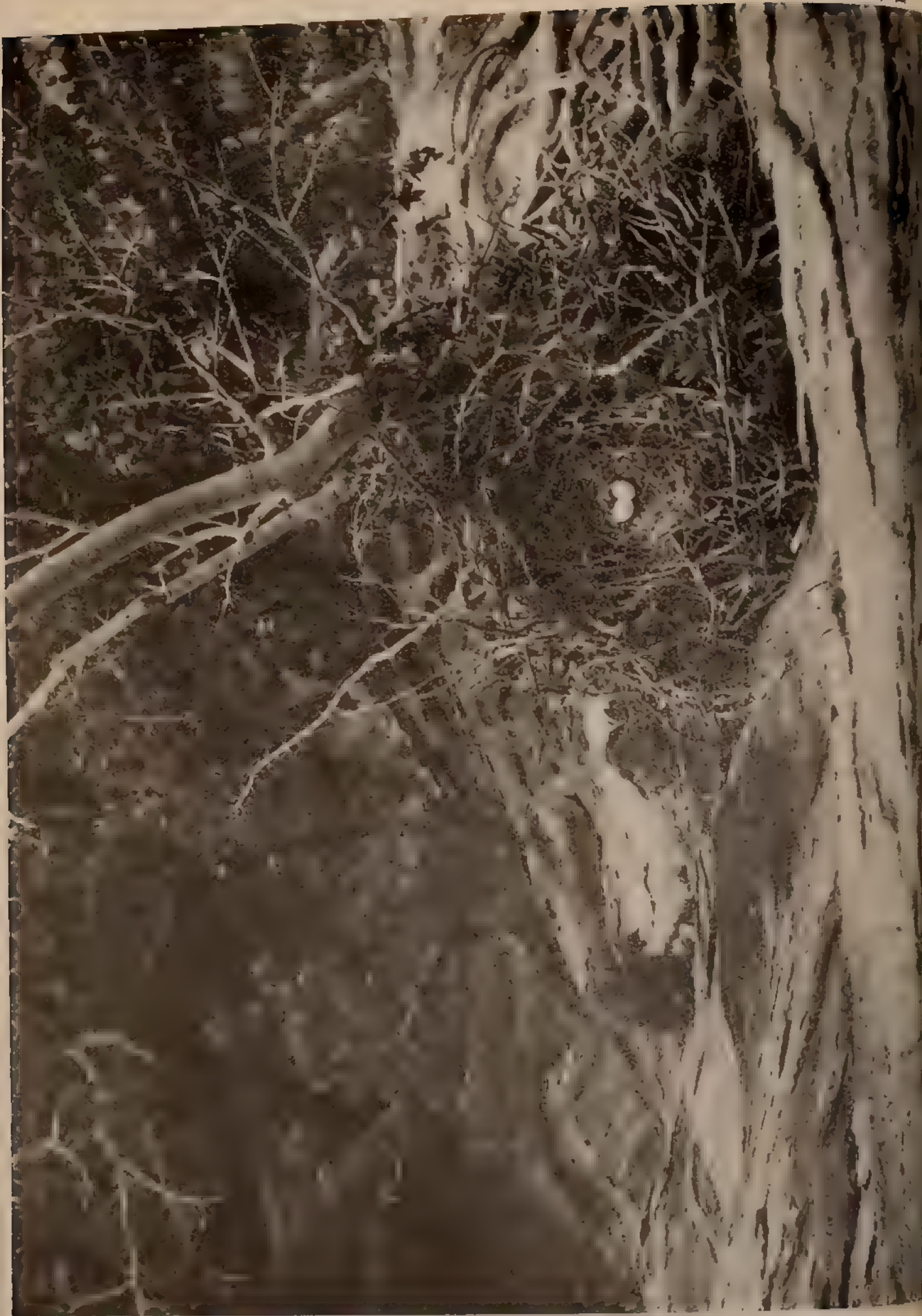
Nest of
Verreaux's
Eagle.



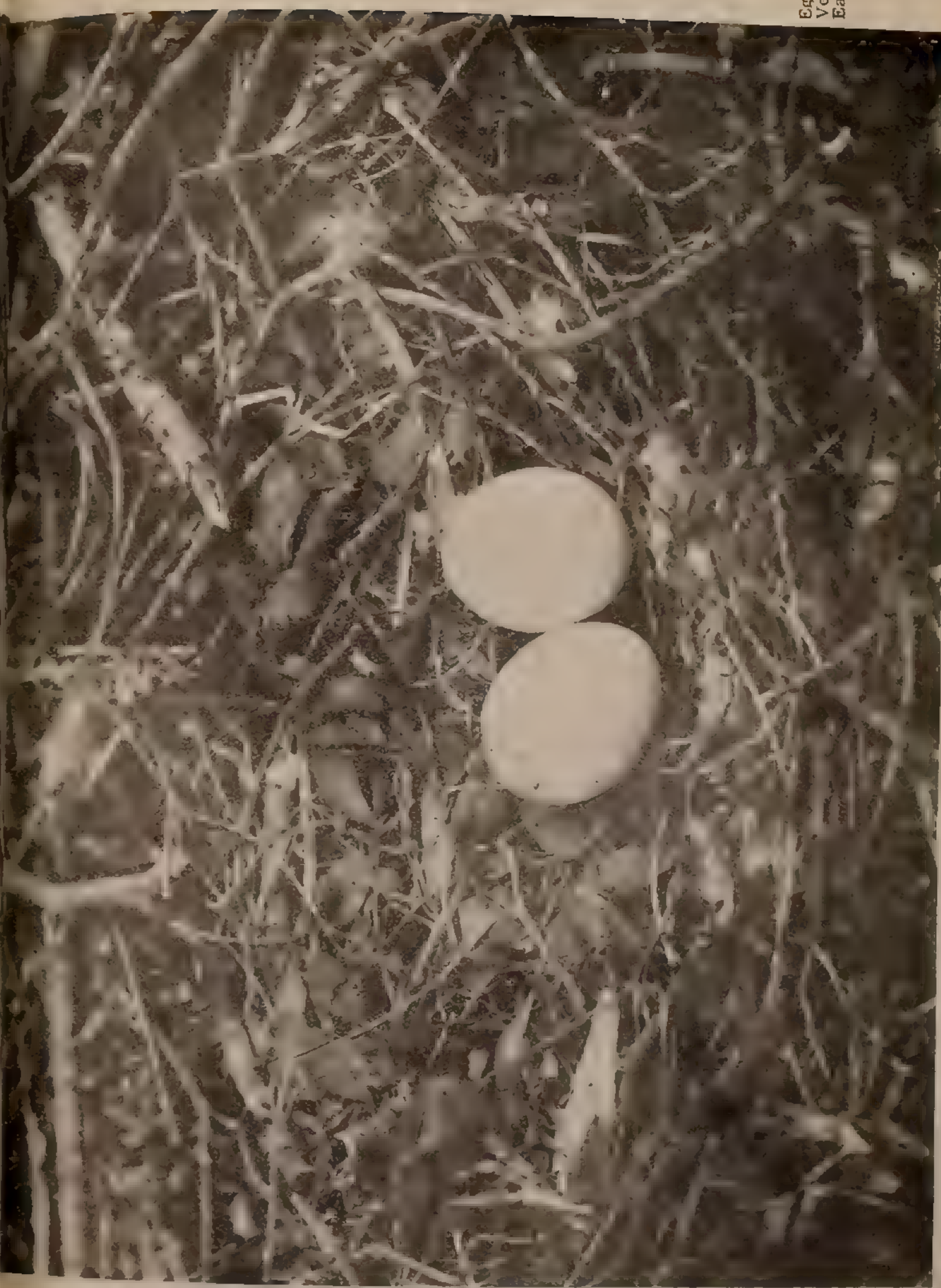
Eggs of
Verreaux's
Eagle.



Nest of
Verreaux's
Eagle.



Eggs of
Verreaux's
Eagle.



Female
Verreaux's
Eagle
on nest.



East Africa Natural History Society

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Journal

OF THE

East Africa Natural History Society

OFFICIAL PUBLICATION OF THE CORYNDON MEMORIAL
MUSEUM (MUSEUMS TRUSTEES OF KENYA)

June, 1945

Vol. XVIII

Nos. 3 & 4 (83 & 84)

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A GUIDE TO THE SNAKES OF THE NAIROBI DISTRICT.

BY ARTHUR LOVERIDGE

(*Museum of Comparative Zoology, Cambridge, Mass.*)

Judged by African standards the snake fauna of Nairobi must be considered poor. To prevent anyone deriving false comfort from this fact, I hasten to add that individuals of a few species are fairly numerous, and of the four commonest Nairobi snakes two kinds are very poisonous. The proportion of venomous to harmless serpents is not so impressive when viewed from the species angle, for of the twenty-one snakes listed below only four are dangerous to man.

It would have been a simple matter to present a more impressive list by adding the names of "probables" or "possibles" from among the remaining hundred and forty forms occurring in British East Africa. Such practices are to be deplored, however, for species listed as probables today are likely to be copied as definite records tomorrow. That the list can be legitimately expanded is certain, for many years have elapsed since I casually searched for snakes in the vicinity of Nairobi. Possibly some additions that have never appeared in the literature are even now to be found in the Coryndon Memorial Museum. I mention this in case anyone assumes that the keys to the species accompanying this article are all-inclusive or final.

LIST OF SPECIES KNOWN FROM NAIROBI DISTRICT.

LEPTOTYPHLOPIDAE.

Leptotyphlops conjuncta conjuncta
(Jan).
Intermediate Worm-snake.

TYPHLOPIDAE.

Typhlops punctatus punctatus
(Leach).
Spotted Blind-snake.

BOIDAE.

Eryx colubrinus loveridgei Stull.
East African Sand-boa.
Python sebae (Gmelin).
Common or Rock-python.

COLUBRIDAE.

Dasypeltis scaber scaber (Linné).
Common Egg-eater.
Boaedon lineatus lineatus Duméril
and Bibron.
Common House-snake.
Lycophidion capense capense
(A. Smith).
Cape Wolf-snake.
Chlorophis neglectus (Peters).
East African Green-snake.
Thrasops jacksonii schmidti
Loveridge.
Schmidt's Tree-snake.
Meizodon semiornata (Peters).
Semiornate Snake.

Duberria lutrix abyssinica
(Boulenger).

Abyssinian Slug-eater.
Crotaphopeltis hotamboeia hotamboeia
(Laurenti).

White-lipped Snake.
Trimerorhynchus tritaeniatus
multisquamis Loveridge.

Northern Striped-schaapsteker.
Psammophis sibilans sibilans (Linné).
Common Hissing Sand-snake.

Psammophis subtaeniatus sudanensis
Werner.

Northern Stripe-bellied
Sand-snake.

Aparallactis concolor (Fischer).
Plumbeous Centipede-eater.

Aparallactis jacksonii (Günther).
Jackson's Centipede-eater.

ELAPIDAE.

Elapsoidea sundevalii güntherii
Bocage.

Günther's Coral-snake.

Naja nigricollis nigricollis Reinhardt.
Black-collared Cobra.

VIPERIDAE.

Causus rhombeatus (Lichtenstein).
Rhombic Night-adder.

Bitis arietans (Merrem).
Puff Adder.

In the preceding list family names have been capitalized and certain changes in them may puzzle those unacquainted with taxonomic procedure as laid down by the International Commission on Zoological Nomenclature. Thus LEPTOTYPHLOPIDAE replaces GLAUCONIIDAE because a family must have a typical genus, and the type genus *Glauconia* of Gray (1845) was found to be antedated by *Leptotyphlops* of Fitzinger (1843). In compliance with the law of priority *Glauconia* becomes a synonym and consequently involves a change in the family name.

It will be noted that the name of the author of *conjuncta* appears in parentheses. This is because Jan, when describing his new species, did not refer it to the genus *Leptotyphlops* in which it is now placed. Parentheses around an author's name are an indication that he gave it a different generic name to the one now recognised. Stull, on the contrary, though she called her new subspecies *Eryx thebaicus loveridgei*, did refer it to the genus *Eryx*. The fact that *thebaicus* was later shown to be a synonym of *colubrinus* does not require that her name be put in parentheses.

Priority requires that the original spelling *Boaedon* (not *Boodon*), *Lycophidion* (not *Lycophidium*), and *Naja* (not *Naia*) be used. Other generic changes which will vex the field naturalist are *Thrasops* (*Rhamnophis*), *Meizodon* (for African "Coronella" as distinct from the true *Coronella* of Europe and North Africa), *Duberria* (*Homalosoma*), *Crotaphopeltis* (for African "Leptodeira" as distinct from the true American *Leptodeira*), *Elapsoidea* (*Elapechis*). These changes are really significant evidence of advances made in our understanding of the relationships of African snakes (suborder SERPENTES of which OPHIDIA is a synonym). These advances show that herpetologists have not been idle during the era of improved petrol engines and more efficient aircraft!

Even the all-important law of priority has been provided with loopholes, for in cases where a generic change is of such a nature as to cause greater confusion than it seeks to remove, it can be set aside by a majority vote of the Commission. Two of the names in the above list call for such action by the Commission when it resumes sittings after the war. I refer to *Trimerorhinus* and *Bitis*, which are generally conceded to be synonyms of *Cerastes* and *Cobra*. Obviously the employment of these names in a new sense would have deplorable results in medical literature. To apply the name *Cobra*, popularly associated with a snake whose venom possesses strikingly different properties from that of the vipers or adders, to the African Puff-adder and its numerous allies of the genus *Bitis* would result in confusion where there is none at present.

While the real basis for the classification of snakes depends largely on characters of dentition and cranial structure, it is possible to diagnose the species by external features when dealing with those from a restricted area such as the Nairobi district. To facilitate this I have devised synopses or keys which should lead one promptly to the right species. Employment of these keys for the identification of snakes taken at Mombasa or Kisumu is likely to prove misleading except in so far as allocation to the correct family. It is assumed that the snake to be classified is dead, but once the student has familiarised himself with deceased reptiles he will soon be able to recognise those of the district at sight.

Except for persons of unusually keen sight, the preliminary identifications of at least the smaller snakes will make a strong magnifying glass necessary. A watchmaker's glass with clockwork-spring attached so as to hold the glass in position over the eye, leaves both hands free for holding the snake. Before attempting to use the keys it is well to make three scale-counts and jot them down on paper for reference.: (1) Ascertain midbody approximately by folding the snake snout to anus, then count the scale-rows from the ventral series (Fig. 1) round the body back to, but not including, the ventral series. (2) Count the ventrals (except in worm-snakes or blind-snakes) from the first transversely enlarged one on the throat to, but not including, the anal shield or shields covering the anus. To avoid losing one's place, counting is best done by placing the left thumbnail on the scale and running it along while counting. (3) Similarly count the shields beneath the tail (subcaudals), commencing with the first large pair posterior to the anus and continuing, but not including, the terminal pointed scute.

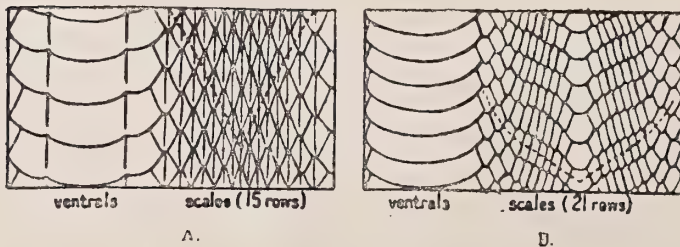
Following completion of the identification, should the student wish to check his finding by comparison with a coloured plate, he is likely to find one in *A Guide to the Snakes of Uganda* by Col. C. R. S. Pitman (Uganda Society, Kampala, 1938) for this work includes all the species, though not necessarily the same subspecies, mentioned here. Detailed descriptions of all except four of the most recently described subspecies will also be found in one or other of the three volumes of Dr. G. A. Boulenger's *Catalogue of the Snakes in the British Museum* (British Museum, N.H., London, 1893-1896). These books are available in the reference library of the Coryndon Memorial Museum. At the same time it should be remembered that our knowledge of the range of variation of many species has been greatly extended since the publication of these volumes fifty years ago.

The accompanying figures are adapted from Boulenger's *List of the Snakes of East Africa, North of the Zambesi and South of the Soudan and Somaliland, and of Nyassaland* (*Proc. Zool. Soc., London*, 1915, pp. 611-640), a paper which is very much out of date.

KEY TO DETERMINE THE FAMILIES OF NAIROBI SNAKES.

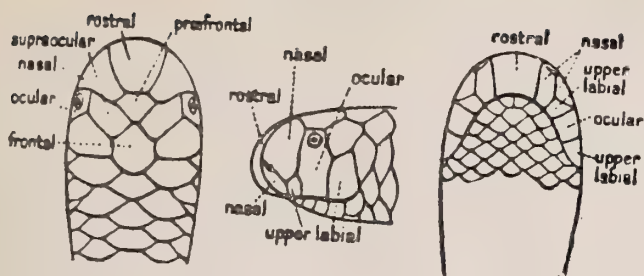
- (1) Body encircled by small scales more or less uniform in size 2
- Body not encircled by small scales owing to presence on belly of a longitudinal series of transversely enlarged plates known as ventrals (Fig. 1) 3
- (2) Ocular shield bordering the mouth (Fig. 2); 14 scales round middle of body; tail three times as long as broad LEPTOTYPHLOPIDAE (worm-snakes)
- Ocular not bordering the mouth (Fig. 3); 18 or more scales round middle of body; tail as long as or only slightly longer than broad TYPHLOPIDAE (blind-snakes)
- (3) Vestiges of hind limbs in the shape of small spurs visible on either side of the anus; ventral shields narrower than the body BOIDAE (boas and pythons)
- No vestiges of hind limbs; ventral shields as broad as, or nearly as broad as, the body 4
- (4) No enlarged poison fangs at front of upper jaw COLUBRIDAE (ordinary snakes)
- One or more pairs of enlarged poison fangs on either side at front of upper jaw (Fig. 4) 5
- (5) Poison fangs grooved, immovable, not enclosed in a very large sheath of membrane ELAPIDAE (cobras and corals)
- Poison fangs perforated, movable, folded back when not in use, enclosed in a very large sheath of membrane VIPERIDAE (vipers and adders)

TEXT-FIGURE 1.



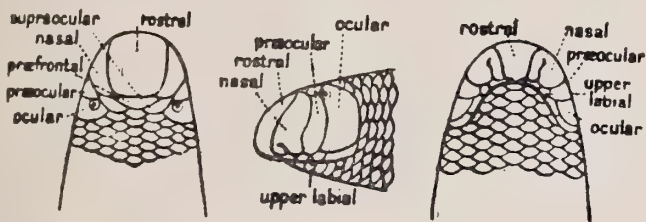
- A. Ventrals of a tree snake with lateral keels, each dorsal with a median keel.
- B. Ventrals of a tree snake without any keels, dorsals oblique but all smooth.

TEXT-FIGURE 2.



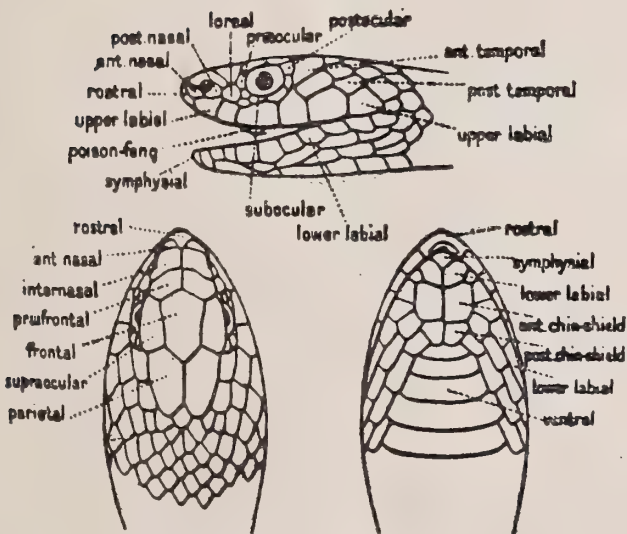
Leptotyphlops emini emini.

TEXT-FIGURE 3.



Typhlops punctatus punctatus.

TEXT-FIGURE 4.



Causus rhombeatus.

WORM-SNAKES (LEPTOTYPHLOPIDAE).

Least snake-like of any serpent to be encountered around Nairobi, is the Intermediate Worm-snake (*Leptotyphlops c. conjuncta*). Less than 8 inches in length, and but little thicker than the lead in an ordinary pencil, its jet black colouring at once distinguishes this species from a worm, though, of course, it has scales, skull, and vertebrae. Indeed it could be better compared with mercury, so smoothly does it appear to "flow" from a restraining hand. Nor need one be afraid to handle a worm-snake, for it is not only non-poisonous, but has no teeth in the upper jaw. Those in the lower jaw are designed to assist in holding the termites ("white ants") on which these little reptiles subsist.

With the object of providing food for some captive worm-snakes, I once made the mistake of placing in their cage a portion of "comb" from a termitarium. Next morning one of the worm-snakes was lying dead, apparently killed by two big-jawed, soldier termites that were still biting the body. Worm-snakes are most likely to be found in situations harbouring abundance of their prey—in, or under, rotting logs, or among the roots of grass being removed during the clearing of a camp site. It is after heavy rain, however, that most people see their first worm-snake. At such times the tiny reptile may be found wriggling on path or road, having been flooded out of its retreat. At Entebbe, I recovered an Intermediate Worm-snake from the stomach of an Irregular Burrowing-adder (*Atractaspis irregularis*). In Kenya, the Intermediate Worm-snake ranges from Lake Victoria to Mombasa, and at times has been confused with Emin's Worm-snake (*L. e. emini*) which differs in having its rostral shield separated from the supraocular (Fig. 2).

BLIND-SNAKES (TYPHLOPIDAE).

Another group of burrowing snakes, differing from the worm-snakes in having teeth only in the upper, instead of the lower, jaw, are commonly called "blindworms" by Europeans as they bear some resemblance to the limbless lizard known as a blindworm in Britain. A better designation for the African reptile is blind-snake, though this is also a misnomer for the tiny eye is usually to be distinguished beneath a shield called the ocular (Fig. 3). With most blind-snakes the only time when the eye is not visible is during a brief period preceding the shedding of the skin's outer cuticle. As in the worm-snakes, the gape of a blind-snake is so small that the reptile is incapable of biting even a little finger. The somewhat shark-like mouth (Fig. 3) is situated on the underside of the head.

One species, the Spotted Blind-snake (*Typhlops p. punctatus*), has been recorded as taken near Nairobi. If correct—and there seems slight reason for doubting its occurrence in such forested areas as Karura or Ngong—specimens with precise locality data are badly needed. With a trans-continental range, though rare east of the Great Lakes, the Spotted Blind-snake is likely to be found in situations similar to those described for the worm-snakes, but only in forested, or recently deforested, country. In the Usambara Mountains, where a slightly differentiated race occurs, the Sambara say that the blind-snake is the "cow" of the *siafu* or driver-ants, claiming that the fierce insects protect the reptile until faced with a food shortage.

It is true that at times one may see a Spotted Blind-snake, unmolested by the workers and apparently protected by the soldiers, wriggling along in a column of the migrating marauders. One such procession was seen by Mr. F. W. Rogers at Amani, and a blind-snake taken under these

conditions was shown me by Mr. C. Clausen on Magrotto Mountain. Further careful observations are needed before we can say why the snake is apparently immune from attack by these insects which are a scourge to most living things.

Both worm-snakes and blind-snakes have vestiges of a pelvis, otherwise it might appear an unwarranted jump to go straight from these small species to the largest serpents. All are primitive, however, for in addition to internal remains of hind limbs most boas and pythons display on either side of the anal opening a small spur or claw. This constitutes the sole external evidence that hind limbs were once present in some remote ancestral stock.

BOAS AND PYTHONS (BOIDAE).

There is no large boa in Africa, the group being represented here by a two-foot-long, stout-bodied sand-boa. Its rather ugly looks are offset by beautiful colouring for the ground colour of the East African Sand-boa (*Eryx colubrina loveridgei*) is bright orange, and this is handsomely blotched with chocolate brown. This sturdy, stumpy-tailed reptile has a distinctly viperish appearance and it spends its time burrowing just below the surface of sandy or red laterite soil.

The inclusion of the sand-boa here is based on a single "near Nairobi" record, for I have never seen one in this neighbourhood. But the record may well be correct, for the sand-boa has a wide distribution in East Africa north of Moshi, and at Voi it might almost be called common. There I captured two adult females beneath the debris of a collapsed hut, a situation they were sharing with two female burrowing-adders (*Atractaspis microlepidotus*). Another female sand-boa was brought to me by a native who had found the reptile with her seven young ones in a hole on April 24th. One of these snakes had eaten a rat-like rodent or gerbil (*Dipodillus pusillus*), and Percival* records surprising another as it was attempting to swallow an Asiatic Dotterel or Caspian Plover (*Charadrius asiaticus*). The bird proved too large a mouthful so after two attempts the boa gave up the contest. A sand-boa, when disturbed, will discharge a very evil-smelling secretion from its cloacal glands. If this method of defence is ignored the snake is likely to follow it up with an unpleasant, though non-venomous, bite.

From its big relative the rock-python, a sand-boa may be readily recognised by the following external features:—

- | | |
|---|--------------|
| Top of head covered with small scales; shield on snout and foremost lip shields without pits; shields beneath tail in a single series | sand-boa. |
| Top of head covered with shields; shield on snout and foremost lip shields deeply pitted; shields beneath tail in a double series | rock-python. |

Why the common Python (*Python sebae*) should be called rock-python rather than bush- or water-python, is not very clear. In East Africa, it is almost as well known by its Swahili name of *satu*, but African attempts to designate various colour forms by different names are unjustified. Not only is the coloration of this snake very variable, but to some extent the pattern is also. On the crown, however, is one constant and characteristic marking shaped like a spear-head. It is brown narrowly edged

*1916, *Journ. E.A. & U. Nat. Hist. Soc.*, No. 10, p. 127.

with black, which in turn is broadly bordered by pale pink. Each side of the head is streaked with brown and there is a more or less triangular blotch of the same beneath each eye. All such brown markings are likely to be edged with black. The back, which may vary from pale (in young) to very dark brown (in old examples), carries a chain of most irregular brown markings that sometimes form a ladder-like pattern, or coalesce with the series of brown blotches along the flanks. On the upper side of the tail is a narrow pale stripe bordered by black-edged brown ones. The white underside of a python is usually more or less speckled with black.

A python of seventeen and three-quarter feet has been recorded by Mr. Hugh Copley; this is fairly close to the authentic maximum. Skins, of course, far exceed these dimensions. I have measured as thirty feet the freshly removed skin of a python speared on the banks of the Ngerengere River, near Morogoro, Tanganyika Territory. Even when dried, skins are nearly a quarter (.21) as long again as the dead snakes from which they were taken. The fourteen-foot python from which this conclusion was drawn, weighed one hundred and thirty-five pounds, but then it had recently swallowed a bushbuck doe in calf.

At times the horns of goats, duiker, or other small antelope swallowed by adult pythons, break through the reptile's skin. Apparently the snake suffers no great inconvenience, and, when the skull has been digested away, the horns drop off and the wounds they caused soon heal. When Africans in the Nairobi district kill a gorged python, they frequently remove its last meal and, if fairly fresh, cook and eat it. It is rare indeed for pythons to kill people; that they do so at times is proved by the cases of the Mkerewe woman and youth to which I have referred elsewhere.* Dogs are often taken by medium-sized pythons, still younger snakes prey on rats and birds. As the prey is suffocated in the snake's coils before being swallowed, it is not surprising that captive pythons can soon be induced to swallow dead food and after a time even the skinned bodies of birds and animals.

Pythons are said to lay from thirty to fifty eggs around which the mother coils for about two months, leaving the eggs only to quench her thirst. During this incubating period the temperature of this poikilothermous reptile actually rises from ten to thirty degrees above the surrounding temperature. When the time comes for the developing python to emerge, it employs the temporary egg-tooth on its snout to make one or more slits in the tough, parchment-like covering that does duty as a shell. Forcing its way through one of the slits, the snakeling departs to pursue an independent life.

ORDINARY SNAKES (COLUBRIDAE).

Key only to the Species found in the Nairobi District.

- | | |
|---|---------------------------|
| (1) Shields beneath tail arranged in pairs | 2 |
| Shields beneath tail in a single series | 12 |
| (2) Scales on body each with a strong median ridge or keel; no teeth on upper and lower jaws in front of eye; pupil vertical; scales around midbody 23-27 | Common Egg-eater (p. 106) |
| Scales on body smooth or at most faintly keeled; teeth present on both upper and lower jaws in front of eye | 3 |

(3) Scales around midbody 25-33; pupil vertical	Common House-snake (p. 107)	
Scales around midbody 15-21		4
(4) Pupil vertical		5
Pupil round		6
(5) Scales around midbody 17; shields on belly 184-214	Cape Wolf-snake (p. 107)	
Scales around midbody 19 (rarely 21); shields on belly 144-180	White-lipped Snake (p. 109)	
(6) Scales around midbody 21; shields on belly 175-204	Semiornate Snake (p. 108)	
Scales around midbody 15-17; shields on belly 110-186		7
(7) Scales around midbody 15 (very rarely 16)		8
Scales around midbody 17; shield covering anus usually divided		9
(8) Shield covering anus single; shields beneath tail 17-39; colour dark olive to blackish; habits terrestrial (secretive)	Abyssinian Slug-eater (p. 108)	
Shield covering anus divided; shields beneath tail 77-114; colour light green; habits arboreal (bushes and trees)	East African Green-snake (p. 108)	
(9) Shields beneath tail 140-144	Schmidt's Tree-snake (p. 109)	
Shields beneath tail 50-114		10
(10) Shields beneath tail 50-66; loreal shield (see Fig. 4) 1-1½ times as long as deep; back with three conspicuous brown stripes, the median narrowest	Northern Striped Schaapesteker (p. 109)	
Shields beneath tail 78-121; loreal shield 1½-2½ times as long as deep; back uniform or with a fine yellow vertebral line		11
(11) Habit of adult stout; loreal shield 1½-2 times as long as deep; belly usually uniform white or plumbeous in adults, younger specimens often have lateral series of dusky dashes or spots; chiefly inhabits riverside bush	Common Hissing Sand-snake (p. 110)	
Habit of adult slender; loreal shield 2-2½ times as long as deep; belly yellow with a conspicuous black longitudinal line on each side of it; inhabits dry scrub or thornbush country	Northern Stripe-bellied Sand-snake (p. 110)	
(12) One or two labial shields (Fig. 4) on upper lip in contact with a parietal; head and body uniformly lead-coloured above ... Plumbeous Centipede-eater (p. 111)		
Upper labial shields separated from parietal by temporals (Fig. 4); head black above, body pinkish brown or terra cotta coloured, with or without a fine black vertebral line	Jackson's Centipede-eater (p. 111)	

ORDINARY SNAKES (COLUBRIDAE).

What may be called "ordinary snakes" comprise about two-thirds of the snakes of the world, if the total is assessed at 2,500 species altogether. At one time the cobras, coral-snakes, and their allies constituted a sub-family (Elapinae) of the COLUBRIDAE, but now these are recognised as a distinct family (ELAPIDAE). Already the sea-snakes had been removed and given family status as HYDROPHIIDAE, so that the 1,600 species left in the COLUBRIDAE may be considered as not dangerous to man with the exception of large examples of the Boomslang (*Dispholidus typus*).

For fifty years it has been the custom to divide the COLUBRIDAE on the basis of their teeth. The harmless ones with solid teeth were grouped in a section known as Aglypha, those with one or more grooved, and usually enlarged, teeth at the rear of the upper jaw were called Opisthoglypha. Recent researches tend to show that this division is an artificial one, for grooves appear to have developed independently in several unrelated groups of genera. The matter is further complicated by such reptiles as the Gray Centipede-eater (*Aparallactus modestus*) of Uganda and West Africa; in this species some individuals have solid teeth, in others they are grooved. Similar anomalies in other parts of the world have led to virtual abandonment of these groupings in recent systems of classification.

The teeth of one African snake, however, single it out from all its continental allies. I refer to the egg-eater which has lost all the teeth on the forward part of both upper and lower jaws, retaining only a few posterior to the orbit. The explanation of this loss is that teeth are no asset to a snake which subsists solely on the eggs of small birds. It is probably the savannah-haunting Common Egg-eater (*Dasypeltis scaber scaber*) which occurs in the immediate vicinity of Nairobi, but at Kabete, Kiambu, etc., the all-black or all-brown rain-forest race (*D. s. palmarum*) is found.

The Common Egg-eater varies from pale sandy to olive brown, with numerous dark stripes or blotches on its flanks alternating with a dorsal series of large rhomboidal or squarish spots which sometimes coalesce to form a zigzag vertebral band. Both in colour and pattern this form of egg-eater so closely resembles the Rhombic Night-adder that the two are often confused by natives, and claimed as evidence of "mimicry" by Europeans. The dorsal scales of both species are keeled. The broad belly scales extend forward on the throat to an unusual degree in both reptiles, in one species to facilitate the swallowing of eggs, in the other, toads. There the resemblance ends for the adder is moderately broad-headed, a thick-set snake with short tail. The egg-eater, on the other hand, has a narrow head, a slender body, and a tapering tail, the total length averaging about eighteen inches.

An egg-eater likes its eggs fresh and cannot be induced to take one that has been incubated for any length of time. The state of the egg is ascertained by the snake touching it with the tips of its delicate forked tongue. The points transfer minute scent-bearing particles to receptacles in the roof of the mouth connected with the organs of smell.

A Boomslang (*Dispholidus typus*), engaged in robbing the nest of a Bronze Mannikin (*Spermestes cucullatus scutatus*) in a mango tree, was startled by a native passing below, lost its balance and fell at his feet. Though I called to the boy to desist, he had killed the snake before I could reach the spot. From its stomach I removed several slightly cracked eggs and fed them to a captive egg-eater which took them without

hesitation. One by one the eggs were swallowed and as each reached the gullet a slight muscular contortion brought into play some specialised device for cracking the egg open. Egg-eaters alone among snakes have certain downward pointing prolongations (hypophyses) of the "neck" vertebrae actually penetrating the gullet. When pressure is exerted they break the egg in much the same fashion that a nut-cracker opens a nut. The snake then raises its head and allows the fluid egg to flow on to the stomach. Once the fluid is safely past the pyloric valve, the snake lowers its head and spews out an elongate mass of neatly crumpled eggshell.

While a large egg-eater can swallow the egg of a domestic fowl, the normal diet of the species consists of entire clutches of small birds' eggs. During nesting seasons when eggs are plentiful the intestines of an egg-eater become filled with a turgid mass of yolk, and the reptile stores up quantities of fat that helps to tide it over the dry seasons when eggs are more difficult to obtain.

Except for the high number of scales around its middle, the egg-eater has little in common with the well-toothed house-snake (*Boaedon l. lineatus*). The latter's diet of mice and rats leads it to enter human dwellings in search of them—hence its name. Partly on this account, partly because of the abundance of rodents in Kenya, this active reptile appears to be the commonest snake in the Colony. Though frequently called "brown house-snake," often the adjective is applicable only to the young as the species darkens with age so that adults are generally black.

A full-grown house-snake may measure four feet, but it is quite unusual to meet with specimens of such a size. Several times at Parklands I have seized three-foot examples as they darted across the road. When captured, a house-snake bites savagely, at times leaving tiny pin-point teeth embedded in the skin of its captor's hand. Generally speaking, however, house-snakes soon tame in confinement though occasional individuals remain irascible and vicious to the last.

The boldness with which a house-snake will tackle a full-grown rat is little short of astonishing, a thirty-eight-inch snake, killed in a native hut at Kaimosi, held a roof rat (*Rattus rattus kijabius*) that measured seven and a half inches from tip of snout to root of tail, the tail itself was partially digested. At Kilosa, I observed a foot of snake's tail hanging from the stone basework of my house. Attempts to get the reptile out failed until some of the masonry was removed, then I found the snake had trapped itself by swallowing a large rat. Where rodents are scarce house-snakes will take other creatures. On Lamu Island, for example, they habitually swallowed frogs of various kinds (*Rana o. oxyrhynchus*; *Hemisus m. marmoratus*), and elsewhere on the Kenya coast, I have taken lizards representing three different families from the stomachs of house-snakes.

Eggs, usually laid between January and March, sometimes deposited in termite hills, may be as many as sixteen though about half that number is more usual. In size the individual eggs show some variation but are approximately an inch in length by half an inch in diameter. One hatchling measured nine and a quarter inches from snout to tail-tip.

Closely related to the house-snake is the more slender Cape Wolf-snake (*Lycophidion c. capense*). It was the sight of one's tail protruding from between the sheets of galvanised iron forming one side of an out-building at Nairobi, that led to the capture of my first wolf-snake. The reptile was a leaden hue lightened by a pale speck on the centre of each scale; an occasional large example may be jet black. For some reason or other one rarely meets with wolf-snakes over a foot in length, though I have taken a yard-long specimen in Tanganyika.

The small size of the majority is probably responsible for their diet being restricted chiefly to lizards, of which I have recovered ten different species from wolf-snakes' stomachs. As these lizards, chiefly skinks, seek shelter under boards or beneath piles of garden refuse, it is there that wolf-snakes are to be found. Usually a wolf-snake lays less than seven or eight eggs; they measure about three-quarters by three-eighths of an inch.

The Semiornate Snake (*Meizodon semiornata*) is a somewhat slender, almost blackish, olive-brown reptile. Adults of two feet in length are nearly uniform above, but younger snakes display a series of vertical, black stripes on either side of the forward part of the body. There are also vertical black bars or blotches on the otherwise white or yellowish upper lips. The colouring of the underside ranges from yellowish to plumbeous.

In Kenya, the Semiornate Snake has been recorded from such widely scattered places as Lake Rudolf, Nyeri, Kijabe, Juja Farm, Kibwezi, Voi, Mombasa, and Malindi. Nowhere common, this secretive and inoffensive species is usually found under piles of rotting vegetation. It is there the snake finds the geckos (*Hemidactylus gardineri*) and skinks (*Riopa m. modestum*) upon which it preys. A female, taken at Kibwezi at the end of March, held two elongate eggs measuring an inch and three-quarters by three-eighths.

Equally secretive is the Abyssinian Slug-eater (*Duberria lutrix abyssinica*), a small olive, brown, or blackish reptile with flecks of white upon its sides and often a fine black vertebral line. No thicker than an ordinary lead pencil, it is rare for a slug-eater to exceed a foot in length, though I caught a female eighteen inches long in the Ruanda highlands of south-west Uganda. The only records of its occurrence in Kenya besides Nairobi, are from the Kinangop Plateau; Aberdare Mountains; Nyeri; and Meru.

In such cool surroundings at altitudes between 3,000 and 10,000 feet, the gentle little slug-eater emerges to bask on short grassy tussocks into which it wriggles when disturbed. Apart from squirming, it makes little objection to being removed from its refuge. The species certainly deserves protection, for its diet is almost exclusively confined to slugs. From six to a dozen young are produced each season, or possibly twice a year.

Probably few serpents are more familiar to Nairobi residents than the East African Green-snake (*Chlorophis neglectus*). No fewer than five of these beautiful little reptiles were killed in one garden on the Hill during the course of a morning just because the lady of the house "didn't like snakes." Yet even the Kikuyu regard green-snakes as harmless. In some parts of the country, of course, there is the danger of mistaking green-snakes for the young of the very venomous green mamba, but fortunately that reptile has not been found around Nairobi so far as I am aware.

Once I was summoned to catch a young green-snake which had thrust its head out of a leather hair-brush case lying on a sunny dressing table in Sixth Avenue. The snake had gained admission to the room from creepers that flanked the open casement. One could always count on finding some green-snakes stretched out on sprays of the bushes that fringed, or overhung, the Nairobi River, into which they would quietly slip when disturbed. One was caught in the act of swallowing a frog, for it is on different species of *Arthroleptis* and *Rana* that these snakes chiefly prey. In young green-snakes, however, I have found small skinks (*Ablepharus wahlbergii*), a buprestid beetle, and a grasshopper's leg.

From five to seven eggs, each measuring about three-quarters by three-eighths of an inch, are laid at a time, probably towards the end of the

rains. Just at first the hatchling snakes are much darker than the adults, which are a uniform rich green above and pure white below. While an average-sized snake measures twenty inches, an occasional specimen may be as much as thirty inches. Among the many places in which this snake has been taken in Kenya, one might mention Tumutumumu, Fort Hall, Nakuru, Kabete, and Mito Andei.

Another climbing snake (*Thrasops jacksonii schmidti*), prefers trees to bushes, and is known from four examples only. A half-grown greyish-white reptile from Meru Boma is greyer beneath the tail, the terminal portion carrying a still darker grey median line. A uniformly black adult, nearly seven and a half feet in length, was killed at Muthaiga, in 1919, by the late A. J. Klein who presented it to what is now the Coryndon Memorial Museum. The black adults so closely resemble the black phase of the venomous Boomslang (*Dispholidus typus*) that an examination of the teeth is necessary to establish its identity.

Of the habits of this eastern race nothing is known, but the typical (western) form, which is common at Kaimosi, seems almost omnivorous. From their stomachs I have recovered an arboreal rat, a bird, an agama lizard, and three species of chameleons. The number of eggs produced ranged from seven to twelve, the largest of them measured about one and a half by five-eighth inches.

The White-lipped Snake (*Crotaphopeltis h. hotamboeia*) is black above freckled with minute white spots that help to distinguish it from the house-snake; underneath it is white. This common species is usually two feet in length, but occasionally individuals over three feet are to be found. It is the first back-fanged snake to be discussed here, and, though the fangs are probably set too far back to cause harm to a human hand, I prefer to pick up a White-lipped Snake by the back of the neck, according to that respect which its appearance would seem to warrant. For a White-lipped Snake, on being disturbed, hisses noisily, inflates its body so that the white spots assume greater prominence, flattens its head to a triangular shape, and then strikes out vehemently in a most vicious manner.

As White-lipped Snakes are largely nocturnal, they seek shelter by day under rubbish heaps or discarded building material. There they are likely to find the toads, frogs, and occasional gecko or pigmy mouse on which they live. It is also among vegetable rubbish, and in similar situations, that they lay their eggs. These range from three to six in number; the largest I have measured was one and a quarter by three-eighths of an inch.

Northern Striped-schaapsteker (*Trimerorhinus tritaeniatus multi-squamis*) is a poor name for so docile a reptile whose bite would not hurt a lamb. But "sheep-sticker" is the title conferred by the Boers on the southern form which ranges from South Africa northwards to the Central Railway of Tanganyika Territory. Both races are grey, olive, or pale brown above, usually with three well-defined lines of darker brown, edged with black, extending from the head to the tip of the tail. Sometimes the middle line is separated by a fine, hair-like, yellow one down its centre; more rarely it may be indistinct or absent. On either side the lateral line is interrupted by the eye; the lips and lower parts are pure white.

The Northern Striped-schaapsteker does not seek safety in full flight if disturbed. Instead it makes for the nearest grass-enveloped shrub and, concealing itself at the base, defies all efforts to drive it out; so much does it rely on remaining quiet for protection that often it can be picked up with ease. Once seized, it flattens its body to a surprising extent, thrashes about, and may even bite, though this is unusual. The bite, while drawing blood, is not followed by any symptoms of poisoning.

Though rodents, and even a shrew, may be eaten by schaapestekers, their food in the main consists of frogs and skinks. One Nairobi snake, a fortnight after being captured, attempted to eat a dead Striped Skink (*Mabuya striata*) that I had put into its cage. For thirty minutes the snake perseveringly tried to swallow the lizard, but failing to get past the front legs eventually disgorged it. Though the head of this snake is small and scarcely broader than the neck, probably an adult thirty-one-inch schaapesteker could have managed the skink. That females under twenty inches long may breed is shown by a couple on Kinangop, each of which held about seven eggs on October 27th.

Elsewhere in Kenya this grassland species is known from Guaso Nyiro; Molo; Nakuru; Lake Naivasha; Kiambu; Juja Farm; the Loita, Athi, and Kapiti Plains; Mtito Andei; and Voi.

The Common Hissing Sand-snake (*Psammophis s. sibilans*) may be olive brown, or yellowish. In young individuals the head is ornamented with black-edged longitudinal streaks anteriorly, transverse ones posteriorly. As the reptile grows these markings disappear until it is uniformly coloured above except for the yellowish white lips, which are rather characteristically spotted with grey. Below, it is plumbeous grey or yellowish white, uniform, or in young examples with a series of dusky lateral dashes longitudinally arranged. The species reaches a length of five feet and the thickness of a broom handle.

In Kenya, the Hissing Sand-snake has been recorded from thirty-four localities between Mount Elgon and Mombasa. It appears capable of adapting itself to a wide variety of habitats from coastal plain to upland savannah at 7,000 feet, showing a preference for well-watered country but shunning rain forest. Temperamentally I should call it irascible, but as it uses its teeth in self-defence perhaps it would be fairer to commend the sand-snake for its love of freedom.

Young sand-snakes feed on frogs and lizards, but older ones prefer rodents and shrews; altogether I have recovered fifteen different species from the stomachs of dead sand-snakes. Almost as diverse as their prey are their enemies and parasites, among which are the Black-collared Cobra and three species of eagles—both harrier and fishing.

It is doubtful if any two species of snakes are harder to distinguish than some individuals of the Common Hissing Sand-snake and the Northern Stripe-bellied Sand-snake (*Psammophis subtaeniatus sudanensis*.) Yet a typical example of the latter is distinct enough with its yellow belly flanked on either side by a *sharply defined* black line bordered externally by a white band. Above, the reptile may be brown or olive with a light vertical line extending across the snout to the posterior end of the frontal shield, where it meets with the first of three light transverse stripes crossing the hinder part of the head. Usually seven middle scale-rows of the back are darker and edged with black, and a fine yellow vertebral line may, or may not, be present.

The Stripe-bellied Sand-snake is definitely more slender than its relative, but this is not noticeable in young specimens. The length rarely exceeds three feet though the record is four feet three inches for a Uganda snake collected by C. R. S. Pitman. The Stripe-bellied Sand-snake is not savage even if it does bite freely when first captured; no ill-effects whatever resulted from the bites I received.

The habitat preference of the stripe-bellied species differs from that of the Hissing Sand-snake, for it favours dry savannah with scattered bush. Being an adept climber it suns itself among the twigs and is difficult to detect as it harmonises so well with its environment. A snake disturbed

in thorn-bush country, flashed across my path and was twenty feet up in the topmost twigs of a stunted tree in a matter of moments. I captured others in the thatches of native huts where they had gone in search of lizards

Frogs, and now and then a mouse or bird, are also eaten. At Frere Town one day my native collector brought in a warbler (*Prinia mistacea tenella*) whose head had been partially shot away. It was useless as a specimen so I dropped it into a small biscuit tin (measuring about five by five by eight inches) in which was a sand-snake I had caught the day before after a hard chase. When I opened the tin next morning there was a bulge in the snake but no sign of the bird. This freshly-caught diurnal snake had eaten a damaged dead bird in the darkness and confinement of a small tin on the day succeeding capture!

Both species of sand-snakes produce the same number of eggs—four to ten, which, in the case of the stripe-bellied species are laid in late October. Those in one batch measured one inch and a quarter by half-an-inch. Sixteen hatchlings were captured between December 10th and January 1st, and in their convulsive efforts to escape two of these hatchlings actually leapt off the ground. Five adults were recovered from the stomachs of harrier-eagles (*Circaetus cinereus*).

The Northern Stripe-bellied Sand-snake has been taken on the Athi Plains outside Nairobi, and is known from a score of places in the eastern half of the Colony from Lake Rudolf to the borders of Tanganyika Territory. The southern or typical race occurs south of the Zambesi.

Neither of the remaining opisthoglyphous snakes can open their mouths wide enough to bite a human finger. Both subsist on centipedes. One Plumbeous Centipede-eater (*Aparallactus concolor*) is reported to have swallowed a centipede as long as a finger and nearly the same diameter as the snake itself. That would be a little thicker than a pencil, while the largest known specimen, a female which I took at Voi, measured twenty and a half inches. This slender snake, as suggested by its name, is uniformly plumbeous above; below it is somewhat paler, sometimes almost white. It occurs on the Athi Plains though in general it is found in even drier regions like Turkana, Tsavo, and Voi.

The inclusion of Jackson's Centipede-eater among Nairobi snakes, is justified by a specimen in the Coryndon Museum which I found on Kell's Farm thirty years ago. It has been taken at Naivasha and recorded, probably in error, from Lamu; south of the border it is not uncommon. There I used to find them beneath stones and logs in the scattered acacia forest of the hot upland steppe. It was one of these inoffensive little snakes that attempted to cross the face of a recumbent trooper when the East African Mounted Rifles were encamped at the foot of Mount Meru.

An eleven-inch male from the foothills of Mount Longido is the longest known example of Jackson's Centipede-eater. In this species the top of the head is black and on the nape is a broad black band edged before and behind by scale-wide bands of bright yellow. The back and tail are a delicate pinkish brown or terra cotta with, or without, a fine black vertebral line, more rarely along the sides is a series of white scales bordered with black above and below. The underside is bright yellow or white.

CORAL-SNAKES AND COBRAS (ELAPIDAE).

The mambas also belong to this family for its members comprise those land snakes at the front of whose mouths is one pair, rarely two, of enlarged, grooved teeth for the conduct of venom. In some species a canal

can be seen down the front of the tooth, in others the fissure is closed with calcium so that the tooth is almost tubular like a viper's. However, in elapid snakes more or less of a groove remains, and the tooth is semi-rigid instead of folding back along the palate.

Elapids are most numerous in Australia where there are approximately sixty kinds; in the Americas nearly as many but all are coral-snakes; in Africa elapids are not quite so numerous. In British East Africa there are but two races of coral-snakes, two species of mamba, and six cobras of which one is semi-aquatic. Both elapids known from the Nairobi district have their scales arranged obliquely (see Fig. 1, B), but may be distinguished as follows:—

Scales around midbody 13; length of tail included in length of head and body more than eight times; cannot spread a hood	Günther's Coral-snake.
Scales around midbody 21; length of tail included in length of head and body not more than five times; spreads a hood only when excited	Black-collared Cobra.

Günther's Coral-snake (*Elapsoidea sundevallii guntherii*) is sometimes called a garter-snake. This second name is unfortunate, for it is likely to result in confusion with the harmless garter-snakes that are so abundant in North and Central America. The half-dozen Nairobi specimens that I caught all had coral pink or red centres to the numerous white crossbands that enliven the black or plumbeous grey body and tail. Elsewhere in the Colony, I came across almost uniformly black specimens which, when annoyed, by inflation of their lungs brought into prominence the previously hidden white-tipped bases of certain scales, thus producing an annulate effect that is quite startling.

Temperamentally, however, Günther's Coral-snake is peaceable and inoffensive, only biting when really provoked. In Parklands Forest Reserve, I nearly trod on one sluggishly making its way through the sparse herbage that had sprung up with the advent of the rains. Though elsewhere this race has an extensive distribution from sea-level to 7,000 feet, in Kenya it seems to prefer the highlands where it is known from Guaso Nyiro; Burnt Forest; Kakamega; Njoro; Kijabe; and Loita Plains. One Kaimosi coral-snake measured just over two feet in length, but this is unusually large.

Though this coral-snake is not uncommon, next to nothing is known of its habits. The only dietetic record for the race is a note that there were four lizard eggs, each measuring about five-sixteenths by three-sixteenths of an inch, in the stomach of a coral-snake that I found wriggling along in a ditch on Sixth Avenue. It is to be hoped that some member of the Natural History Society will endeavour to fill the gaps in our knowledge by keeping some of these coral-snakes in captivity and supplement any observations made by studying their habits in the field.

The Black-collared, or Black-necked Cobra (*Naja n. nigricollis*) is certainly one of the most variably coloured snakes. In Nairobi, there is an olive-coloured form with lemon-yellow markings on its throat; the common slatey-black variety is also present, and young cobras are usually greyish, or slatey-grey, with pink bars on their throats. In the red laterite country extending from Lake Rudolf southwards through Kibwezi and Tsavo to Mount Longido, occurs a salmon-pink to rich red phase distinguished by its more numerous scale-rows. These number twenty-seven and justify

the recognition of a geographical race that, rather unfortunately, has been named *Naja n. pallida*, because the fugitive red had disappeared from the preserved snake on which the original description was based.

It is not often that one meets with a Black-collared Cobra over four feet in length, though they do grow to seven feet in remote districts. Only the equally large Egyptian Cobra (*Naja h. haje*) is likely to be confused with it. As the Egyptian Cobra has been found at Thika, there seems no reason why it should not turn up nearer Nairobi. An examination of the eye in relation to the upper lip scales makes it easy to distinguish between the two reptiles.

- Eye in contact with the third or third and fourth upper labials, which are the largest Black-collared Cobra.
- Eye separated from the upper labials by suboculars; sixth or seventh upper labial largest and deepest Egyptian Cobra.

Apparently the Egyptian Cobra lacks the ability to eject its venom, a habit which has made the Black-collared Cobra as feared as the Ringhals of the Transvaal. The rapidity and precision with which a cornered cobra "spits" is truly remarkable. Throwing back its head to the correct angle, it ejects the venom from its fangs with such force that the twin jets of fluid carry to a distance of six feet or more. The discharge of the poison is accompanied by a sharp hiss that has the effect of spraying the venom at the face of the snake's opponent.

Several times when shielding my eyes with my bare arm I have had the venom fall upon it and my neck, where it does no harm unless there is a scratch or abrasion present. The effect on the eyes, however, is instantaneous agony. Blinding tears course over the burning eyeballs as the venom is rapidly absorbed by the tiny superficial blood vessels. Unless the venom is washed off promptly—milk or plain water will do—the sight may be affected permanently. Dogs that have been targets, frequently go blind, for, being closer to the cobra they receive a more concentrated discharge of the poison.

Mammals, birds, reptiles, and amphibians are alike included in the menu of the Black-collared Cobra. Doubtless this wide range of food explains in part their comparative abundance and extensive distribution. In search of eggs, chickens, and rodents, the cobra visits human dwellings where it is frequently found in sheds, fowl houses, rubbish heaps, and even tents. In open country they take up their abode in termite heaps, upon which they like to lie and bask in the morning sunshine.

Termitaria are known to be one of the situations chosen by these cobras in which to deposit their eggs. I have never found any, but in September, 1920, a captive snake laid ten, each of which measured about one and three-eighths inches by three-quarters of an inch. They were brought to the Museum by an itinerant snake-charmer then living in Nairobi.

ADDERS AND VIPERS (VIPERIDAE).

Members of the VIPERIDAE are characterised by the possession of tubular fangs that bear a marked resemblance to a hypodermic needle. When the mouth is closed these long fangs lie along the palate, but are raised when required by rotation of the abbreviated maxillary bone to which they are fused. Normally there are just a pair—one on each side of the front of the mouth, but occasionally a replacement pair moves into position before the functional pair is shed.

Since the separation of the New World pit-vipers into a distinct family (CROTALIDAE), the distribution of true vipers is restricted to Europe, Asia, and Africa. The name viper is given in allusion to the ovo-viviparous mode of reproduction of the great majority of species that give birth to live young. This is true of four of the Kenya genera, but does not apply to the egg-laying *Atractaspis* and *Causus* for whom it might be well to reserve the name adder, derived from the Anglo-Saxon *naedre*, if it were not so inseparably linked with the commonest African viper, the puff-adder.

It is surprising that no burrowing-adders (*Atractaspis*) have been reported from Nairobi forests, for one species occurs on Mount Kenya and others are known from east, west, and south of the capital. These very venomous, but unviperish reptiles, have small heads no broader than the slender attenuated body; the colour of most species is black. In the under-mentioned key they would answer best to the night-adder, but may be distinguished from it by having more than two hundred belly shields, apart from the subcaudals beneath the rather short tail.

- Top of head covered with large shields;
pupil of eye round; 17-21 scales around
midbody Rhombic Night-adder.
- Top of head covered with small scales;
pupil of eye vertical; 29-41 scales around
midbody Puff-adder.

The Rhombic Night-adder (*Causus rhombeatus*) is usually about eighteen inches long, though examples measuring two and a half feet are known; in girth it is approximately the thickness of a man's thumb. The colour varies from pale brown to olive; on the crown is a dark arrow-head or A-shaped marking with its point resting on the frontal shield; along the back are a series of light-edged, dark, irregular markings, that may, or may not, be rhomboidal. The shields on the underside are grey or yellowish white, uniform or each shield with a dusky edge.

This night-adder ranges over most of tropical and South Africa outside the forest areas, in Nairobi it is one of the commonest snakes. It spends the day in rubbish heaps, piles of stones, or among the litter of outbuildings. Towards evening it emerges from its retreat, and is then most frequently encountered as it crosses paths or roads. If intercepted it will coil and strike viciously until, having intimidated the aggressor to its satisfaction, it moves off with neck flattened cobra-fashion and head raised about five inches from the ground.

Apparently the diet of night-adders consists chiefly of toads, notwithstanding the acrid secretions that cause these amphibians to be avoided by most animals. I have seen a captive night-adder take in quick succession seven small toads, each about the size of a thimble. Another snake took nine very small toads, three small ones, and a rather large frog, all in the course of a week. A week later I chloroformed this adder and found everything had been digested except the feet of the frog.

The venom, which presumably assists the adder in overpowering the toads, is produced in unusually elongate glands. In most snakes these glands are almond-shaped and confined to the head, but in the Rhombic Night-adder extend along either side of the back for almost a quarter of the length of head and body. The venom produces serious symptoms in man, but is rarely fatal for adults. On the other hand the child of a European missionary at Rungwe died from the bite of a night-adder.

The Rhombic Night-adder lays from one to two dozen eggs, and, in captivity at least, coils about them. Further observations are required to establish whether the snake registers a definite rise in temperature and maintains her guardianship until the eggs hatch. At Fort Hall, a Chanler's File Snake (*Mehelya c. chanleri*), about four feet in length, was killed in the act of swallowing a night-adder half its own length. The interesting pair are preserved in the Coryndon Memorial Museum.

The Puff-adder (*Bitis arietans*) has a trans-African range from Southern Morocco to the Cape, outside forest areas. Naturally so widely distributed a species shows many different types of coloration. The basic colour of some is chocolate-brown, of others reddish brown, and less commonly lemon-yellow, with a variegated pattern chiefly consisting of a series of light-edged, dark, V-shaped markings along the back. The largest I have collected was a fifty-five-inch male, weighing six pounds, from Mkonumbi near Lamu, but the species is said to reach five feet, though such monsters are undoubtedly rare today.

When unmolested the average Puff-adder is a sluggish reptile whose colour harmonizes so perfectly with its surroundings that there is a real danger of the snake being trodden upon and hurt by ornithologists, lepidopterists, and others whose attention is directed elsewhere. Then the snake swells visibly by inflating its lungs, and hisses and blows in the vigorous manner that has earned it the name of Puff-adder. This is the reptile's way of warning that it is about to strike, for with startling suddenness it lunges forward, or sideways, the mouth flashes open, and the snake recoils on the defensive. It is all over so quickly that it is easy to understand the faulty observation responsible for the statement that a Puff-adder strikes backwards.

I was once struck a glancing blow on the thumb by one fang of a Puff-adder I had just released; no symptoms of poisoning resulted. Alternatively a native who was struck by one fang on the knuckle at the base of the index finger of his left hand, had a very bad time. Within five minutes of being bitten Abedi was in hospital, where potassium permanganate was applied to rather superficial incisions at the site of the bite. Though bitten at 9 a.m., he showed no signs of poisoning the first day except for a certain amount of drowsiness. The next day his arm swelled gradually from the hand to the shoulder till, when I saw him at 4 p.m., it was enormous. About this time some antivenin was procured and injected. The medical officer told me that the man's condition was decidedly precarious, and he doubted if the antivenin, being injected so long after the fellow had been bitten, had much effect one way or the other. No information was available on the type of antivenin used and if it was Calmette's serum based on the Indian cobra it may well have been useless. Nevertheless, on the fifth day the patient was so far recovered that he was able to rise and wash himself, and thereafter his condition improved steadily. The doctor inclined to the opinion that he had received a non-lethal dose and might well have recovered without any treatment.

The stomach of one young Puff-adder held an orthopteran, but they soon begin to take young toads and mice. An adult Puff-adder that I caught, had eaten quite a large bird to judge by the undigested quills in its stomach, in general, however, the larger adders prey on full-grown rats. The maximum number of eggs or embryos that I found in one of these snakes was seventy-one.

NOTES ON THE OCCURRENCE OF MIGRANT WHEATEARS
-AT NAIROBI.

By A. F. MORRISON.

These notes are compiled from a series of observations made at High Ridge Golf Course, Nairobi, from September, 1943, to March, 1944. Most of the observations were made in the evenings after 5-30 p.m. It was only possible on a few occasions, as at week-ends, to observe at other times of the day.

Of the six species of the Genus *Oenanthe* described in Jackson's *Birds of Kenya Colony and the Uganda Protectorate*, three migrants and one resident were noted in the area. The resident bird, *Oenanthe pileata livingstonii* (Tristram) (Zambezi Capped Wheatear) was uncommon. On four days in February, single birds were seen, but that was all. The other three form the subject of these notes.

The three species under review are:—

- (1) *Oenanthe oenanthe oenanthe* (Linn.), the Common Wheatear, a migrant from Europe, including Great Britain;
- (2) *Oenanthe isabellina* (Temm.), the Isabelline Chat, a visitor from Russia and Asia; and
- (3) *Oenanthe leucomela leucomela* (Pall.), the Pied Wheatear, another visitor from Russia.

OCCURRENCE AND DISTRIBUTION.

The Common Wheatear was first recorded on 29th September, 1943, and last recorded on 24th March, 1944, cf. Jackson (op. cit.) who records the earliest and latest dates as 26th September and 26th March respectively.

It soon appeared probable that a definite, though small number of the birds had adopted the observed area as their winter quarters. With the object of ascertaining whether this was indeed the case, a count of the three species was begun on 13th December, and was continued until it was clear that the last bird had departed. A summary of the results is given in the appendix.

Up to 24th March, which was the latest date on which any bird was seen, the total number of days on which records were made was 47. Except after 11th March, when the number of Common Wheatears fell off very rapidly, I failed to find any at all only on two days, 5th and 23rd January. The largest number counted on any one day was seven (twice), and the average number was about three to five. The figures remained remarkably constant, and such irregularities as there were, suggest incompleteness in the count rather than trends towards irruptions of fresh birds or of departures. From 11th March, however, there was a definite downward trend, when the numbers gradually fell to zero and never increased again.

There were probably never more than two adult males. On 15th December, three males were recorded, but at that time it was often very difficult to distinguish the sexes, and an error is quite possible. The remainder were females or juveniles, which were difficult to distinguish. Males in breeding dress were recorded first on 12th February, but before that a good deal of grey was often noticed in the plumage, and also the blackening of the wings due to the fulvous edges to the feathers becoming

worn. The skins in the Coryndon Museum show this grey on the back as early as November in some specimens, and one specimen, taken in January, is quite grey and has the wings completely black. No adult males were recorded after 11th March. During the last week of observations, which ended, as stated above, on 24th March, only one bird, which appeared to be a juvenile, could be found anywhere in the area.

Common Wheatears were scattered rather evenly over the area, there never being more than three as close together as 100 yards, and it soon became clear that single birds or pairs could be looked for with confidence at any time, in certain well-defined parts of the area. There was one outstandingly bright fellow, who was noted, if it was always the same bird, as seems likely, some six times in late February and early March. Four times out of the six he was seen about the same place, and the greatest distance between any of his situations was not more than 300 yards. Such observations as were made in the mornings and afternoons gave the same results as the evening ones.

This uniformity suggests that the same birds were actually resident throughout the season, and that each bird tended to establish its own territory, with or without a companion. More detailed observations on individual birds in a future season would help to verify this.

I was unable to determine the date of arrival of the Isabelline Chat with any certainty, as owing to its superficial resemblance to the female Wheatear, it may have been confused with the latter until experience made its appearance familiar. I first recorded it on 13th December, but up to about 6th January its identity was still doubtful. After that date the regularity of the record is even more striking than that for the Wheatear. About half the counts gave two birds, and about half gave one bird. Only very seldom were none seen. Except once the birds were in a definitely restricted area all the time. In the exceptional case one of two birds was about two hundred yards from the normal territory. They departed about 4th March, one bird having been seen for the last time on that day. These results indicate that the same birds were resident in the area for the season, as is suggested in the case of the Wheatear.

There is no such indication in the case of the Pied Wheatear, which appeared merely to visit the locality at irregular intervals, although there is some indication, to be referred to later, that one or two females used to roost in a ditch that crosses the golf course. On one occasion a male was watched flying from one side of the course to the other. He paused to perch in a bush in between, but then flew on and disappeared through the trees outside the course. I never saw either of the other two species do this; in fact, I cannot recollect one of them flying more than a hundred yards or so at a time. The Pied Wheatear first appeared on 13th January, and was last seen on 10th March. There were never more than a male and a female, or two females. Altogether the male was seen only four times, and there was no sign that he had a territory or anything like permanent quarters.

HABITS.

Although the habits of the Genus *Oenanthe* are well-known, it may be of interest to give a few points of comparison. There were no great differences in behaviour, and the Wheatear and Isabelline Chat were particularly alike. These two preferred the short grass of the fairways, and were usually found in that situation. If by chance, one strayed into the rough, it usually found a convenient bare patch. The Wheatear

sometimes perched in a bush or tree, but the Isabelline Chat as a rule found a small mound or the edge of a tee sufficient elevation for a look round. The Pied Wheatear, as Jackson indicates (op. cit.), was much fonder of getting off the ground, and on three of the four occasions when the male was seen, he chose a small bush about two feet high as a look-out post. On 10th March, however, he was out in the fairway, where his behaviour was exactly like the other species. He hopped and ran about in the short grass in search of food, occasionally flying a few yards to explore fresh territory.

All three hop as well as run, the gait being suited to the ground. On the smooth sand of the putting "greens," for instance, where any might sometimes stray, they would run, but on the grass which might be as much as two inches long, they appeared to find hopping more convenient as a means of getting about in search of food. The normal flight of all three was similar. When moving from place to place, they flew steadily, but, particularly if the whole journey was a short one, this might be varied by a pronounced dipping. The Wheatear after alighting almost always flicked his wings and bobbed his head two or three times. Both the Wheatear and the Isabelline Chat seemed to delight in flying in odd places, such as round the edge of a bunker, or along a ditch, keeping all the time below the top. Another type of flight was indulged in by females of the former species, and appeared to be a play flight. This was noticed chiefly in the evenings, just before dusk. The bird would rise almost straight up, whirl round in a circle and alight almost where it had started from. The call note "tchick tchick" seems to be uttered both in flight and on the ground, the latter particularly if there were two birds moving about together.

The Pied Wheatear had a play flight and call-note of its own, different from the others. It was noted at dusk, and was performed by females only. My note made at the time reads as follows:—

"On 22nd February, two females were near a dry ditch on the golf course, just before dusk. They were close to a pair of *Myrmecocichla aethiops cryptoleuca* in a patch of rough grass. They both hovered at a height of about two feet, remaining stationary in the air and maintaining themselves by means of a rapid wing-beat, and uttering cries like a thumbnail being drawn rapidly over a comb. At the same time the Anteaters were hopping about and uttering whistling cries. After a minute or so, the Wheatears flew off a little way and settled on flat ground."

Similar behaviour was noted on subsequent evenings. It should be added that it is very difficult to distinguish these birds from female or juvenile common Wheatears in fading light. It was easy enough to make sure that they belonged to the Genus *Oenanthe*, as the characteristic rump and tail showed up well, but efforts to make a more precise identification were not helped by their persistent habit of keeping their backs to the observer. However, after watching one bird for quite a long time, she at last faced towards me, and, with the aid of an electric torch, I made out the dark brown throat of a female Pied Wheatear.

The call-note referred to by Jackson (*The Ibis*, 1901, p. 77), was never heard. In fact, I never heard the male Pied Wheatear make a sound of any kind.

The well-known Wheatear habit of standing bolt upright was much more noticeable in the Isabelline Chat than in the Wheatear. The latter often adopted such an attitude when perched on a small hillock or clod of earth, but just as often stood or perched in the normal attitude. The

Isabelline Chat could always be seen in such a posture. It would often stand so, as I approached, facing me with an air of great boldness, and would allow me to pass within three or four yards.

Indications were found during February, that some of the birds were in the habit of using the ditch mentioned already as a roosting place. On the 22nd of the month a Common Wheatear alighted in the ditch at dusk, and began to settle down on a little ledge in the side of it. It looked like a male, although the light was too bad to make certain of this. Unfortunately an incautious move caused it to fly off in alarm. Both the Common and Pied Wheatears were seen on several evenings in and around this ditch at dusk. Indeed, one of the hovering performances of the female Pied Wheatear, was begun by a bird which rose out of the ditch close to my feet, just after sundown. On two different evenings, well after dark, birds were flushed from the ditch by shining an electric torch along it. These could not be positively identified under the conditions, but I thought they were Wheatears, especially as once, shortly afterwards, the call of a Wheatear was heard. An examination in daylight of those parts of the ditch haunted by the birds revealed excreta in several little nooks and crannies in the sides of the ditch. In most cases, the excreta could not have been dropped from above, but must have been dropped by a bird actually perched in the cavity. Round about 3rd March, this ditch became waterlogged, and after this no birds were found there in the evenings.

In the case of the Isabelline Chat, nothing like such clear evidence was obtained. They did not appear to resort to the ditch at dusk. One might be seen not far from it at this time, but they were just as often near it in the day-time.

On 21st February, one bird was kept under continuous observation for an hour from 6 p.m. to 7 p.m. During the whole period, it made only three flights, each quite short, and the last one brought it to within thirty yards of its starting point. Practically the whole time was spent feeding. At 7 p.m. the light was so dim that the bird could hardly be seen. Then I realised that I could not see it at all, so I moved carefully forward. If it flew off, I certainly did not see it do so; in fact, I never saw it at all, but just at the spot where it had last been, there were a number of rat-holes. The possibility that it had entered one of the holes for the purpose of roosting would hardly be worth mentioning, but that I had a similar experience about a week later. On another evening an Isabelline Chat, instead of remaining near one place, as was usual, varied the procedure by moving frequently from one place to another, without however, leaving its territory. It finally disappeared while flying at a height of about twenty feet. It was then nearly dark.

These evening observations were started too late in the season, so that it was not possible to get a long enough series on roosting habits. I have been able therefore to do little more than make suggestions in the hope that other observers will be able to confirm them or otherwise.

TABLE OF OBSERVATIONS.

Date.	<i>O. oenanthe oenanthe.</i>	<i>O. isabellina.</i>	<i>O. leucomela leucomela.</i>	Remarks.
1943				
Sept. 29	Several	—	—	Winter plumage.
Oct. 6	Several	—	—	Winter plumage.
9	Several	—	—	Winter plumage.
19	Several	—	—	Winter plumage.
24	Several	—	—	Winter plumage.
31	Several	—	—	Winter plumage.
Nov. 1	Several	—	—	Winter plumage.
10	Several	—	—	Winter plumage.
13	Several	—	—	Winter plumage.
14	Several	—	—	Winter plumage.
20	Several	—	—	Winter plumage.
21	Several	—	—	Winter plumage.
27	Males and females	—	—	Plumage wearing.
28	Some seen	—	—	—
30	Males and females numerous (7 or 8)	—	—	—
Dec. 2	Fewer	—	—	—
5	Numerous	—	—	—
13	M. 2 F. 2	1	—	<i>oenanthe</i> , plumage well-worn.
15	M. 3 F. 2	2	—	—
16	M. 2 F. 3	3	—	Figure for <i>isabellina</i> doubtful.
21	M. 2 F. 3	2	—	—
22	M. 2	5	—	Many of these identifications may be wrong.
23	M. 1	1	—	More seen unidentified.
1944				
Jan. 5	Nil	1	—	—
6	M. 1 F. 2	1	—	A good identification of <i>isabellina</i> .
11	M. 1 F. 1	1	—	—
13	3	—	M. 1 F. 1	—
14	F 1	1	—	—
23	Nil	Nil	—	—
25	M. 1 F. 1	1	—	—
26	M. 2 F. 1	1	—	—
27	4	2	—	—
Feb. 6	5	Nil	—	—
8	M. 2 F. nil	2	M. 1	—
10	M. 2 F. 1	2	—	—
11	M. 2 F. 1	1	—	—
12	5	2	—	Includes one paired male in full breeding dress. (<i>oenanthe</i> .)
13	2	1	M. 1	—
16	M. 1 F. 2	2	—	Male <i>oenanthe</i> in full breeding dress.
18	7	2	—	One pair. One full-dress male solitary.
19	2 or 3	1	—	—
20	5	2	—	<i>oenanthe</i> one breeding male.

Date.	<i>O. oenanthe oenanthe</i> .	<i>O. isabellina</i> .	<i>O. leucomela leucomela</i> .	Remarks.
1944				
21	M. 1 F 1	1	—	At dusk
22	2	2	F. 2	At dusk.
24	2 or 3	1	F. 1	At dusk.
25	1	1	—	At dusk.
27	3	—	F. 1	At dusk.
28	Heard	—	—	At dusk.
March 1	Heard	1?	—	At dusk.
2	M. 2 F. 2	1	—	Two <i>oenanthe</i> males in breeding dress, especially one of these.
3	F. 1	Nil	F. 1	At dusk.
4	M. 1, indeterminate	—	—	At dusk.
6	Juvenile 1	—	—	—
10	M. 2 F. 5	—	M. 1 F. 1	Males were not very bright —probably first season.
11	M. 1, indeterminate	—	—	The male in breeding dress.
14	3	—	—	—
14	—	—	Nil	—
15	Young M. 1	—	—	—
	F 1	—	—	—
16	—	—	Nil	—
17	M. 1 F. 2	—	—	—
19	Juvenile 1	—	—	—
20	Juvenile 1	—	—	—
21	—	—	Nil	—
23	Juvenile 1	—	—	—
24	Juvenile 1	—	—	—

The whole area was not searched on these days.

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EAST AFRICAN SUCCULENTS.

PART VI.

BY PETER R. O. BALLY,

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(DRAWINGS AND PHOTOGRAPHS BY THE AUTHOR.)

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N.O. COMPOSITAE.

The *COMPOSITAE* with more than 800 genera and over 13,000 species is the largest family of Dicotyledons; its distribution extends all over the globe and over all altitudes and climatic conditions where plants can subsist. They are mostly herbaceous, rarely woody, plants and it may be mentioned in passing that East Africa harbours one of the largest of the woody species, *Brachylaena Hutchinsii*, the Muhugu tree which attains a height of 100 feet and which is one of our most valuable timber trees.

Other remarkable members of this family are the tree-like giant groundsels which give the higher alpine zones of the African mountains a character all of their own.

It is surprising that this large family of plants whose immense range of distribution speaks for its high adaptability has evolved comparatively few true succulent forms.

The "flowers" of the *Compositae* are composed of numerous individual florets, assembled on a common base, the "receptacle"; they are surrounded by involucre bracts which bear a close resemblance to the sepals of the calyx in a true flower; this assemblage of flowers and bracts is called a "capitulum."

Fig. 1 shows the flower of a composite (*Notonia*) and its various parts.

In a very large Order such as the *Compositae* differentiation between species is often difficult, and intermediate forms are continually being discovered which tend to obliterate clear-cut distinctive characters.

The result is that the nomenclature is in constant fluctuation; a few words on botanical nomenclature may therefore be not out of place here.

The generic name usually includes a group of plants which all have certain common and constant characters; the specific name—which always comes second—is affixed to plants belonging to the same genus but which differ from one another by minor, but equally constant, characters.

The name of the botanist who has described the plant is added for reference.

So far there is nothing confusing in this, but the difficulty comes in with the definition of generic and specific characters as such. Botanists disagree widely upon this subject, some tending to split up plants over-much into genera and species, others inclining to over-simplify nomenclature by disregarding minor generic and specific characters.

For this reason—and also because of added knowledge, more detailed study, or a different view on relationship or for convenience—re-naming of plants takes place very frequently.

Any such alteration—and indeed the initial giving of a name—is subject to certain rules laid down in an international convention to the effect that botanical names are valid throughout the civilised world.

Though plant names under such circumstances tend to become very unwieldy, an analysis of one of them will show the reader that in spite of their apparent clumsiness they are perfectly suited for their purpose.

However, misleading or even erroneous plant names must often be maintained for the sake of their priority; for, unless a name has been altered in an officially accepted revision, it must stand as it is.

EXAMPLE:

Senecio longiflorus (DC) Oliv. et Hiern., var. *violacea* (A. Berg.) E. A. Bruce and Hutchinson.

This very lengthy designation tells the following tale: The plant was described by A. Berger as *Kleinia violacea* Berg. Schultz and Bip. gave it the name of *Notonia kleinioides* Schultz Bip. M. R. F. Taylor, in his revision, placed the plant again into the genus *Kleinia*; he retained—for reasons of priority—Schultz Bip.'s specific name; it read now: *Kleinia kleinioides* (Schultz Bip.) M. R. F. Taylor. Oliver and Hiern, thereafter incorporated the genus *Kleinia* into that of *Senecio*, so that our plant now became *Senecio kleinioides* (Sch. Bip.) Oliv. et Hiern.

In a later revision E. A. Bruce and Hutchinson decided that the plant was not sufficiently distinct from *Senecio longiflorus* (DC) Oliv. et Hiern. to let it stand as a separate species, and they described it as a variety of the latter plant.

The fact that a very closely allied plant from Somaliland was described by E. Chiovenda as *Kleinia polycotoma* Chiov., which is its present valid name, is bewildering, but without being in possession of all dates of publications and revisions the writer cannot satisfy the reader as to this apparent illogism. Possibly Chiovenda does not agree with the sinking of the genus *Kleinia*; on the other hand, it is possible that Oliver and Hiern. had no material available to enable them to include Chiovenda's species in their revision.

TRIBE: *SENECIONIDAE*.

GENUS: *Gynura*.

A genus of the Old World, with few species occurring in East Africa, mostly herbaceous, erect plants, sometimes scandent. They are characterised by long, subulate, puberulous style branches.

Some of the plants described hereunder can hardly be termed true succulents but they are included here as examples of the beginning stages of succulence.

Gynura scandens O. Hoffm.

A scandent herb which climbs high into trees. Stems turgid and fleshy. Leaves slightly fleshy with incised margins.

Texture of leaves large-celled, surface covered with tapering, soft, turgid hairs, about 1 mm. long, giving it a velvety appearance.

Capitula arranged in corymbose heads at the end of the branches.

Florets all tubular, bright orange. Pappus about as long as the florets.

G. scandens occurs in Tanganyika and in Kenya Colony. Records in the Coryndon Museum show it to be distributed all over the Kenya Highlands at 5,000 feet to 6,000 feet altitude. It is usually found at the edge of forests. Fig. 2.

Gynura valeriana Oliv.

An erect herb up to 2 feet high with a very fleshy stem and fleshy, petiolate leaves with lyrate-pinnatifid margin. Appearance of surface smooth with few, scattered, short, soft hairs. Inflorescence in loose, corymbose cymes. Capitula of numerous, orange-yellow, tubular florets. The long, protruding, subulate style branches lemon yellow.

Scent strong, reminiscent of Valerian. The plant is known from Kenya and from Tanganyika. In the Chyulu Hills, where it is common at 6,000 feet to 7,000 feet altitude, it frequently grows epiphytically on mossy tree-trunks in mist forest. Fig. 3.

Gynura sp. nov. (Coryndon Museum, 6799).

An erect, somewhat succulent herb, 1 foot to 2 feet high, with a large, tuberous root. Leaves pinnatifid with incised lobes, petiolate, to 15 cm. long, slightly fleshy and covered with a coarse tomentum, arranged in a whorl at the base of the stem.

Capitula in a few-flowered, loose cyme on an erect stalk, 30 cm. to 40 cm. long, tomentose, with sparse, small, bractal leaves.

Florets numerous, all tubular, bright yellow. Style branches much protruding beyond the florets.

The only known locality of this plant is the Game Reserve between Nairobi and the Ngong Hills and the adjacent Escarpment, where it grows on rocky soil. It was first collected by Miss Evelyn Napier in 1934. Fig. 4.

GENUS: *Kleinia*.

Kleinia polycotoma Chiov.

A small, straggly shrub with cylindrical, fleshy, striated branches; branchlets 5 to 6 mm. diameter. Leaves fleshy, linear-obovate, 6 to 8 mm. long, shortly petiolate. Inflorescence consisting of 3 to 5 few-flowered, cylindrical capitula on short (5 mm.) peduncles with sparse minute scale-like bracteoles. Bracts 5, elliptic-linear, 7 to 9.5 mm. long and 2 to 2.3 mm. wide, with a blunt tip, reddish brown. Margins membranaceous, transparent. Florets 5, tubular, 12.5 to 14 mm. long, narrow at the base, inflated at the top, inflated part 1.5 mm. wide, with 5 triangular, blunt-tipped lobes, bright magenta. Anthers slightly exerted above corolla.

Style branches recurved, much prolonged above the corolla, with truncate, minutely bristly tip, yellow. Achenes cylindrical, 2 to 3.5 mm. long, minutely hairy. Pappus consisting of numerous bristles, to 15 mm. long, white.

The plant occurs in Northern Somaliland and in Somaliland Protectorate.

The plant has not been recorded from Kenya. Fig. 15.

(The plant is very closely allied to *Senecio longiflorus* (DC) Oliv. et Hiern. which has been transferred from *Kleinia* into the genus *Senecio* together with *Kleinia kleinoides* (Sch. Bip.) M. R. F. Taylor. From the descriptions and illustrations it is obvious that all three plants belong to the same genus.)

GENUS: *Lopholaena*.

Primarily a South African genus it extends into Rhodesia, Angola, and South-Western Tanganyika Territory. Shrubs or herbaceous plants, leaves fleshy with entire margin, capitula few-flowered.

The writer has not seen living plants and the following sketchy descriptions and illustrations were based upon pressed material kindly lent

for the purpose by the Herbarium of the E.A.A.R. Institute, Amani, Tanganyika Territory.

Lopholaena dolichopappa (O. Hoffm.) S. Moore. (Syn. *Senecio dolichopappus* S. Moore.)

A more or less procumbent, shrubby herb with fleshy, narrow, oblanceolate leaves. Capitula solitary, produced on long peduncles set with scarce bractal leaves. Bracts 5, broadly linear, 9 to 10 mm. long, glabrous with membranous margin. Florets few (5 to 6) white, hardly exceeding calyx and pappus.

The plant occurs in Southern Tanganyika, on Mbeya Mountain, at 8,500 feet altitude.

Lopholaena Whyteana (Britt.) Phill. and C. A. Sm. (Syn. *Othonna Whyteana* Britten.)

A herb to 12 inches high with fleshy, lanceolate leaves 4 to 6 cm. long.

Capitula solitary, on slender peduncles produced from the leaf axils. Bracts 5, broadly lanceolate, pointed at the apex, margins membranous. Florets few (5 to 7) white, well-exserted above the bracts.

Occurs in Southern Tanganyika, Iringa Province, at 5,400 feet to 6,000 feet altitude. Fig. 5.

Lopholaena sp. (cf. *Senecio trianthemos* O. Hoffm.).

A shrubby, white-flowered plant up to 4 feet tall. Leaves fleshy, obovate.

Capitula in terminal, dense panicles. Bracts 5, broadly linear, 8 to 9 mm. long, florets 3 to 4, tubular, 10 to 11 mm. long.

Southern Tanganyika, Mbozi, 5,100 feet altitude, common in old abandoned native cultivations.

GENUS: *Notonia*.

This genus is predominantly African with a few species occurring in India. The African species are fleshy undershrubs or herbs with succulent or with rudimentary leaves and with comparatively large, solitary or cymose, generally brightly coloured, capitula.

The *Flora of Tropical Africa*, Vol. III, 1877, pp. 406-408, describes five species of *Notonia* from East Africa, including Abyssinia. A few other species have been described since, while several still remain undescribed.

On the following pages only the named species and a few of the more characteristic unidentified species are being described.

TENTATIVE KEY OF EAST AFRICAN NOTONIAS.

- (A) Achenes glabrous, leaves persistent, comparatively large, stems uniformly green.
- (I) Leaves with entire margin—
- (a) Involucral bracts 13 to 15 *Notonia abyssinica* A. Rich.
- (b) Involucral bracts 8 to 10—
- (1) leaves elliptic, apex tapering *Notonia Hildebrandtii* Vatke.
N.sp. nr. *N. Hildebrandtii* Vatke.
- (2) leaves elliptic, apex rounded ... *Notonia Grantii* Oliv. et Hiern.
- (3) leaves oblanceolate, apex rounded—
- robust, erect herb *Notonia amaniensis* Engl.
- small, decumbent herb *Notonia petraea* R. E. Fries.
- (4) leaves fusiform *Notonia coccinea* Oliv. et Hiern.
- (II) Leaves with incised margin..... *Notonia incisifolia* sp. nov.

- (B) Achenes hairy, leaves deciduous and much reduced. Stems grooved, variegated.
- (a) involucre bracts 12 to 13 (*Notonia pendula* Forsk.)
Senecio pendulus (Forsk.) Sch. Bip.
- (b) involucre bracts 7 to 10—
- (1) leaves subulate, fleshy *Notonia subulata* sp. nov.
- (2) leaves scale-like, rudimentary *Notonia Gregorii* S. Moore.

Notonia abyssinica A. Rich.

A fleshy, glabrous perennial, up to 150 cm. high. Leaves thick, elliptical, narrowed at both ends, sessile, spreading, often marbled with purplish maroon, to 10 cm. long. Closely disposed at the base of the stem, more scattered and diminishing in size along the erect stems. Capitula in loose sparse cymes, hemispherical, 2.5 to 5 cm. in diameter. Involucre bracts 13 to 15. Florets tubular, with 5, narrowly triangular lobes. Style branches exerted with clavate, papillose tips. Achenes glabrous.

The plant is widely distributed in East Africa through Uganda, Kenya, and Tanganyika Territory; it is found at most altitudes from near sea-level to 4,500 feet; it prefers dry, stony, well-drained soil. Fig. 6 (a).

Notonia Hildebrandtii Vatke.

A fleshy, glabrous herb to 4 feet tall with tuberous rootstock. Leaves thick, elliptical, tapering towards the base and towards the mucronate tip, green and brown mottled, often purple flushed below.

Inflorescence in loose cymes. Capitula hemispherical, many-flowered.

Florets tubular, 5-lobed, lobes to 5 mm. long, crimson. Achenes glabrous.

Locally common and sometimes a dominant undergrowth on cliff tops in coastal bush between Mombasa and Pangani in Tanganyika Territory.

Occurs in Kenya in similar localities.

Notonia sp. nr. *N. Hildebrandtii* Vatke.

A glabrous, fleshy, robust herb, 90 to 150 cc. high with erect, stout stems and fibrous roots. Stems to 200 cm. long, decumbent at the base, to 3 cm. thick. Leaves elliptic, narrowed towards the base, retuse at the apex, to 25 cm. long and 10 cm. wide, pale glaucous green, underside covered with a waxy bloom, often tinged with pale purple. Along the flowering stem leaves scattered, small. Inflorescence cymose, with 2 to 5 hemispherical capitula on pedicels 7 to 10 cm. long. Involucre bracts 8, broadly linear with broad transparent margins, 1.5 cm. long.

Florets 40 to 50, tube 15 mm. long with five acute teeth. Pappus half as long as the tube. Style branches with tapering tips, recurved, sparsely papillose. Achenes glabrous, costate.

This very showy and freely flowering plant with bright vermilion flowers is common in Kenya Colony; specimens have been recorded from the Nairobi area, the Chyulu Hills and from Thomson's Falls. Fig. 6 (b) and Fig. 10.

Notonia Grantii Oliv. et Hiern. (Syn. *Kleinia Grantii* Hook f.)

A short, fleshy, glabrous perennial, rising 10 cm. high from a tuberous root. Basal leaves elliptical, rounded and retuse at the apex, tapering towards the sessile base, 1.5 to 2 cm. long. The one to two hemispheric capitula are produced from the flowering stem on pedicels 2.5 cm. long or less. They are composed of 20 or more blood-red or wine coloured florets. Involucre bracts 10, pappus slightly shorter than the bracts; achenes glabrous.

Occurs in Kenya Colony and in Tanganyika.

PLATE XIX.

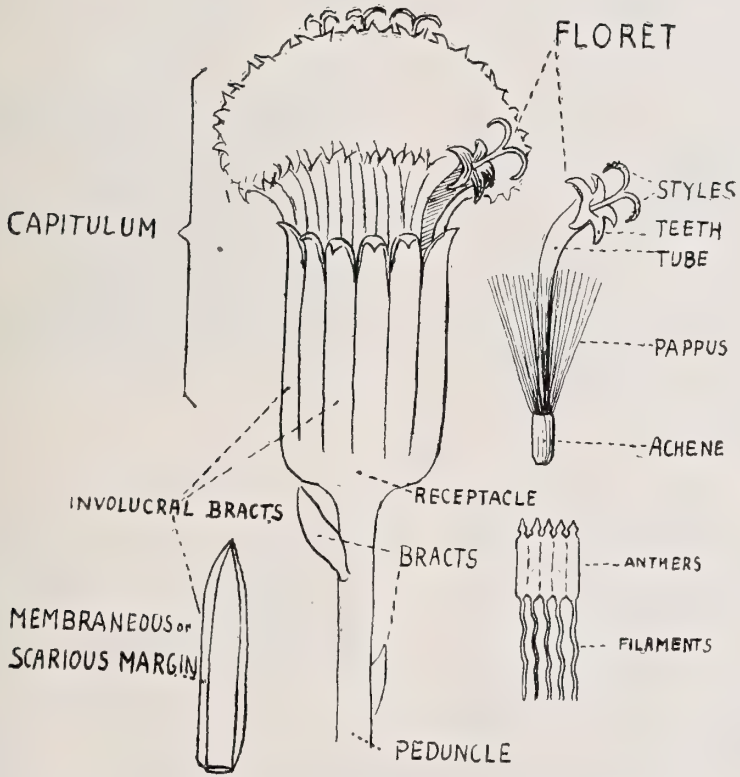


Fig. 1. Capitulum of a composite and its various parts.



Fig. 2. *Gynura scandens* O. Hoffm.



Fig. 3. *Gynura valeriana* Oliv.



Fig. 4. *Gynura* sp. nov.

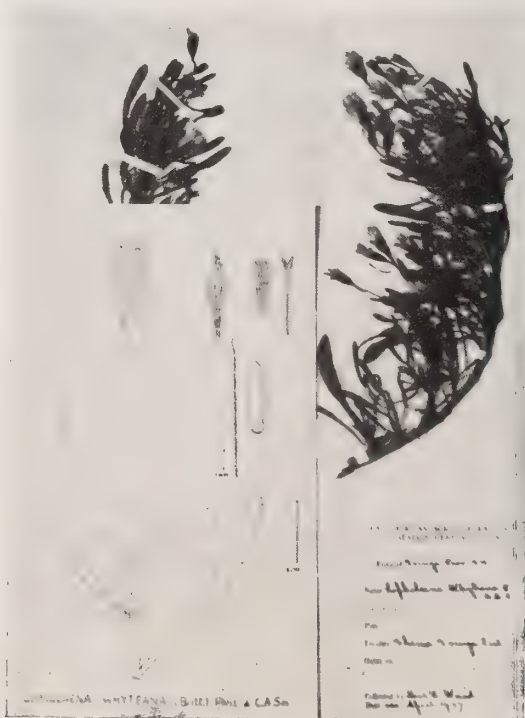


Fig. 5. *Lopholaena Whyteana* (Britt.) Phill.
at C.A.S.

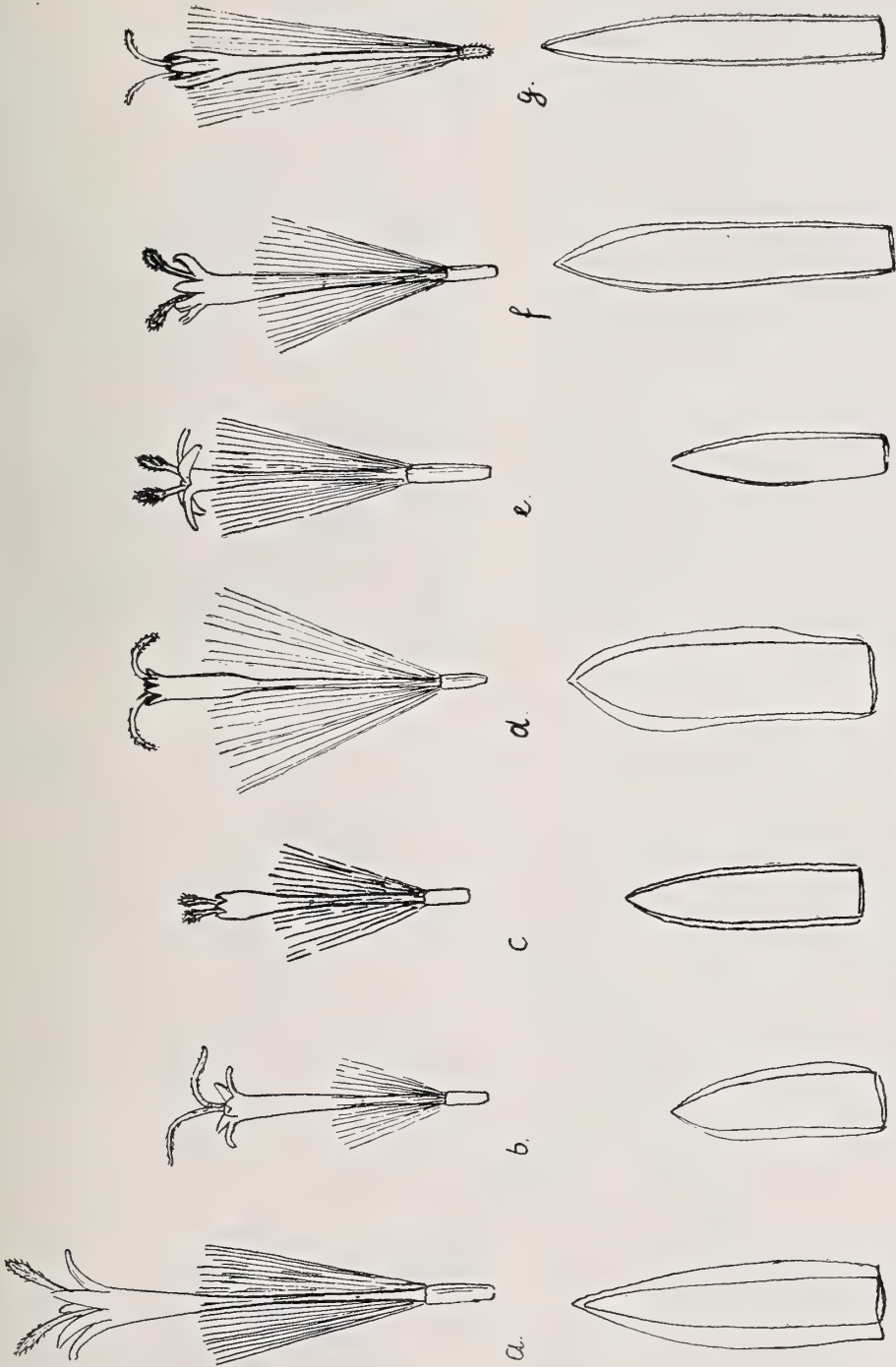


Fig. 6. Florets and involucre bracts of—
 (a) *Notonia abyssinica* A. Rich.
 (b) *Notonia* sp. n. *N. Hildebrandtii* Vatke.
 (c) *Notonia amaniensis* Engl.
 (d) *Notonia petraea* R. E. Fries.
 (e) *Notonia coccinea* Oliv. et Hiern.
 (f) *Notonia incisifolia* sp. nov.
 (g) *Notonia Gregorii* S. Moore.



Fig. 7. *Notonia amaniensis* Engl.



Fig. 8. *Notonia petraea* R. E. Fries.



Fig. 9. *Notonia incisifolia* sp. nov.



Fig. 10. *Notonia* sp. n'r *N. Hildebrandtii* Vatke.

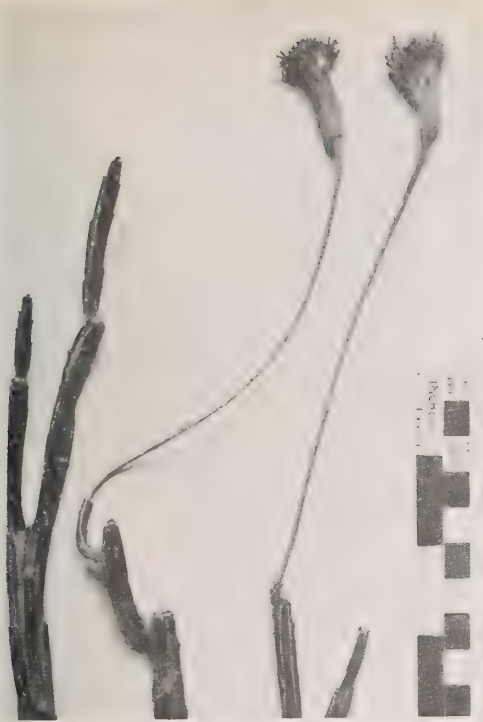


Fig. 11. *Notonia Gregorii* S. Moore.

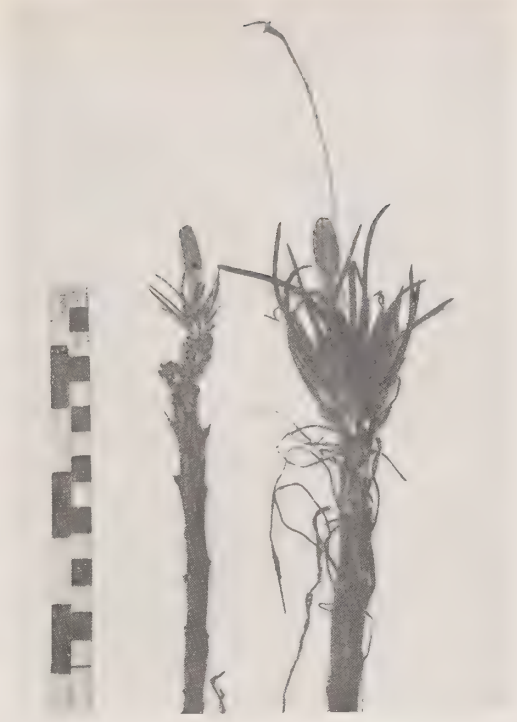


Fig. 12. *Notonia subulata* sp. nov.



Fig. 13. *Notonia pendula* (Forsk.) Chiov.

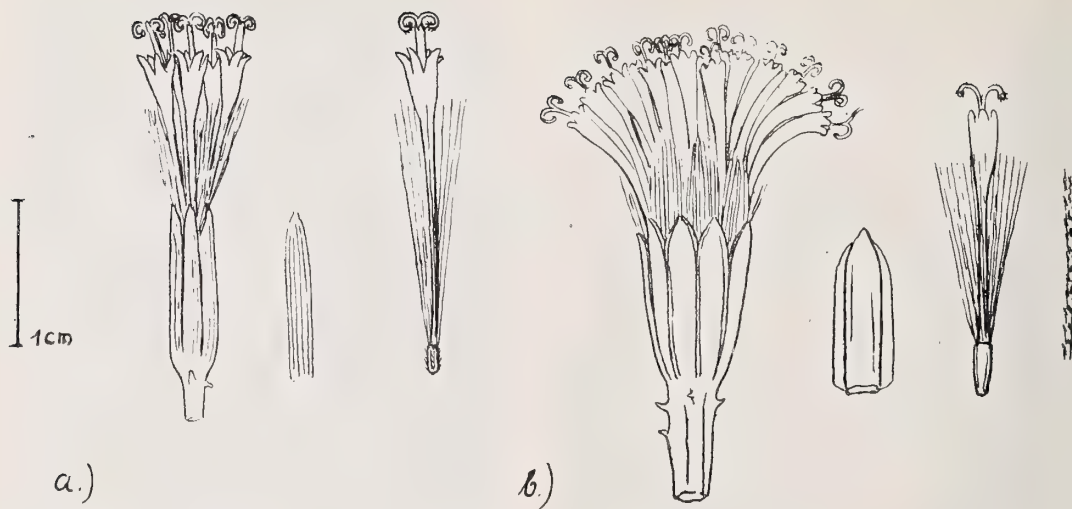


Fig. 14. Capitulum, floret, bract, of—
 (a) *Senecio longiflorus* (DC) Oliv. et Hiern.
 (b) *Senecio longiflorus* (DC) Oliv. et Hiern. var. *violaceus* Berg.)
 Hutch et E. A. Bruce.



KLEINIA POLYCOTOMA CHIOV.

Fig. 15. *Kleinia polycotoma* Chiov.



Fig. 16. *Senecio longiflorus* var. *violaceus*.

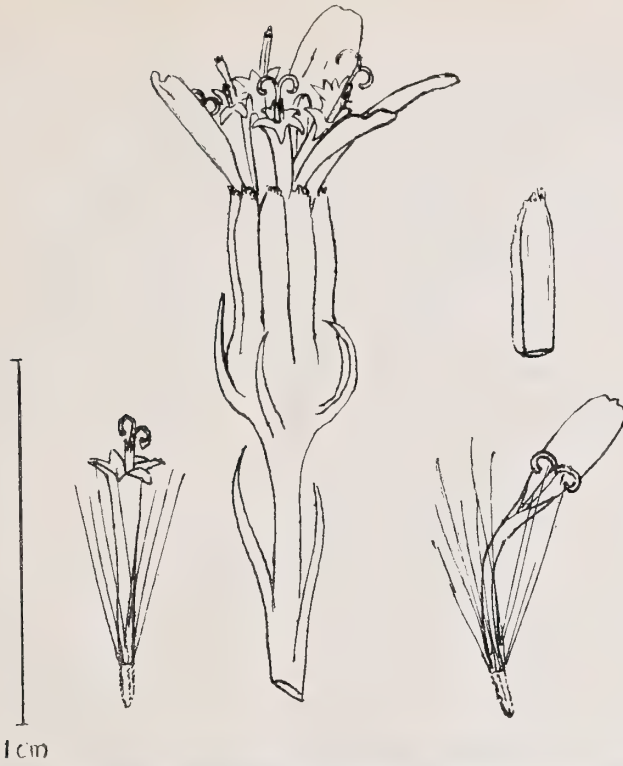


Fig. 17. *Senecio Petitianus* A. Rich., capitulum, involucre, bract, and florets.



Fig. 18. *Senecio Petitianus* A. Rich.



Fig. 19. *Senecio subscandens* Hochst.

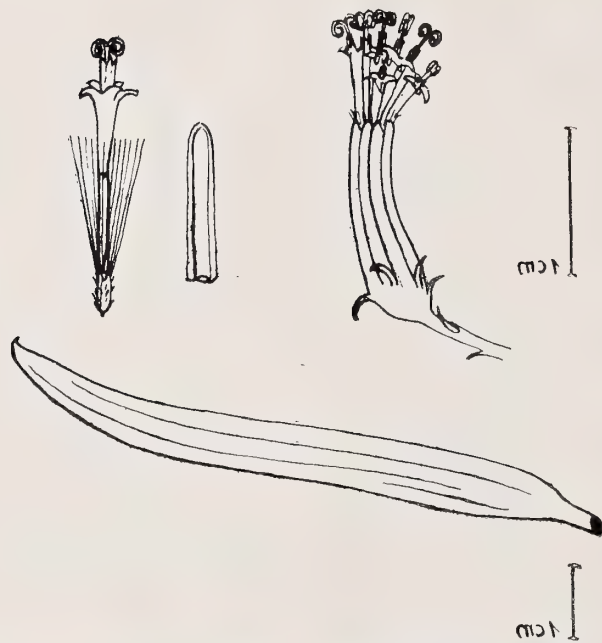


Fig. 20. *Senecio* sp. (Bally, 1013) drawing of capitulum, involucre bract, floret, and leaf.



Fig. 21. *Senecio* sp. (Bally, 1013).

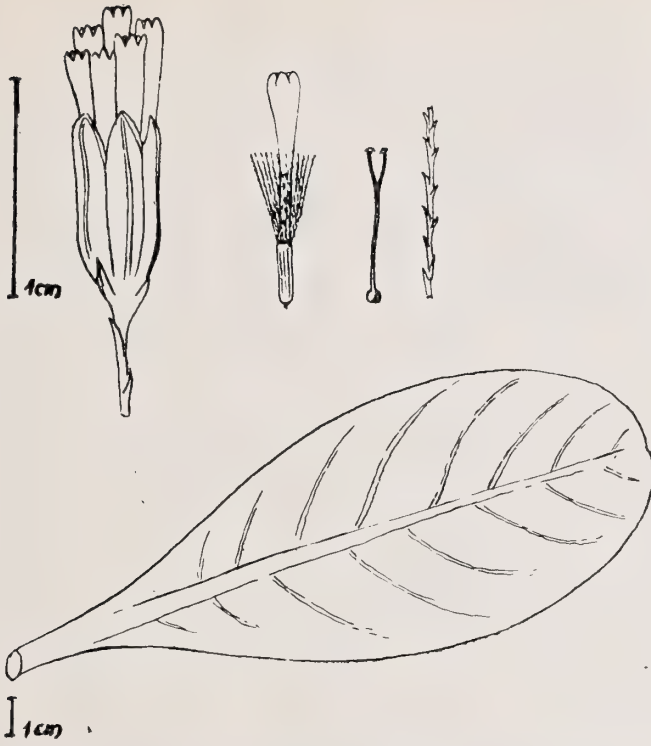
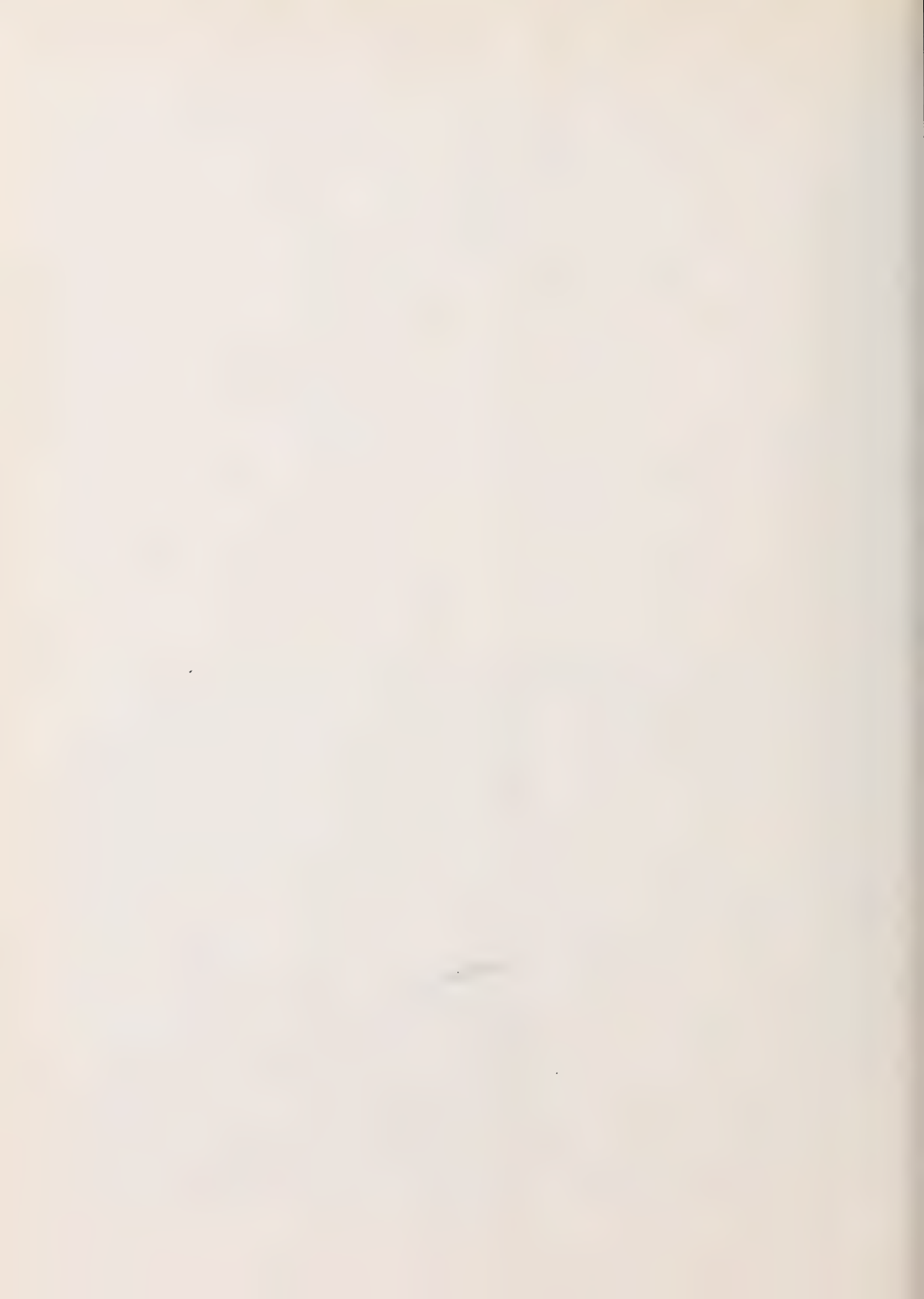


Fig. 22. *Senecio* sp. (Museum, 11283) drawing of capitulum, floret, pistil, part of pappus hair and leaf.



Fig. 23. *Senecio* sp. (Museum) flowering branch.



Notonia amaniensis Engl.

A robust, erect, fleshy, glabrous perennial, to 125 cm. high. Roots fibrous. Stems to 20 mm. thick. Leaves persistent, oblanceolate with rounded apex, tapering towards the sessile base, fleshy, to 18 cm. long and 6 cm. wide. Flowering stems sparsely branched, to 50 cm. high, secondary branches to 30 cm. long, each bearing a loose cyme of 2 to 5 capitula on peduncles 3 to 5 cm. long. Capitula 60- to 70-flowered, pendent.

Involucral bracts 8, broadly linear with narrow, transparent scarious edges, 24 mm. long. Florets tubular, 15 mm. long with five shortly triangular, rounded teeth, orange. Style branches protruding with club-shaped, densely papillose tips. Pappus 10 mm. long; achenes glabrous.

Known from Tanganyika only, where it was collected by the writer near Lembeni, 3,000 ft. approximately, in scrub country. Fig. 6 (c) and Fig. 7.

Notonia petraea R. E. Fries.

A glabrous, fleshy, prostrate perennial, freely rooting from the nodes. Stems fleshy, to 1 cm. thick and to 50 cm. long, sparsely branched, fleshy. Leaves persistent, very fleshy, oblanceolate with rounded apex, tapering towards the sessile base, 5 to 7.5 cm. long, 1 to 2.5 cm. wide, very closely arranged on the prostrate stems.

Flowering stems erect, to 25 cm. high, with few scattered small, narrowly elliptic leaves. Inflorescence bearing 1 to 3 capitula. Involucral bracts 10, broadly linear, 21 mm. long, with transparent, scarious margins. Florets tubular, with five, shortly triangular teeth, 24 to 24 mm. long, orange. Number of florets: 60 to 70. Style branches recurved, with tapering, papillose tips.

Achenes glabrous, striate.

The little plant occurs all over the Kenya Highlands and it is also found in Tanganyika Territory; a variety with scarlet flowers is found in Ngare Nairobi, on the western slopes of Kilimanjaro.

In view of its spreading habit and of its high resistance to drought *N. petraea* can be recommended for binding the soil on steep banks. Fig. 6 (d) and Fig. 8.

Notonia coccinea Oliv. et Hiern.

A fleshy, glabrous, decumbent or ascending herb to 30 cm. long, with narrow, fleshy, glaucous leaves, 2.5 to 7.5 cm. long and 1 to 2 cm. wide, tapering at both ends. Capitula many-flowered, two to three on a loose cyme. Involucral bracts 8 to 11; florets bright scarlet, tubular, 1.5 cm. long, with acute teeth. Style branches with club-shaped papillose tips. Pappus about as long as the florets; achenes glabrous, costate.

Occurs at altitudes from 3,000 feet to 6,000 feet. Localities recorded in Kenya Colony are: Voi, Kajiado, Machakos, and Nairobi. Fig. 6 (e).

***Notonia incisifolia* sp. nov.** (Coryndon Museum, 7595.)

A short, erect, glabrous, fleshy plant with perennial, tuberous root. The plant has two distinct growing periods. In the vegetative period, a short, erect stalk, 3 to 8 cm. long, is produced, bearing 4 to 10 fleshy, elliptic, sessile, leaves with deeply incised margin, to 10 cm. long and 4 cm. wide.

In the flowering period the plant develops an erect, fleshy stem, 12 to 15 cm. high and 1 cm. thick, bearing scattered, scale-like, incised bractal leaves. The stem bears usually three capitula on pedicels 6 to 8 cm. long. Involucral bracts: 13 to 16, linear, 24 mm. long, with narrow, transparent margins. Florets 50 to 53, tubular, equalling the involucre, with five acute

teeth, of a rich red-orange. Style branches protruding, with club-shaped, densely papillose tips. Achenes glabrous.

The plant was collected by the writer in Kenya Colony in the plains between Kibwezi and the Chyulu Hills, at 3,000 feet in dry bush country in 1938. Fig. 6 (f) and Fig. 9.

Notonia Gregorii S. Moore.

A glabrous, fleshy, prostrate or ascending herb with fibrous roots, developing rhizomes to 30 cm. long. Stems to 50 cm. long, rarely branching, 5-angled with prominent tooth-like leaf scars with 3 to 5 decurrent, linear, dark green markings. Leaves rudimentary, ensiform, to 3 mm. long, deciduous. Flowering stem erect, 15 cm. long and more, bearing few ensiform bractal leaves, and terminating in a solitary capitulum. Involucral bracts 10, linear, to 24 mm. long with membranaceous margin. Florets tubular 20 mm. long, with five acute teeth, 4 mm. long, bright scarlet. Style branches slender, recurved, sparsely papillose. Pappus as long as the florets. Achenes striate, hairy.

N. Gregorii is common in Kenya Colony; localities recorded in the Coryndon Museum are the Rift Valley, the Nairobi Area, Machakos, Ngong Hills, and Kavirondo Gulf, at altitudes from 3,000 feet to 6,000 feet. Fig. 6 (g) and Fig. 11.

***Notonia subulata* sp. nov.** (Coryndon Museum, 11611.)

An erect, fleshy, glabrous herb to 20 cm. high with tuberous root. Stem solitary, to 2 cm. diameter at the base, fleshy, grooved, with slightly prominent, tooth-like leaf scars with decurrent, linear, dark green markings.

Leaves subulate, to 4 cm. long, glabrous, fleshy, sub-pedunculate, deciduous. Dried leaf base persistent, spine-like. Flowering stem erect, to 12 cm. high with few scattered, linear bractal leaves, 6 to 8 mm. long. Capitulum solitary, composed of 48 to 50 tubular florets. Florets 25 to 28 mm long, inflated at the top, with five, narrowly triangular lobes, bright scarlet.

Style branches exerted, recurved, with thickened tips. Pappus 20 mm. long, white. Achenes 3 to 8 mm. long, striate, set with minute hairs or bristles

The plant was discovered in Isiolo, Kenya Colony, by Mrs. Joy Bally in May 1943. Fig. 12.

Notonia pendula (Forsk.) Chiov. Syn. *Senecio pendulus* (Forsk.) Sch. Bip.; *Kleinia pendula* (Forsk) DC; *Cacalia pendula* Forsk.; and *Notonia trachycarpa* Kotschy.

A fleshy, decumbent herb with a weak, fibrous root system. Plant to 10 cm. high with few articulated, sub-angular, compressed branches, often rampant, to 15 cm. long. Leaf scars only slightly raised, but conspicuous by spreading, decurrent, linear, dark green markings. Leaves filiform, to 7 mm. long, spine-like. Inflorescence terminal on an ascending peduncle 5 to 10 cm. long, with scattered, filiform leaves. Calyculus absent as in all *Notonias*. Capitulum solitary, composed of 68 to 70 florets. Involucral bracts 12 to 13, linear, with transparent, scarious margins, valvate, 20 mm. long. Florets tubular, 25 mm. long with triangular, acute teeth, bright scarlet. Style branches recurved with tapering, slightly papillose tips. Pappus as long as the tubes of the florets. Achenes cylindrical, striate, minutely hairy.

The plant is distributed through Somalia, Somaliland Protectorate, the Northern Frontier District of Kenya Colony, to Tanganyika (Lasa Hill).

It prefers rocky, well-drained soil. When not in flower it is very easily overlooked, as the flattened branches creep close to the ground, often hidden under stones. Fig. 13.

GENUS: *Senecio*.

Senecio longiflorus (DC) Oliv. et Hiern. (Syn. *Kleinia longiflora* D.C.)

An erect, glabrous, perennial bush 60 to 120 cm. high with rigid branches. Branches grooved, fleshy, green, turning woody with age, green parts with distant, sausage-shaped leaves, 10 to 15 mm. long, deciduous. Inflorescence terminal, 2 to 5 cymes on short, fleshy peduncles bearing scale-like bracts.

Capitula sub-cylindrical, calyculus reduced to few minute scales.

Involucral bracts 5 to 6, narrowly linear, striate, 10 mm. long. Florets generally 5, occasionally up to 10, tubular, white, mauve or yellow, 20 mm. long, with 5 acute teeth. Styles protruding. Style branches recurved, sparsely papillose at the tips. Pappus 17 mm. long. Achenes 2 to 4 mm. long, costate, with short hairs between the ribs.

The distribution of this plant ranges from Abyssinia, British Somaliland, Kenya Colony, and Northern Tanganyika, to South Africa. In Kenya, it is found at altitudes from 200 feet to 3,000 feet., in semi-desert conditions. Fig. 14 (a).

Senecio longiflorus (DC) Oliv. et Hiern. var *violacea* (A. Berg.) Hutch. et E. A. Bruce. (Syn. *Kleinia violacea* Berg.; *Kleinia kleinoides* (Sch. Bip.) M. R. F. Taylor; *Notonia kleinoides* Sch. Bip.; and *Senecio kleinoides* (Sch. Bip.) Oliv. et Hiern.)

An erect, glabrous shrub to 120 cm. high with rigid branches.

Branches grooved or striate. Leaves distant, fleshy, obovate-oblong, tapering towards the base, apex rounded, sub-petiolate, to 56 mm. long and 22 mm. wide, deciduous. Inflorescence terminal with numerous (20 and more) pedunculate capitula. Peduncles stout, bearing scale-like bracts, calyculus reduced to few minute scales. Involucral bracts generally 8, linear-oblong with wide, membranous margins, 12 mm. long. Florets 13 to 22, tubular, 16 mm. long with 5 short, rounded teeth, violet. Style branches protruding, recurved, with papillose, thickened tips. Pappus 13 mm. long, white, protruding over involucral bracts by half their length. Pappus hairs minutely barbed.

Achenes 3.5 to 5 mm. long, striate, minutely hairy, or villose.

This variety, distinguished from *S. longiflorus* by its dense heads of violet flowers and by its sturdier growth, is more common in Kenya and in Tanganyika; it occurs at altitudes up to 5,000 feet, in dry, open country. Fig. 14 (b) and Fig. 16.

Senecio nyikensis Baker.

A perennial, slightly fleshy herb with oblanceolate, oblong leaves, tapering towards the base, 13 to 15 cm. long and 25 mm. wide. Margin entire. Inflorescence a terminal, few-flowered corymb.

Capitula 25 mm. diameter, borne on long, erect peduncles, with 13 to 14 linear, glabrous, involucral bracts. Florets tubular, 20 mm. long, orange

Achenes cylindrical, glabrous, 4 mm. long. Pappus soft, white, 12 mm. long.

The plant occurs on the Nyika Plateau, Tanganyika Territory, at 6,000 feet to 7,000 feet altitude.

Senecio Petitianus A. Rich.

A glabrous, perennial, rampant or climbing herb, often reaching the top of trees. Leaves elliptical, to 10 cm. long and 4 cm. wide, very fleshy, shiny and bright green. Margin denticulate.

Inflorescence a terminal, rounded cyme, to 30 cm. diameter. Capitula very numerous, narrowly campanulate, about 20-flowered, 10 to 13 mm. long, on bracteolate peduncles, 9 to 18 mm. long. Involucral bracts 8 to 9, linear, pointed at the apex, with ciliolate tips. Florets bright yellow, ligule of ray florets oval-oblong, 4.5 to 5 mm. long.

Achenes costate, scattered with short, thick hairs. Fig. 17 and Fig. 18.

When in full bloom this climbing *Senecio* is a very striking sight with its dense mass of golden-yellow flower heads. It is widely spread in East Africa and has been recorded from Abyssinia down to Tanganyika Territory.

Senecio subscandens Hochst.

A glabrous, climbing herb with striate, or slightly grooved, branches. Leaves fleshy, mat glaucous green, oval in outline, with pinnatipartite margin, 3- to 5-toothed lobes on each side, auriculate at the base. Inflorescence terminal, cymose.

Capitula narrowly campanulate, 8 to 10 mm. long, on short, slender peduncles. Calyculus consisting of a few, narrow bracts. Involucral bracts 5, broadly linear, 6.5 to 8.5 mm. long. Florets 10 to 11, all tubular. Achenes costate, minutely hairy. Fig. 19.

Its distribution extends over most of East Africa and over a great range of altitudes; on the whole it favours dry country and it is often found to form thick covers overhanging rocky slopes.

Senecio sp. nov.? (Bally, 1013).

A stout, glabrous, much-branched fleshy shrub to 120 cm. high with rounded stems. Leaves linear, fleshy, sausage-like, to 8.5 cm. long and 7.5 mm. thick, sessile or sub-petiolate, with mucronate tip.

Inflorescence many-flowered, cymose. Capitula obconical. Calyculus consisting of 4 to 5 scale-like bracteoles. Involucral bracts 8, linear, with a narrow, membraneous margin, 11 mm. long. Florets 12, tubular, 8 mm. long, 5-lobed, golden yellow. Anthers and style exerted. Style branches recurved, glabrous. Pappus 9 mm. long, white.

Achenes costate, covered with short hairs, 3 mm. long.

Collected by the writer on the Escarpment South of the Ngong Hills on the old Kajiado Road, and on Mount Margaret in the Rift Valley, at 6,000 feet altitude, in 1940. No other localities known. Fig. 20 and Fig. 21.

Senecio sp. nov.? (Coryndon Museum, 11283.)

A robust, glabrous, much-branched, fleshy perennial, to 180 cm. high. Stems round, fleshy. Leaves obovate-oblong to 18 cm. long and 8 cm. wide, sessile, tapering at the base, apex rounded; margin entire; fleshy, dark glaucous green, crowded at the end of the branches. Flowering stems to 30 cm. high. Inflorescence terminal, cymose-corymbose. Stems and involucre purple. Capitula crowded in groups of 4 or 5. Involucral bracts 5, broadly linear, keeled with membraneous margins, 8.5 mm. long. Calyculus rudimentary or absent. Florets generally 9, tubular, with five rounded teeth, 11 mm. long, orange. Style included in the tube, tips of style branches triangularly thickened, papillose. Pappus 4 mm. long, with barbed, white hairs. Achenes costate, glabrous, 4 mm. long.

The plant was collected by a native collector, Boy Joanna, on Mbololo Hill, Kenya Colony, in October, 1938. No other locality known. Fig. 22 and Fig. 23.

(TO BE CONTINUED)

THE DANCING DISPLAY AND COURTSHIP OF JACKSON'S
WHYDAH (*COLIUSPASSER JACKSONI* SHARPE).

By VERNON D. VAN SOMEREN, Ph.D., M.B.O.U.

INTRODUCTION.

The dancing display of Jackson's Whydah (*Coliuspasser jacksoni* Sharpe) is a familiar sight in many parts of the central highlands of Kenya Colony during May and June, in areas where suitable grasslands exist between 5,000 and 8,000 feet; in such areas several males may be seen in quite a small patch of ground bobbing up and down, resembling small black fountains spouting up in the grass. Each male has its own dancing rhythm which it appears to keep up with only short pauses for several hours a day.

This dancing habit has long been considered as a sexual display occurring in the breeding season only, but it has not been intensively studied in any way. Jackson (1938) gives an account of the dancing areas used by the males, and a good description of the male while dancing, while Moreau (1938) gives a short account of their call notes and the occurrence of dancing areas at Oldeani, Tanganyika. Delacour (1933-34) also gives an account of the appearance of the dancing area and of the males while dancing, as also does Percival in Bannerman (1910).

The function of these dancing areas and dancing habit in relation to the territorial concept has not been discussed. Related genera and species, which do not however dance, have been studied in respect of territory by Lack (1935) for *Euplectes hordeacea hordeacea* (Linn.) with notes on *Coliuspasser ardens ardens* (Bodd) and *E. capensis sabingo* (Reichnow); and also by Moreau (1937) in short notes on *Coliuspasser albonotatus eques* Hartl. and *E. nigroventris*.

While staying near Nyeri Station, Kenya Colony, in May 1944, my father first drew my attention to the number of male Jackson's Whydahs dancing in the grasslands on the roadside between Nyeri Station and Naro Moru; and at Mile 7 on this road, several males were found dancing in a quite small area of grassland on the east side of the road. From hides built about twelve feet away from two of these dancing rings, I was able to make a series of observations and photographic records at close quarters of this very interesting habit, but owing to the short time I had at my disposal in this district, the records are necessarily incomplete in several respects; these it is hoped later to complete at an area now under continuous observation at Kabete, Kenya Colony.

These observations at Mile 7 were made on—

- 8/5/44, 1300 to 1545 hours, no wind, dull, and threatening rain.
- 9/5/44, 1000 to 1200 hours, cold, slight east wind and dull till 1100 hours, thereafter bright sunshine. There had been very heavy rain during the night and the grass was very wet.
- 10/5/44, 1000 to 1400 hours, dull and misty with no wind up to 1030, then onwards bright sunshine.

THE DANCING RINGS.

The rings were situated in an area of open grassland with a slight slope westwards to the main road (Fig 1), the grass being mainly about 18 inches high with smaller open patches where the grass was shorter, about 6 to 12 inches high. The grasses were unfortunately not identified at the time, but the dominant was probably *Themeda triandra*, which is common in this part of the country, with *Panicum* sp. mixed in with it (Edwards, 1940), the seed heads of which appear to be used in the construction of the nests. In general, the longer grass was in patches of even appearance, the shorter grass areas appearing rather tussocky, and the rings were usually situated in this shorter grass. A few small *Acacia drepanolobium* trees up to 4 feet in height were sparsely scattered throughout the area.

Within this area of 8,029 square yards there were nine dancing rings, seven of which were in use, while two (very close to two others) appeared uncompleted. The maximum distance between two rings was 152 feet, the minimum (excluding the two half-completed rings) was 53 feet. In the area now under observation at Kabete there are at least 100 rings some of which are not more than 3 to 4 feet apart from each other.

Each ring consists of a central tuft of grass surrounded by a circular, beaten-down patch of grass (Fig. 2). Each central tuft is oval shaped, about 8 inches high, and 4 inches wide by 8 inches long, irregularly pointed with the tallest blades of grass usually to one end. On each side of the longest axis of the tuft, there is a cupshaped shallow depression or recess about 3 inches wide where the sides and bottom of the tuft have been hollowed out by the male as described below. Surrounding this central tuft there is a circular beaten patch of grass occasionally worn down to bare earth, of remarkably uniform size in all rings measured, from 24 to 28 inches in diameter, and usually very even and circular in shape. Occasionally this beaten ring has a "tail" of beaten grass at one side as if the bird had made a "run-in." In all except one of the rings examined the longest axis of the central tuft was orientated N.-S. (the one irregular one being N.W.-S.E.), and this may be correlated either with the direction of the wind while the bird is dancing as mentioned later, or else with the sun, this orientation providing shade on one or other side of the tuft during the day. This orientation of the central tuft, however, is not an entirely constant feature, as those now under observation at Kabete are orientated in several different directions, although the majority are N.W.-S.E. At two of these Kabete rings, about 4 feet apart from each other, there is a definite beaten runway connecting the two, but as they are now unoccupied I cannot say whether both rings were used by the same bird.

Jackson (*loc. cit*) mentions that occasionally the central tuft may have three recesses, but none of those I examined at Nyeri had more than two; but some of the Kabete rings have three, the third being at one end of the tuft. This author also mentions that the beaten ring is about 2 feet in diameter which agrees well with my measurements. He further states that the grass surrounding the dancing ring may occasionally be "snipped off, or broken down and graduated, apparently to enable a better view all round" up to 6 feet and more in diameter, but this feature I have not noted in any of the rings.

Moreau mentions that the coarse Eleusine grass at Oldeani may be beaten down to a ring a yard across, and Delacour records them as being almost one metre in diameter. The central tuft is a feature noted by all authors, but only Jackson notes the recesses. A small point of interest is that on none of the rings I have seen has any excreta been found, the

birds obviously defaecating somewhere outside the dancing area. The marks made by these dancing rings are extraordinarily persistent, and the grass does not seem to recover for over a year after it has been beaten down.

THE DANCING DISPLAY OF THE MALE.

According to observations made by my father, these males had been dancing for at least a fortnight previous to my visit, and continued for at least a fortnight after, but the actual length of time in weeks the males spend on the dancing grounds is not yet accurately known. Jackson has no information on this point, but it appears likely that the males display on these grounds for at least six weeks at the height of the breeding season.

As to the actual time each day spent dancing, I believe this is dependent on the weather and the state of the grass, whether wet or not. Jackson states that they dance on and off throughout the day, but more vigorously in the early morning and after four o'clock. I have no records for the early morning or late evening, but the birds under observation rarely commenced dancing at all vigorously until after 1030 hours when the grass was almost dry after the night's rain or dew, and ceased entirely after 1600 hours, when all the males flew off to the feeding grounds—banks of Mexican Marigold along the roadside.

Very shortly after I had settled in one or other of the hides and my companion had walked away, the cock bird would return to the vicinity of the ring, alighting first of all on the tops of the long grass stems nearby, but outside, the dancing ring. From here he would call fairly persistently for a short time, this call being what I term a "presence-announcing" note, as I heard them call thus only when in the vicinity of the ring. One male which I watched closely had a call rendered as a whistle followed by two clicks "tu-eee—sik-sik," these last two clicks being rather ventriloquial and often sounding as if they came from another bird at a distance. This call is made with the beak open, and is repeated in frequent succession while just outside the ring, the cock flaunting his curved tail plumes and pulling at bits of grass round about with his beak. The other male which I studied closely had a quite different "presence-announcing" note, rendered as "wit-trueee," the first syllable a click, the second a whistle, and unlike the other male he occasionally also used this while standing on the ring. For various reasons which I could not clearly determine this cock appeared to be more successful in attracting females than the former, and it is interesting to record that his call note was different, though his behaviour outside the ring was in general similar to the other, preening and plucking at the grass; he would often also sit on the branches of my hide from where he flew down to the ring, unlike the other male who would never use the hide as a perch. I could not see any difference in plumage between the two, however.

Occasionally when standing on the long grass outside the rings both birds made an extraordinary sound for all the world like a cow cropping grass followed by a swallowed click note—the whole very difficult to render on paper, and I found it very hard to believe at first that no cattle were grazing near, until I had completely satisfied myself that only the birds could be responsible for this amazing sound. There appeared to be no obvious reasons for this note to be made, and it is almost inaudible a few feet away, unlike the "presence-announcing" calls.

The alarm note when the birds are disturbed is a chattering, scolding "cik-cik-cik" note as the birds fly away from the rings, and this note is also used in relation to the behaviour of the females as mentioned later.

Having flaunted, preened and called outside the ring for a varying period of time, the male then flies down to the beaten ring and commences jumping, these jumps being of two types—a high jump about 2 feet up in the air above the level of the surrounding grass, and a short jump only a few inches in the air. The jumping is done from place to place in the ring, but always facing the central tuft of grass; and usually, if there is a wind, facing the direction of the wind as well, possibly to prevent being upset by the wind catching the long tail plumes broadside on. The short jumps have a bouncing appearance accompanied by a side to side twisting, but still facing the central tuft. High and low jumps alternate irregularly, about four or five high leaps followed by a few low ones then a rest, but this rhythm is not uniform, and the cock may perform with only low leaps for a period, or only high leaps, or low followed by high, but as Jackson also notes rarely more than six high leaps are made without a pause (Fig. 3).

The appearance of the bird while leaping is very characteristic; the head is thrown back so that the beak is held almost horizontal, the neck feathers are ruffed out conspicuously, the long tail plumes are arched upwards and forwards so that they almost touch the back of the head, the whole body also appearing to be curved upwards; but two of the tail plumes always hang sideways and downwards. These main tail plumes arched in a high deep curve with the two outer feathers pointing sideways and downwards give the whole tail a typical triangular appearance, the body appearing as a puffed-out ball at the lateral apex. The initial impetus for the spring appears to be given by the feet and legs which also beat rapidly while the bird is rising in the air, while the half-opened wings are worked with a quivering motion at the same time. The bird seems scarcely to touch the ground before it rises up again, and the whole performance is very gracefully done, reminding one strongly of the beautiful up and down rhythm of the "Yo-Yo" toys that children used to play with.

While rising and falling in the air, the bird makes a soft tinkling note rather like that of a small rather dull bell, and like a softer quicker edition of the tinkle made by *C. ardens suahelica* males as they fly from perch to perch.

When not leaping the bird struts about on the beaten ring, flaunting his tail from side to side, ruffling the neck hackles and posturing towards the central tuft with bows and scrapes (Fig. 4), particularly after the short leaps, but keeping silent while on the ground. He butts the recesses at the sides of the central tuft, taking short runs at them with lowered head, and then pressing into them and smoothing them out with his breast; this is undoubtedly how the recesses are first made. Occasionally the cock picks at, and arranges the grass in, these recesses, one of the cocks once picking out a long dry piece of grass and flying away with it, dropping it about 6 feet outside the ring as if its presence was unsuitable in the cup.

Never once did I see any male perch on top of this central tuft, which appears to be the whole centre of valence (Russell, 1938) of the ring, all postures and leaps being made facing it and particular attention being paid to the concavities on each side. I also formed the strong impression that this plucking at bits of grass and shaping of the recesses may be related to the false nest building as described by Howard for moorhens, and several of the buntings and warblers. The second male, which I considered more successful with females, was noticeably more vigorous in leaping and posturing than the first.



Fig. 1. Grassland area in which dancing rings of *C. jacksoni* occur.

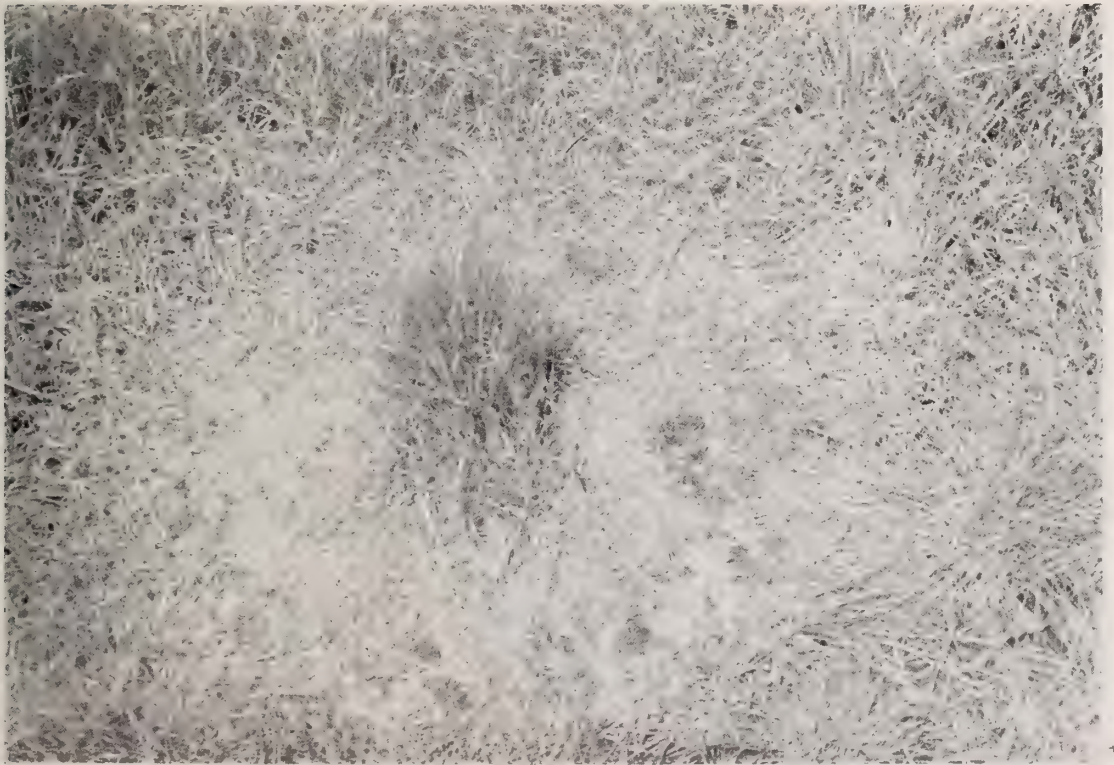


Fig. 2. Dancing ring of *C. jacksoni*, showing circular beaten patch of grass and central tuft with two recesses (the left hand recess not well seen).



Fig. 3. ♂ *C. jacksoni* on dancing ring, not displaying.



Fig. 4. ♂ *C. jacksoni* on dancing ring, showing attitude adopted during display and posturing.



Fig. 5. ♂ and ♀ *C. jacksoni* on dancing ring. The ♀ has just alighted, and the ♂ has commenced the quivering courtship display, on the opposite side of the tuft to the ♀.



Fig. 6. ♂ and ♀ *C. jacksoni* on dancing ring. The ♀ is examining the left hand recess of the central tuft, while the ♂ has again circled to the opposite side of the tuft to the ♀.



Fig. 7. ♂ and ♀ *C. jacksoni* on dancing ring. The ♀ has just alighted, the ♂ again displays on the opposite side of the tuft.



Fig. 8. ♂ and ♀ *C. jacksoni* on dancing ring. The ♀ closely examines the right hand recess, the ♂ continues quivering on the opposite side of the tuft.

PLATE XXXII.



Fig. 9. ♂ *C. jacksoni* on dancing ring. The ♀ has just flown off and the ♂ immediately droops his plumes and stops quivering, looking up at the ♀ as she leaves.

THE BEHAVIOUR OF THE MALES IN RELATION TO FEMALES.

For various reasons discussed later, I cannot believe that this dancing display is in any way connected with a threat, and it appears to me much more likely that, teleologically speaking, it is directed towards attracting the females to the males—in other words a simple advertisement of the male presence. Jackson regards the evidence against polygamy in this species as being conclusive on the basis of a count made of nests found within an area occupied by a known number of dancing males, on no occasion the number of females with discovered nests equalling the number of males although the area was searched thoroughly. Lack (*loc. cit.*) and Moreau (*loc. cit.*) have, however, shown that two species of a closely related genus, *Euplectes*, and another species of the same genus, *C. albonotatus eques*, are definitely polygamous, and I believe from these observations that *C. jacksoni* is also polygamous, though more work is required yet on this aspect of the breeding cycle.

I could not count the total number of females present in this area of this species, as there appeared to be a greater number of females than males, but some of these may have been, and probably were, the females of *C. ardens suahelica* and *C. progne delamerei*, two species also frequenting this area. The observations, however, in relation to *jacksoni* females were as follows:—

Female birds are definitely attracted to the rings and dancing males, flying down and alighting on the ring while the male is posturing on it, but only one female at any one time; most interesting however, is the fact that on 9/5/44, a single female alighted on the ring I was watching while the male was several yards away, having been scared off shortly before; this hen bird then spent a short while inspecting the central tuft, flying off before the male returned. Single females have also been seen round other untenanted rings, and it would appear as if these rings themselves are valent for the females even when untenanted by a male.

On several occasions a female would fly down to a tenanted ring, be courted by the male, then fly off, to be immediately followed by another female who had been perched on the grass a few feet away flying down to the ring and also being courted by the male. More observations are required on this point, but it seems very significant that each male may attract several females; and particularly since the dancing may continue for several weeks it would seem strange if only one female was being courted the whole time.

On several occasions I watched a female fly down to a ring the male of which was perched on the long grass (or in the case of the second male, my hide) a few feet away, settle on the ring and be immediately followed down by the male who commenced courting her on the ring.

On other occasions the male while dancing would look about from side to side as if looking for passing females, and also while posturing on the ring. If no female appeared in a short time, the hackles would be lowered, the tail folded, and a scolding "cik-cik" note made facing away from the central tuft and looking about; to venture upon rather dangerous anthropocentric terminology, the male appeared "annoyed" at the absence of females.

I could not, in the short time at my disposal, make any clear-cut observations on the behaviour of the females in relation to particular areas; it appeared to me as if the females flew at random singly or in

twos or threes over the whole area, dropping occasionally to a ring; but whether any females were related to any particular males, or whether their whole behaviour was completely promiscuous I could not determine.

The second male I had under close observation undoubtedly took an interest in passing females. If one came at all near, he would either fly down to the ring and start dancing at once, or if he was already on the ring would commence high and quick low leaping and bouncing about, stopping at once and lowering tail and hackles if the female passed over without dropping down.

On two occasions, however, on 9/5/44, while I was watching the male from the hide, a single female alighted on the ring and the behaviour of the cock changed most dramatically. Jumping ceased at once, he circled to the opposite side of the tuft from the female, stiffened up with his head well back, neck hackles ruffed out, tail spread up in a deep curve with the two long, lower plumes pointing outwards and downwards, and quivered all over with hackles and tail plumes shivering, and making the low tinkling note used when leaping; always circling with short quick steps on the opposite side of the tuft to the hen as she moved about, but keeping her just visible over the tuft. (Figs. 5 and 6). The hen on each occasion appeared rather unconcerned at this display, not appearing to notice the quivering cock, but taking a considerable interest in the central tuft and particularly the concavities on the sides, picking at the grass in them and examining them closely all round (Figs. 7 and 8). On each occasion also another hen was sitting on the long grass a few feet away but the cock now took no notice of these, concentrating all his attention on the one on the ring.

After a few seconds each time the females flew away, never once coming round to the same side of the tuft as the cock bird, who immediately drooped and looked up at the disappearing hen (Fig. 9). It is of interest to note that the leaping stops the moment the hen alights on the ring, strutting and quivering taking its place; and also how little interest the hen appears to take in the cock—much more interest being shown in the central tuft with its recesses.

On 10/5/44, this same cock was again visited on three occasions by a female, the behaviour of both being as on the previous day, but on two of these occasions when the hen appeared to be indifferent for too long to the cock's display, the cock moved round the tuft to the hen's side, became if anything even more puffed out and quivered more violently, making a curious hissing noise with his beak wide open while making short rushes and prances at the hen. On each occasion the hen flew off without further happening, the cock then subsiding with a scolding note. On other occasions I have seen the cocks rise up and chase the females for a short distance as they fly away from the rings. On this date the cock bird spent much more time than previously in adjusting the grass on the central tuft, and occasionally plucking at the grass outside the ring.

Although I have never actually observed it, I have little doubt that copulation occurs on the rings as a culmination of this display, as on several occasions on more distant rings I watched what seemed to be copulation in progress on the ring, although I could not see clearly on any one occasion what was happening.

At Kabete on 26/6/44, an interesting example of what appeared to be end-of-season behaviour was noted. A mixed flock of males and females was feeding in the grass round a ring of this year, when a

male who was on the ring started making a few low jumps and one high, but the females round about, within only a few inches, took no notice whatsoever, though the cock actually displayed to one female who settled on the ring, who also ignored him. Another male was present in almost full plumage about 2 feet away, but appeared unconcerned, and was of no concern either to the male on the ring. The dancing male finally flew off with the whole flock, about 20 strong, when it left the area. This has been almost the last effort at dancing I have seen in this area, all the birds now being in large flocks (25/6/44) with mixed males, females and young on the wing, the males having nearly all shed their tail plumes. The whole incident appeared to be a very half-hearted end-of-season effort by a male whose gonads had probably not regressed as much as the remainder of the birds, as the majority of males on this date are now feeding in the mixed flocks and showing no signs of sexual activity at all.

THE FUNCTION OF THE CENTRAL TUFT.

I have mentioned previously that the central tuft with its recesses appears to be a feature of the ring possessing a special valence for the cock, the posturings and dancing leaps being directed towards it, the recesses also being butted and smoothed and arranged from time to time. It is evident also that the recesses in particular possess a special valence for the hen bird when on the ring, her attention being mainly directed towards these.

In order to determine something of the nature of this valence, during the course of the morning of 10/5/44, when the second male was dancing well, I cut down the central tuft of his ring completely, leaving the ring as a plain flat surface and removing the cut tuft some distance away.

The behaviour of the cock thereafter was somewhat surprising. He returned within a few minutes to the ring after I had settled in the hide again, and took practically no notice at all of the altered ring beyond a somewhat "inquiring" look at where the tuft should have been; thereafter continuing dancing and posturing just as previously except that all the leaps and postures were now directed towards a non-existent tuft! However (and this is an act which I had not seen him do before), after a short while dancing he left the ring for the grass a foot or so outside the circle, and for a few seconds only crouched before and buffeted another tuft of grass outside the ring, as if it was the central tuft; then returned to dancing on the proper ring just as usual.

While still hiding by this altered ring, a female (or two separate females, one after another, I could not be sure which), flew down to the ring, but would not alight on the ring itself, one standing on the grass just outside it while the cock who was on the ring displayed and quivered at her; she then flew off. The "other" female slanted down to the cock on the ring, but suddenly sheered off without landing at all. I then left the hide, stripping it of all possibly alarming features such as the camera, and retired to watch from a distance, leaving the surroundings again normal apart from the altered ring on which the male continued dancing. In a short while another hen apparently refused to land on the ring, circling round it and then flying off, vigorously chased by the cock over the grass for some distance. The cock then returned to the ring, and a second hen appeared to land on the ring for only a second or two, then she flew off. A third female then appeared, making as if to land on the ring but she also sheered off without actually alighting.

It certainly seemed from these observations as if the altered ring was more alarming to the females than to the male, the central tuft perhaps possessing more significance for the hens than the cocks, but it is difficult at the moment to discuss this further. The curious implications of this experiment with regard to *Gestalt* and the pattern concept of animal behaviour will require much further experimentation before they can be made definite.

THE RINGS AND DISPLAY IN RELATION TO THE TERRITORIAL CONCEPT.

It is not yet clear with only these few observations as a basis, what interpretation to place on the formation of these rings and the type of behaviour shown on them by the cocks, in relation to the territory concept of the nesting cycle. A very significant observation appears to be the fact that although there were nine males with rings in this relatively small area I did not on any occasion see the various males taking any notice of each other whatsoever, even when flying over the grass by another occupied ring; nor was there any form of territorial pugnacity between any of the males, nor did any male ever try to land on the ring of another male: At Kabete, however, on 20/6/44, when all the birds were in mixed flocks and showing no sign of sexual behaviour in any form, having lost much of their breeding season plumage, I noted one cock who was on a ring suddenly commence displaying and quivering before another almost full-plumaged cock who alighted on the same ring; but this second male did not appear to take any notice, finally flying off and being chased for a short distance by the displaying male. This was the only occasion I have ever noted any reaction between males, but it is difficult to say whether this was a form of territorial reaction, or merely an inverted response to a "bird-on-ring" pattern shown by a cock at the end of the breeding season.

These dancing rings are not comparable to the leks of the blackcock, since they are used by one male only, nor do they appear to be used as threat areas between males; they are perhaps more comparable in some ways with the bower-bird playgrounds. It is hoped shortly to conduct a series of controlled experiments on the actual territorial aspect of these rings by the use of stuffed males and females, as has been done for the Robin by Lack.

With regard to nest-building, I have as yet no information, and very little in respect of actual nesting in relation to the rings and dancing areas.

In the whole of this area I found only one nest of this species, 20 feet away from the second cock's ring, in the grass and close to my hide. The nest was of the typical form, and contained two eggs, but the female was extraordinarily elusive and I was unable satisfactorily to identify her or study her behaviour, or to determine to which cock she was related. This scarcity of nests was a very puzzling feature, but it may be that the females nest some distance away from the dancing grounds.

In the closely related genus and species *Euplectes hordeacea hordeacea* studied by Lack, he has shown that the males are polygamous and hold very rigidly defined territories, averaging about 925 square yards and Moreau (1937) states that these features are even more marked in *Euplectes nigroventris*, while *C. albonotatus eques* males hold very large territories, about 2,000 square yards in size, the males also being polygamous. Lack believes that the territories held by male *hordeacea* are unconnected with food supply, their chief function appearing to be that of achieving isolation for the different cocks, a feature which is, of course, biologically advantageous in any species; and he also considers that possibly in the first place the females seek out the males in these territories.

Although apparently as far as my observations have gone, they are uncharacterised by typical territorial behaviour, I believe that these *jacksoni* rings may be a further advance on the isolationism of the *hordeacea* males, whereby the male *jacksoni* are completely isolated from one another, each to his own particular very small area, thereby possibly rendering the attraction of females even more certain. In agreement with Lack's ideas concerning *hordeacea*, I believe that the dancing of the male *jacksoni*, leaping above the level of the surrounding grass, and the use of the "presence-announcing" note (like the colours, song and display of male *hordeacea*) are used solely as a means of advertising his presence, but unlike the similar characters of *hordeacea* they appear to be used in no way in defence of his territory.

The actual courtship is more complicated than in *hordeacea*, full use being made of the secondary sexual plumage such as the neck hackles and tail plumes while quivering in front of the hen on the ring—this is a different phase entirely to the dancing itself.

Jackson (*loc. cit.*, p. 1527) has mentioned the fact that the related genus and species *Vidua macroura* also shows a "dancing" habit which is more aerial in nature than that of *jacksoni*, but the breeding male appears also to show a marked territorial pugnacity in addition. It may be possible later to form a graded series in respect of territory and behaviour in the *Coliuspasser-Euplectes-Vidua* group, and this species *C. jacksoni* in particular would appear to offer most suitable material for assessing the "success" of individual males. There is, however, one point in connection with this aspect of the behaviour, and that is that while I have occasionally seen individual males dancing by themselves some considerable distance away from any other rings, the majority of rings are concentrated within a relatively small area, one ring with its male certainly being visible from several other rings at the same time; this may introduce the social sexual stimulus postulated by Darling (1938) and a possible form of communal courtship such as this author has shown occurring in species of gulls.

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I am very much indebted to my father Dr. R. A. L. van Someren for constant interest and assistance in these observations, and also to Mr. R. E. Moreau for reading the M.S. of this paper, and for much helpful criticism and advice concerning literature.

SUMMARY.

1. The appearance of the dancing rings of *Coliuspasser jacksoni* Sharpe is described, these being situated sometimes only a few feet from one another in grass varying from 6 to 18 inches high. The essential feature of each ring is a circular beaten-down patch of grass about 2 feet in diameter in the centre of which is left an oval tuft of grass, the sides of the long axis of which are hollowed into two recesses, one on each side, with occasionally a third recess along one of the short sides.

2. From the grass surrounding the circular dancing ring, the cock bird calls with a "presence-announcing" note which may vary with individual birds. Having called for a short period, the cock then dances for a while on the ring, leaping in the air either high above the surrounding grass to a height of about two feet, or with short leaps only a few inches in the air, making a special tinkling note while leaping. The appearance of the

leaping bird is described, the bird making full use of the secondary sexual plumage characters. All these leaps are made facing the central tuft.

3. The cock also, while on the ground on the ring, postures before the central tuft, butting and smoothing and arranging the grass in the recesses on each side.

4. The species is believed by the present author to be polygamous, and females are attracted one at a time to the ring—either when the cock is present or sometimes when the cock is not present.

5. On the arrival of a hen on the ring, the cock's behaviour changes to a courtship type of behaviour, again involving the use of the secondary sexual plumage; this behaviour is described and differs in consisting only of posturing and quivering before the hen, no leaps being made. It varies in intensity with the behaviour of the hen, and probably culminates in copulation on the ring.

6. The hens observed appeared to take little interest in the display of the cock, their attention being mainly directed to the central tuft and particularly the recesses.

7. Removal of the central tuft does not appear to affect the dancing display of the cock bird, but appears to affect the hens more, the latter seeming alarmed at the altered appearance of the ring.

8. The relation of these rings and behaviour to territory is discussed, the rings probably achieving a successful biological isolation of the cock, being an advance on the rigid but fairly spacious territorialism shown by the related genus *Euplectes*.

9. Nothing, however, of territorial pugnacity appears to be shown by the males, the dancing appearing to be simply an advertisement of the male presence for the purpose of attracting the females who are then courted on the rings, the male showing a different type of behaviour during this courtship.

10. The proximity of several rings occupied by dancing males may involve a social sexual stimulus such as has been postulated as occurring in communally nesting gulls.

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ADDENDUM.

Subsequent to writing the above paper, detailed observations have been carried out on a mixed flock of *C. jacksoni* males and females at Kabete over the last twelve months. These have shown that true territorial behaviour becomes evident early in the sexual break-up of the flock. The males, isolating themselves on rings, establish a well-defined territory of small extent, of which the ring itself is the focal point; the territory extends all round the ring at a radius of 6 to 10 feet from the central tuft.

A female alighting anywhere within this territory may be solicited by courtship behaviour by the male on the ring, even though she may not alight on the ring itself. Another full-plumaged male alighting in this territory is treated in one of two ways, depending on the attitude of his tail as he alights. If he alights with his tail arched and the two outer plumes drooping as in the dancing attitude, he is attacked with pursuit flight if the owner is present in the territory. If however, the intruding male alights with his tail folded in the normal flight attitude he is usually solicited and displayed to by the owner as if he was a female. It is very noticeable that when a male returns to his territory from outside it, the tail is arched and the two outer plumes drooped the moment he crosses the boundary; the bird alights in the dancing attitude, and thus shows his ownership by his appearance. Thus the attitude of the tail is a most clearly marked behaviour recognition signal (Tinbergen) or releaser (Lorenz) in this species of bird.

Where two or more rings are found within a few inches of one another these observations have established that they are all formed by the one male, who may use them alternately while dancing, and keep them all in good order. Owing to the establishment of these fairly rigid territorial boundaries, rings occupied by two *separate* males are not found closer than about 12 feet. These boundaries are accepted by the other members of the flock early in the break-up, hence territorial squabbles are seldom seen late in the season. This explains the absence of rivalry in the Nyeri observations. This territory is related purely to sexual functions and has no food significance; feeding is carried out in a mixed flock even in the height of the dancing season, on neutral ground where sexual rivalry is notably absent.

Furthermore, this territory appears of no significance to the females apart from the fact that they are attracted to the rings; they are unaware of the boundaries of the male territories. At nesting time, the males cease dancing vigorously and the main dancing area may become completely deserted; the females nest in a different area which is usually some distance away from the dancing grounds. The nests tend to be grouped together, and are usually about 20 to 30 feet away from the nearest ring if males have been dancing previously in the neighbourhood, i.e., well outside the territory boundaries.

Polygamy appears to be general, and seems to arise because of the imperfect correlation between the maturation of the males and females. Some males mature early, others late, and the early males may cease dancing and start moulting while later males are just beginning to assume breeding plumage and dance. This irregular maturation of the males may be spread over several months, while by contrast, the females mature almost simultaneously, and all the nests are found at the same stage of building or incubation within a few days. Since the sex-ratio of the mixed flock is almost 50:50, late maturing males are thus able to mate with several females, because the mature females probably now outnumber the mature males. Males may commence dancing some four months before the first nest is found, but these early males are probably unsuccessful at mating because of the unready state of the females. Males may start dancing while still in non-breeding plumage, but the behaviour pattern of these immature males is undeveloped in several respects.

It is hoped later to publish a full account of these observations on the development of the sexual break-up in a mixed flock.

VERNON D. VAN SOMEREN.

13th November, 1945.

TWO RODENTS FROM THE MASAI RESERVE.

BY PROF. DR. AUGUSTO TOSCHI,

Lecturer in the Bologna University.

Among the mammals collected by the Coryndon Museum Staff at Olorgesailie, Magadi Road (Masai Reserve) in August, 1943 and 1944, there are two very interesting forms, which I think in some respects appear to be new.

At the request of Dr. L. S. B. Leakey, I am giving this short account of the systematic position and geographical distribution of these two rodents from the Masai Reserve. Biological notes will appear later in a report of the mammals collected at Olorgesailie.

Xerus rutilus massaicus subsp. nov.

TYPE from Olorgesailie, 20 miles north of Magadi, on the Magadi Road (Masai Reserve), Kenya Colony; altitude 3,450 feet. No. 3055, Coryndon Memorial Museum; adult male collected May 8th, 1944, by Mr. F. Meneghetti.

DIAGNOSIS: A rather large *Xerus*, somewhat like *X. r. rufifrons* Dollman, but without the great extension of the rufous tinge on the forehead so typical of that form and washed more with yellow on the throat and under-parts. Skull larger, with zygomatic arch thicker showing a higher orbital aperture.

DESCRIPTION: Size and general proportions as in *rufifrons*. General colour of the upper-parts, head, back and rump, white-yellowish pink, speckled black; the posterior part of the back darker than the anterior, but not as dark as the head; the anterior third part of the head and muzzle reddish-yellow; the red tinge not so diffuse and bright as in *rufifrons*, but rather as in *X. r. dorsalis* Dollman. Flanks rufous pinkish without black speckling. Under-parts whitish-yellow; the yellow wash brighter along the sides of muzzle, neck and flanks. Ring around the eyes and spot in front of ears whitish. Single hairs of the back are ringed from below to above: whitish, black, whitish-yellow, washed pink, black with whitish tips; those of the flanks whitish, pale rufous-pinkish, whitish. The forelegs are a reddish-yellow. The feet show yellow-whitish colour: the anterior ones have a more intense tinge. Thighs are coloured like the flanks. Tail as in *rufifrons*.

The skull is much like that of *rufifrons* and of *dorsalis*, but distinctly larger and thicker especially regarding the zygomatic arch where the jugal is higher and thicker, and seems to reach a lower level than in the other forms; the orbital aperture as a result being more roomy.

MEASUREMENTS IN MM.: Average of four selected specimens, measured on the flesh by the collector: head and body 234.7; tail 195.2; hind foot 54.2; ear 15.2.

Type specimen: head and body 240; tail 220; hind foot 56; ear 16. Skull: greatest length 56; condylo-incisive length 50; basilar length 41.3; condylo-basilar length 44.6; zygomatic breadth 31.2; interorbital breadth 16; breadth of brain case across squamosal region 25; greatest length of nasals 18.2; palatal length 23.3; width of palate inside first molar 6.9; length of upper cheek-teeth 9.9.

DISCUSSION AND REMARKS: The new race differs from the related forms as follows: It is readily distinguishable from *X. r. saturatus* Neumann because this latter shows a dark reddish general tinge very typical and unmistakable. It differs also from *dorsalis* because of its more uniform and less sharply defined coloured parts of the body. On the other hand *dorsalis* shows darker head, a lack or a lesser amount of yellow tinge on the flanks, white under-parts and feet, instead of whitish yellow as in *massaicus*. The latter is distinct too from *rufifrons* for the rufous tinge on the front and head are very much less extended and less bright and the shorter light rings of the hairs of the back are more whitish instead of yellowish as in *rufifrons*, and the under-parts more yellow than in the last mentioned form.

In the Coryndon Museum collections there are five specimens from Kismayu, one from Lovernovu, one from Marsabit, and one from Serenli, which were identified by the British Museum Staff as *X. r. stephanicus* Thomas. I have not examined *stephanicus* from the type locality and descriptions are in general not available for an exact identification as are the direct comparisons of the skins and skulls. In every case *massaicus* differs very much from the specimens from North-Eastern Kenya which are remarkably more pale yellow and rosy throughout. They show the reddish forehead, a character in common with *rufifrons*, but do not agree perfectly with the specimens from the typical locality of *rufifrons* from the Northern Uaso Nyiro because they are less black speckled. de Beaux (1934) assigns to *rufifrons* the specimens from Southern Coastal Somaliland, but it may be that he has not compared these specimens with typical *rufifrons* from the Northern Uaso Nyiro. The lack of specimens of *stephanicus* from the type locality prevents me establishing what may be the exact systematic position of the population of ground-squirrels from the coast of Southern Somaliland and the coast of North-Eastern Kenya, but as I have pointed out, they seem to differ in some respects from the specimens of *rufifrons* from the type locality.

We need not discuss the probable affinity between *stephanicus* and *massaicus*, apart from their somatic characters, the two forms being separated by *dorsalis* and *rufifrons* in their geographical distribution.

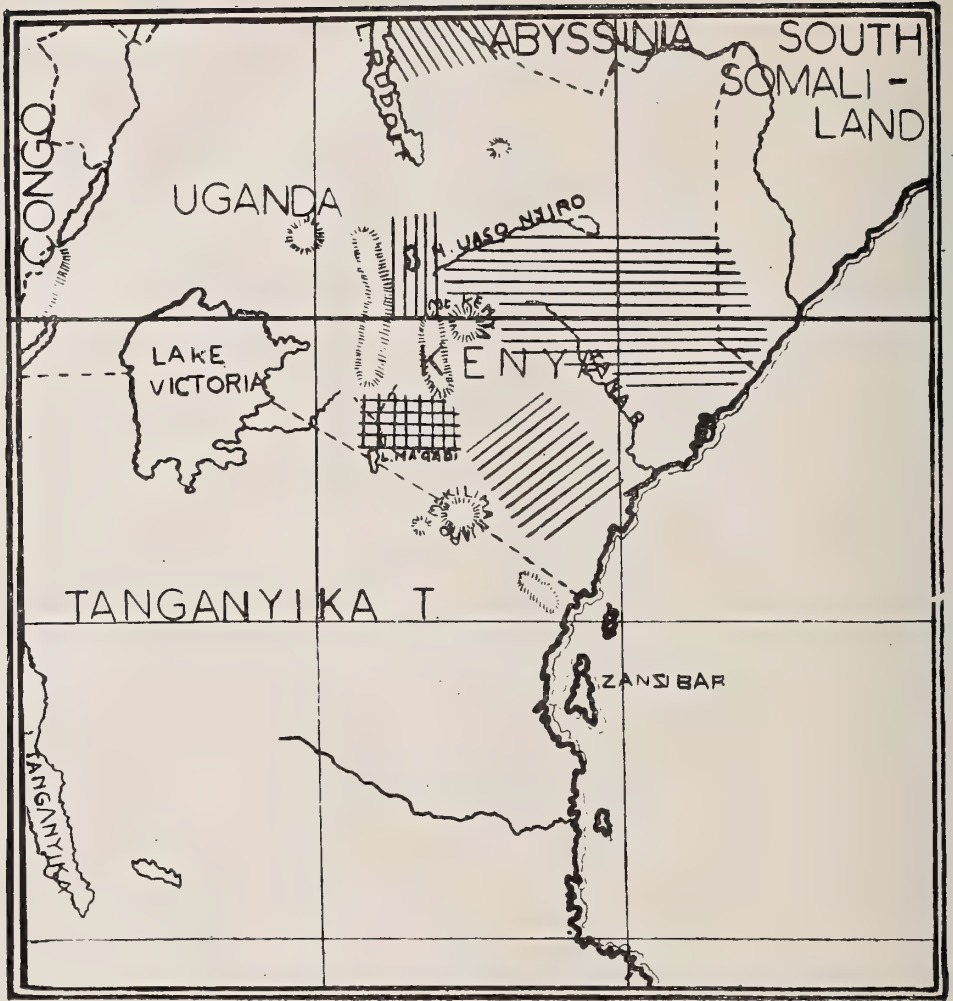
The specimen from Marsabit, near the range of *stephanicus* is a uniform rosy animal with very few black speckles.

Young specimens of *massaicus* are very much duller in general colour than the adults and are very different from a young specimen from Serenli (Juba River) in the Coryndon Museum collection which is a great deal brighter and redder than the young *massaicus* of about the same age. The specimen from Serenli is young and can hardly be compared with *rufifrons* from Kenya.

Miss J. St. Leger (1937) attributes some specimens of ground squirrels from Turkwell and Northern Lake Rudolf to the *dabagala* race. This attribution worries me, for, if it is correct, the geographical distribution of *X. r. dabagala* would be discontinuous; the population of North-Western Kenya being separated from the typical one of Northern Somaliland by *X. r. intensus* of Central Somaliland and possibly by *X. r. stephanicus* and *X. r. rufifrons* from the north-east of the Colony.

As I have pointed out in the above the skull of *massaicus* seems larger and thicker with a higher jugal bone than in other races of *Xerus rutilus* examined.

GEOGRAPHICAL DISTRIBUTION: The ground squirrels belonging to genus *Xerus* inhabit Abyssinia, Somaliland, and Kenya. It is probable that some of the races described from the countries mentioned above may transgrade along the Sudan, Uganda, and Tanganyika borders, but no



Xerus r. stephanicus.



Xerus r. dorsalis.



Xerus r. rufifrons.



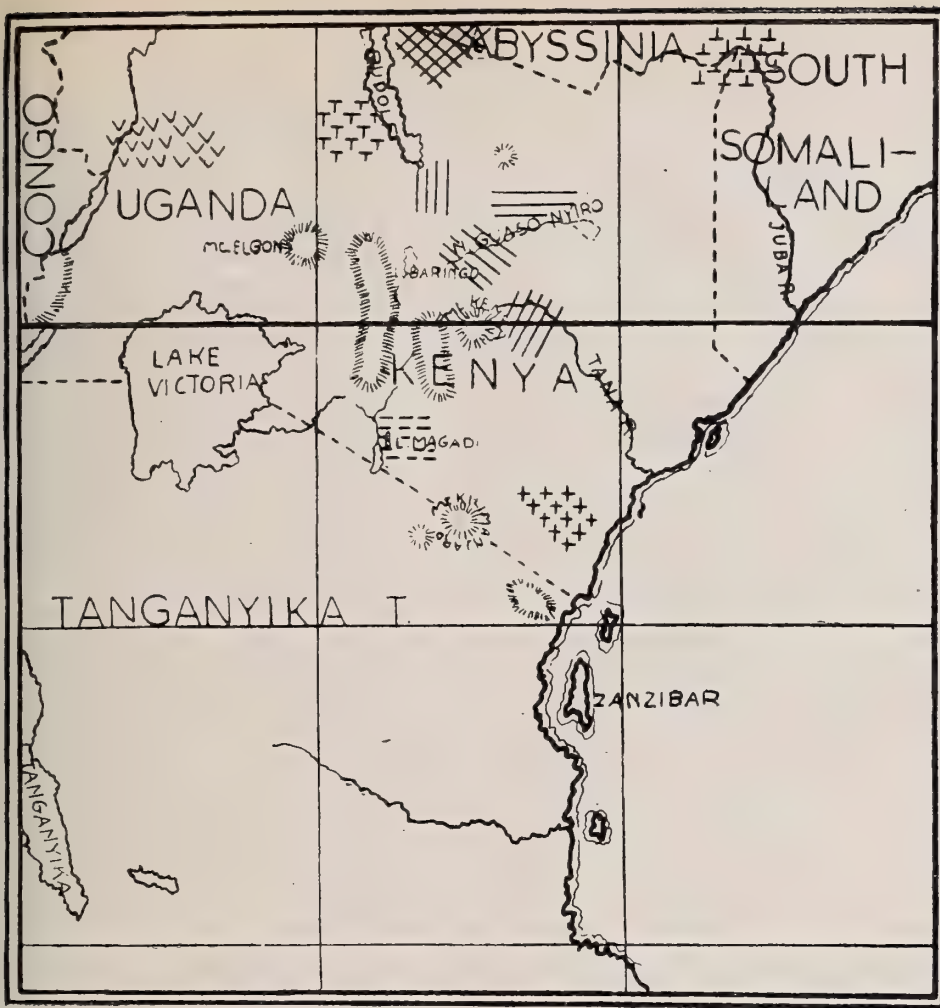
Xerus r. saturatus.













Xerus r. massicus.



Map. No. 1 showing the distribution of the races of *Xerus rutilus* in East Africa.



- | | | | |
|-----------------------------------|---|---------------------------------|---|
| <i>Taterillus e. emini.</i> |  | <i>Taterillus lowei.</i> |  |
| <i>Taterillus harringtoni.</i> |  | <i>Taterillus e. zammarani.</i> |  |
| <i>Taterillus n. nubilus.</i> |  | <i>Taterillus n. illustris.</i> |  |
| <i>Taterillus tenebricus.</i> |  | <i>Taterillus melanops.</i> |  |
| <i>Taterillus n. meneghettii.</i> |  | <i>Taterillus osgoodi.</i> |  |

Map No. 2 showing the distribution of the races of *Taterillus* in East Africa.

special form has been described up to now from these latter territories. Mammalogists recognise the following seven geographical races of the species *Xerus rutilus*. The typical one *X. r. rutilus* Cretzchmar, including the synonymous *Sciurus abessinicus* Gmelin, *Sciurus brachyotus* Hemprich and Ehrenberg, *Sciurus fuscus* Huet, inhabits Eritrea and Abyssinia; *X. r. dabagala* Heuglin living along the coast of Northern and Eastern Somaliland; *X. r. intensus* Thomas from Central Somaliland or Ethiopian Somaliland (type locality: Gerlogoby Wells); *X. r. rufifrons* ranging, according to de Beaux throughout Southern Somaliland, to Northern Uaso Nyiro. Allen thinks that *Sciurus xerus flavus* of A. Milne-Edward may be a synonym of *X. r. rufifrons*; the type locality of *flavus* being not exactly known but supposed to be Gnelide or Ras Hafun (Somaliland). Only comparisons between large series of skins of ground squirrels from the coastal Somali strip between the Migiurtine to the Kenya borders and those of Northern Uaso Nyiro can solve the question. *X. r. stephanicus* inhabits the territories between Lake Rudolf and L. Stephanie and possibly further. *X. r. dorsalis* from L. Baringo. *X. r. saturatus* ranges throughout South-Eastern Kenya. *X. r. massaicus*, the race which I now propose, living in the Masai Reserve west of the range of *saturatus* and south of *dorsalis* and *rufifrons*. The west and southern limits of diffusion of *massaicus* have to be established.

SPECIMENS OF *Xerus rutilus* EXAMINED: Serenli, 1; Marsabit, 1; Kismayu, 5; Lovernovu, 1; Kumgu, north of Lamu, 1; Nyama Nyangu, 3; L. Baringo, 2; Tsavo, 1; and Olorgesailie, Masai Reserve, 10.

***Taterillus nubilus meneghettii* subsp. nov.**

TYPE from Olorgesailie, 20 miles north of Magadi on the Magadi Road (Masai Reserve), Kenya Colony; altitude 3,450 feet. No. 3255, Coryndon Memorial Museum; adult male collected on August 5th, 1944, by Mr. F. Meneghetti.

DIAGNOSIS: Similar to *T. n. nubilus* Dollman but duller on the upper-parts and lighter on the cheeks and along the sides of the body, with the fore feet nearly white and the under tail lighter.

DESCRIPTION: Size and proportions of the body as in *T. n. nubilus* Dollman; colour of the upper parts slaty grey suffused with bright straw-buff. The single hairs of the upper-parts being coloured as follows, from below to above: for the most inferior part slaty grey, bright straw buff, tips dark brown. The straw tinge more developed on back. Stripe along the muzzle and the middle of head, blackish, but cheeks whitish buff. Flanks with a whitish tinge and intermingled with a tinge of bright straw buff. Under-parts pure white. Feet white with a slight wash of buff. Tail intermingled with dark brown hairs on upper side. Terminal brown tuft well-developed.

A very young specimen is darker, less slaty above with more buff tail blackish tufted.

Juvenile specimens show a duller pale buff upper-parts.

Skull very much as in *nubilus*.

MEASUREMENTS IN MM.: Average of three selected specimens: head and body 116; tail 150.7; hind foot 29; ear 17.3.

Of the type: head and body 120; tail 158; hind foot 30; ear 19. Skull: greatest length 35; basal length 29; condylo-incisive length 31; zygomatic breadth 17.1; interorbital constriction 6.7; squamosal breadth of brain-case 15.2; length of nasals 14.4; palatal length 17.3; length of palatal foramina 5.7; length of upper molar series 4.2; length of the alveolar upper molar series 5.2.

DISCUSSION AND REMARKS: The present race differs from the typical one, being duller on the upper-parts. In spite of the fact that the straw-buffy tinge may sometimes be brighter, the general effect is of a duller animal because of the more marked dark speckling of the hairs of the back. The same thing is true about the comparison with *T. n. illustris* Dollman, which is paler than the typical race and with the dark stripe of the forehead and muzzle scarcely defined. *T. n. illustris* is regarded as a pale coloured race of *nubilus*, but in *meneghettii* the cheeks and flanks are possibly lighter and the fore legs especially more whitish with only a very pale wash of buff.

We need not compare this race from the Masai Reserve with *T. osgoodi* Wroughton, a very bright reddish *Taterillus* or with the dark *T. tenebricus* Dollman, or with *T. melanops* G. M. Alle, *T. e. emini* (Thomas), and generally with the other subspecies from East Africa.

GEOGRAPHICAL DISTRIBUTION: *T. n. meneghettii* is with *T. osgoodi* one of the most southern races of this genus as shown in the accompanying small map (No. 2), *T. e. emini*, *T. e. zammarani*, *T. lowei*, *T. harringtoni*, *T. n. nubilus*, *T. n. illustris*, and *T. tenebricus*, are distributed north of the equator. The range of *T. melanops* extends throughout it, while *T. n. meneghettii* and *T. osgoodi* live south of the equator.

The nearest races to *meneghettii* geographically speaking, are *melanops* to the north and *osgoodi* to the east, but it is separated from both by the hills of the Machakos country. On the other hand until now no particular race of *Taterillus* seems to have been described from Tanganyika. The systematic affinity between *T. n. meneghettii* and the other races of *nubilus* could not be explained by a probable communication of these forms along the Rift Valley, but the limits of diffusion of the race, which I am describing must be established by further research.

SPECIMENS OF *T. n. meneghettii* EXAMINED: Olorgesailie, Masai Reserve, seven.

I have named this form after my friend Mr. F. Meneghetti, who has collected and skinned most of the specimens.

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STUDIES ON THE BIOLOGY OF RAINBOW TROUT
(*SALMO IRIDEUS*) IN EAST AFRICA.

I.—THEIR FOOD IN THE THIBA, KERINGA AND SAGANA RIVERS,
KENYA COLONY.

BY VERNON D. VAN SOMEREN, M.B.E., B.Sc., Ph.D.

INTRODUCTION.

Although trout were first introduced into Kenya Colony in 1905, little published information exists as to the general food eaten by these trout, based on a number of trout from any one river. Copley (1940) has tabulated the food of 48 Brown Trout taken in the Gura River, and in Part II of the same paper discusses briefly the food of Rainbow Trout in general. A number of stomach-content examinations from various rivers have been made by the Game Department, Kenya, and are available in their files, and from time to time various keen anglers have opened up fish which they have caught to see on what they have been feeding.

The subject is of very considerable importance however, because trout are not fish which are indigenous to any East African river, and the introduction of any non-indigenous animal in numbers to a new environment may cause considerable upsets in that environment; it has been said, for example, by certain authorities that the introduction of non-native trout to the inland waters of New Zealand has in some cases so depleted the available aquatic life in these waters serving as trout food, that the trout are in danger of starving themselves to extinction—the increase in trout numbers having been so great due to lack of competition that the food supplies can no longer be sufficient for all. That this will ever be the case in Kenya is doubtful, except perhaps in parts of certain rivers, and trout are unlikely in the near future to become a nuisance to the lower river fishings because at present they are limited in their breeding range to temperatures below 58° F.

At the same time however, trout themselves are a tremendous sporting asset to the Colony, and earn a not inconsiderable revenue each year from the sale of trout-fishing licences; because of these facts any information relating to their general biology is of considerable importance from the point of view of conserving the fishings in the best possible manner.

The material on which the following notes are based was collected during a few days spent fishing in August, 1942, the stomach and intestines of the fish caught being cut out as soon as possible after landing the fish and preserved in 5 per cent formalin; all the material being examined at a later date.

All the fish examined were Rainbow Trout (*Salmo irideus*) only, taken from the Thiba and Keringa Rivers of the Kerugoya District of Mount Kenya, and the Sagana River in the Nyeri District of Mount Kenya. Details of the fish examined are listed in the appendix; they include 37 fish from the Thiba, and much smaller numbers from the Keringa and Sagana, eight and four respectively. For purposes of examination of food taken by the fish, only the stomachs were examined, from the oesophagus to the pyloric constriction, as the food in the intestines is usually much digested and mainly unrecognisable. The intestines were, however, examined for parasitic worms. The Thiba River material is analysed in two parts according to a natural division of the river; those from the forest Thiba (Upper Thiba) being taken from that stretch of the river from the public fishing camp upstream to the limit of fishing, about 6,800 to 7,200 feet, this part of the river flowing fairly rapidly with occasional, deep, rocky pools in fairly

shaded conditions in the lower rain-forest belt; and those from the lower Thiba being taken from the second large waterfall below the "D.C.'s Camp" (reached by Jokton's camp road) to the old posho mill pool some two miles upstream, from about 6,100 to 6,500 feet, this part of the river flowing between open grassy and shrubby banks, exposed to sunshine most of the day, without heavy shading trees; and being rapid in some parts, but also with many large, sometimes canal-like pools.

The Keringa fish were taken from the lower Keringa, upstream for about two miles from the very large waterfall pool from just above which the present irrigation scheme has its origin. This part of the river is not so open as the lower Thiba, with several forest patches and steep banks, many rapids and large rocky pools, the altitude being in general similar to that of the Lower Thiba.

The Sagana fish were taken from just below the railway bridge crossing to the junction with the Thego River in the forest, the lower $\frac{3}{4}$ mile being in open country with fairly well-exposed large pools and occasional short rapids; the upper stretch being in dry forest, fairly shaded with deep rocky pools and rapids; altitude about 5,800 to 6,000 feet. It must be very clearly emphasised that these results are limited in nature being taken from only a few fish, particularly in the Keringa and Sagana, in limited parts of the rivers, at only one time of the year and, therefore, may not be of general application. Subsequent examination of over 100 Rainbow stomachs from the Thego-Sagana River complex (this examination is not yet complete for a whole year) has, however, tended to confirm these results in general, and to emphasise the necessity for dividing the samples into upper and lower river fish, whose food appears to differ somewhat in composition, and perhaps also into even more exact divisions. These present results are recorded now mainly for reference purposes as there may be a possibility that over a period of years there is a change in the food composition owing to the grazing of the trout in any one particular river.

Another very considerable difficulty which arises in work of this nature in trout rivers in East Africa is that much of the aquatic insect and other life in Kenya rivers is unstudied and unclassified, and it is possible in most cases to refer the food animal only to its order or family, with an occasional tentative generic classification which is provisional only until more is known about these animals in East Africa; and the results are based on a very generalised classification of the food which I hope will allow of a more exact classification later.

ANALYSIS OF RESULTS.

The analyses of these stomach examinations are recorded in Figs. 1 and 2 in graphic form. Fig. 1 shows the percentage composition of recognisable food (exclusive of portions of food animals only doubtfully identifiable, and "mush" in the stomachs) taken in each locality by the trout, the different kinds of food being recorded as a percentage of the total number of food animals in all stomachs in each area. Fig. 2 shows for comparison between the forest Thiba and lower Thiba river, the percentage number of stomachs in each stretch containing the different kinds of food, which combined with the former percentage composition, is the only true way in which to record the "feeding potentiality" of the trout themselves (with a certain reservation mentioned below). The numbers of fish from the Keringa and Sagana Rivers are too few to enable a second analysis such as Fig. 2 to be made.

It is clear from Fig. 1 that the majority of food animals taken by the trout in both the forest and Lower Thiba stretches are *Baetis* nymphs (the

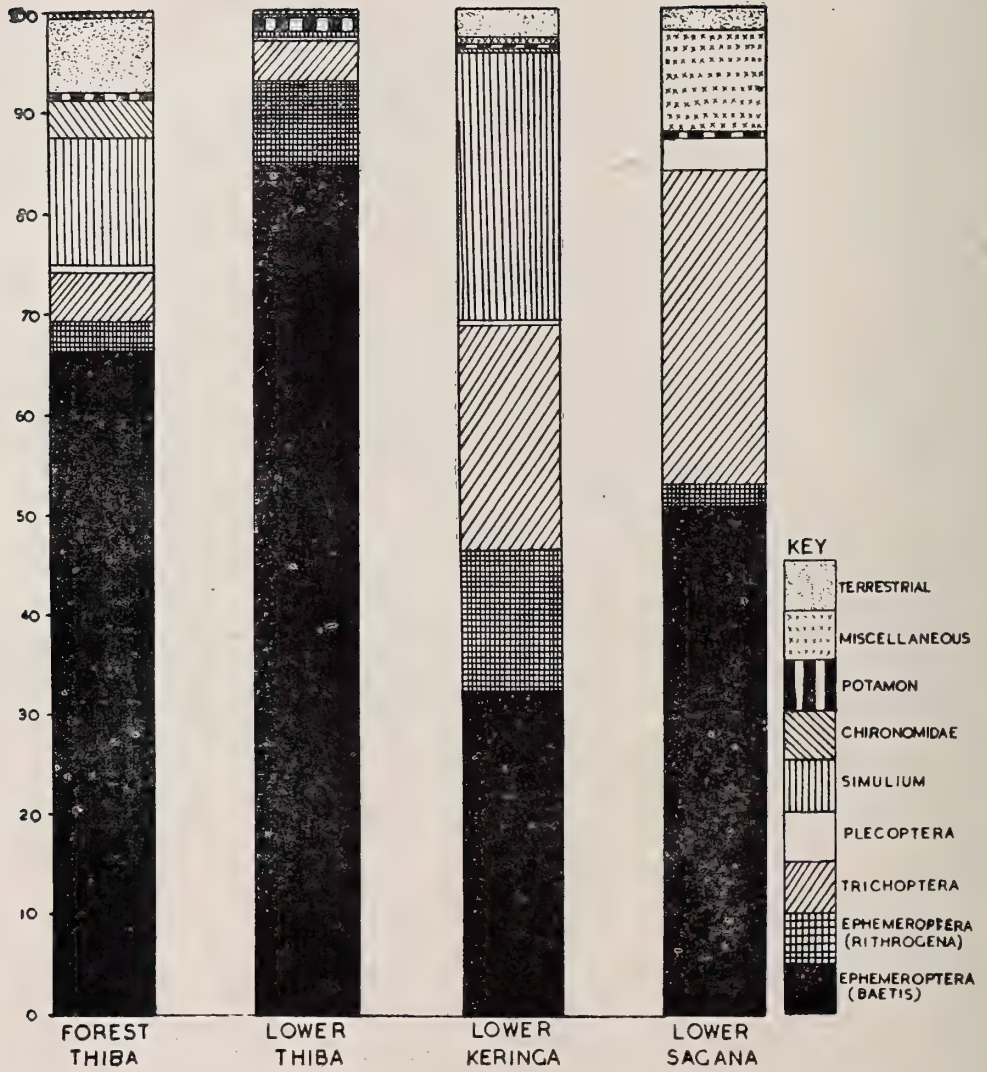


FIG. 1.

PERCENTAGE COMPOSITION OF TROUT FOOD.

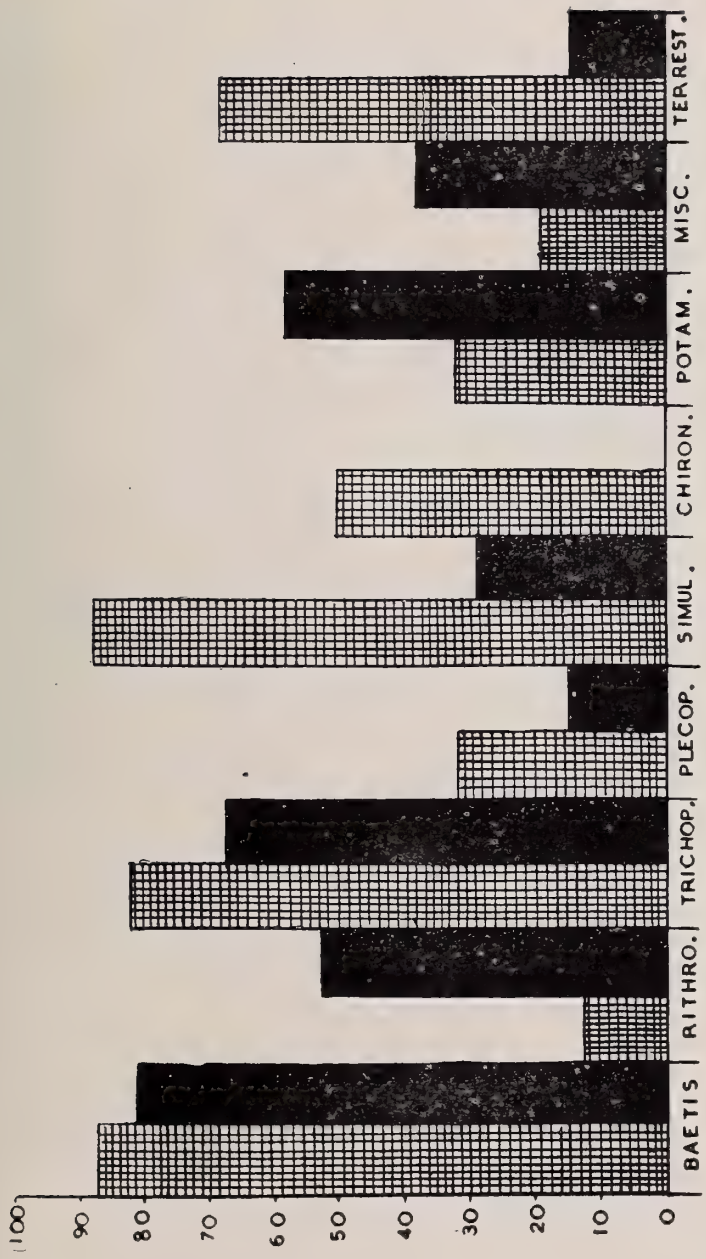


FIG.2.

PERCENTAGE STOMACHS CONTAINING FOOD.

Olive Dun nymphs of anglers), as many as 181 being counted in a single stomach from the forest Thiba, and 242 in a stomach from the lower Thiba; Fig. 2 shows that such baetid nymphs are taken by an equally high percentage of trout in each locality.

The second ephemeropterid taken as food in both stretches appears to be a nymph which is provisionally assigned to the genus *Rithrogena*, a nymph allied to the March Brown nymph of anglers, *Ecdyonurus*. In the forest Thiba this is eaten by trout both in smaller numbers and by fewer fish than in the lower Thiba, and it may well be that this nymph is not so abundant in the upper shaded waters.

Trichoptera larvae (the caddis fly grubs of anglers) form also an equally small percentage of the total food in each stretch, taken by approximately the same percentage of fish. These included mainly a species of hydroptychid, and a very few *Leptoceros* larvae taken with their characteristic cases—slightly curved and made only of sand grains—in both reaches.

Plecoptera (Stone Fly creepers) nymphs appear to be very scarce both in numbers and the number of fish grazing upon them; these have not yet been identified definitely as to genus or species.

Simulium (Buffalo gnat) larvae are taken by a greater number of fish in greater numbers in the upper reach, thus reversing the *Rithrogena* position and indeed are grazed upon in the upper reach by as many fish as graze upon baetid nymphs.

Chironomid (Midge) larvae, while forming quite a large portion of food for a quite large percentage of trout in the upper reach, are, surprisingly, completely absent in stomachs from the lower stretch.

The ordinary river crab, *Potamon*, represents only a very small percentage of the total food consumed in both stretches, but here such percentage results based on numbers only are liable to give an untrue picture; when based on bulk of food a different aspect is clear, since most of the other food organisms taken vary from $\frac{1}{2}$ to 1 inch in length and are slender larvae or nymphs, while one single crab of reasonable size (the crabs taken measured from $\frac{1}{2}$ to 2 inches across the carapace, and were, therefore, of considerable bulk) must be equal in bulk and probably food value also to several score of the smaller organisms. In an exact detailed survey, this bulk factor should also be considered.

All this food material so far discussed has been composed of aquatic organisms found on the river bed, on stones, under stones, or burrowing in the bottom silt, and as has been found in all other food surveys, a certain number of miscellaneous animals, generally occurring in the same type of habitat, are picked up. In the forest Thiba fish, these included two dipterous larvae (a small dipterous Midge), two *Nepa* sp. (the water Scorpion, belonging to the aquatic bugs, or Hemiptera), and one Zygoptera Odonata nymph (Damsel Fly), and one very damaged specimen of a species of two-tailed ephemeropterid nymph. Miscellaneous food taken on the lower Thiba included fourteen Zygoptera nymphs, two large specimens of another genus of ephemeropterid nymph, and four libellulid (Dragon Fly) nymphs. In both reaches this underwater aquatic food forms over 90 per cent of the total food taken, indicating that the main food supply of the trout is found by bottom grazing, as has been repeatedly shown in trout food surveys in other parts of the world. The terrestrial and aerial food, obtained by some form of "rising," comprises the remaining small percentage of the food taken, being the "savoury" as so aptly termed by Allan (1936). Such terrestrial food, however, in the stomachs examined comprised a higher percentage both of total food and of trout taking such food in the upper than in the lower Thiba; it is interesting also that on nearly all occasions I have fished this river, the trout do rise more freely in the forest stretch

than in the lower. The composition is very mixed, obvious "casuals" being eaten by the trout as they fall into the river; in stomachs from the upper stretch these included two small carabid beetles, four staphylinid beetles, one spider, one grasshopper, one trichopteran adult and one adult *Simulium*, one small dipterous fly, four small Hymenoptera, four small black ants, and 36 "Siafu" (safari ants), found in three stomachs in lots of eleven, thirteen and twelve, and comprising both soldier and worker forms. These are in fact common enough in this stretch of the forest, and may have been casualties from one of the numerous "living bridges" they build across a small stretch of water. In addition one stomach contained one pigeon breast feather, and one small black seed.

On the lower Thiba, terrestrial food included only one grasshopper, one syrphid fly and one zygopteran adult.

The question naturally arises in such food surveys as to whether the trout are exercising any selection with reference particularly to the aquatic food; whether, for example, they are grazing upon one species of organism to the exclusion of other species which may be equally abundant in the same stretch and equally obtainable. Such a question can only be answered by a survey, both qualitative and quantitative, of the river bed fauna taken preferably at the same place and the same time at which the fish are presumed to have been feeding. Such faunal surveys are urgently required, particularly in unstocked rivers to give some idea of the "faunal balance" into which the trout are being introduced, and from the results of such surveys, in conjunction with a survey of the other river conditions, it is relatively easy to assess the success or failure of a stocking before it is undertaken, and later to trace possible causes of depreciation in a stock already introduced.

Copley (*loc. cit.* Part II) gives a very interesting table of the types of river food available at various altitudes on the Thiba River. The "Forest" sample given in this table of Copley's was taken at an altitude considerably higher than that at which the fish stomachs recorded in this present paper were caught, and for purposes of comparison I have taken his 7,000 feet (Bracken) sample as corresponding to my forest Thiba fish, and his 5,800 feet (Native Reserve) sample as corresponding to my lower Thiba fish; these slight differences in habitat (and also microhabitats of the organisms involved, which differ between species) should be borne in mind as the comparison cannot be exact unless the samples are taken in the same area as the fish sample. For comparison I append the tables herewith.

Copley Thiba River, 7,000 feet.		%.	% in trout stomachs (<i>v. S.</i>)	
Ephemeroptera Baetidae	...	60.7	...	66.4
Ephemeroptera Ecdyonuridae	...	11.4	...	2.9
Ephemeroptera Leptophlebiidae	...	7.1	...	—
Plecoptera Perlidae	...	7.1	...	0.7 (Perlidae ?)
Trichoptera Hydropsychidae	...	3.5	...	4.9
Trichoptera Leptoceridae	...	3.5	...	4.9
Diptera Chironomidae	...	3.5	...	3.7
Diptera Simuliidae (none recorded, but from the 8,200 feet sample)	...	11.8%	are recorded	12.9

Thiba River, 5,800 feet.		%.	% in trout stomachs.	
Ephemeroptera Baetidae	...	13.5	...	84.5
Ephemeroptera Ecdyonuridae	...	43.0	...	8.5
Ephemeroptera Oligoneuridae	...	2.2	...	—
Plecoptera Perlidae	...	2.2	...	0.2 (Perlidae ?)
Trichoptera Hydropsychidae	...	2.2	...	3.75
Diptera Chironomidae (none recorded)	—
Diptera Simuliidae	...	37.0	...	0.45

Allowing for sampling errors inevitable in such work, the fact that the river samples were taken a few years previous to the fish samples, and the reservations made above, the agreement between the food actually present and the food eaten by the trout is very close in most instances. I doubt, however, in the present state of knowledge, whether one is justified in drawing closer comparisons from these two tables as much remains yet to be discovered about the ecology of these aquatic organisms in different parts of the same river at the same altitude, with particular reference to their availability as trout food in respect of their habits, and also of the feeding habits of the trout themselves.

The few Keringa stomachs examined again show over 90 per cent of aquatic food as forming the bulk of the diet, but on the whole this diet would appear to show a more balanced appearance, the various food organisms being taken in comparatively equal numbers; though the large proportion of *Simulium* larvae eaten in this river is of interest when compared to the similar stretch of the Thiba River. Crabs again, though few in number, would provide food in large bulk in a single organism. Plecoptera are again scanty. Miscellaneous aquatic food included one beetle (probably an aquatic type), and one libellulid nymph. Terrestrial food comprised seven adult Trichoptera, one adult *Simulium*, one small beetle, three ladybird beetles, three froghoppers (Hemiptera) and one small acraeid caterpillar. The Keringa fish (a river only recently stocked in 1938) are considered by many anglers to be better fish than those of the lower Thiba, and it would be interesting to discover whether, as a result of having been grazed upon for a short period only by the trout, a "balanced" underwater fauna as is suggested leads to better fish.

The Sagana River fauna, grazed upon by the few trout examined from this river, presents a slightly different aspect to either of the foregoing rivers. Baetid nymphs again form just over 50 per cent of the total food organisms taken, but the total numbers are small when compared with those from the smaller Thiba fish, 38 nymphs being the maximum recorded from any one stomach. Ecdyonurid nymphs again form only a small part of the food, but trichopteran larvae (mainly hydropterygids) form a large percentage, unlike the Thiba River, and more comparable with the Keringa. Plecoptera nymphs are more numerous in the few stomachs examined than in either of the preceding rivers. *Potamon* crabs are scarce.

Miscellaneous food forms a quite large percentage of the total underwater food. This consisted of one dytiscid water beetle, five libellulid nymphs, two aeschnid (Odonata) nymphs, one zygopteran nymph and two notonectid water bugs.

Terrestrial food, as generally, forms only a very small percentage of the total food, and comprised one winged form of an ant, one adult trichopteran, while a 1-lb. 6-oz. fish had in its stomach a small vole, about 4 inches long. It was impossible to identify this properly or to say whether this had been taken alive or dead as the surprisingly powerful gastric juices had already digested away the flesh and partly macerated the bones of the skull and spine.

Amongst miscellaneous oddments picked up by the fish, one stomach contained a stick $1\frac{3}{4}$ inches long and about $\frac{1}{8}$ inch in diameter—this "stick-eating" habit has proved to be not uncommon in stomachs subsequently examined from this river, and will be discussed in a later note. Another stomach contained four breast feathers from a pigeon and a francolin.

DISCUSSION.

No parasitic worms were found in the intestines or stomachs of any of the fish examined, but one four-ounce fish from the upper Thiba had a nematode worm about 2 inches long in its stomach, but this was not preserved properly and I cannot state to which species it belongs or even whether it is parasitic or accidental. This lack of parasites is very interesting, and may perhaps be expected as the trout is only a comparatively recent introduction to this country, being established first in the form of eyed ova, and, therefore, having had no chance of bringing its own parasites with it from the introducing country; moreover, they have probably had insufficient time in these Kenya rivers to have become parasitised by worms, particularly so since they live in stretches of rivers uninhabited by any other indigenous fish except a small fish belonging to the cat-fish type (*Amphilius grandis* from 6,000 to 6,800 feet), whose parasites may in time adapt themselves to trout.

It is encouraging to note that, judging from these stomach contents only, there appears to be an adequate and varied food supply in these rivers, even in the Sagana which has been stocked since 1921, but without a survey of the river fauna *per se* one cannot state whether the trout find this quantity and quality of food difficult to find, or whether there is an actual abundance. There is also, generally speaking, a size selection of food by trout, the larger trout tending to take the larger food organisms and the stomachs of small and large fish may show a quite different picture of the fauna eaten. This is discussed in general terms by Copley (*loc. cit.*), who has also pointed out the absence of helminth parasites, both in Kenya Rainbow and Brown Trout.

It is probable that seasonal differences in the food taken also exist, hence it is clear that many factors have to be taken into consideration when examining trout stomachs; these results present only one small aspect of the whole story.

From the practical anglers' point of view, however, these results indicate that probably Kenya Rainbow are in no way markedly different from European trout in the food taken within the limits of the waters, and while lures of bright colours and large size are undoubtedly successful in catching these Rainbow Trout, there is no reason why small "pattern" flies of the dun and spider type should not be equally successful as imitating the bulk of the trouts' underwater food more closely and in as natural a manner as possible; and indeed in skilled hands such patterns are quite as successful in Kenya rivers as the lure type.

In conclusion, I am very much indebted to Mr. Hugh Copley of the Kenya Game Department for reading the M.S. of this paper, and for many helpful criticisms, and to Dr. E. B. Worthington for helpful criticism of the subject matter and arrangement.

(M.S. received for publication on 8th January, 1945.)

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APPENDIX.

Details of Rainbow Trout Examined.

Name of River and Date.	Weight.	Length.	Sex.
FOREST THIBA:			
16/8/42	4 ozs.	10 $\frac{1}{4}$ ins.	♀ immature.
16/8/42	6 ozs.	11 ins.	♀ spent.
16/8/42	3 ozs.	9 ins.	♂ ripe.
16/8/42	4 ozs.	9 $\frac{3}{4}$ ins.	♂ ripe.
16/8/42	4 ozs.	9 $\frac{3}{4}$ ins.	♂ ripe.
16/8/42	3 ozs.	9 ins.	♂ ripe.
16/8/42	4 ozs.	9 $\frac{3}{4}$ ins.	♀ ripe.
16/8/42	5 ozs.	10 $\frac{1}{4}$ ins.	♀ spent.
16/8/42	4 ozs.	9 $\frac{3}{4}$ ins.	♂ ripe.
16/8/42	12 ozs.	11 $\frac{1}{4}$ ins.	♂ ripe.
16/8/42	4 ozs.	9 $\frac{1}{2}$ ins.	♂ ripe.
16/8/42	4 ozs.	10 ins.	♀ immature.
16/8/42	4 ozs.	9 $\frac{3}{4}$ ins.	♂ ripe.
16/8/42	4 ozs.	10 ins.	♂ immature.
16/8/42	7 ozs.	10 $\frac{1}{2}$ ins.	♀ ripe.
16/8/42	13 ozs.	12 ins.	♀ immature.
LOWER THIBA:			
3/8/42	32 ozs.	17 $\frac{3}{4}$ ins.	♂
3/8/42	12 ozs.	12 $\frac{1}{2}$ ins.	♂
3/8/42	7 ozs.	10 ins.	♀ immature.
3/8/42	8 ozs.	11 ins.	♀ immature.
3/8/42	20 ozs.	14 ins.	♀ immature.
3/8/42	12 ozs.	11 $\frac{3}{4}$ ins.	♀ ripe.
3/8/42	12 ozs.	11 ins.	♂
3/8/42	12 ozs.	11 $\frac{1}{2}$ ins.	♀
3/8/42	12 ozs.	11 $\frac{3}{4}$ ins.	♀ immature.
3/8/42	24 ozs.	14 $\frac{1}{2}$ ins.	♀ immature.
3/8/42	16 ozs.	13 $\frac{1}{2}$ ins.	♀ ripe.
3/8/42	9 ozs.	11 ins.	♀ immature.
3/8/42	12 ozs.	11 $\frac{3}{4}$ ins.	♀ immature.
3/8/42	12 ozs.	11 $\frac{3}{4}$ ins.	♂ immature.
17/8/42	12 ozs.	12 ins.	♀ immature.
17/8/42	10 ozs.	11 $\frac{3}{4}$ ins.	♀ immature.
17/8/42	16 ozs.	13 $\frac{1}{2}$ ins.	♂ spent.
17/8/42	12 ozs.	12 ins.	♀ immature.
17/8/42	16 ozs.	13 ins.	♀ immature.
31/8/42	16 ozs.	12 $\frac{1}{2}$ ins.	♀ immature.
31/8/42	14 ozs.	12 $\frac{1}{4}$ ins.	♀ immature.

Name of River and Date.	Weight.	Length.	Sex.
LOWER KERINGA:			
2/8/42	32 ozs.	17 ins.	♀ spent.
2/8/42	16 ozs.	13 ins.	♂ immature.
2/8/42	16 ozs.	12 $\frac{1}{4}$ ins.	♂ immature.
2/8/42	18 ozs.	13 $\frac{1}{2}$ ins.	♂ immature.
2/8/42	20 ozs.	14 $\frac{1}{2}$ ins.	♂ ripe.
2/8/42	28 ozs.	15 ins.	♂
2/8/42	12 ozs.	11 $\frac{1}{2}$ ins.	♂
30/8/42	10 ozs.	11 $\frac{3}{4}$ ins.	♂ ripe.
LOWER SAGANA:			
9/8/42	16 ozs.	13 $\frac{1}{4}$ ins.	♀ immature.
11/8/42	41 ozs.	18 $\frac{1}{2}$ ins.	♀ immature.
12/8/42	20 ozs.	14 $\frac{1}{2}$ ins.	♀ immature.
13/8/42	22 ozs.	14 $\frac{3}{4}$ ins.	♀ immature.

River.	Average Weight.	Average Length.
Forest Thiba	5.3 ozs.	10.3 ins.
Lower Thiba	14.9 ozs.	12.4 ins.
Lower Keringa	19 ozs.	13.6 ins.
Lower Sagana	24.7 ozs.	15.2 ins.

OCCASIONAL NOTES.

BREEDING SEASON OF *SAGITTARIUS SERPENTARIUS*. With reference to the breeding season of the Secretary Bird, I notice in Jackson's Volume 1, page 126, under the notes supplied by Mr. Clifford Hill, that the birds mentioned (around Wami Hill near Kapiti Station) nested during October, November, and December. It may, therefore, be of interest to quote the following note of mine, dated 5th May, 1944: On the second of May, 1944, I found a nest of *Sagittarius serpentarius* quite by chance in the top of an isolated flat-topped thorn tree about 15 feet from the ground in the Como Valley (Thika). The nest was obviously new and placed in the centre of the tree level with the top and quite invisible. I happened to be standing under the tree when I noticed a *Kaupifalco monogrammicus meridionalis* flying past, and when I fired, the Secretary Bird flew out of the tree above my head. It returned to the nest after about 15 minutes. On that day the nest contained one egg only. I returned this morning after obtaining permission from the Game Warden to shoot the bird for my collection. I went underneath the tree (both nest and bird invisible) and my native collector tapped the stem with his hunting knife. Suddenly the cockbird flew off the nest, but unfortunately in the opposite direction to the one I had expected it, and due to the wideness of the top, when I did fire, I missed it! A friend who was watching from about 100 yards distance told me afterwards that the bird never stood up before taking off but seemed to slide off the nest into the air in one movement. I then concealed myself in a low bush about 15 yards from the tree and after half an hour I spotted the henbird approaching on foot carrying some lizards in its beak. When it reached a distance of 25 yards from the tree it flew up towards the nest and I shot it while in the air. The crop of the henbird contained five lizards and wings and breast (torn in half) of a young partridge, the stomach contained the head and legs of the partridge, two lizards and lots of locusts. The ovaries had lots of small yolks attached and two big yolks one $\frac{3}{4}$ inch and one 1 inch in diameter which points to the fact that this bird breeds twice a year probably April-May and October-November. The nest contained two eggs today. It was built with sticks blackened by grassfires and stems of sodom-apple and lined with small tufts of dry grass torn up by the root and a few green leaves. The eggs were white, slightly glossy and rather pointed at one end like oversized turkey eggs, they measured: 78+56 and 76+57 mm.

J. BLOM-BJORNER,
Thika.

HARRIER-EAGLE EATING A TOAD. In Jackson's Volume 1, page 190 (*Cicaetus cinereus*), Sir Frederick writes under Notes as follows: "One shot in such a position, at Jipi, had in its stomach the fur of several rats, and a large toad (not a frog) that quite recently had been bolted whole. This was the first and only time that I have ever known of a bird eating a toad, and scarcity of other food was certainly not the reason, in this instance."

With reference to the above it may be of interest to record that in my notes, dated 10th January, 1944, I wrote as follows: "Collected today a very fine specimen of *Circaetus pectoralis* an adult female in fine plumage. The bird was observed walking through the grass in a swampy

patch of the Como Valley (Thika); when skinned the crop contained a large toad recently swallowed whole. As regards *Circaëtus cinereus* mentioned by Jackson, two birds in my collection, both adult females, shot at Thika on 3rd December, 1943, and 2nd August, 1944, had both been feeding on snakes. Unfortunately the contents of their stomachs were rather decomposed, but I think the snakes were cobras; a third bird, an adult male shot in the Ithanga Hills on 12th June, 1944, had empty crop and stomach.

J. BLOM-BJORNER,
Thika.

CIRCAETUS CINERASCENS. This bird is referred to in Jackson's book (Volume 1, page 191) as "Smaller Banded Harrier-Eagle," but I think it must be meant to be "Larger Banded Harrier-Eagle" as the Smaller Banded Harrier-Eagle surely is *Circaëtus fasciolatus* which is found further south than Kenya. In any case *Circaëtus cinerascens* is considered a rare bird in this country and, it may interest readers to know that I managed to obtain two adult specimens this year; the first one an adult male was shot by my native collector on 26th May, 1944, sitting in a large tree overhanging the Chania River (Thika) eating a snake at approximately 11 a.m. When shot it dropped the snake into the river. Stomach contained scales and vertebrae of a snake. This bird was just getting new tailfeathers, the old ones being very worn, the new ones protruding from 2 inches to 3 inches. The rest of plumage all old and very worn. The second bird, also an adult male, was shot by me on 25th July, 1944, sitting resting in a tall tree overhanging the Chania River (Thika) at 10-30 a.m. This bird was in full, fresh plumage and when skinned the crop contained two small green whipsnakes (*Chlorophis*).

SIDNEY BLOM-BJORNER,
Thika.

PERNIS APIVORUS APIVORUS. On Sunday, 2nd July, 1944, when I was sitting on a friend's verandah in Upper Thika, near the Indarugu River, at 11 a.m., I suddenly noticed a big bird coming over high and fast looking very white on the underside; when directly overhead it half-closed its wings and came down at an angle of 45 degrees like an arrow, settling on the top of a tall bluegum on the edge of a small plantation approximately 250 yards from where I sat. I at once got my shotgun and started stalking the bird along the edge of the plantation, but when I arrived near the tree there was no sign of it. I stood very still looking into the plantation, which sloped away downhill.

Suddenly I heard some small birds making a lot of noise and, on looking carefully in the direction indicated, I spotted the bird standing on a nest made by a Kenya Green Pigeon (*Vinago calva brevicera*) feeding on something, so I at once shot it. It proved to be an adult female Honey-Buzzard and when skinning it for my collection I found in its crop, besides ants and eggshells, an embryo of the above-mentioned pigeon. Now as far as I know this is the latest date recorded for *Pernis apivorus apivorus* (Lin.) in Kenya, all other records being between October and April. Dr. van Someren mentions an example obtained by him in April as being in full, fresh plumage; my bird was in very old and worn plumage only having the two centre tailfeathers and three secondaries in each wing in new plumage.

SIDNEY BLOM-BJORNER,
Thika.

LIST OF COWRIES COLLECTED ON THE KENYA COAST BY COLONEL MAXWELL AND FRIENDS DURING JULY, 1944. The following lists which have been given to me by Colonel Maxwell will be of great use to collectors of shells:—

LIST OF COWRIES FROM MALINDI AND NEIGHBOURHOOD.

Cypraea arabicula. One at Malindi, one at Watamu.
Cypraea tigris. Plenty.
Cypraea annulus. Plenty.
Cypraea lynx. Vast numbers.
Cypraea reticulata. Fair numbers.
Cypraea pallida. Fair numbers.
Cypraea erosa. Fair numbers.
Cypraea isabella. Fair numbers.
Cypraea hirondo. Fair numbers.
Cypraea carneola. Fair numbers (small).
Cypraea moneta. Not many.
Cypraea helvola. Not many.
Cypraea caputserpentis. Two only alive.
Cypraea microdon. Two only.
Cypraea stapylaea. Ten only.
Cypraea cribraria. Two only.
Cypraea cruenta. One only.
Cypraea globosa. Fair number.
Cypraea sp. ? Four only (mantle greyish green).

LIST OF COWRIES FOUND AT MOMBASA.

Cypraea lurica.
Cypraea tigris. Many.
Cypraea reticulata.
Cypraea lynx.
Cypraea isabella.
Cypraea reticulata.
Cypraea carneola.

H.C.

THE BARBUS OF THE SUAM RIVER. I was posted to Kapenguria in August, 1943, and in the following October, in connection with district work, was able to walk along part of the Suam River. Having discovered that there were trout near Nairassi Rassa, the hillock marking the boundary between the Kitale and Kapenguria Districts, I took a rod with me. I caught some trout when camped on the boundary and know that they can be got down to a little below the junction of the Suam and Bukwa Rivers although, owing to the situation of my camps, I was unable to fish the actual junction pools.

After leaving the district boundary, I camped again after a walk of perhaps ten miles through hilly country. Here the natives told me that there were no trout; but it seemed worth while to give my rod an airing on the off-chance. I caught no trout but I did get barbus both at noon and in the evening, the latter being as usual, the better time. I used an ordinary wet fly, without shot, and had very good fun.

I found small flies more killing than big ones since the barbus took rather slowly. With a big fly I was apt to tighten up before the hook was really home. Once properly hooked the barbus went off with a good rush. Some broke surface a few times, but I never saw one jump. I did notice that if I touched one and missed him, he never came to me again, as trout so often will. The barbus fought hard for a time and then collapsed. I suppose that this is because they live in warmer water than trout which will often put up several last efforts, even after you begin to try to bring them to the net.

I wrote to Mr. Hugh Copley who replied that he was not aware that these fish would take a fly and asked me to secure specimens for the Museum. Many people in Kitale are, however, aware of this fact and there are pools near the junction of the Suam and Bukwa Rivers where trout and barbus overlap.

I was unable to visit the Suam again until February, 1944, when, during one evening in a suitable spot, I was able to collect some specimens for the Museum. There are similar fish in several other rivers in the area; but, owing to being transferred, I was unable to collect any in order to determine whether they are the same species or not.

I caught barbus up to about 1½ lbs.; but some fishermen in Kitale told me that they run to quite a bit more. My porters wolfed them down. I liked the flesh; but found that it was full of floating bones. I was told later that the fish should be soaked in vinegar, or crushed as fishcakes, fish-puddings, etc.

The fish lie in holes in rocks or under stones and come for the fly fairly hard. The Suam teems with them and might be all the better if more were taken out than are at present.

The colour of the fly did not appear to make much difference, possibly because there are so many fish that they just eat anything that comes their way. Over two days I changed flies frequently and, although I do not remember the exact details, I certainly took them on the following: Butcher, Alexandra, March Brown, Greenwell's Glory, Ogden's Invicta, Blue Doctor and Silver Doctor. I do not remember trying a fly which failed to kill. It is delightful water, so open that in many places you can really throw a fly either up- or down-stream. Shot would probably pay in some of the deeper pools. A spoon might be effective; but I have never used one and have no desire to do so.

This note may interest those who know something about fish and encourage someone to try a fly on our indigenous fish elsewhere.

R. G. DARROCH,
Nairobi.

AFRICAN HARRIER-HAWKS HUNTING WEAVER FLEDGLINGS.

When on the Gura River in July, 1944, I was interested to watch the behaviour of two African Harrier-hawks (*Gymnogenys typicus typicus*). These two birds flew downstream and looking for the pendant nests of weaver birds worked every tree in the valley. When one was found, the bird held on with its claws, its wings waving backwards and forwards to keep it in position. With its head it reached into the inside of the nest evidently on the hunt for fledglings. Not a nest was missed during the time that I watched the proceedings.

H.C.

PALE SPECIMEN OF YELLOW-VENTED BULBUL (*PYCNONOTUS TRICOLOR FAYI*). On August 11th, 1944, I was fortunate in being able to secure for the Museum a pale specimen of this common bird. It looked almost white when feeding with half a dozen normal specimens on the lawn. In the hand, however, the general colour has a very pale, brown tinge. The upper wing coverts are slightly deeper in tint and the upper breast and crown approach the normal colour. The forehead and chin are a medium sepia. The yellow patch from which the species derives its common name is of the usual tint and there are a few yellow feathers scattered around the base of the bill and on the lores. The iris was dark

brown, the legs dull brown. The bird is a female and the measurements in mm. are length 190; wing 91; tail 80; tarsus 25; culmen 15.

Jackson (Volume 2, page 852) mentions what must have been a similar aberration of *P. tricolor tricolor*.

J. RICHARD HUDSON,
Kabete.

NEST OF THE GREY-CAPPED WARBLER (*EMINIA LEPIDA*). In the dense bushes surrounding a wood of wattle at Kabete these warblers are common. The place often resounds with their singing and I know of no local bird that surpasses this species as a vocalist. Owing to its habit of hopping about inside the thickets and bushes it is usually its voice rather than its appearance that attracts attention.

During 1944, we located three nests all in the vicinity of this wood. Two were found at the end of April and one on May 10th. The three were identical in structure and were suspended from twigs in the shelter of creeper-clad bushes.

The nest itself is of the closed-in type with the entrance at the side and is rather similar to that of a sunbird, in fact until we saw a bird fly off we mistook the first for a sunbird's. The nest is built of strips of very thin dead bark, dry grass and small twigs, with a lining of fine fibre and sometimes the flowering heads of a plant, possibly a grass. As will be seen from the photograph, the loose pieces of bark-fibre left hanging from the outside give the nest an untidy appearance; but among the surrounding creepers they tend to camouflage it.

Of the three nests that we found this season, one was empty, one contained a single very pale, blue egg and the third a complete clutch of three eggs. These were also a very pale blue, although one had a few small, faint, brown speckles at the larger end. The sizes of the eggs in this clutch vary from 17.5×13 to 21×14 mm.

It is perhaps worth mentioning that, in so far as the Kabete birds are concerned, the name "Grey-capped *Swamp* Warbler" which is given to this species in Jackson, is a misnomer. I know of one pair that has lived and bred for several years in the garden of one of the Kabete houses at a considerable distance from any swamp or stream. Of the three nests mentioned above, the two which contained eggs were about two hundred yards from a small stream from which they were separated by a large wooded hill.

A. J. WILEY,
Kabete.

ELEPHANT DRIVING OFF LIONS. Mr. George Adamson, Game Ranger in the N.F.D., Kenya Colony, contributes a personal observation which shows that elephant with calves are very much on the alert when lion approach them. He writes as follows:—

"One afternoon in the Northern Mathews Range, I was following up three lions which had killed one of my pack donkeys. I put them up in fairly thick bush and they raced off, right into the middle of a small herd of cow elephant with calves. The elephant promptly started to scream and gave chase to the lions and when losing them they milled around looking for them until they got my wind, whereupon they charged me. According to native stories, lions sometimes do charge elephant calves."

ELEPHANT VERSUS LIONS. Two cases of lions endeavouring to kill young elephants have come to my notice within the last six months,

PLATE XXXIII.



Nest of the Grey-capped Warbler. (*Eminia lepida*).



both in Kenya, and I think that they are sufficiently interesting to be put on record:—

On the Athi near Kibwezi some six months ago two Indians were watching from a high vantage point a small herd of cow elephants with calves, when suddenly two lions from a donga pounced on a calf elephant. The calf screamed and this brought several cow elephants to its rescue; the lions made off, with two other lions still hiding in the donga.

The second case took place within five miles of the same locality:—

Natives heard screaming, trumpeting and crashing in the bush. They went to investigate in the morning and found the mangled remains of a lion; every bone in his body was crushed and broken and the whole place around the carcase had been trampled down by elephant.

C. G. MACARTHUR,
Assistant Game Warden.

1st April, 1945.

TORTOISES EATING BONES. If one is to believe the Natural History books, land tortoises live entirely on a vegetable diet, though it is mentioned that on occasion they will not despise slugs, earth worms and such-like soft animal food.

Their toothless jaws are sheathed with a horny beak which only just enables them to bite through the soft cellular structure of plants such as cabbage leaves, grass, etc., but they cannot cut through the more fibrous or woody parts.

The writer made a chance observation with the East African Leopard Tortoise [*Testudo pardalis* (Bell.)] which does, however, suggest an appetite for a much less herbivorous fare.

One day his tame tortoise found a small chickenbone, with not a scrap of meat left on it. The bone was twice as long as its head, but it proceeded to swallow it whole with every sign of enjoyment.

When some days later it came across a much larger bone which it nosed and pushed around longingly, the writer smashed the bone into jagged splinters, some to 1½ inches long; the tortoise swallowed them all greedily one by one, and since then it has been enjoying its daily ration of bone splinters and is thriving on them.

Possibly, in their wild state, land tortoises devour the shells of snails which are common everywhere, but the writer's tame tortoise will not touch them. It prefers splintered bones to anything besides the grass and the fleshy leaves of *Cissus rotundifolius* which form its ordinary fare.

Perhaps one of our readers has made similar observations to show that land tortoises are not the exclusive vegetarians they are made out to be?

P. R. O. BALLY.

11th April, 1945.

TEMMINCK'S STINT. The Editor regrets that in H. F. Stoneham's Occasional Note (17, 396) on the shooting of a specimen of *Calidris temminckii* at Lake Naivasha, the year was given as 1939 instead of 1936.

FURTHER RECORDS OF TEMMINCK'S STINT IN KENYA. With reference to H. F. Stoneham's note on this species (17, 396), it may interest readers to know that I have records of the species obtained at Lake Magadi, 1934, 1941, and 1942.

V. G. L. VAN SOMEREN.
The Sanctuary, Ngong.

REPORT ON THE FOURTH ANNUAL CONVERSAZIONE HELD
ON THE 27TH TO THE 30TH OCTOBER, 1944.

The opening evening on Friday the 27th was attended by 68 members of the Society and 138 guests. This is the largest number attending since the function was started.

In fact the hall was too crowded to be comfortable.

The visitors included His Excellency the Governor, many heads of Departments; His Worship the Mayor and Municipal Councillors and many others.

The attendance of the public totalled 428 during Saturday afternoon and Sunday whilst 537 school-children visited the exhibits on Saturday and Monday morning.

The following exhibits were displayed:—

Those put up by the Museum Staff:

1. The Prehistoric Site of Ologasailie with Dr. Leakey in charge.
2. Man's Place Among the Primates with Captain and Mrs. Trevor in charge.
3. A Demonstration on Mounting a Game Head with Ferruccio Meneghetti demonstrating.
4. The Classification of Rodents with Professor Toschi in charge.
5. Models of Native Traps.
6. The Classification of Butterflies and Moths, an Exhibit by R. Tenniel Evans.
7. An Exhibit of Arrow Poisons, by P. R. O. Bally.

Those put up by Government Departments:

8. The Economic Development of Graphite, Garnets, Soapstone and Talc, by the Mining and Geological Department.
9. Worm Diseases of Sheep, by the Veterinary Department.
10. Kenya Timbers, by the Forest Department.

Those put up by Members of the Society:

11. An Exhibit of Bird Photography by Dr. Vernon van Someren.
12. Reading the Age of Trout by Their Scales, by Dr. Vernon van Someren.
13. Paintings of Mount Kenya Flora, by Mrs. Joy Adamson.
14. Chalks, by Mr. Powell.
15. The Chemicals of Fire Extinguishers, by the Magadi Soda Company.
16. An Exhibition of Kenya Leather, by Bulley's Limited.

The Society held a guessing competition which yielded Shs. 163/02 and this was presented to the Red Cross.

On Saturday morning the scholars from six schools visited the exhibition whilst on Monday morning the scholars of five schools made a visit.

Owing to the absence of the Honorary Secretary the bulk of the work fell on Mr. Bally and the Society is most grateful for the excellent way he carried out his duties. Many other members and friends of the Museum gave willing help whilst Sir Charles Belcher provided a blaze of flowers to beautify the exhibition hall.

This year's exhibition was voted a great success.

H.C.

THE THIRTY-FOURTH ANNUAL REPORT OF THE EAST AFRICA
NATURAL HISTORY SOCIETY FOR THE YEAR 1944.

1. *Officers.*—The following members of the Society constituted the Executive Committee for the year 1944:—

R. Daubney, Esq., President and Chairman.
H. J. Allen-Turner, Esq., Vice-President.
Miss K. Attwood, Honorary Treasurer.
J. R. Hudson, Esq., Honorary Editor of the Journal.
Hugh Copley, Esq., Honorary Secretary.
Sir Charles Belcher.
Dr. L. S. B. Leakey.
Dr. D. G. MacInnes.
Dr. A. J. Jex-Blake.
F. B. Hannam, Esq.

The Executive Committee held twelve meetings during the year.

2. *Membership.*—During the year the following new members were elected to the Society:—

Institutional Members	...	...	...	2
Life Members	...	...	...	2
Junior Members	...	...	...	2
Complimentary Members	...	...	...	3
Ordinary Members	...	...	...	71
				—
			Total for 1944	80
				—

3. *Finance.*—The Honorary Treasurer has prepared the financial statement for the year, and this will be laid before the meeting in due course.

4. *Conversazione.*—The Fourth *Conversazione* of the Society was held in October. It proved a great success and was well-attended by the public. A short account will appear in the *Journal* if space can be made available.

5. *Library, Journal, and Publications.*—The Editor and the Executive Committee have been continually face to face with grave difficulties and long delays in the publication of the Society's *Journal*. Because of these delays, it has not been possible to issue more than one double number in 1944. Another double number, which was ready for press in August last, has not yet been printed. There is no dearth of good papers; in fact, the Editor has a considerable number of first-class manuscripts in hand, many more than he can deal with in the immediate future; but it is unlikely that the rate of publication can be accelerated in 1945. With the issue of the next number, the size and format of the *Journal* will be changed to a small quarto, which your Committee think is a handier and more appropriate form for a scientific publication.

A cumulative Index is already in the press to complete the period up to the last issue of the *Journal* in its present format.

The sale of brochures, reprints, etc., has been well-maintained, but has not reached the large volume of last year. Many of the brochures

are now going out of print and the Committee must consider the question of reprinting or replacing them by revised and improved editions.

The Society has recently been able to employ a bookbinder and an effort is being made to catch up with arrears of binding in the Library. A good deal of assistance in this connection has been provided by the Veterinary Research Laboratory.

6. *Obituary.*—By the death of Mr. A. J. Klein the Society has lost an old and valued member. Mr. Klein joined the Society in 1912, and at one time served as a member of the Executive Committee. He was always interested in the work of the Society and the Museum; and his own personal collection of mammal skulls, skins and collecting apparatus have been presented to the Museum by Mrs. Klein. As an addition to the study collection, they will no doubt prove of great value in the years to come.

7. *Conclusion.*—There is very little else to report. If the increase in membership is taken as the sole criterion of success, then the year has been a successful one; but if one considers the slow rate at which numbers of the *Journal* are being issued; then results are not nearly so good. The printing of the *Journal* is the greatest difficulty facing the officers of the Society, and this difficulty will remain with us until the war is over.

It will be gratifying to members of the Society to know that the Museum, under the capable direction of Dr. L. S. B. Leakey, has had another successful year. The Society takes the greatest interest in the activities of the Museum for the management of which it was long responsible. The progress of the Museum and the services that it provides for the Community have been recognised both by Government and the Municipality this year in the most practical form, that of an increase in their annual grants.

EAST AFRICA NATURAL HISTORY SOCIETY

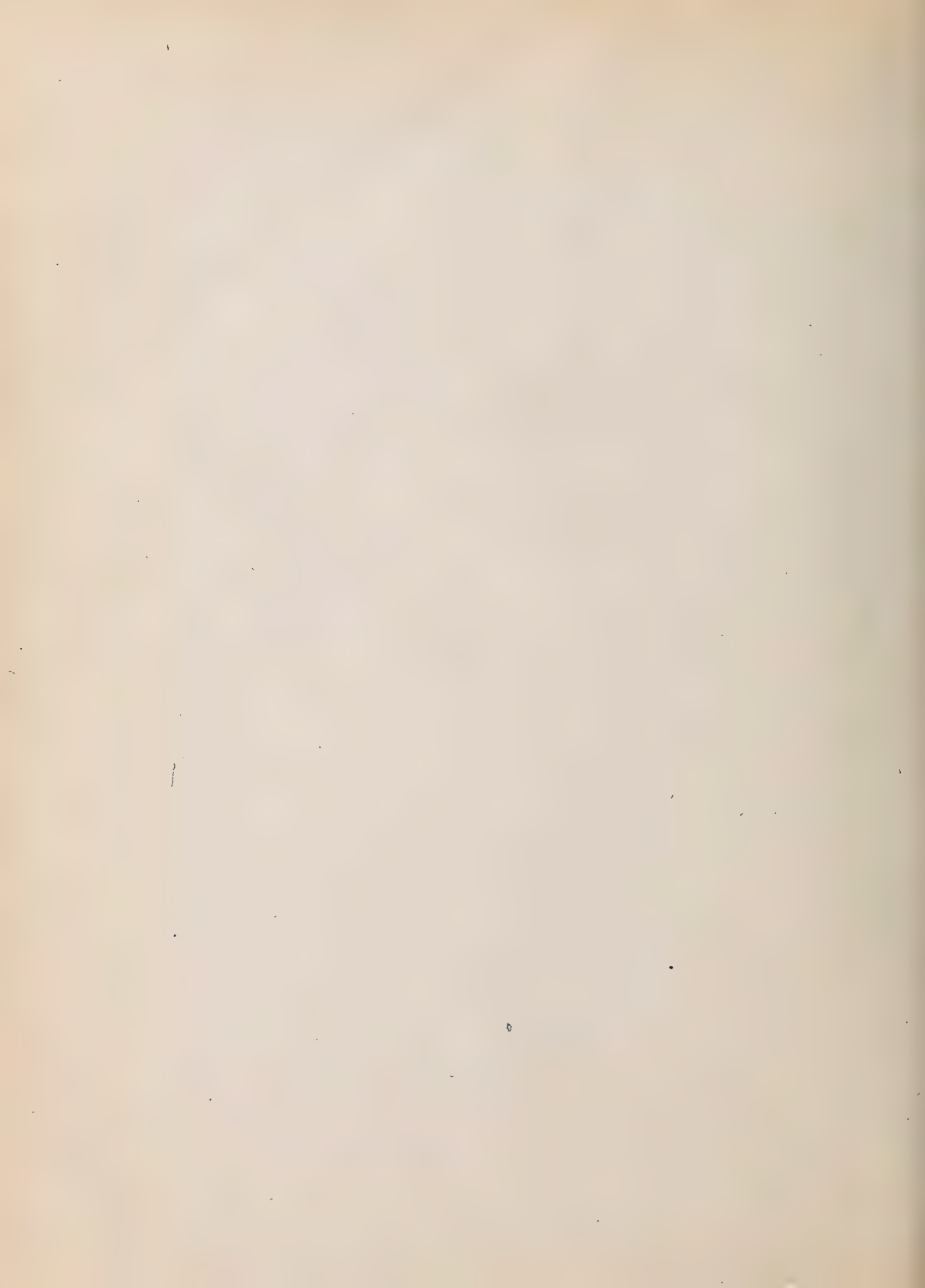
Comparative Cash Statement, 1943 and 1944

	1943.	1944.	1943.	1944.
To Balances:	Shs. cts.	Shs. cts.	Shs. cts.	Shs. cts.
Anthropological Fund	1,000 00	1,000 00	1,000 00	1,000 00
P.O. Savings Account	265 93	297 13	3,515 00	5,342 25
Cash at Bank	4,301 85	9,422 05	440 20	441 20
Cash in Hand	— —	89 70	973 35	271 50
Museums Trustees	2,000 00	2,000 00	(inc. above)	18 86
Subscriptions Paid into Bank	6,910 00	7,166 80	649 40	339 00
Sales of Reprints, etc.	1,350 40	680 05	— —	289 60
Donations	121 75	581 00	— —	6 65
Museums Trustees' Donation to Publishing of <i>Journal</i>	1,000 00	— —	— —	296 20
Conversazione, Door Takings	454 70	296 20	— —	— —
Interest on P.O. Savings Account	— —	32 00	— —	— —
Miscellaneous	134 70	— —	— —	— —
Shs. 17,539 33	21,564 93	Shs. 17,529 33	21,564 93	

	1943.	1944.	1943.	1944.
By Museums Trustees (under Agreement)	Shs. cts.	Shs. cts.	Shs. cts.	Shs. cts.
Subscriptions to Institutes	142 50	142 70	1,000 00	1,000 00
Publishing <i>Journal</i>	3,515 00	5,342 25	297 13	329 13
Postages	440 20	441 20	9,422 05	11,988 14
Miscellaneous Items	973 35	271 50	89 70	89 70
Bank Charges	— —	— —	— —	— —
Refund on Subscription	— —	— —	— —	— —
Purchase of Books	649 40	339 00	— —	— —
Bookbinder (Italian)	— —	289 60	— —	— —
Sundries	— —	6 65	— —	— —
Conversazione Takings (not recd.)	— —	296 20	— —	— —
Balances:	1,000 00	1,000 00	11,988 14	11,988 14
Anthropological Fund	— —	— —	296 20	296 20
P.O. Savings Account	— —	— —	— —	— —
Cash at Bank	— —	— —	— —	— —
Cash in Hand	— —	— —	— —	— —
Shs. 17,529 33	21,564 93	Shs. 17,529 33	21,564 93	

	1943.	1944.	1943.	1944.
Balance at Bank on 31st December, 1944	Shs. cts.	Shs. cts.	Shs. cts.	Shs. cts.
Balance at Bank on 31st December, 1944	11,988 14	11,988 14	11,988 14	11,988 14
Add: Amount Owed by Museum for Door Takings at Conversazione	— —	— —	— —	— —
Deduct: Cheques Not Presented:	12,284 34	12,284 34	12,284 34	12,284 34
C.I.C. (for Bookbinder)	64 25	64 25	64 25	64 25
Postages	30 00	30 00	30 00	30 00
C.M.S. Bookshop	62 85	62 85	62 85	62 85
E.A. Standard (<i>Journal</i>)	4,226 25	4,226 25	4,226 25	4,226 25
Other Debits:	— —	— —	— —	— —
Draft for South Africa (approx.)	155 50	155 50	155 50	155 50
C.I.C. (Bookbinder) November	100 50	100 50	100 50	100 50
C.I.C. (Bookbinder) December (approx.)	100 50	100 50	100 50	100 50
Net Balance Shs. 7,544 49 (approx.)	4,739 85	4,739 85	4,739 85	4,739 85

(Sd.) V. H. M. BLOOD,
Honorary Treasurer.



EAST AFRICA NATURAL HISTORY SOCIETY

PUBLICATIONS OF THE SOCIETY.

Copies of most of the back-numbers of the *Journal* can be supplied at prices varying from Shs. 2/- to Shs. 20/- per copy. Members of the Society are entitled to a 20% discount. Reprints of many of the articles that have appeared in the *Journal* are also available.

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by Dr. V. G. L. van Someren.

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From time to time the Society also publishes popular brochures dealing with various groups of animals or plants to enable those with no scientific knowledge of the subject to identify the various members of those groups in which they may be interested. These brochures may be obtained at the uniform price of Shs. 3/- per copy from

The Coryndon Memorial Museum,
Nairobi.

S. J. Moore's Bookshop,
Government Road, Nairobi.

The C.M.S. Bookshop,
Nairobi.

The East African Standard Ltd.,
Delamere Avenue, Nairobi.

or by post from the Honorary Secretary, East Africa Natural History Society,
P.O. Box 658, Nairobi.

The following brochures have been published:—

A SHORT ACCOUNT OF THE FRESHWATER FISHES OF KENYA,
by Hugh Copley.

A POPULAR GUIDE TO SOME OF THE FISHES OF THE CORAL REEF,
by Hugh Copley.

A FIELD GUIDE TO THE SCAVENGING BIRDS OF KENYA,
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EAST AFRICAN STAPELIAE,
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AN INTRODUCTION TO THE EPIPHYTIC ORCHIDS OF EAST AFRICA,
by W. M. and R. E. Moreau.

SOME COMMON BUTTERFLIES OF THE NAIROBI DISTRICT,
by A. J. Wiley and J. R. Hudson.

A GUIDE TO THE SNAKES OF THE NAIROBI DISTRICT,
by Arthur Loveridge.

Journal

OF THE

East Africa Natural History Society

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(MUSEUMS TRUSTEES OF KENYA)

June, 1946.

Vol. XIX

Nos. 1 & 2 (85 & 86)

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Journal of the East Africa Natural History Society

* JUNE 1946

VOL. XIX

Nos. 1 & 2 (85 & 86)

BIRD NOTES CHIEFLY FROM THE NORTHERN FRONTIER DISTRICT OF KENYA.

PART I.

By W. Tomlinson.

STRUTHIONIDÆ.

Struthio camelus massaicus Neum. Masai Ostrich.
Serengeti Plains ; Athi Plains.

Struthio camelus molybdophanes Reich. Somali Ostrich.
Isiolo ; Garba Tula ; Benane ; Habbaswein ; Merille.

In September and October birds very scattered ; singly, pairs and small lots. An Ostrich chick was captured near Habbaswein in early October and was then about the size of a goose on very sturdy legs. Subsequently it thrived in captivity and when last seen was about four feet high. In November and December Ostriches were often seen in large flocks ; one such near Isiolo numbered nearly a hundred individuals.

PODICIPIDÆ.

Poliocephalus ruficollis capensis (Salvadori). African Little Grebe.
River near Meru, April 2nd.

ARDEIDÆ.

Ardea cinerea cinerea Linn. Grey Heron.
Siolo River, late November ; Benane.

Ardea melanocephala Vigors & Child. Black-headed Heron.
Isiolo ; Garba Tula ; Marsabit (crater lake).

Bubulcus ibis (Linn.). Cattle Egret.
Mombasa.

Nycticorax nycticorax nycticorax (Linn.). Night Heron.
Benane.

Ardeirallus sturmii (Wagler). African Dwarf Bittern.
Siolo River, March 23rd.

A bird was driven up from the river bed and perched in a thorn tree. When again disturbed it flew into the top of another thorn. Flight was rather weak and irregular. Was absolutely silent.

* Date of Publication, January, 1947.

SCOPIDÆ.

Scopus umbretta bannermani C. Grant. Lesser Hammerkop.
Molo ; Benane ; Nanyuki.

Comparatively rare in the N.F.D., although fairly widespread along the Northern Uaso Nyiro and about Meru and Nanyuki. Many nests were found in trees over streams on the lower slopes of Mt. Kenya, in April. None were tenanted.

CICONIIDÆ.

Ciconia ciconia ciconia (Linn.). White Stork.
Isiolo, November 19th ; Merille, December 3rd ; Marsabit, December, 1940 ; Meru, April 2nd ; Eastern slopes of Mt. Kenya, April 10th, 1941.

Immense numbers were seen at Isiolo in November. At Merille, a fortnight later, Storks were moving north and at Marsabit they were common in December ; but uncommon in February. Great numbers were seen on the eastern slopes of Mt. Kenya in April.

Leptoptilus crumeniferus (Lesson). Marabou.
Nairobi ; Nanyuki ; Benane ; Merille ; Marsabit ; Meru ; Angata Kaisut ; North Horr ; Isiolo.

At North Horr in February, where vultures were conspicuous by their absence, the Marabou was fairly common. The largest concentration of the bird that I ever saw was south of Nairobi, when over 200 birds were seen in a small area resting on the ground and in nearby trees.

Ibis ibis (Linn.). Wood Ibis.
Kalacha, February 23rd.
Two birds were seen in a marsh following heavy rains.

ANATIDÆ.

Anas sparsa Eyton. African Black Duck.
Meru, common in April.

Alopochen aegyptiacus (Linn.). Egyptian Goose.
Kalacha, March 6th, in patches of swamp after rain.

SAGITTARIIDÆ.

Sagittarius serpentarius J. F. Miller. Secretary Bird.
Isiolo ; Benane ; Merille ; between Nanyuki and Meru.

AEGYPIIDÆ.

Gyps ruppellii erlangeri Salvadori. Abyssinian Griffon.
Isiolo ; Benane ; Merille ; Gamra ; Angata Kaisut ; Marsabit.

Some birds, like some people, sit back and have a good time during war, and the Vultures had a rare time of it during the East African campaign. I found all species of vultures common throughout the N.F.D. They concentrated around field butcheries, big military camps, etc., where there was plenty to eat. At Merille we killed a sheep and, having extracted what we required, bundled the offal into a metal incinerator hidden underneath a tall and particularly dense Acacia tree. The contents of the incinerator were fired with petrol and left to burn out. In the meantime the local Kites, Ravens and Cape Rooks had been watching our movements and, as soon as we left the incinerator, there was a general move by them to the

tree to see what was doing. In no time at all there were close on a hundred of them together. A few minutes later there was several Hooded Vultures and a single Egyptian Vulture on the scene, eyeing the smoke somewhat dismally from a nearby tree. A little later as I watched them, there was a series of rocket-like "whizzes" and a pair of Abyssinian Griffons came down at terrific speed, followed by several White-backed Griffons. Apparently they sensed that some mistake had been made for they cleared off almost immediately.

On another occasion, at Benane, where we had an isolated camp deep in the thorn bush, a hyaena was trapped and shot and the carcass was laid down under some thorn trees so as to be invisible from the air. Now, at Benane there were exceptionally few scavenger birds. Kites and Ravens were seldom seen. The first day no vultures appeared at all. The only birds that seemed interested in the kill at all, were a flock of Somali Helmet Shrikes. I inspected the carcass several times that day and always, as I approached, there were birds perched either on it or on the branches nearby. They seemed to be feeding off ants and other insects that abounded on the body. The Helmet Shrikes were extremely excitable uttering loud "chow-chow" calls and withdrawing as I approached, only to return as soon as my back was turned.

The second day, in the early morning, there was a flock of twelve Red-billed Ox-peckers on the scene, pecking about the torn flesh on the head where the bullet had emerged. The Helmet Shrikes still hung about on the surrounding trees and bushes; but did not, as far as I could tell, approach the carcass. In the early afternoon the first Vultures arrived, mainly Hooded Vultures and Abyssinian Griffons; but they appeared to be suspicious of a trap, for except for a few tentative snaps at the now stinking carcass, they left it severely alone, retiring to the tree-tops. So I had to bury the body. The interesting point, I think, is that here undoubtedly it was the Helmet Shrikes and the Ox-peckers that showed the Vultures where the carcass lay.

Vultures were practically absent from the Karoli Desert, particularly North Horr, where the principal scavenger was the Dwarf Raven. On the other hand, in the lava to the east around Gamra and the Huri Hills, Vultures were extraordinarily numerous, perhaps because the lava plains there were frequented by camel caravans, in which, judging by the number of dead camels that I saw, the mortality was high. By contrast, a dead camel in a very "high" state was found in the Karoli untouched and not a bird was in sight!

The Hooded Vulture was the most common species, with the Abyssinian Griffon, the White-backed Griffon, the White-headed Vulture, the Northern Lappet-eared Vulture and the Egyptian Vulture next in order of commonness.

Pseudogyps africanus (Salvadori). White-backed Griffon.
Isiolo; Benane; Habbaswein; Merille; Gamra; Marsabit; Laisamis.

Torgos tracheliotus nubicus (H. Smith). Northern Lappet-eared Vulture.
Isiolo; Siolo River; Benane; Merille; Gamra.

Trigonoceps occipitalis (Burchell). White-headed Vulture.
Siolo River; Benane; Merille; Marsabit; Gamra; Laisamis.

Neophron percnopterus percnopterus (Linn.). Egyptian Vulture.
Merille; Isiolo; Habbaswein.

The Egyptian Vulture was uncommon; but several haunted a *Manyatta* near our camp at Merille. They were so gorged that when chased they hopped and leapt amongst the low, hide huts, hardly attempting to rise.

Necrosyrtes monachus pileatus (Burchell).

Hooded Vulture.

Very common everywhere, occurring from the forests of Meru and the Jombeni Mountains to the lava plains of Gamra. Immense concentrations of this Vulture, with a few of the others and often many Marabou, used to occur in three most ghastly spots. One of these was on a burning hot, lava plain south of the Siolo River not far from its junction with the N. Uaso Nyiro : another was on a lava plain at Laisamis : the third on the lava escarpment near Gamra. On the hottest days, when the rocks were blazing with heat, hundreds of birds used to collect and listlessly lie about, the Marabou squatting on their hocks.

One Hooded Vulture was found so gorged on the road between Isiolo and Benane that it refused to move, so we jumped out of the car and lifted it out of the way by its primaries, plucking one or two for helmet decorations.

FALCONIDÆ.

Falco tinnunculus tinnunculus Linn.

European Kestrel.

Between November and March, European Kestrels were seen around Isiolo, Nanyuki and Siolo River. On March 21st, at Isiolo, a mass movement occurred. There was a long straggling wave of Kestrels about a mile wide and many miles deep. Unfortunately it was dusk and I could not say whether it was this species or not. Thousands of birds passed over, flying in an easterly direction.

Falco naumanni naumanni Fleisch.

Western Lesser Kestrel.

This bird was common near Merille in January ; a flock of about thirty individuals was seen at Laisamis at the end of that month. On April 8th, a large flock was seen at 7,000 ft. on the eastern slopes of Mt. Kenya, steadily moving northwards. Next day they had disappeared.

Poliohierax semitorquatus castanotus (Heuglin).

Abyssinian Pigmy Falcon.

Benane, a single bird seen December, 1940 ; another individual at Merille in January.

Milvus migrans parasitus (Daudin).

African Kite.

Generally distributed. At Kalacha and the surrounding lava country this race was common in February and March. By comparison, at North Horr it was rare.

Elanus cæruleus cæruleus (Desfont).

Black-shouldered Kite.

Nanyuki, April ; Thika, April ; Mombasa, May.

I did not see this bird in the thorn bush of the N.F.D.

Aquila rapax raptor A. E. Brehm.

Abyssinian Tawny Eagle.

Isiolo ; Merille.

One of a pair, shot on March 12th at Merille, was attacked by a Goshawk whilst perched on an exposed tree stump, the Eagle taking no notice save to snap at the Goshawk with its beak as it passed overhead.

Aquila wahlbergi Sundev.

Wahlberg's Eagle.

Merille.

Lophaëtus occipitalis (Daudin).

Long-crested Hawk-eagle.

Meru.

This bird was common at Meru, haunting river-valleys, presumably looking for the pretty striped rats that live there. One was seen perched on a dead tree eating a trout !

Terathopius ecaudatus (Daudin). Bateleur.

Isiolo ; Garba Tula ; Benane ; Habbaswein ; Merille ; Laisamis.

Well-distributed throughout most of the N.F.D. ; but none seen north of Marsabit.

Buteo buteo vulpinus (Gloger). Steppe Buzzard.

At about 4,000 ft. on Marsabit Mt. an adult bird was shot on March 16th with a .303. It was perched in the topmost branches of a tall forest tree by a stream.

Buteo rufofuscus augur Ruppell. Augur Buzzard.

Marsabit ; Meru ; Nanyuki.

Common in forested areas above 4,000 ft., haunting on Marsabit the lower fringes of the forest near the village. Call suggests Sea-eagle : appearance Bateleur. Said to have nested in Marsabit in February.

Astur tachiro sparsimfasciatus Reich. East African Goshawk.

Siolo River.

I was able to get close, and so identify, a bird resting in the branches of a tree on the banks of the Siolo River.

Melierax poliopterus Cabanis. East African Chanting Goshawk.

30 miles east of Marsabit ; Benane ; Merille ; North Horr.

Probably all seen were of this species. Goshawks were common at Merille in late December and January and must have caused havoc amongst the Weavers. One was seen in January with a fledgling drongo in its talons.

Melierax gaber (Daudin). Gaber Goshawk.

Benane ; Merille ; Marsabit ; Isiolo.

At Merille in January, several resident and roosting in trees in our camp, were seen with fledglings in their claws. This bird is crepuscular in its habits and, at Merille on moonlit nights, was seen fighting about long after sunset, whirling round and round very fast as if pursuing bats.

Gymnogenys typicus typicus (A. Smith). African Harrier Hawk.

Nanyuki. A single immature adult was seen in forest by a stream at 7,000 feet, perched on a low branch of a tree against the bole. On my throwing a bit of stone at it, the bird fell in fright through the branches almost into the water before it recovered and flighted away. The owl-like effect on a frontal view was most striking.

PHASIANIDÆ.

Francolinus sephæna grantii Hartlaub. Colonel Grant's Crested Francolin.

Merille ; one bird shot. Fairly common in dense cover by river-bed.

Francolinus africanus uluensis O. Grant. Kenya Grey-wing Francolin.

Siolo River, March 2nd, covey of four.

Pternistis leucoscepus infuscatus Cabanis. Kenya Yellow-throated Francolin.

Kinjanga (Jombeni Mts.) ; Siolo River ; Merille ; North Horr.

I was rather surprised to find these birds in fine condition at North Horr in February. They lived in a drying stream-bed in bush east of the oasis, and were shy and wild.

- Numida mitrata reichenowi* O. Grant. E. African Helmet Guinea-fowl.
Meru ; Isiolo.
A flock of 50 birds seen near Meru in May.
- Numida meleagris macroceras* Erlanger. Baringo Tufted Guinea-fowl.
Near Benane ; Meru.
- Acryllium vulturinum* (Hardwicke). Vulturine Guinea-fowl.
Benane ; North Horr.
Common at Benane in December. One female was shot in breeding condition at North Horr. Vast flocks occurred in February in dense thorn bush east of the oasis and gave fine sport with little risk to the birds which were very wild.

RALLIDÆ.

- Porzana pusilla obscura* Neum. African Spotted Crake.
Benane, November.
In swampy country at Benane. This bird led me a merry dance for a long time until I managed to find one under a bush at a range of a few feet, when I was able to identify it for certain. A great runner, and very shy, it is probably commoner than appears.

OTIDÆ.

- Choriotis kori struthiunculus* (Neum.). Northern Kori Bustard.
Isiolo ; west of Benane ; Matthews Range.
Many of these game birds, called by the South Africans "Peacocks," passed through my hands, having been shot by men on the road. I never killed one myself, although I once stalked one through scattered bush on the lower slopes of the Matthews Range. It ran so quickly, using every patch of cover, that I could never get near it. Flocks usually ran obliquely when pursued and, when forced to take to the air, flew 150 to 200 yards before stopping and running again. Alarm call is a snoring note audible about 100 yards away. Often found sheltering from the mid-day sun under thorn trees. Average weight of birds handled did not run to more than 20 lbs.

- Eupodotis canicollis somaliensis* (Erlanger). Somali White-bellied Florican.
Garba Tula. One, killed with a catapult west of Garba Tula, seemed reluctant to take to the wing, preferring to run.
- Lophotis gindiana gindiana* (Oustalet). Buff-crested Florican.
Benane ; Merille ; Angata Kaisut.
Common in bush-veld. One was shot at Merille in January. Seen displaying in evening at Benane, one shot up like a rocket to a height of about 5 feet, dropping like a stone, its wings closed. On being touched, the bird ran fast and finally flew up, dipping for cover. In the Kaisut, south of Marsabit, very noisy and active following heavy rain in March. Flight is very strong.

CHARADRIIDÆ.

- Charadrius hiaticula tundræ* (Lowe). Siberian Ringed Plover.
Benane, common in November.
- Charadrius dubius curonicus* Gmelin. Little Ringed Plover.
North Horr, a few by a desert pool in February.

Charadrius tricollaris tricollaris Vieillot. Three-banded Plover.

Benane, November ; North Horr, a few by a desert pool, February 18th, 1941.

Stephanibyx coronatus coronatus (Boddaert). Crowned Lapwing.

Isiolo ; Garba Tula ; Benane ; Habbaswein ; Merille ; Kalacha ; 20 miles north of Marsabit ; Thika.

Sometimes in pairs, as at Merille in December and January ; more often in scattered parties. Noisy on moonlit nights.

Stephanibyx melanopterus minor Zedlitz. Lesser Black-winged Plover.

A flock of about a dozen birds seen on plains near Nanyuki.

Hoplopterus spinosus (Linn.). Spur-Winged Plover.

North Horr ; Kalacha.

Haunted oasis pools at North Horr and Kalacha in February and March. Not shy and mainly in lots of 3 to 4 birds.

Sarciophorus tectus latifrons Reich. Smaller Blackhead Plover.

Isiolo ; Benane ; Merille ; Habbaswein.

In small lots in open country and in pairs at Merille in January. A common habit is for one bird to squat, whilst the other moves round and round in small circles calling vigorously.

Himantopus himantopus (Linn.). Stilt.

Benane, common in November, singly and in pairs by shallow river pools.

SCOLOPACIDÆ.

Calidris minuta (Leisler). Little Stilt.

North Horr, February 18th, 1941, flock of about 20 birds by a pool.

Actitis hypoleucos (Linn.). Common Sandpiper.

Archer's Post, December ; Benane, November ; North Horr, February ; Meru April 3rd, 1941.

Tringa ochropus Linn. Green Sandpiper.

Benane, November, rare and very wild.

Tringa nebularia (Gunnerus). Greenshank.

Benane, November.

Tringa glareola Linn. Wood Sandpiper.

Marsabit Crater Lake, February ; Meru, April 2nd, 1941.

GLAREOLIDÆ.

Rhinoptilus cinctus cinctus (Heuglin). Heuglin's Courser.

Isiolo ; Benane.

This bird was common at both Isiolo and Benane between November and March. It likes rocky country with fairly thick bush. At Benane one allowed me to approach to within a foot or so, and seemed dazed by the sunlight as I kept edging into the shade. When I circled the bird it pivoted round on its feet with quick jerks, always keeping broadside on to me. It is adept at keeping still and crouching amongst the rocks. The call is two-noted, rasping and plover-like.

BURHINIDÆ.

- Burhinus capensis maculosus* (Temminck). Senegal Dikkop.
 Isiolo ; Merille ; Benane.
 Common. A young fledgling was picked up by a dry stream at Merille in December.

LARIDÆ.

- Larus hemprichii* Bruch. Sooty Gull.
 Mombasa.

PTEROCLIDÆ.

- Pterocles exustus somalicus* Hartert. Somaliland Pin-tailed Sandgrouse.
 Merille ; Isiolo ; Gamra ; North Horr.
 February 16th-20th, at North Horr, I saw thousands of Sand-grouse fighting in from the desert to drink at a desert pool some way from the wells. The birds came in from the north-west at 9 a.m., flying at about 500 feet in closely-bunched but distinct flocks, calling loudly as they flew over. One morning I hid in a patch of scrub some way from the pool and watched as the birds arrived. They lost altitude gradually as they drew near, wheeled once over the pool and then dropped like stones to the shallow water, into which many birds waded. In five minutes there were thousands. They did not stay long ; but drank quickly and took wing, wheeling once again and flying away eastwards at about 400 feet. I recognized this Pin-tailed Grouse, which was the commonest one, and in smaller numbers the Pale Black-faced Sand-grouse.

Next night there was a rain-storm and the desert seemed to be a vast flood for miles around. Consequently the Sand-grouse did not arrive the next day to drink, nor did I see any more of these mass movements before I left North Horr a few days later.

The Pin-tailed was surprisingly common on the lava plateau above Gamra. At Merille flocks of thirty or so were often seen.

- Pterocles decoratus ellenbecki* Erlanger. Pale Black-faced Sand-grouse.
 Benane ; North Horr. Common in pairs at Benane in November.

- Pterocles lichtensteinii sukensis* Neumann. Suk Sand-grouse.
 Merille ; Marsabit.

Several of these birds were killed by me on the road through their habit of crouching in the dust and rising too late to get out of the way of the truck. At Merille in pairs. Common around Marsabit where numbers used to drink at a pool near the village at dusk.

COLUMBIDÆ.

- Columba guinea guinea* Linn. Speckled Pigeon.
 Merille ; Laisamis ; Meru.

Extremely common in doum palms by river bed at Merille and in fine condition. In pairs in late January and February. Launching itself from a high perch, the bird would beat its wings noisily once, then glide 25 yards or so, another beat, and so on until it reached its objective.

- Columba arquatrix arquatrix* Temminck and Knip. Olive Pigeon.
 Marsabit ; Meru

Streptopelia semitorquata semitorquata Rüppell. Red-eyed Dove.
Merille ; Meru ; Nanyuki ; Isiolo ; Thika.
Breeding at Merille in January. Widely distributed.

Streptopelia decipiens perspicillata (Fisch. and Reich.). Masai Mourning Dove.
Isiolo ; Benane ; Merille ; Habbaswein ; Kalacha ; North Horr.

Common throughout the arid thorn scrub, particularly around Benane and Merille. Breeding at Merille in January. A male tried to draw me from the nest by the plover trick of running along the ground, trailing a wing and limping. Finally a Sparrow-weaver, which had been watching, jumped on the Dove as it passed below and forced it from the ground. The call is curious, sometimes like a snarl rather than a chuckle. At North Horr this bird drank in some numbers at the oasis pool about 10 o'clock in the morning.

Streptopelia capicola somalica (Erlanger). South Somali Ring-necked Dove.

Isiolo ; Benane ; Merille ; Meru ; North Horr ; Kalacha ; Habbaswein.
Common in thorn-bush. Vast numbers used to drink at river pools at Benane, mostly in the morning. At Merille in January this bird was seen creeping about in pairs below dense bush.

Stigmatopelia senegalensis aequatorialis (Erlanger). Cape Laughing Dove.
Isiolo ; Benane ; Merille ; Marsabit ; Laisamis ; Meru.

Oena capensis (Linn.). Namaqua Dove.
Isiolo ; Benane ; Habbaswein ; Merille ; Kalacha ; North Horr.
Very common at Benane, drinking in the river there with *S. capicola*.

Tympanistria tympanistria fraseri Bonaparte. Tambourine Dove.
Siolo River ; Merille ; Marsabit ; Meru ; Nanyuki.

Turtur chalcospilos chalcospilos (Wagler). Emerald-spotted Wood-Dove.
Isiolo ; Merille ; Meru ; Marsabit ; Benane ; North Horr ; Habbaswein.

Aplopelia larvata larvata Temminck and Knip. Lemon Dove.
Marsabit ; Meru.

CUCULIDÆ.

Cuculus solitarius Stephens. Red-chested Cuckoo.
Numbers passed through Merille in late December when it was very noisy. Not seen or heard later.

Clamator jacobinus jacobinus (Boddært). Black-and-White Cuckoo.

Isiolo, November ; Benane, December 6th, 1940 ; Merille, February 2nd, 1941.
Common at Isiolo in November ; but then disappeared. The one or two seen at Benane in open, sparsely-treed country, were shy and difficult to approach. One seen mobbed by Weavers, also at Benane. A single immature bird seen in February in interesting circumstances. It was first with a party of Rufous Chatterers, individuals of which it constantly approached with beak agape and fluttering wings as through demanding food. The Chatterers always repulsed it with wing-flicks. Next day the party was seen again : this time the Chatterers gave the Cuckoo a bad time by diving into dense thorn thicket where it could not follow, so that it was reduced to perching on top to wait until they emerged. The immature bird had a whitish bill and feet and was only slightly glossed above, the throat being greyish.

- Chrysococcyx cupreus intermedius* Hartlaub. Emerald Cuckoo.
Meru, in lower forest in April.
- Lampromorpha caprius* Boddært. Didric Cuckoo.
Isiolo ; Benane ; Siolo River.
Widely distributed. At Dar-es-Salaam a fledgling cuckoo was observed being fed by several female Spot-backed Weavers.
- Lampromorpha klaasi* (Stephens). Klaas's Cuckoo.
Nanyuki, April ; not noticed in the N.F.D.
- Centropus monachus monachus* Rüppell. Blue-headed Coucal.
Archer's Post ; on reed beds along N. Uaso Nyiro ; Meru.
- Centropus superciliosus superciliosus* Hemp. & Ehrenb. White-browed Coucal.
Isiolo ; Thika ; Nairobi ; Mombasa ; Jombeni Mts. ; Meru ; Marsabit.
- Ceuthmochares aereus australis* Sharpe. South African Green Coucal.
A single bird was seen in a tree outside Mombasa on May 25th.

MUSOPHAGIDÆ.

- Turacus hartlaubi* (Fisch. and Reich.). Hartlaub's Lourie.
Nanyuki ; Mana (Jombeni Mts.).
- Corythaixoides leucogaster* (Rüppell). White-bellied Goaway Bird.
Isiolo ; Siolo River ; Benane ; Garba Tula ; Merille ; Habbaswein ; Laisamis.
The largest number of birds seen together was seen near Merille. One bird on the Siolo River imitated perfectly the bark of a dog.

PSITTACIDÆ.

- Poicephalus gulielmi massaicus* Fisch. & Reich. Masai Red-headed Parrot.
Nanyuki. Common in April, in small lots.
- Poicephalus rufiventris rufiventris* (Rüppell). Red-bellied Parrot.
Benane ; Merille. Uncommon at the former, very common in doum palms at the latter.

CORACIIDÆ.

- Coracias garrulus garrulus* Linn. European Roller.
Isiolo, November 15th ; Benane, November 20th ; Merille.
Great numbers seen, particularly at Benane, where the bush was full of them on their way south in late November.
- Coracias caudatus caudatus* Linn. Moselikatse's Roller.
Nanyuki ; Siolo River ; Merille.
I think that this race and the next *C. caudatus lorti*, occurred side by side at Merille.
- Coracias caudatus lorti* Shelley. Pink-throated Roller.
Angata Kaisut ; Merille.
There seemed to be a big influx of Rollers of this race to Merille in January and February. The call is particularly harsh. Another call, possibly from hen to cock, was a thin, high and very plaintive whistle and two seen later appeared to be mating.

Coracias naevius naevius Daudin. Rufous-crowned Roller.

Merille ; Benane.

Somewhat rare, a quieter bird than the rest. One seen performing aerobatics at Merille on December 30th.

Eurystomus afer suahelicus Neumann. East African Broad-billed Roller.

I have a doubtful record of three of these birds perched on a dead tree in the wilderness near Laisamis in late December. I know this race well from Zanzibar.

ALCEDINIDÆ.

Ceryle rudis rudis (Linn.). Pied Kingfisher.

Sixty miles north of Mombasa ; none seen along N. Uaso Nyiro River.

Megaceryle maxima maxima (Pallas). African Giant Kingfisher.

Meru, where common in the lower forests.

Corythornis cristata cristata (Pallas). Malachite Kingfisher.

Meru ; Merille, one bird at a water-hole in river-bed.

Ispidina picta picta (Boddært). Pigmy Kingfisher.

Meru, one bird seen by a stream in the lower forests.

Halcyon senegaloides A. Smith. Mangrove Kingfisher.

Mombasa.

Halcyon albiventris orientalis Peters. East African Brown-hooded Kingfisher.

Meru, in lower forests ; Mombasa.

Halcyon leucocephala leucocephala (P. L. S. Müller). Grey-headed Kingfisher.

Merille ; Siolo River ; Thika.

This Kingfisher, with its high chattering note,* was particularly common at Merille. One bird on the Siolo River was violently mobbed by great numbers of sunbirds.

Halcyon cheliculi cheliculi (Stanley). Striped Kingfisher.

Isiolo ; Mombasa ; Thika.

Fairly common round Isiolo ; but scarce deeper in the N.F.D.

MEROPIDÆ.

Merops apiaster Linn. European Bee-eater.

Isiolo, November 20th and March 21st. In each case the migrating flock consisted of about 50 individuals.

Merops superciliosus Linn. Madagascar Bee-eater.

Mana (Jombeni Mts.), April 6th, 1941 ; Mombasa, May.

A flock of a hundred birds seen at Mana, settled on trees for some time and then flew towards the Tana Valley. Common at Mombasa in May.

*The description of the note makes it sound like a subspecies of *H. senegalensis*.—*Editor*.

Merops nubicus nubicus Gmelin. Nubian Carmine Bee-eater.

Merille, a party of half-a-dozen or so hung about the trees by the river-bed in January. They foraged with a large flock of Wattled Starlings for a few days and then disappeared.

Aerops albicollis major Parrot. Eastern White-throated Bee-eater.

Isiolo, November; North Horr, February 23rd.

I was surprised to meet with this bird in dense bush country east of North Horr. Birds were numerous; but obviously on the move for they were gone next day.

Melittophagus pusillus cyanostictus (Cabanis). East Coast Little Bee-eater.

Isiolo; Merille; Meru; Mana (Jombeni Mts.); Siolo River.

Common in October at Isiolo; but disappeared afterwards. On the Siolo River on March 23rd, it was numerous and many immature birds were seen. The alarm call is short and metallic; but in March a liquid trill was heard persistently.

Melittophagus lafresnayii oreobates Sharpe. Elgon Cinnamon-chested Bee-eater.

Meru; Nanyuki; Jombeni Mts.

Common at altitudes of 5,000 feet and over, particularly at Meru and Jombeni Mts. in April.

Melittophagus revoilii (Oustalet). Somali Bee-eater.

Benane; Merille; Angata Kaisut; North Horr.

Widely distributed in arid bush. A charming bird. In pairs at Merille in January, otherwise in straggled parties up to about a dozen strong. Noisy in late January and February. Song loud and clear, a joyous trill in descending tones, something like "Twee-tee --- twee-tee --- twee-tee --- twee-tee," and quite distinct from other bee-eater songs. Occurs in deserts provided there is a patch of scrub for it to perch on, and several times seen in the Kaisut. Common and noisy at North Horr in February.

BUCEROTIDÆ.

Bycanistes cristatus (Rüppell). Silvery-cheeked Hornbill.

Meru, following heavy rain on April 9th, lots of five or six of these great birds were seen descending towards the lower forests, feeding en route.

Lophoceros erythrorhynchus erythrorhynchus (Temminck). Red-beaked Hornbill.

Isiolo; Benane; Merille; Wajir; Habbaswein.

Lophoceros flavirostris (Rüppell). Yellow-beaked Hornbill.

Benane; Garba Tula; Habbaswein; Merille; Laisamis.

Lophoceros deckeni (Cabanis). Von der Decken's Hornbill.

Isiolo; Garba Tula; Benane; Merille; Habbaswein.

These three species were common throughout the N.F.D.; but particularly so at Benane. The country there was ideal for them, dense thorn-bush, rocks, intense heat, they seemed to thrive on it and were extremely noisy.

Lophoceros melanoleucus geloensis Neumann. Gelo River Crowned Hornbill.

Definitely seen at Meru many times and I think also seen at Benane in park-like country by the river there, although the birds I saw may have been strays from the Tana Valley.

UPUPIDÆ.

Upupa epops somaliensis Salvin.

Somali Hoopoe.

Merille ; Laisamis.

Common at Merille and surrounding districts between December and February in open, well-treed, acacia country.

Upupa africana Beckstein.

South African Hoopoe.

Isiolo ; Benane ; Merille.

Individuals frequently seen. A flock of about twenty birds seen near Merille in late January.

PHÆNICULIDÆ.

Phœniculus purpureus marwitzi (Reichenow).

East African Kakelaar.

Mombasa, in pairs and I think breeding in May.

Phœniculus damarensis granti (Neumann).

Ukamba Kakelaar.

Isiolo ; Merille ; Laisamis ; Habbaswein ; Benane.

Seen singly and in parties of four to eight. Very common in doum palm country around Merille. Immature birds with shorter tails than their parents seen at Merille in January. Their beaks also were hardly curved, short and of a dull leaden colour, and their plumage lacked gloss.

Rhinopomastus cyanomelas schalowi Neumann.

East African Scimitar-bill.

Merille, seen only twice, on both occasions in pairs. It has a chattering call similar to the Kakelaar's.

Rhinopomastus minor cabanisi (Defilippi).

Cabanis' Scimitar-bill.

Isiolo ; Merille ; Laisamis.

Locally common in acacia country, in which trees it likes to search for insects like a tit, hanging in all sorts of positions. At Isiolo it was common in November in pairs. At Merille it was nesting in December and January, one site found being a narrow cleft in the bole of an acacia about fifteen feet from the ground. Obviously there were nestlings inside, this was early January, for the parent birds were busy taking up insects. The following records refer to this nest :—

January 14th.—Two fledglings with parents, the young birds perched close together on a branch uttering constant thin little piping hunger-calls that rose to a crescendo whenever the parents approached. Their bills were straight, very short and dusky in colour. Plumage had practically no gloss, being deep dusky with some white on the tail feathers and some white streaking on the abdomen and belly. Both young birds essayed flight ; but one was weak and they seemed to experience trouble when alighting, wobbling about and having to use their wings to maintain their balance. Tails were naturally shorter than those of their parents and the graduated form was not at all clear.

January 15th.—One of the young was taken by a Goshawk. Parents uttered loud calls of distress for some time ; but soon forgot and were feeding the other youngster.

January 20th.—Immature bird more confident ; but still being fed by its parents and making no attempt to feed itself. Bill a little paler dusky, a little longer ; but with only a very slight curve. It looks very brittle and fragile and needle-pointed. Tail about normal in length.

January 26th.—Bill slightly longer, with increased curve, pale pink towards the tip and dusky flesh at the base ; but still with same needle-pointed, brittle appearance. Tail showing graduations and all white disappeared. Definite signs of gloss showing. Very voracious and still being fed by its parents.

January 31st.—Young bird feeding itself tentatively ; but using its bill very awkwardly. Once I noticed it peck something out of a crevice and then cock up its head in an attempt to swallow it by sliding it down the gape ; but the something, after a few futile snaps, dropped out.

February 7th.—In plumage almost identical with parents ; bill quite pinkish, still quite brittle-looking, but length and curve apparently as that of parents. Attempting to feed itself ; but still accepting food from parent birds.

The shape of the bill in this bird would seem to be designed for picking up insects inside holes and crevices in trees. Many times at Merille, I watched birds insert their heads and necks in a hole and peck at something inside. The call of this race is very attractive, a low, musical, trilled note uttered both on the wing and when scrambling about in trees.

TYTONIDÆ.

Tyto alba affinis (Blyth).
Mombasa.

African Barn-Owl.

STRIGIDÆ.

Glaucidium perlatum (Vieillot).

Pearl-spotted Owl.

Isiolo ; Merille.

Particularly common and noisy at Merille, its loud whistling notes being heard day and night. I saw a curious little owlet that must have been this, possibly immature, in the daytime. At first the bird, perched on a dead tree, seemed to have its head towards me. Suddenly as I watched it through the binoculars at close range, it turned its head and presented its real face to me. It was truly astonishing how the markings on the rear crown and nape so closely correspond to its true facial aspect. The whitish eyebrows were there, also dark spots below for the wide, irised eyes, and a strip of white feathers between representing a perfect beak. I noticed in this particular bird a habit of shivering its tail in a sideways motion when resting. Often seen mobbed, particularly by Bulbuls and Weavers.

Bubo africanus cimerascens Guér.-Mén.

Abyssinian Spotted Eagle-Owl.

North Horr, February 22nd, 1941.

A single bird seen perched low in a tree by a sluggish stream east of the oasis of North Horr, after being flushed from dense bush. It appeared completely dazed by the brilliant sun and was promptly mobbed by Dwarf Ravens.

Bubo lacteus (Temminck).

Verreaux's Eagle-Owl.

Isiolo ; Merille.

A pair of these great birds haunted our camp at Isiolo, with their headquarters in some tall acacias. As I slept in the open, they often woke me at night with their deep calls and fleeting shadows under the moon. At Merille I saw this species many times in tall riverside timber : it was never difficult to approach.

CAPRIMULGIDÆ.

Caprimulgus rufigena frenatus Salv.

Kenya Rufous-cheeked Nightjar.

Isiolo.

Many Nightjars were seen in Kenya, but few classified. One of this species was killed through dashing into my truck at night.

Caprimulgus donaldsoni Sharpe. Donaldson-Smith's Nightjar.

Isiolo. A single bird was seen on a plain near Isiolo on March 22nd. Its beautiful plumage made it difficult to pick out amongst the rocks. Once it alighted, it immediately crouched and became invisible. Only after a long and difficult stalk could I get a clear view of it.

Caprimulgus fossii apatelius Neum. Abyssinian Mozambique Nightjar.
North Horr, February ; Mombasa.

MICROPIDÆ.

Micropus apus shelleyi (Salvadori). Abyssinian Swift.
Kikuyu.

Micropus æquatorialis æquatorialis (J. W. von Müller). Mottled Swift.
Archer's Post ; Isiolo.

Micropus affinis abessynicus (Streub.). Little African Swift.
Mombasa ; N. Uaso Nyiro near Archer's Post.

Micropus caffer streubelii (Hartlaub). Abyssinian White-rumped Swift.
Meru ; Mombasa. Nesting on a rock face overlooking a stream at Meru in early April.*

Cypsiurus parvus myochrous Reich. East African Palm Swift.
Archer's Post ; Benane ; Isiolo ; Merille.

COLIIDÆ.

Colius striatus kikuyuensis van Someren. Kikuyu Speckled Mousebird.
Isiolo ; Siolo River ; Nanyuki ; Merille ; Marsabit ; Meru.
Nesting at Meru in April.

Colius striatus mombassicus van Someren. Mombasa Speckled Mousebird.
Mombasa.

Colius leucocephalus turneri van Someren. North Uaso White-headed Mousebird.
Isiolo ; Benane ; Merille ; Laisamis.

Common in flocks throughout the thornscrub of the N.F.D. Call note is a musical although plaintive whistle.

Colius macrourus pulcher Neum. East African Blue-naped Mousebird.
Isiolo ; Merille ; North Horr ; Laisamis.

I found this less shy than *C. leucocephalus turneri*. From November through to March it was in flocks. Call, a rough, rather mournful, whistle frequently uttered both whilst on the wing and at rest.

TROGONIDÆ.

Apaloderma narina narina (Stephens). Narina Trogon.
Meru, April 10th, 1941, seen in lower forest.

*No doubt in a swallow's nest.—Editor.

CAPITONIDÆ.

Lybius melanopterus (Peters).

Brown-breasted Barbet.

Isiolo ; Siolo River ; Benane ; Merille ; Laisamis ; North Horr.

Common throughout N.F.D. The North Horr birds were conspicuously streaked above with greenish-yellow. A pair was seen *in cop.* at Merille in January. Call note very loud, an explosive "querr-querr." Seen singly, but often in parties. Seems to prefer rather stunted trees to giant acacias. In January at Merille, one evening at sunset, I was walking through the bush when I heard this bird calling loudly from above my head. At first I failed to see it, then suddenly I saw its head protruding from an untenanted roosting nest of a Black-billed Sparrow-weaver. I waited some time until the sun was practically down ; but the bird was still there. Eventually I scared it off with a near miss from a stone, and sure enough it was a bird of this species. Whether it was using the old nest as a roosting-spot, or possibly even as a nesting-site, I cannot say : the first conjecture is more probable.

Tricholaema diadematum diadematum (Heuglin).

Red-fronted Barbet.

Nanyuki ; Siolo River ; Isiolo.

On March 23rd, this bird was common in well-treed country by the Siolo River. A nest-hole was found 10 feet up the bole of an acacia. There were nestlings inside ; but I could not reach the nest. The call seems similar to that of the Brown-throated Barbet. Probably wanders about during the year, for none were seen round Isiolo until March when they suddenly became common. On the 29th of the month they were seen in parties, including many young birds. Seen at 6,000 feet near Nanyuki in April in open country dotted with low bush.

Buccanodon leucotis kilimensis (Shelley).

Kilimanjaro White-eared Barbet.

Meru, April 7th, 1941. A party of four birds, seen at about 5,000 feet, in forest trees by a stream at Meru, hunting vigorously but silently amongst the top-most branches, twisting and turning about like tits.

Pogoniulus pusillus affinis (Reich.).

East African Red-polled Tinker Bird.

Meru ; Isiolo.

Trachyphonus erythrocephalus versicolor Hartlaub.

North Kenya Red and Yellow Barbet.

Isiolo ; North Horr.

Seen many times in the thorn bush, particularly about Isiolo. A fine male was seen perched in a tree at North Horr in February.

Trachyphonus darnaudii boehmi Fisch. & Reich.

Black-capped Ground Barbet.

Isiolo ; Laisamis ; Merille.

A stolid bird, and at Merille much given to creeping in and out through and below bushes. Common at Laisamis in rocky valleys choked with thornscrub.

INDICATORIDÆ.

Indicator indicator (Sparrman).

Black-throated Honey-Guide.

Siolo River ; Meru ; Thika.

Became suddenly common on the Siolo River on March 23rd, their appearance coinciding with a mass invasion of sunbirds. Immature birds were also numerous that day. In April at Meru a bird was seen hovering round a native honey-pot.

Indicator variegatus variegatus Lesson.

Scaley-throated Honey-Guide.

Siolo River. One individual was with the Black-throated Honey-Guides on March 23rd.

PICIDÆ.

Campethera nubica nubica (Boddaert).

Nubian Woodpecker.

Isiolo ; Merille ; Siolo River ; Nanyuki.

Very common at Isiolo and along the riverbeds of Merille. Frequents low bush as well as trees and perches, often for long periods, like an ordinary bird. A young bird, being fed by parents on the Siolo River at the end of March, uttered a curious imitation of their call, a prolonged sound like the squeaking of rusty hinges on a swinging gate.

Dendropicus fuscescens hemprichii (Ehrenberg). Abyssinian Cardinal Woodpecker.

Isiolo ; Benane ; Habbaswein ; Merille ; Laisamis ; Marsabit ; North Horr.

Very common and has a wide range.

Thripias namaquus schoensis (Rüppell).

Abyssinian Bearded Woodpecker.

Isiolo ; Benane ; Habbaswein ; Merille ; Laisamis ; North Horr.

Extremely common at Merille. Several birds seen there very dark above and below, possibly referable to *Thripias namaquus turkanæ*.

Mesopicos goertæ rhodeogaster Fisch. & Reich.

Kenya Grey Woodpecker.

Nanyuki at 6,500 ft., a single bird.

(To be continued).

EAST AFRICAN BUTTERFLIES.

GENERA

Pseudoneptis, *Catuna*, *Pseudargynnis*,
Pseudacraea, *Neptis*.

By R. Tenniel Evans.

INTRODUCTION.

It is with a feeling rather akin to diffidence that I commence the task of writing a descriptive list of the butterflies of Kenya and Uganda. This was started, many years ago, by Dr. V. G. L. van Someren and the late Canon K. St. A. Rogers, and the resulting series of papers—written almost entirely by Dr. van Someren alone—dealt, in an extremely able and painstaking fashion, with the families *Danaidæ*, *Acraeidæ*, and part of the *Nymphalidæ*. In attempting to carry on from where Dr. van Someren has left off, I will at least endeavour to be as painstaking, even should my ability leave something to be desired.

In the following descriptions, I have been compelled to leave the life-histories of the species described unwritten, due to the fact that I have no data available from which to compile them, beyond a few meagre notes, made by myself from time to time, as to food-plants, etc. Where relevant, these will be put in, and if any reader is in a position to supply any of the missing life-histories, however incomplete his notes may be, they will be most welcome. Our knowledge of the butterflies of this country, as with most other branches of entomology, has many gaps, and private workers are in a position to fill a lot of these gaps. I would like to take the opportunity here of stressing the importance of noting the correct locality on labels. I have frequently seen collections, admirably arranged and classified, which were useless because the insects were labelled only "Kenya" or "Uganda," or, worse, had no labels at all. New locality records are continually cropping up. It is possible that the distribution of many of our Kenya butterflies is far wider than is at present suspected. Within the past month, I have had brought to my notice the taking of the Lycaenid *Heodes abbotti* at Nairobi, a new locality record, and a record (not quite certain) of *Charaxes lactinictus* seen near Lumbwa, also a new locality record. Any records of this kind will be most welcome, also, as I said before, any notes as to life-histories, food-plants, etc.

In the descriptions which follow, I am carrying on from the point where Dr. van Someren left off. He described the *Nymphalidæ* as far as the genus *Pseudathyma*, and I intend to continue from there with the genera *Pseudoneptis*, *Catuna*, *Pseudargynnis*, *Pseudacraea* and *Neptis*. The first three genera consist, in our territories, of one species only each, and therefore no general description of the genus will be necessary. Where necessary, a general description of the genus will be given before I start on the description of the different species.

Genus *PSEUDONEPTIS* Snell.

PSEUDONEPTIS COENOBITA F. (Plate I). Expanse :—Male 50 mm.
Female 60 mm. Sexes alike.

General colour black with numerous pale blue marks.

Male. F.w. Ground-colour black. A fine longitudinal pale-blue streak in the cell, terminating in a small quadrate mark. Distal to this is a second, larger, rectangular mark, and a pale-blue triangle at the apex of the cell. Three pale-blue streaks towards the tip of the costa. Remaining spots are as follows :—A series of

arrow-shaped pale blue marks, sub-marginal, following the contour of the wing, but absent in area 5. That in area 4 is larger than the rest, and that in 1b is present as a double rectangular spot. Internal to this is a further row of arrow-shaped marks, that in 5 being very indistinct and that in 4 considerably larger than the rest. This row is continued in 1a, 1b and 2 as three nearly circular spots. A broad pale-blue bar crosses the base of 1a and 1b, and is continued as a large rectangular spot, basal in 2, and an irregular shaped spot basal in 3. This bar continues in 4, 5 and 6 as a series of small circular spots, one to the midpoint of each area. There is a pale-blue streak at the base of 4, and one each sub-basal in 5 and 6. The outer margin is adorned with a series of white internervular spots, and internal to this a fine pale-blue line.

H.w. Ground-colour as fore. Most of the costa is white. The extreme base of the wing is black, followed by a broad pale-blue line, continuous with that of the fore-wing. Distal to this is a straight row of small pale-blue spots from the inner margin across the apex of the cell and terminating as a greyish spot submarginal in area 7. This is followed by a broad band of the ground-colour, followed again by a straight row of large rectangular pale-blue marks from the anal angle to area 6. The margin is decorated with a broken pale-blue line from 1b to 6, followed by a fine, indistinct, blue line parallel to it. The extreme edge of the wing bears internervular white spots. Thorax black with a pale-blue band behind the head, two pale blue spots at mid-point, and a pale-blue band just above the abdomen. Abdomen black with pale-blue rings. Antennæ very long.

Underside. Similar to above, but ground-colour greyish and pale markings larger and paler, the whole with a silky sheen.

Female. Like the male, but larger, with blue markings larger and paler.

Distribution. Nandi and Kakamega and throughout Uganda in forest areas.

Habits. *P. coenobita* is a creature of the dense forests, much given to floating about in the undergrowth, where it looks very like a *Neptis*. The flight is slow and rather weak and floating, and it is easily taken. I have never found it particularly common, but it is not a rare species. It does not appear to have any close mimics, or to mimic any particular species closely. In markings and coloration it bears a close resemblance to *Tirumala petiverana*, but I would hesitate to attach any importance to this resemblance, owing to the very great difference in size between the two species. There is also a certain resemblance to the male of *Euptera elabontas*.

Genus *CATUNA* Kirby.

CATUNA CRITHEA Drury (Plate I). Expanse :—Male 60 mm. Female 65 mm.

Sexes alike.

General colour dark-brown with grey-brown and yellow marks.

Male. *F.w.* Ground-colour dark chocolate-brown. The cell is invaded by a pale-brown colour which cuts up the ground-colour into spots as follows :— a small circular spot at the base, followed by a larger circular patch, and then by a roughly semicircular area, flat side towards the base. A further spot occupies the apex of the cell and the bases of 4 and 5, and is bordered distally by grey-brown. Further light-brown spots and lines are as follows :—An indistinct sub-marginal line, followed internally by a further line, rather indistinct in 6, 7 and 8, well-marked from 1a to 5. This is touched proximally by light-brown loops in 4, 5 and 6, enclosing areas of the ground-colour. Veins 2, 3 and 4 are coloured light-brown. A straight

light-brown line crosses the mid-points of areas 5 and 6. A light-brown area in 3 encloses two roughly circular areas of the ground-colour, with a similar marking enclosing larger areas of ground-colour in area 2. Two light-brown line, one straight, one curved, cross area 1b at the mid-point, and a broad light-brown line crosses the base of 1a and 1b, enclosing two spots of the ground-colour at the extreme base of these areas. The edge of the wing bears white internervular spots.

H.w. Ground-colour as fore. The whole of the costa light Naples-yellow. The base of the wing chocolate-brown with a pale-brown line at the base of the cell. Inner fold yellowish-grey. The distal half of the cell, sub-base of 1c and base of 2 and most of areas 5 and 6 Naples-yellow, with a band of similar colouring running in a straight line across the mid-point of 1c and 2, the sub-base of 3 and the base of 4, joining the large patch of yellow in 5 at mid-point, cutting off a triangular patch of the ground-colour which has its base at the inner fold and its apex just entering 5. Other marks are:—A series of yellow internervular marks at the margin, a sub-marginal double line of brownish-yellow from anal angle to 5, and a sub-marginal brown line crossing the yellow area in 6. Thorax and abdomen black-brown with yellow bands. Antennæ very long.

Underside. *F.w.* Ground-colour Naples-yellow. A brown spot at base of cell, followed by a brown circle, and a roughly "B"-shaped brown mark enclosing greyish-yellow. An irregular greyish mark, bounded proximally by a dark brown line, at bases of 4 and 5. This mark is followed by a band of the ground-colour, then by a large greyish area, bounded distally by a whitish line. A sub-marginal series of greyish spots, decreasing in size, runs from 1b to 7, following the contour of the wing. Those in 4, 5, 6 and 7 are edged with whitish. Each spot is followed distally by a dark mark. There is a dark brown circle enclosing greyish at the bases of 1b and 2, and dark marks in areas 1b, 2 and 3 corresponding in position to the dark areas of above.

H.w. Ground-colour as fore. Almost plain, except for two black spots in the cell. Dark marks corresponding to those of above, but very much reduced. The double sub-marginal pale lines of above are here represented by a series of fine dark "V" or "W" shaped lines.

Female. Very similar to the male, but larger and duller. All pale areas much larger.

Distribution. Fairly common where it occurs, which is, roughly, in forest areas from Kakamega and Tiriki throughout Uganda to the Belgian Congo.

Habits. Very similar to those of members of the genus *Euphadra*, to which it is related. They are creatures of the forests, and are fond of roads, paths and sunny spots, although one also comes across them in those parts of the forest where the floor is clear of grass and weeds. They are low-flying insects, skimming over the ground seldom more than two or three feet up, and often settling on the ground. Both sexes can usually be found in the vicinity of fallen fruits, and can be attracted to bait made from fermented pineapple or banana. They are not easy to catch as they are very wary, and their flight is swift. They frequently lead one a long chase, gliding ahead just out of net-reach for a considerable distance before diving into the undergrowth.

Mimetic Associations. There is a strong resemblance between this species and the females of several *Diestogyna* and *Euryphebe*, also the female of *Cynandra opis*, and they are believed to act as models for the group.

Genus *PSEUDARGYNNIS* Karsch.*PSEUDARGYNNIS HEGEMONE* Godt. (Plate I). Expanse :—Male 50-60 mm.

Female 65 mm. Sexes alike.

General colour orange-brown with black-brown spots.

Male. F.w. Ground-colour orange-brown. A dark brown spot at base of cell, followed by five wavy transverse lines. Two large black spots at bases of 4 and 5. Two brown spots basal and two sub-basal in 1b, one basal and one sub-basal in 2, one each at mid-point of 3, 4 and 5. Edge of wing ornamented with dark internervular spots. A double row of dark spots sub-marginal from apex to hind-angle, the outer row tending to become lunular, inner row double in 1b. The inner row of spots are accentuated proximally in 4, 5, 6 and 7 by a white spot.

H.w. Plain orange-brown with a sub-marginal row of lunular brown marks from anal angle to 7, and internal to this a row of circular brown spots. Margin dark brown. Thorax greenish-black, abdomen orange-brown. Antennæ very long.

Underside. General pattern similar to above, but pale yellow with a greyish area at apex of F.w. Dark spots of above are represented by indistinct dark marks. A conspicuous orange-brown line crosses both wings, running straight from the apex of the f.w. to 2/3 along inner margin, and continuing in a curve parallel to the outer margin across the h.w. to the inner fold. The base of h.w. is ornamented with wavy dark lines, and there is a circular mark in the cell.

Female. Very similar to the male, but larger and paler, with dark marks more conspicuous. Above, a third row of sub-marginal dark spots crosses both wings, and the wavy dark marks at base of h.w. as well as the circular mark in the cell, show through from below. On the underside, all dark marks are more conspicuous than in the male.

Distribution. Throughout Kenya and Uganda in forest and scrub country. One usually finds it more common on the outer fringes of forests than in the depths.

Habits.—Both sexes are fond of feeding at flowers, where they can be easily taken. The flight is powerful for the size of the insect, but not very fast. They are given to flying round and round low trees, and in flight are very difficult to distinguish from their very common model, *Atella phalantha*. The males are also attracted to animal droppings and mud.

Mimetic Associations. This species is a member of the mimetic group centring round *Atella phalantha*, and in flight is confusingly like its model.

Genus *PSEUDACRAEA* Westw.

The name *Pseudacraea* means "False *Acraea*," and, as might be expected, the genus is one of mimetic butterflies, with models among the *Acraeidae*. They are, for the most part, confusingly like their models, both in appearance and habits. Most of them have the *Acraea* habit of sailing round the tops of flowering trees, and of settling with wings closed for a long time on a sunny leaf. They are related to the *Euphaedra-Euryphene* group of butterflies, and this relationship can be seen in the long, conspicuously clubbed antennæ, and the tendency to banding and spotting across the thorax and abdomen. The larvae, too, are somewhat similar. They are hardly likely to be confused with any other genus, with the possible exception of one or two species of *Hypolimnas*, another mimetic genus which chooses its models from among the *Danaidae* and *Acraeidae*. They can at once be distinguished from their models, when taken, by the open discoidal cell in the hindwing.

PSEUDACRAEA SEMIRE Cr. (Plate I). Expanse:—Male 60 mm. Female 70 mm. Sexes alike.

General colour black-brown with a broken pale green bar crossing both wings.

Male. F.w. Ground-colour black-brown. Basal triangle to mid-point of costa brownish-ochreous with black spots as follows:—Three in cell, four in 1b, one at base of 2. A pale green triangle in the middle of the cell. A large oval green patch crosses the base of 2 and the middle third of 1b, and is bisected by vein 2. There is an oval green patch at base of 3, and one each at bases of 4 and 5. A small pale green mark at mid-point of 4, and two larger oval pale green spots, one each at mid-point of 5 and 6. The margin of the wing bears a series of greyish-brown internervular streaks, tending to become oval spots in 1b and 2.

H.w. Ground-colour as fore. Basal triangle to basal third of cell brownish-ochreous. Three black spots in cell. Distal two-thirds of cell, mid-points of 1c, 2, 5 and 6, and base of 3, occupied by a broad pale green patch, somewhat irregular distally, and divided by the black nervules. Distal to this is a series of triangular reddish-chestnut marks from 1c to 4, and a sub-marginal series of oval, double, greyish-brown spots from 1c to 6. Marginal fold dark brown.

Underside. Much as above but paler, with ground-colour ochreous-grey. Grey-brown sub-marginal marks in fore and hindwing pale grey and very distinct. Basal areas in fore and hindwing yellow ochre. Spots much as above, but h.w. shows one at base of costa, one sub-basal and one at mid-point of 7, one at base of 6, one basal and one sub-basal in 1c. Thorax and abdomen black-brown. Antennæ long.

Female. Very like the male, but larger and paler.

Distribution. This beautiful species appears to be somewhat rare in East Africa. It is a West African species which just extends into Uganda. Of the two specimens in the Museum collection, one is labelled Belgian Congo, and one Bwamba Forest, Uganda. Seitz gives the distribution as "Sierra Leone to Angola."

Habits. I have no information as to the habits of this species. It does not appear to have any Acraeid or Danaid model in East Africa.

PSEUDACRAEA BOISDUVALI TRIMENI Butl. (Plate I). Expanse:—Male 90 mm. Female 100 mm. Sexes alike.

General colour orange-red with black spots.

Male. F.w. Ground-colour bright orange-red with large round black spots as follows:—One at base of cell, followed by two at mid-point and two at discocellulars. One at base of 1b, followed by two sub-basal and one at mid-point touching vein 1, and one sub-basal across vein 2. There are black streaks as follows:—one each sub-marginal in 1b and 2, one at mid-point of 3, one each sub-basal in 4 and 5. A greyish semi-transparent area crosses the apex of the cell, the bases of 3, 4 and 5, and just enters 2 at mid-point. Distal to this is a sub-apical orange-yellow bar. Base of wing, costa, apex, and outer margin black, extending up the veins.

H.w. Ground-colour much as forewing, but slightly redder. Base of costa, base of cell, and base of 1 and 2 black, with a whitish spot at base of cell. Black spots as follows:—A small black spot near base of cell, contiguous with black basal patch. A large round spot near apex of cell, one sub-basal in 5, and a large spot sub-basal in 2. These spots are bordered with white, which colour has a decided tendency to spread along the veins. Margin heavily black, enclosing indistinct round orange spots. Thorax and abdomen black, with white and orange spots. Antennæ very long.

Underside. Much as above but paler, ground-colour more pink. Black basal area of h.w. split up into large spots as follows:—One lunular spot at base of cell, one each sub-basal in 7, 8 and 9. Sub-marginal h.w. marks pink and very distinct.

Female. Similar to the male but larger and paler.

Distribution. Typical *boisduvali* is a South African species. The local race, *trimeni* appears to extend throughout Kenya and most of Uganda, and appears to be represented in Western Uganda by a race described hereafter. I have seen *trimeni* in forest patches near Thika, at Lugari, and in the Kabras Forest, and it also occurs round Nairobi, in forest country.

Habits. A forest insect, much given to floating, usually just out of net reach. It does not seem to be particularly common, but is easily spotted on account of its very brilliant colouring and large size. It is one of the finest of the genus, and a very conspicuous insect.

Mimetic Associations. This race is a very good mimic of *Acraea zetes acara*, and is easily mistaken, when on the wing, for that species. It can usually be distinguished, however, by its superior size.

PSEUDACRAEA BOISDUVALI BOISDUVALI Doubl. (Plate I). This race was taken by T. H. E. Jackson in the Bwamba Forest, Uganda. It differs from *trimeni* in that the f.w. is almost entirely grey-black, brownish at the base, with a little red sub-marginal in 1b. Spotting as in *trimeni*. The female is greyish-ochreous with spots as in *trimeni*, except for a reduction in the black areas at base of h.w. Below, the h.w. in both sexes tends to take on a greenish tinge.

Distribution. The series in the Museum, 3 males, 1 female, come from Bwamba, Uganda, T. H. E. Jackson, May-June, 1940.

Mimetic Associations. In both sexes, above and below, this race bears a remarkable resemblance to *Acraea egina* and also to *Acraea zetes menippe*.

PSEUDACRAEA DOLOMENA ALBOSTRIATA Lathy (Plate 1). Expanse
Male 72 mm. Female unknown to me.

General colour orange-brown and black with white patch in h.w.

Male. F.w. Most of the cell, basal two-thirds of 1a, 1b and 2 warm orange-brown, with an extension of the orange-brown (slightly paler) into 3 at the mid-third. Costa black-brown. Cell with five circular black spots, two next to costa, two, somewhat ill-defined, on discocellulars, and one on median. The two spots next to the costal nervule are bordered with white. A circular black spot in 1b, near the base of vein 2. Apex from end of cell, and outer margin to hind angle black-brown with dark internervular rays. Four white streaks at apex of cell.

H.w. Basal triangle black-brown. A light bar crosses the discal area of the wing from inner fold to 6, white from inner fold to cell, and orange in 5 and 6. Outer margin black-brown with rays as in f.w. Spots in basal triangle as follows:—Four in the cell, two in 1c, one each in 5, 6 and 7, at the extreme base of each area.

Underside. F.w. much as above, but paler throughout. Black spots larger and more conspicuous. Rays as above.

H.w. marked much as above. Basal triangle greeny-grey with black spots as above, very conspicuous. Discal bar greyish-white and broader than above, and marginal border greyish-brown. Rays as above.

Distribution. To the best of my knowledge, Western Uganda to the Congo.

Mimetic Associations. This insect bears a decided resemblance to *Bematistes quadricolor latifasciata*, and would appear to enter the mimetic group of which that species forms the centre.

PSEUDACRAEA EURYTUS (Plate II). A very variable species, the different forms of which have been given names as follows:—

1. f. *TIRIKENSIS* Neave. Expanse:—Male and female 90-100 mm. Sexes alike.

Male. F.w. Ground-colour black. A broad white sub-apical bar crosses the wing from the costa, across discocellulars to 2, where it turns almost at right angles and continues as a greyish bar to the hind border. It does not reach the outer margin. 3 black spots in cell, one at base of 1b.

H.w. Basal triangle reddish-ochreous with black spots as follows:—One at base of cell, two at mid-point, one sub-basal in 2, one at base of 5, one at base of 6, one at base of 7, one each sub-basal in 8 and 9. The disc of the wing taken up by a broad triangular white patch, base at inner margin, apex at costa. Distal third of wing black-brown with border black, extending into the white area as internervular rays.

Underside. As above, but base of h.w. redder. Spots as above, but more conspicuous.

Distribution. Tiriki and Kakamega to Uganda.

Mimetic Associations. This race mimics the females of several *Bematistes*, such as *B. alcinoe camarunica* and *B. aganica montana*.

2. f. *HOBLEYI* Neave (Plate II). Marked as *tirikensis*, but in the male the fore-wing sub-apical bar is orange. The female has a white sub-apical bar.

Distribution. Occurs along with the previous form.

Mimetic Associations. The male enters the mimetic group round *Bematistes poggei nelsoni* and its allies.

3. f. *TERRA* Neave (Plate II). Spotting as in the other forms. A large orange area occupies most of 1a and 1b, and the basal two-thirds of 2. An orange sub-apical bar crosses the bases of 4, 5 and 6, and just enters 3.

H.w. Almost entirely orange-brown. Margin black, extending in the form of internervular rays almost to the cell. Spotting very conspicuous owing to absence of black base.

A variety of this form has the f.w. sub-apical bar creamy-white. (f. *schubotzoides*).

Distribution. Western Uganda.

Mimetic Associations. Typical *terra* is a mimic of *Bematistes tellus*. The white-barred form mimics *Bematistes tellus eumelis* and *Bematistes schubotzi*.

4. f. *OBSCURA* Neave (Plate II). Marked much as in *terra*, but pale areas creamy-grey, and very reduced in area. It is found in the forests of Uganda, and is a mimic of *Bematistes epaea paragea*.

5. f. *ROGERSI* Trim. Marked somewhat like *terra*, but with f.w. pale areas much extended and pale tawny-orange. The patch at the base of the f.w. is extended to occupy most of the cell, and is only separated from the sub-apical bar by a narrow black bar. The one specimen in the Museum is labelled Dalgube. It is a mimic of a form of *Acraea esebria*.

Distribution. *Pseudacraea eurytus* in its various forms occurs throughout most of Kenya and Uganda in forest country, but is commonest in West Kenya and in Uganda. I have never found it particularly plentiful anywhere, and it does not appear to be very common in collections. Possibly this is because it is overlooked on account of its remarkable resemblance to its various models.

The localities from which the specimens in the Coryndon Memorial Museum were collected are as follows:—

f. <i>TIRIKENSIS</i>	3 specimens, 1 labelled Bwamba Forest, Uganda.
	1 ,, Kakamega
	1 ,, Budongo Forest, Uganda.
f. <i>HOBLEYI</i>	1 specimen, labelled Budongo Forest, Uganda.
f. <i>TERRA</i>	1 specimen, labelled Nabugabo, Uganda.
f. <i>SCHUBOTZOIDES</i>	1 specimen, labelled Budongo Forest, Uganda.
f. <i>OBSCURA</i>	3 specimens, labelled Budongo Forest, Uganda.
f. <i>POGGEIOIDES</i>	4 specimens, 1 labelled Budongo Forest, Uganda.
	1 ,, Kakamega.
	1 ,, Kabras.
f. <i>ROGERSI</i>	1 specimen, labelled Dalgube.

PSEUDACRAEA KUNOWI HYPOXANTHA Jord. (Plate II). Expanse 75 mm.

Female unknown to me.

Male. F.w. Ground-colour velvety black-brown. An orange-red bar crosses the apex of the cell, the base of 4, 5 and 6, and the distal two-thirds of 1a, 1b, 2 and 3, thus being sharply curved at vein 4. Apex and margin black-brown.

H.w. Base black-brown. Central third of wing with a white bar crossing distal half of cell, bases of 1a, 1b, 1c, 2, 3, 4, 5, and mid-points of 6 and 7. Distal third of wing black-brown, with black internervular rays reaching from margin to cell. Anal angle orange-brown. Thorax and abdomen black with small white spots.

Distribution. This appears to be a somewhat rare species. The one specimen in the Museum is labelled Mawakota, and Seitz gives the distribution merely as Uganda.

Mimetic Associations. This species would appear to be a mimic of *Bematistes macarista* and its allies.

PSEUDACRAEA LUCRETIA Cr. (Plate III). Expanse 70-80 mm., male and female. Sexes usually alike but female rather variable.

General colour black and white.

Male. F.w. Ground-colour black-brown. A rectangular greyish-white spot at apex of cell, a greyish-white triangle at base of 4, an oval white patch at base of 3, another oval white patch at mid-point of 2, with, contiguous to it, a small greyish-white spot in 1b. A semicircular white patch at mid-point of 1b, base on vein 1, and not reaching vein 2. This is continued as a rectangular patch in 1a. A white sub-apical bar crosses the wing, consisting of a rectangular spot at sub-base of 6, a rectangular spot at mid-point of 5, and a streak in 4. Tip of wing white. A series of double greyish internervular streaks from 1b to 5, contacting the rectangular white patch in 5, and the streak in 4. These streaks are separated by dark rays, and tend to become circular in 1b.

H.w. Ground-colour as fore. Basal triangle black-brown. Discal third occupied by a well-defined white area, crossing the wing from inner fold to costa. Distal third black-brown, with dark internervular streaks just reaching and invading the white area. A sub-marginal row of whitish internervular spots from 2 to 7.

Underside. Markings much as above. Ground-colour greyish ochreous. F.w. with a dark streak in cell. H.w. ground-colour brownish-ochreous. Black spots at base as follows:—Three at extreme base. One at base of cell, followed by two more sub-basal, one each sub-basal in 7, 8 and 9. Internervular dark rays from 1c to 8. White sub-marginal marks of above very distinct.

Female. Somewhat variable—in three main forms.

1. Like the male, but larger, with white areas somewhat expanded.
2. Like 1, but with h.w. patch ochreous.
3. Like 1 and 2, but with all pale areas orange-ochreous.

Distribution. Roughly from Thika and Nairobi to Uganda and the Congo. Fairly common where it occurs, in forests and along wooded river-courses. I found it particularly abundant at Thika during 1941.

Habits. Given to floating, usually fairly high. Both sexes are attracted to flowers, and are easily captured. The males come to the evil-smelling baits beloved of the male *Charaxes*, and to mud.

Mimetic Associations. The black-and-white male and the male-like form of the female resemble, in flight, the various forms of *Amauris damocles*. The female form with the ochreous patch in the h.w. is an excellent mimic of *Amauris albimaculata* and its allies, while the orange-ochreous form bears a certain resemblance to *Bematistes tellus eumelis* and to certain forms of *Acraea esebria*.

PSEUDACRAEA LUCRETIA EXPANSA Btlr. (Plate III). Very similar to the previous race, but with all pale marks much enlarged, particularly those occupying the central area of the forewing. The females seem to have similar variations to those of *lucretia*.

Distribution. The coastal districts of Kenya to Thika and Nairobi, where it appears to intergrade with *lucretia*. Habits similar to *lucretia*.

Mimetic Associations. This race, in the black-and-white forms, is a fairly close mimic of *Amauris ochlea*. The female with orange-ochreous marking bears a fairly close resemblance to certain forms of *Acraea esebria*.

Genus—*NEPTIS* F.

This genus should not need much description, as it is, or should be, familiar to most collectors. The butterflies in it are, for the most part, black with a broad, broken bar of white crossing both wings. They are small to medium-sized insects, and the great majority of the species are confusingly alike. The habits of all the species are sufficiently alike to be described here. They are creatures of the forest and scrub country, with a few species, such as *N. agatha*, found in open savannah forest as well as in the thick forests. The flight is slow and somewhat jerky, and they are rather given to floating. They appear to have influenced the coloration of a few other butterflies to a certain extent. The species of the genus *Pseudathyma* are very *Neptis*-like, and so are certain of the *Euptera*, such as one of the forms of the female of *E. elabontas*, both sexes of *E. pluto kinugnana*, one form of the female of *Euryphura plautilla albimargo*, the local species of *Neptidopsis*, *ophione* and *platyptera*. At times the female of *Charaxes baumanni*, when laying, looks not unlike a *Neptis*. I have no data as to the edibility or otherwise of the genus. Some of them, in fact, appear to be mimetic, notably *N. woodwardi*, which bears a decided resemblance to *Amauris albimaculata*, and to *Acraea lycoa* and *A. johnstoni*.

In order to assist in separating the species, I append hereto Dr. H. Eltringham's Key to the genus (Trans. Ent. Soc. Lond. 1921, p. 532).

KEY TO THE AFRICAN FORMS OF THE GENUS *NEPTIS*.

(The sexes are alike in pattern).

Some or all of the discal spots and bands of upperside yellow.	a.
All paler markings above white (rarely bluish).	g.
(a) F.w. cell on underside contains white dots, usually also visible above.	b.
Cell without white dots.	d.
(b) F.w. inner marginal spot absent or only faintly developed	<i>comoravum</i>
F.w. with a well-marked inner-marginal spot, sometimes confluent with spots in 2 and 3.	c.
(c) Expanse about 50 mm., h.w. discal band only about 3 mm. wide, distally-edentate	<i>dumetorum</i>
Expanse about 35 mm., h.w. discal band about 5 mm. wide, distally regular	<i>mayottensis</i>
(d) Discal yellow band broad (4-5 mm.) quite or nearly continuous from inner margin of h.w. to f.w. area 3, its proximal margin almost a straight line.	e.
Yellow band narrower (2-3 mm.) and having a curved proximal outline from inner margin of h.w. to f.w. area 3.	f.
(e) F.w. band continuous from inner margin to area 3	<i>ochracea</i>
F.w. band interrupted by ground-colour in anterior half of 1b	<i>ochracea ochreate</i>
(f) H.w. band nearer to base than to hind-margin, short and pale ochreous	<i>woodwardi</i>
H.w. band nearer to hind-margin than to base, long and deep yellow	<i>frobenia</i>
(g) Base of h.w. beneath practically unicolorous with rest of ground-colour (generally red-brown) not striped or spotted.	h.
Base of h.w. beneath striped or spotted.	m.
(h) White spots within f.w. cell.	i.
No white spots in cell.	j.
(i) On h.w. underside a small white spot in area 6	<i>neavei</i>
No white spot in area 6	<i>swynnertoni</i> *
(j) Underside ground-colour red-brown or orange-brown.	k.
Underside ground-colour ochreous	<i>exaleuca exaleuca</i>
(k) H.w. underside without heavily marked dark internervular rays	<i>incongrua incongrua</i>
H.w. underside with heavily marked dark internervular rays.	l.
(l) F.w. with three or four minute white dots beyond cell, h.w. white band about 2 mm. wide	<i>incongrua occidentalis</i>
F.w. without such minute dots, h.w. band about 5 mm. wide	<i>exaleuca suffusa</i>
(m) Base of h.w. beneath irregularly marked and spotted, not with regular pale bands on a dark ground.	n.
Base of h.w. beneath with curved bands of white or whitish on a dark ground.	r.
(n) F.w. cell nearly all white.	o.
F.w. cell dark or only with white dots.	p.
(o) H.w. discal band only about 3 mm. wide	<i>metella</i>
H.w. discal band about 5 mm. wide	<i>metella f. gratilla</i>

*This is the principal difference between typical *neavei* and *swynnertoni*, and it is not a constant one. Nevertheless, the male armatures differ.

(p)	F.w. sub-apical spots in 5 and 6 not separated by ground-colour	<i>nemetes</i> f. <i>carpenteri</i>
	F.w. ditto. separated by ground-colour, at least proximally.	q.
(q)	H.w. discal band about 5 mm. wide and not markedly projecting outwards in area 5	<i>saclava</i>
	H.w. ditto. about 3 mm. wide and with prominent discal projection in area 5	<i>saclava</i> f. <i>marpessa</i>
(r)	F.w. cell dark above like ground-colour, or with only minute white dots, not with sharply defined streaks or spots (<i>trigonophora</i> sometimes has a diffused white streak in f.w. cell above).	s.
	F.w. cell contains more or less white, at least some part of which is sharply defined.	h°.
(s)	F.w. discal band practically continuous from nervure 2 to, or nearly to, costa (nervule 4 may be rather blacker than the rest, but see footnote on <i>seeldrayersi</i>).	t.
	F.w. discal band discontinuous, generally owing to reduction of spot in area 4.	a°.
(t)	F.w. cell on upperside has white dots.	u.
	Ditto. rarely with faint paler markings, but not in the form of dots.	w.
(u)	F.w. delicate sub-marginal lines are continuous, interrupted only by the nervules.	v.
	These lines less distinct between nervules 3 and 4	<i>agatha</i> , <i>jordani</i> *
(v)	H.w. discal band extends beyond nervule 6	<i>seeldrayersi</i> †
	H.w. ditto. does not extend beyond nervule 6	<i>livingstonei</i>
(w)	Proximal edge of f.w. discal band straight.	x.
	Ditto. concave or indented.	z.
(x)	F.w. discal band sharply defined, the nervures only very faintly marked.	y.
	Discal band formed of elongated white spots rounded and deeply indented distally between nervules	<i>nysiades</i> (part)
(y)	F.w. discal band almost pyriform and pointed at costal end. Sub-marginal lines on both wings markedly white	<i>nina</i>
	Ditto. narrower towards costa, but not pyriform. Sub-marginal lines not so markedly white	<i>puella</i>
(z)	F.w. band somewhat indented distally by ground-colour, especially in 3 and 4, band composed of spots of nearly equal length	<i>nysiades</i> f. <i>continuata</i>
	Ditto. with the spot in 2 very small and only touching that in 3 at its inner anterior angle	<i>nysiades</i> f. <i>metanira</i>
	Ditto. with spots in 4, 5 and 6 considerably longer than those in 2 and 3	<i>nicomedes</i> f. <i>puelloides</i> ‡
(a°)	F.w. band does not reach costa, only just extending as a narrow longitudinal streak beyond nervule 6	<i>nysiades</i> f. <i>clarei</i>
	F.w. band reaches costa or at least into area 8.	b°.
(b°)	F.w. cell distinctly dotted with white.	c°.
	F.w. cell dark, though rarely with vestiges of an ill-defined streak.	e°.
(c°)	White band of both wings very broad (6-10 mm.) and continuous from h.w. inner margin to nervule 4 of f.w.	<i>kikideli</i>
	White band not so broad and distinctly interrupted in area 1b.	d°.

*No absolutely constant character can be given to distinguish these two species; *jordani* is smaller than the average size of *agatha*, and the ground-colour is paler. In *jordani* the discal band is more consistently narrowed towards the costa.

†Occasional examples of *seeldrayersi* have the f.w. band separated into elongated spots by an increased blackening of the nervules. Such examples are distinguished from *nysiades* by the white dots in f.w. cell above.

‡*Puelloides* can generally be distinguished from *conspicua* by its smaller size and the interruption of the f.w. sub-marginal lines in area 3 and often in 6.

- (d°) The fine line just beyond the discal band is almost straight between the nervules
This line is well arched (proximally concave) between the nervules, especially in 2, 3 and 4 *rogersi*
barnsi
- (e°) On h.w. underside distal to white band a row of large more or less rounded dark spots on a lighter ground-colour.
Without such spots. f°
g°
- (f°) H.w. beneath with conspicuous costal white band extending from base to about middle of costa *poultoni*
H.w. beneath with such band if visible at all very short and not extending along costa *nemetes nemetes*
- (g°) In f.w. cell beneath is an elongated curved clavate spot followed by two to four very small spots beyond cell *trigonophora*
F.w. beneath with an irregular narrow white mark along costal edge of cell and a transverse streak across end of cell *nysiades* (part)
- (h°) On h.w. upperside the innermost of the three white sub-marginal lines is widened so as to form a conspicuous white band at least 2 mm. wide.
This line at most only slightly wider than the others, not more than 1 mm. i°
k°
- (i°) A narrow but continuous longitudinal white stripe in f.w. cell, but no transverse stripe *rothschildi*
A transverse white stripe across end of f.w. cell. j°
- (j°) F.w. cell with a longitudinal white stripe *paula*
Ditto. with three transverse marks progressively smaller proximally *biafra*
- (k°) Discal band of f.w. continuous from area 2 to, or nearly to, costa, or only just interrupted by nervule 4.
F.w. band markedly interrupted at nervule 4. l°
m°
- (l°) In f.w., proximal edge of spots in 2 and 3 forms a straight line at or nearly at right angles to the long axis of spot in 4 *nicomedes quintilla*
This proximal edge is S-shaped without a sharp angle *nicomedes nicomedes*
- (m°) White marks in f.w. cell are transverse and usually three in number. (When very faintly developed = *nysiades* typical) *nysiades* (part)
White stripe in cell longitudinal. n°
- (n°) In f.w. cell a white wedge-shaped mark followed distally by a contiguous triangular patch of greyish white scales *jamesoni*
Without such greyish patch (rarely with a few grey scales). o°
- (o°) Discal spot in area 4 of f.w. is a mere narrow line touching nervule 5, such line nearly as long as the spot in 5 *nicoteles*
F.w. discal spot in area 4 not of this form. p°
- (p°) F.w. spot in 4 well-developed and at least as long as that in 5 *strigata*
This spot, if present at all, very small and isolated. q°
- (q°) The white streak in f.w. cell is long and narrow and just above the origin of nervule 3 is sharply indented anteriorly but not quite divided by the ground-colour. Beneath, this indentation usually contains a white dot *nebrodes*
F.w. cell streak otherwise formed. r°
- (r°) F.w. discal spots in 2 and 3 and in 5, 6 and 7 are not notably separated and so form two conspicuous white patches, very little white in cell *melicerta f. goochi*
F.w. discal spots divided by more or less complete invasions of the ground-colour. s°
- (s°) F.w. discal spots in 5 and 6 very short, almost rounded. Inner marginal spot obsolescent *nicobule*
F.w. discal spots in 5 and 6 elongated, inner marginal spot or spots well developed. t°

- | | |
|--|-----------------------------|
| (t°) White mark in f.w. cell beneath followed distally by a curved white line parallel with its distal outline | <i>lermanni</i> |
| Without such line. | u°. |
| (u°) A well-developed triangular spot just distal to f.w. cell stripe | <i>melicerta</i> |
| Without such triangular spot | <i>mixophyes, nicodice*</i> |

The above key includes all the African *Neptis* known in 1921, when Dr. Eltringham wrote his monograph on the genus. Some may have been discovered since, but I am not aware of them. A large number of the species mentioned in the key are not described below, as some are West African, and others come from Madagascar and the Comoro Islands.

NEPTIS SACLAVA MARPESSA Hpffr. (Plate IV Figs. 1-3). Expanse :—Male

40-45 mm. Female 50 mm. Sexes alike.

General colour black and white.

F.w. Ground-colour sepia-black. Cell with three white dots, followed by four white dots in 4, 5 and 6. A discal white patch in 2 and 3, divided by the nervules. A white patch in 1a and 1b, continuous with the discal band in h.w. Three sub-apical white spots, ovoid in shape, one very small in 9, one much larger in 6, and one smaller in 5. Two fine parallel sub-marginal lines, greyish-white, the inner one broken by the nervules. Internal to these a series of indistinct dark spots, proximally marked greyish in 4, 5 and 6. Marginal fringe with white dots.

H.w. Ground-colour as fore. A white discal bar crosses the wing from mid-point of inner fold to mid-point of costa. This bar is perfectly regular proximally, but somewhat irregular distally, with a marked projection in area 5. Distal to the bar is a series of large dark spots, somewhat ill-defined, followed by two parallel greyish sub-marginal lines, broken by nervules. Margin white-spotted.

Underside. F.w. Ground-colour greyish-ochreous. White markings of above show through, much enlarged. Cell with a curved transverse whitish mark across discocellulars, and the three dots of above, which show through greatly enlarged, as reddish-bordered white spots. Distal to the cell, in 4, 5 and 6, are three white spots, edged proximally with reddish, and followed by a dark area terminated by the sub-apical white marks. The sub-marginal series of whitish lines are represented here by dark streaks broken by the nervules, and the series of dark spots internal to this are clearly shown up by the paler ground-colour.

H.w. Ground-colour as fore. Basal triangle ornamented with reddish lines and spots as follows :—Two red spots, the distal one grey-centred, and a red "V"-shaped mark in the cell. A reddish-grey streak crosses the base of 1c, cell and 8. Another similar line crosses the base of 6 and 7 and the sub-basal area of 8. A dark spot each at mid-point of 6 and 7. Discal bar as above, much enlarged, and bordered, distally and proximally, with brown. Dark spots of above brownish, well-defined. Sub-marginal lines as fore.

Female. Like the male, but larger and paler, with white marks larger.

Distribution. In forest country throughout most of Kenya and Uganda.

*I can find nothing in the description of *nicodice* to distinguish it from *mixophyes* except its size. The former is said to have an expanse of 48 mm. and the latter 32 mm. Size is of little value in the genus. I have before me examples of *agatha* varying 20 mm. in expanse.



PLATE I.

Pseudoneptis coenobita F.
Catuna crithea Drury.
Pseudargynnis hegemone Godt. ♂
Pseudargynnis hegemone Godt. ♀
Pseudacraea semire Cram.

Pseudacraea boisduwali trimeni Butl.
Pseudacraea boisduwali boisduwali Doubl. ♂
Pseudacraea boisduwali boisduwali Doubl. ♀
Pseudacraea dolomena albostrata Lathy.



Pseudacraea eurytus
 f. *tirikensis* Neave.
 f. *hobleyi* Neave.
 f. *terra* Neave.
 f. *schubotzoides*

PLATE II.

Pseudacraea eurytus
 f. *imitator* Trim.
 f. *obscura* Neave
Pseudacraea kunowi hypoxantha Jord.
Pseudacraea lucretia lucretia Cram. ♂



Pseudacraea lucretia lucretia Cram.

- | | | |
|----|---|-------|
| 1. | ♂ | f. 1. |
| 2. | ♂ | f. 2. |
| 3. | ♀ | f. 3. |
| 4. | ♀ | |

PLATE III.

5. *Pseudacraea lucretia expansa* Btlr.

- | | | |
|----|---|-------|
| 6. | ♂ | f. 1. |
| 7. | ♀ | f. 2. |



PLATE IV.

- | | | |
|--|---|---|
| 1. <i>Neptis saclava marpessa</i> Hpffr. Diani. | 6. <i>Neptis incongrua occidentalis</i> . Molo. | 12. <i>Neptis asalia</i> Stoll. underside. |
| 2. <i>Neptis saclava marpessa</i> Hpffr. Bura, Teita. | 7. <i>Neptis woodwardi</i> Sharpe. Kabras. | 13. <i>Neptis melicerta</i> Drury. Marsabit. |
| 3. <i>Neptis saclava marpessa</i> Hpffr. underside. | 8. <i>Neptis ochracea</i> Neave. ♂ Kalinzu. | 14. <i>Neptis melicerta</i> Drury. Kwale. |
| 4. <i>Neptis melella</i> Dbl. & Hew. Bwamba, Uganda. | 9. <i>Neptis ochracea</i> Neave. ♀ Katera. | 15. <i>Neptis melicerta</i> Drury. underside. |
| 5. <i>Neptis nemetes carpenteri</i> . Budongo, Uganda. | 10. <i>Neptis exaleuca</i> Karsch. Bwamba. | 16. <i>Neptis stricata</i> Auriv. N'tebi, Uganda. |
| | 11. <i>Neptis agatha</i> Stoll. Kabete. | 17. <i>Neptis nysiades</i> Hew. Belgian Congo. |

NEPTIS METELLA Dbl. & Hew. (Plate IV, Fig. 4). Expanse 50 mm. Sexes alike.

General colour black and white.

Male. F.w. Ground-colour sepia-black. Cell with a conspicuous scimitar-shaped white streak, followed by two minute white streaks in 5 and 6. A quadrate white spot each in 3 and 4 at mid-point, separated by the nervule. A small white streak in 9, a quadrate spot in 6, a broad streak in 5, and two spots in 4, all form a very much broken sub-apical bar. There is a pair of parallel white lines sub-marginally, broken by the nervules. The marginal fringe is spotted with white. There is a series of indistinct dark spots internal to the sub-marginal white lines, marked with white internally, and a small white area in 1a, just entering 1b, and continuous with the h.w. discal bar.

H.w. Ground-colour as fore. A straight parallel-sided white bar crosses the wing, broken distally by intrusions of the ground-colour along the nervules. Sub-marginal lines as fore, with a series of ill-defined dark quadrate marks between these and the discal bar.

Underside. F.w. Ground-colour ochreous-yellow at base, fading to greyish towards the apex. White and dark marks as above. White marks much enlarged, and dark spots more conspicuous owing to paler ground-colour.

H.w. Ground-colour yellow-ochreous. White marks as above. Base of wing ornamented with conspicuous black spots as follows:—One at extreme base of wing. Four in cell, one in 1b, two each in 1c, 5, 6, 7 and 8, those in 6 and 7 tending to be large and somewhat diffuse. White discal bar bordered with a series of black semi-circular dark spots internal to the sub-marginal series, which show through very conspicuously from above. Sub-marginal lines as above.

Female. Similar to the male, but larger and paler.

Distribution. Western Kenya through Uganda to the Congo, in forest country. This insect can be immediately distinguished from others of the genus by the characteristic ochreous, black-spotted hindwing basal triangle.

NEPTIS NEMETES CARPENTERI (Plate IV, Fig. 5). Expanse 50 mm. Sexes alike.

General colour black and white.

Male. F.w. Ground-colour deep brown-black. A white discal bar runs from 1a to 3. This bar is continuous with the h.w. discal bar, and is regular proximally, indented by the nervules distally, particularly at nervule 2. A white quadrate patch crosses the mid-points of 5 and 6, not interrupted by nervule 6. A series of indistinct dark spots sub-marginal from 1a to apex, followed by a double fine white line, slightly interrupted by the nervules. These dark spots are accentuated proximally by a greyish mark.

H.w. Ground-colour as fore. A straight white bar crosses the wing, continuous with the white bar in f.w. This bar is regular proximally, and indented by the nervules distally. It is followed by a sub-marginal row of large, ill-defined dark spots, and fine white lines as fore.

Underside. F.w. Ground-colour reddish-grey with white marks as above, but larger. Dark sub-marginal marks more conspicuous, and fine sub-marginal white lines whiter, more continuous and more distinct. Cell with a greyish-white streak along costal edge and curving over discocellulars, and two greyish areas, one ovoid, one quadrate.

H.w. Ground-colour as fore. Marked as above, but with two whitish lines crossing the basal triangle parallel to the discal bar, the distal of these two lines not very distinct. Cell with two reddish spots.

Female. Similar to male, but paler.

Distribution. Of a series of 9 in the Museum, 7 are labelled Budongo, and 2 Kalinzu. The distribution may be wider.

NEPTIS POULTONI Eltr. We have no specimen, and I quote from Eltringham, Trans. Ent. Soc. Lond. 1921.

"Expanse 38-42 mm. Ground-colour dark sepia, with white discal markings. F.w. with an inner marginal patch in 1a and 1b, the proximal edge of which forms a straight line continuous with that of the h.w. discal band. In 2 and 3 are large contiguous spots forming a sub-ovate patch of regular outline. In area 4 a minute white dot placed distally. In 5, 6 and 10 contiguous spots forming a large sub-apical patch. Distal to the white markings and roughly following their contour a line somewhat paler than the ground-colour, followed by a band of more or less rounded internervular dark spots, this followed again by three paler lines forming the hind-marginal border. Fringes dotted white between nervules.

H.w. with a white discal band of irregular outline 4 mm. wide on inner margin, and rather broader in 5, thence narrowing to a small spot in 7. Distal to the white band a border similar to that in f.w.

Underside. Ground-colour paler than above. Costa white at base and as far as cell end. In cell a white line on subcostal curving downwards and outwards, its end pointing to origin of nervule 3. On end of cell a white transverse line, and beyond this, indications of a second indistinct line. Discal white spots as above, but sub-apical extends into 10. The border arrangement of pale lines much accentuated owing to increased whiteness of lines and an additional fine marginal line.

H.w. brown at base, but with a conspicuous curved white costal bar from base to end of 8, followed by two indistinct narrow whitish streaks on dark ground. Beyond discal band border of same pattern as in f.w."

Distribution. Given by Eltringham as Uganda.

NEPTIS INCONGRUA OCCIDENTALIS (Plate IV, Fig. 6). Expanse 55-60 mm.

Sexes alike.

General colour black with a narrow white bar.

Male. F.w. Ground-colour sepia-black. A white patch on inner margin just touches a quadrate white mark in 2, which is contiguous with a similar mark in 3. A roughly circular white spot in 4, another in 5, and a white mark on the costa form a sub-apical bar, and there are three white dots on discocellulars. Fringe white-spotted.

H.w. Ground-colour as fore. A narrow white discal bar crosses the wing from just above the anal angle to mid-point of costa, continuous with the inner marginal patch in f.w. This bar is regular proximally, indented by nervules distally. Fringe white-spotted.

Underside. Both wings. Ground-colour rich coppery-red with a sheen, tending to become ochreous at f.w. margin. All white marks of above present, somewhat enlarged. Internervular rays distinct at forewing margin to discal area.

Female. Similar to male, but larger and paler.

Distribution. Throughout Kenya at moderately high altitudes. I have seen it at Nairobi, and found it fairly common at Molo and on Mt. Elgon. It is given to floating round trees, high out of net-reach, and is not, in my experience, easy to capture. It is one of the finest of the genus, and cannot be mistaken for any other species. Its rich coppery underside makes it unmistakable. There is a distinct superficial resemblance between this species and the female of *Charaxes baumanni*, but the two could never be confused.

NEPTIS WOODWARDI Sharpe (Plate IV, Fig. 7). Expanse :—Male 48-54 mm.
Female 60 mm. Sexes alike.

General colour black-brown with white spots in f.w., ochreous bar in h.w.

Male. F.w. Sepia-brown. Almost unicolorous. The only markings are a small round white spot each in areas 2 and 3 and in 5 and 6.

H.w. Ground-colour as fore. A narrow ochreous discal bar from mid-point of 2, crossing the base of 3, and mid-points of 4 and 5. Fringes of both wings white-spotted.

Underside. F.w. Ground-colour brownish ochreous with a bronzy sheen, becoming more ochreous towards outer margin. White spots of above present, much enlarged. Internervular spaces marked with dark rays.

H.w. Ground-colour much as fore, but more ochreous. Inter-nervular rays well defined. Pale bar of above present, somewhat larger.

Female. Like the male, but larger, with pale areas very much enlarged, and h.w. bar paler.

Distribution. West Kenya (Kakamega) and Uganda, in forest areas.

Mimetic Associations. Both sexes bear a remarkable resemblance to certain forms of *Acraea johnstoni* and *Acraea lycoa*, and also to *Amauris echeria* and its allies. This resemblance is particularly well marked in the female.

NEPTIS OCHRACEA Neave (Plate IV, Figs. 8 and 9). Expanse 55-60 mm.
Sexes alike.

General colour sepia-brown with an ochreous bar crossing both wings.

Male. F.w. Ground-colour sepia-brown. A broad ochreous bar crosses the wing from 1a to 3, tending to turn inwards in 2 and 3. A large quadrate ochreous spot in 5 and 6 forms a sub-apical bar. Ill-defined dark internervular rays just reach the pale areas from the margin.

H.w. Ground-colour as fore. Middle third of wing taken up by a broad regular ochreous bar from inner fold to costa, regular proximally, indented distally by the nervules and by dark, ill-defined rays which run inwards from the margin and just reach the pale area.

Underside. Both wings. Ground-colour greyish ochreous. All pale markings as above, larger and paler. Internervular rays and nervules well-marked.

Female. Like the male, but larger and paler, with pale markings more extensive. *H.w.* Pale area reaches base of wing.

Distribution. A series of 6 in the Museum, 4 from Kalinzu and 2 from Katera.

Mimetic Associations. This species, and especially the female, bears a strong resemblance to certain forms of *Acraea esebria* and *Acraea jodutta*. The resemblance is seen on both upper and under surfaces.

NEPTIS EXALEUCA Karsch (Plate IV, Fig. 10). Expanse 55-60 mm. Sexes alike.

General colour black with white bar crossing both wings.

Male. Very similar in markings to the fore-going, but the pale markings are white instead of ochreous, and the ground-colour is blacker. The internervular rays are more clearly defined, particularly in the h.w. There is a deep interruption of the white bar in the forewing by the ground-colour along nervule 2, dividing this bar into two areas.

Underside. F.w. Ground-colour at base reddish-ochreous, greyish towards apex. Pale marks as above, with dark internervular rays well defined.

H.w. Ground-colour reddish-ochreous at base, yellowish-ochre at distal third. Pale marks as above. Dark internervular rays well defined.

Distribution. There is a series of 5 in the Museum, labelled Bwamba, Uganda, T. H. E. Jackson, April-May, 1940.

Mimetic Associations. There is a certain resemblance between this species and certain black and white forms of *Acraea esebria*. Possibly some of the black and white females of species of *Bematistes*, such as *aganica montana*, also enter this association.

NEPTIS AGATHA Stoll (Plate IV, Figs. 11 & 12). Expanse:—Male 50-55mm.

Female 55-60 mm. Sexes alike.

General colour black and white.

Male. F.w. Ground-colour almost dead black in fresh specimens. Three to five white spots in cell, varying in size, one on costa by apex of cell, two on discocellulars. A white patch on inner margin at middle third, extending into 1b. A continuous broad white bar from 2 to costa, bending at an obtuse angle at vein 4, and indented distally by the nervures. Three interrupted white sub-marginal lines follow the outline of the wing from 1b to apex, and there is a trace of a fourth, which curves round as an indistinct pale line parallel to the broad sub-apical bar. The inner line of the sub-marginal three lines is widened, particularly towards the apex, where, in 7 and 8, it appears as two spots. Fringe white-spotted.

H.w. Ground-colour as fore. The middle third of the wing is taken up by a broad white bar, regular proximally, indented distally by the nervules. Margin with three interrupted white lines as fore. Fringe white-spotted.

Underside. F.w. Ground-colour slightly paler than above. All white marks as above, but much larger. Spots in cell tend to coalesce, particularly at the base.

H.w. Ground-colour as fore. White marks as above, but larger. Basal triangle ornamented with a white streak on costa and two white streaks parallel to this between costa and discal bar. A white spot at mid-point of 7. A series of white spots forms a row parallel to and just distal to the white discal bar.

Female. Like the male but larger.

Distribution. This is one of the commonest of the *Neptis*. It is found in forest and scrub country from the Coast to the Congo. Its habits do not differ from those of others of the genus.

For the descriptions of the following species, i.e. *jordani*, *seeldrayersi*, *barnsi*, *rogersi*, *trigonophora*, *nicoteles*, *nicomedes* and *puella*, which, according to Eltringham, occur within the bounds of Kenya and Uganda, I have been obliged to quote from Dr. Eltringham's monograph on the *Neptis*, as I have not been able to obtain any specimens from which to prepare a first-hand description.

NEPTIS JORDANI Neave.

" A detailed description would follow so closely that of *agatha* that it would seem of more use to state as fully as possible the directions in which it differs from that species In general appearance the ground-colour is browner than *agatha*. The f.w. discal band is very complete and shows no blackening at the nervules. In practically every case the white spot in area 4 is longer than that in area 5, whereas in *agatha* 4 is generally shorter than 5. In *jordani* the white in 6 is so markedly shorter than in 5 that the whole band has a narrowed appearance towards the costa, an effect much less apparent in *agatha*. The distal margin of the discal band from nervule 4 to the costa presents on the whole a straight or even concave line, whereas in *agatha* such margin is convex. In h.w. the white of the discal band projects outwardly between the nervules, especially in 4 and 5, and the ends of such projections are well rounded. In *agatha* the ends of the component white spots are generally cut off nearly straight, and they are not liable to so prominent a projection in 4 and 5. This feature is perhaps even more evident on the underside."

NEPTIS SEELDRAYERSI Auriv. Kumasi to Mombasa.

" Expense 45-60 mm. Sepia-black with white markings. F.w. with three white spots in cell and from one to five beyond it. An inner marginal patch formed by two spots in 1a and 1b, usually coalescent, or at most only divided by the nervule. A discal band of white spots in 2 to 6 and 9. This band may be quite continuous with the nervules only just visible, or it may be distinctly separated into spots, distally somewhat divergent. The tendency to separation is greatest on nervule 4, but the spot in 4, though it may be narrow, is not appreciably reduced in length (differing in this respect from *rogersi* and *barnsi*). Distal to the discal band and following its contour a pale line well marked or faint, not thrown into distinct arches between the nervules. Three sub-marginal lines, the first more or less expanded into spots near apex (rarely traces of a fourth near apex). These lines, however faint, are interrupted only by the nervules and never markedly obsolescent in area 3.

H.w. with a white discal band beginning at inner margin and usually ending in area 6, but sometimes extending into area 7. Its proximal margin forms an almost continuous straight line with the f.w. inner marginal patch as far as the median nervule, whence it turns downward towards the anal angle. This discal band varies in width from 4 to 10 mm., and may be quite continuous, even the nervules being white, or it may consist of spots separated by black nervules, and distally still more so by invasions of the ground-colour. Beyond this band a pale line only faintly indicated, followed by three, sometimes four sub-marginal lines. Both wings with white spotted fringes.

Underside. Ground-colour little paler than above. F.w. white at base of costa. Pattern in cell variable, but usually consisting of a white mark on subcostal side with a small proximal and a larger distal posterior projection, between which are two rather faint spots. Following this an irregular line across cell end. White discal marks as above, the first line yellowish-white, the sub-marginal lines much accentuated, the most proximal one being widened into sub-triangular spots towards apex.

H.w. with a conspicuous white basal band extending along costa nearly to middle of its length, followed by two rather well-defined white bands. These are much more regular and less broken than in *agatha*. Discal band as above. First pale line well developed and yellowish white. Sub-marginal lines similar to those on f.w., the most proximal being expanded into subquadrate spots."

NEPTIS BARNESI Eltr. Expanse 55-60 mm. Congo River to Semliki Valley.
Kisumu.

" This species closely resembles *seeldrayersi* Auriv., from which it may generally be distinguished by the obsolescent character of the streak in f.w. area 4, and by the fact that the pale line on f.w. immediately distal to the discal markings is deeply arched (distally convex) between the nervules"

NEPTIS ROGERSI Eltr. Rabai. Expanse about 50 mm.

" At once distinguished from *agatha* and *seeldrayersi* by the small spot in f.w. area 4, whilst they differ from *barnsi* in the straight formation of the f.w. discal line bordering on the large white spots. Also in the much narrower basal costal band and in the pure white markings of the underside."

NEPTIS TRIGONOPHORA Btlr. East and South Africa (Rabai to Pondoland).

" Expanse 45-50 mm. Sepia-black with white markings. F.w. cell without white dots, but sometimes with vestiges of a longitudinal streak. An inner marginal patch in 1a and 1b, followed by two spots in 2 and 3 slightly separated distally. In 4 a very small spot distally placed, and in 5, 6 and 9 three white spots distally separated, the third very small and streak-like. A pale discal line following the contour of the discal spots. Three delicate but usually well-defined sub-marginal lines.

H.w. with a white discal band from inner margin to area 7, straight proximally and very slightly indented distally at nervules. This followed by a pale discal line and three, sometimes four sub-marginal lines, the innermost of these brownish, the rest extremely fine and scaled with white.

Underside. F.w. very slightly white at base of costa, a curved clavate white mark in cell, its distal end often bordered by a delicate pale curved transverse line. Beyond this four rather ill-defined spots. White discal marks as above, followed by a well-developed pale line of a yellowish tinge and four white sub-marginal lines, the first about 1 mm. wide.

H.w. with a small narrow white streak at base of costa followed by two curved well-defined white lines. Discal band as above, followed by a yellowish line and four sub-marginal white lines. All fringes white between nervules."

NEPTIS NICOTELES Hew. Cameroon to Mombasa.

" Expanse 37-42 mm. Ground-colour sepia-black with white markings. F.w. with a white clavate mark nearly filling cell. An inner marginal patch in 1a and 1b followed by a more or less rounded patch of two spots in 2 and 3. A sub-apical patch of white in 4, 5, 6 and 9. In 4 this patch begins only just below nervule 5, so that the spot in that area is a mere streak. The discal marks followed by a pale line, beyond which are three delicate whitish sub-marginal lines. Fringes white between nervules.

H.w. with a discal white band from inner margin to area 6 about 5 mm. wide, almost straight on both edges, nervules thereon not or very little blackened. Discal and marginal lines as on f.w.

Underside. F.w. just noticeably white at base of costa. H.w. with a white streak at base of costa followed by two more on the dark ground of basal area. Other marks as above, but white sub-marginal lines much more accentuated.

This little species is apparently not common. It may be distinguished from others by the streak of white below and adjacent to nervule 5 in f.w."

NEPTIS NICOMEDES Hew.

Apparently occurs in three forms, *nicomedes*, *quintilla*, and *puelloides*, the distributions of which, as given by Eltringham, are "Uganda," "Entebbe," and "Kampala" (inter alia) respectively. There are no specimens of any form in the Museum; I quote from Eltringham.

NEPTIS NICOMEDES f. *NICOMEDES* Hew.

"Expense about 38 mm. Sepia black with white markings. F.w. with a white mark in cell sometimes clavate extending from near base, widening and curving over downwards and outwards to end of cell, sometimes divided into two, the basal part remaining only as a dot. On inner margin a white mark in 1a and 1b, the marginal part rather wide and the inner edge forming a continuous straight line with that of h.w. discal band. A large continuous white discal band from 2 to 9, its outer and inner edges regularly curved, proximally concave, distally convex. Beyond this a pale line, faint or well-developed, followed by a narrow white line which is usually expanded into a spot near apex. Two delicate sub-marginal lines, more or less interrupted in area 3, especially beneath.

H.w. with a broad discal band about 5 mm. wide, both edges rather straight, and nearly parallel, extending from inner margin to 6, this followed by a pale line, and three sub-marginal lines.

Underside. The clavate mark in f.w. cell better developed than above, and sometimes with a faint pale transverse line beyond it. Base of costa faintly white. Other marks as above but marginal pattern whiter, and interruption of lines more obvious in 3, and often in 6.

H.w. with a conspicuous curved white band at base of costa, extending to middle of same, followed by two narrow lines, the lower rather longer than the upper. Other markings as above but marginal lines more developed.

NEPTIS NICOMEDES f. *QUINTILLA* Mab. Resembles the type form, but the spots in f.w. 2 and 3 are short and quadrate, so that the contour of the inner edge of the discal patch is materially altered. All stages of intermediates occur.

NEPTIS NICOMEDES f. *PUELLOIDES* Eltr. F.w. cell without any trace of white mark, and on underside the white in cell is reduced to a line on subcostal which curves sharply downwards and outwards at cell end. Just beyond this a transverse white line. The spots in f.w. 2 and 3 vary in length, so that the proximal edge of discal patch may be of the type form or may approach that of *quintilla* . . ."

NEPTIS PUELLA Auriv. Cameroon. Congo. Uganda.

"Expense about 35 mm. Sepia black with white markings. F.w. without marks in cell. An inner marginal patch in 1a and 1b, its inner edge quite or nearly continuous with that of h.w. discal band. A large continuous discal patch from 2 to 9, the inner edge of which is either straight or convex. This patch not or but little reduced in width till just before reaching costa, where the spot in 9 is very small. The usual discal pale line followed by three fine whitish or bluish-grey sub-marginal lines, these interrupted only at nervules. Fringes white between nervules.

H.w. with large discal patch continuous and with smooth outlines followed by discal and sub-marginal lines as on f.w.

Underside. F.w. as above but white markings, especially sub-marginal lines much accentuated. Costa whitish at base. In cell a longitudinal streak on sub-costal, followed by a diagonal line across end of cell.

H.w. with large white curved band on costa from base to a point just above end of proximal edge of discal band, followed by two narrow whitish lines. Otherwise as above with pale lines accentuated, the discal line brownish-white.

This species may be distinguished by its small size and by the large continuous discal patch in f.w. The straight or convex proximal edge of this patch and the uninterrupted sub-marginal lines distinguish it from *nicomedes puelloides*."

NEPTIS MELICERTA Drury (Plate IV, Figs. 13-15). Expanse :—Male 40 mm.

Female 50 mm. Sexes alike.

General colour black and white.

Male. F.w. Ground-colour sepia-black. Cell mostly taken up by a club-shaped white area, occasionally somewhat obsolescent at the base, and followed by a white triangle in area 4. A small white patch on inner margin in area 1a, a circular white patch, interrupted by the nervule, across nervule 3, and a white sub-apical bar composed as follows :—a small white dot in 4, a long white spot in 5, an irregular shaped mark in 6, and a very small quadrate spot in 9. Three pale, greyish-white sub-marginal lines, not interrupted by the nervules, and a fourth indistinct pale line curving over, parallel with the sub-apical bar. A series of indistinct dark spots between third and fourth lines.

H.w. Ground-colour as fore. A medium-width white bar crosses the disc of the wing from inner fold to costa, regular proximally and distally. Three sub-marginal whitish lines as fore, with indistinct dark spots internal to the third line.

Underside. F.w. Ground-colour sepia-brown. White marks as above, but larger and more distinct.

H.w. Ground-colour as fore. White marks as above, but larger. Dark markings more distinct. A white streak on costa, followed by two indistinct greyish lines parallel to the discal bar.

Distribution. As far as my information goes, from Western Kenya (Kakamega) through Uganda to the Congo.* It is a forest species.

NEPTIS STRIGATA Auriv (Plate IV, Fig. 16). Expanse 50 mm. Sexes alike.

General colour black and white.

Female. F.w. Ground-colour sepia-black. A club-shaped white mark in the cell. A large white patch on inner margin, reaching nearly to nervule 2. An ovoid patch in area 2, contiguous with a similar, smaller patch in 3. A large white semi-circular area, not interrupted by nervules, from costa to vein 4. Three sub-marginal white lines follow the contour of the wing from hind angle to apex, the most proximal much widened towards the apex, and curving somewhat inwards.

H.w. Ground-colour as fore. Middle third with a broad white bar, regular proximally, slightly indented by nervules distally. Sub-marginal white lines as fore.

Underside. F.w. Ground-colour sepia-brown. White markings as above, but larger.

*There is a specimen in the Coryndon Memorial Museum collection labelled "Marsabit" and I have taken this species at Kwale in the Coast Province of Kenya.—*Editor.*

H.w. Ground-colour as fore. White markings as above, but larger. A large white streak on costa, and two curved greyish-white lines cross the basal triangle, roughly parallel to the discal white bar.

Distribution. One specimen only, a female, in Museum collection, labelled N'tebi (? Entebbe), Uganda, Jackson, May/June, 1895.

NEPTIS NYSIADES Hew (Plate IV, Fig. 17). Expanse 50 mm. Sexes alike.
General colour black and white.

Male. F.w. Ground-colour sepia-black. Cell with three small white streaks or spots. A white patch on inner margin, reaching half-way through area 1b. An angled sub-apical bar from 2 to costa, but not invading costa, and indented by nervules distally, particularly by nervules 3 and 4. An ill-defined whitish line runs distal to and parallel with this patch, from 2 to 6, followed by a row of indistinct dark spots. Three fine white sub-marginal lines, just interrupted by nervules, follow the contour of the wing from 1b to apex, the inner one of these much widened and curving inwards at the apex.

H.w. Ground-colour as fore. Middle third with a wide white discal bar crossing the wing, regular proximally, indented distally by nervules. Sub-marginal markings as in f.w.

Underside. F.w. Ground-colour sepia-brown. All white markings as above, much enlarged and less interrupted by nervules. Cell markings appear as two transverse streaks.

H.w. Ground-colour as fore. White markings of above present, much enlarged and more regular, less interrupted by nervules. Costa broadly white. Basal triangle with two ill-defined transverse whitish streaks. A further ill-defined whitish line is found distal to and parallel with the white discal bar.

Distribution. As far as my information goes, throughout Uganda to the Belgian Congo.

(To be continued).

REPORT ON A VISIT TO THE SITE OF THE EYASI SKULL,
FOUND BY DR. KOHL-LARSEN.

PART I.

By L. S. B. Leakey, Ph.D., M.A.

PUBLISHED BY PERMISSION OF THE ROYAL SOCIETY.

INTRODUCTION.

In July, 1936, I was invited to go to Berlin to examine the fragments of a fossil skull which had been found by Dr. Kohl-Larsen at the North-East end of Lake Eyasi during his 1934-36 Expedition.

In "Nature" (Dec. 26, 1936—page 1082), I published a preliminary note on the views I had formed as a result of examining the skull itself and the associated finds. Briefly, my views were that the skull was not of *Homo sapiens* type, and that it was of Upper Pleistocene age, being associated with a fauna indicating the age as Gamblian Pluvial, and with an industry of the Levalloisian culture.

After my note was published in "Nature," it was suggested to me by various workers that an Upper Pleistocene (Gamblian) date was unlikely, owing to the fact that the skull represents an extinct type of man. In consequence I made plans to visit the site in 1937, in order to examine the evidence for the age of the skull on the spot.

The Royal Society very kindly provided funds to enable me to go from Kenya, where I was then working, and, at the special request of the Royal Society, the Geological Department of Tanganyika Territory agreed to send Mr. Reeve to carry out the Geological side of the study of the site. His report is now published with mine.

The original plan was to visit the site in company with the discoverer of the skull, Dr. Kohl-Larsen, but at the last moment he was detained in Germany. Although he was therefore unable to come with us himself, he very generously arranged with his son, who had a farm in the Territory, to provide us with one of his original native workmen to act as our guide. For this help we were exceedingly grateful.

The site was eventually reached on Nov. 4th, 1937, in the afternoon, and during the succeeding three days we studied all the available evidence as carefully as was possible under the circumstances.

THE SITE.

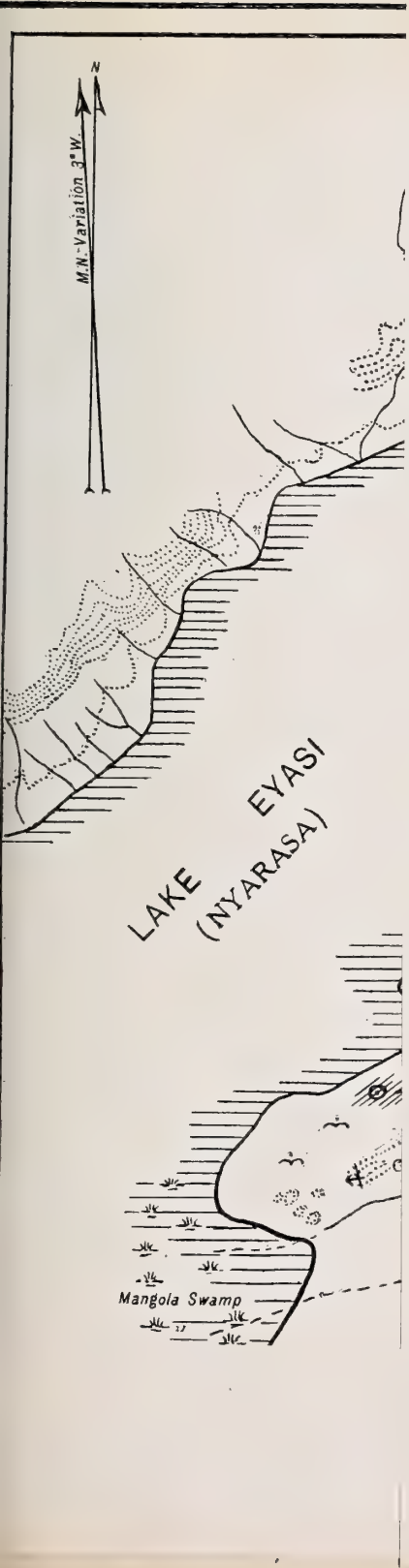
The site is situated on the extensive flats which border Lake Eyasi in this region, and although at the time of our visit, which was at the very end of the dry season, the edge of the lake was about 600 yards distant, it was obvious that during the last wet season the lake level had risen sufficiently to flood the site itself, and had only recently receded.

Since the site thus lies at the approximate level of the lake during the wet seasons, there were practically no natural exposures, the few there were being exposed in shallow erosion gulleys, hardly worthy of the name. The deepest natural exposure noted within half a mile of the site in any direction had a depth of only slightly over three feet.

N
M.N. Variation 3° W

LAKE EYASI
(NYARASA)

Mangola Swamp







Dr. Kohl-Larsen described the fossil bones as coming from a "bone-bed." This "bone-bed" was found to be more strictly a bone-bearing horizon, which consisted of a deposit of slightly consolidated sand, but it was certainly not a sandstone in the ordinary sense. It overlay a thin stratum of greenish clay with sporadic fish remains. The greatest depth of the bone-bearing sand noted by us was in our Pit No. 1, where it was 49 inches thick.

Over an area of several acres, this bone-bearing sand had been eroded into gentle slopes by the seasonal rains, and the accompanying fluctuations of the lake. As a result of this, the coarser materials in the sand, including the fossil bones, are washed out and left lying on these slopes. Many fragments of bone, including some bones and teeth, can therefore be collected from these slopes. All this bone is heavily mineralised, most of it is black in colour with some browner pieces, and both rolled and unrolled bones occur together.

Very few complete or even identifiable pieces of bone were found by us during our visit, as the whole area had been carefully combed by Dr. Kohl-Larsen in 1936, and the amount of erosion since then has been small. Faunal evidence as to the age of the deposits can therefore only be adduced from Dr. Kohl-Larsen's collection.

On the other hand, during the digging of our Pit No. 1, it was definitely established that the sand which we identified as Dr. Kohl-Larsen's "bone-bed" does contain bone, and two unrolled vertebrae, probably of hippopotamus, were found *in situ*. Besides these, a few heavily rolled fragments of bone were also found in this deposit.

This association of both rolled and unrolled bone *in situ* in the deposit is very important because the fossil bones collected by Dr. Kohl-Larsen include a few heavily rolled bones and teeth, in addition to a large number of unrolled specimens.

When I was in Berlin in 1936 to examine the collections, I noted that a separation of the fauna into species represented by rolled and unrolled remains was very informative. The rolled fauna included the following:—

Hipparion sp. Two very rolled teeth and perhaps one or two fragments of limb bone.

Simopithecus sp. Several rolled teeth.

Giraffid teeth and

Half a mandible of a large carnivore.

Of these, the first two are extinct genera which are characteristic of the Middle Pleistocene fauna of East Africa, while the other two, although not characteristic, also occur at that period.

The *unrolled* fauna in the Berlin collection included the remains of a much greater variety of species, which with very few exceptions are living species, such as the black rhinoceros, white rhinoceros, hippopotamus, zebra, giraffe, wart hog, forest hog, several antelopes and a porcupine. The only extinct species in the *unrolled* fauna were a bovid of the *Bubalus* type and possibly an antelope and a carnivore.

This unrolled fauna, consisting chiefly of living species with a few extinct forms, such as *Bubalus*, is typical of the Gamblian Pluvial deposits of East Africa, that is to say of the Upper Pleistocene.

It must be noted in fairness that most of the above mentioned species also occur in the Middle Pleistocene, side by side with extinct genera such as *Hipparion* and *Simopithecus*, but the two latter do not occur, unrolled, as far as we know in any Upper Pleistocene deposits in East Africa. In the Eyasi deposits these extinct genera which Dr. Kohl-Larsen found occur *only as very rolled and derived fossils*.

It should be noted here that the fragments which represent the principal human skull from this site are unrolled and that the skull must be regarded as belonging with the unrolled fauna, which—taken as an assemblage—indicates an Upper Pleistocene age.

Although this fauna is mainly composed of living species, the presence of such animals as the white rhinoceros and the forest hog, whose present distribution does not include this area, as well as the extinct species *Bos bubalus* shows that we are not dealing with a fauna of absolutely recent date.

THE CULTURE.

Although no artefacts were found by us *in situ* in any of the pits or trenches which we dug, two were found as a result of breaking open lumps of the sandy bone-bearing bed which were on the dump of Dr. Kohl-Larsen's excavations, thus confirming his statement that the artefacts are in the "bone-bed."

In addition to this, a certain number of artefacts were found by me lying on the above-mentioned eroded slopes associated with the fragments of fossil bone, and clearly being washed out of the bone-bearing sand.

With the sole exception of one or two broken and probably derived hand-axes, all the artefacts from this site in the Berlin collection, as well as those found by us, belong to a typical Levalloisian assemblage, and they correspond closely to Levalloisian material from Gamblian Pluvial deposits in Kenya Colony. In other words the evidence of the culture confirms the Upper Pleistocene date indicated by the fauna.

THE GEOLOGICAL EVIDENCE.

The details of the geological evidence that we were able to obtain is the subject of Mr. Reeve's geological report (See Part II). I will therefore confine my remarks to certain broad issues.

In dealing with Tertiary and Quarternary deposits one of the chief lines of evidence to be used for dating purposes must always be that given by the fossils, if there are any. In the present case, the evidence of the fossils found by Dr. Kohl-Larsen is quite clear, and it points to a post-Middle Pleistocene date, although heavily rolled and therefore *derived* Middle Pleistocene fossils occur in the deposit. The fossils that are unrolled and therefore contemporary with the deposits indicate, on the other hand, an Upper Pleistocene date.

Secondly, in East Africa, and particularly in the Rift Valley zones, we know that the Middle Pleistocene period was followed by a period of very severe earth movements, and we know, too, that these movements were very marked all round the Eyasi region.

The Middle Pleistocene deposits of the Olduvai Gorge, for example, which are only about thirty miles away from the Eyasi site were seriously affected. The Eyasi Lake basin itself is almost certainly a product of this same Middle Pleistocene faulting, forming as it does a direct continuation of the Balbal Depression, and separated from it only by Lemagrut mountain, which is itself cut to some extent by these faults.

If the Eyasi deposits which are the subject of this report, were of Middle Pleistocene age or earlier, they could hardly have failed to have been affected by the disturbances of the earth's crust which, as we know, followed immediately after the Middle Pleistocene.

Instead, we find that they lie on the floor of the Rift Valley, and so far as we could discover, are quite undisturbed. They appear to be quite comparable in this respect to deposits laid down during the Gamblian Pluvial period, in the various lake basins situated in the floor of the Rift Valley to the North.

THE SKULL FRAGMENTS.

What is known as the Eyasi Skull is that reconstructed from a number of unrolled broken fragments that were found together, and it must not be confused with a distinct and separate skull fragment which will be mentioned later.

As I noted in "Nature" (Dec. 26th, 1936), the Eyasi Skull is definitely not of *Homo sapiens* type, but represents an extinct species, or even an extinct genus of man, allied to *Paleoanthropus*. This skull has now been studied in detail by Dr. Weinert of Kiel, who has created a new genus *Africanthropus* for it. From the available evidence, which I have summarised above, it would seem to be quite clear that this skull is younger than the Middle Pleistocene and that it represents a maker of one of the African branches of the Levalloisian Culture.

For some years now, it has been known that in East Africa during the Gamblian Pluvial period there were two contemporary cultures, the Kenya Aurignacian, and the African Levalloisian. The type of man who made the former is known from Gamble's Cave and elsewhere, and is *Homo sapiens*. The Eyasi Skull represents the makers of the Levalloisian culture, and, as might be expected, is not of *Homo sapiens* type. This agrees with all the European evidence, where the skulls associated with the Mousterian-Levalloisian complex are invariably of the Neanderthalian type.

THE ROLLED SKULL FRAGMENTS.

In addition to the Eyasi Skull, Dr. Kohl-Larsen's collection included a small rolled skull fragment; this is too small to be determinate, but the possibility must not be lost sight of that this piece may belong with the rolled Middle Pleistocene fauna, and have no connection with the principal Eyasi Skull. Equally it may have been collected on the surface, and be regarded as having been rolled on the slopes of the mounds in very recent times.

CONCLUSIONS.

There is nothing in the evidence resulting from our visit to the Eyasi site to contradict the view expressed in the paper published by the late Professor Reck and Dr. Kohl-Larsen in "Geologische Rundschau" (Nov., 1936), that the Eyasi Skull is of Upper Pleistocene age. Rather does our work confirm such a finding in all respects.

GEOLOGICAL REPORT ON THE SITE OF DR. KOHL-LARSEN'S
DISCOVERY OF A FOSSIL HUMAN SKULL, LAKE EYASI,
TANGANYIKA TERRITORY.

PART II.

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INTRODUCTION.

The object of the writer's visit to this region was to report upon the geological aspect of the site of Dr. Kohl-Larsen's discovery made in the period 1934-36.* The visit was paid in company with Dr. and Mrs. L. S. B. Leakey and camp was established at the northern end of the Mumba Hill range, a distance of three and a quarter miles from the actual point of discovery.

The accompanying sketch-map drawn from Geological Survey Map G.S. 91 (1 : 200,000) indicates the position of the site accurately only with reference to the highest (southern) peak of the Mumba Hills and to the position of the first cave excavated by Kohl-Larsen. It is 1.9 mile west of this cave and 1.25 mile on a bearing of eleven degrees† from the western base of the southern peak of Mumba Hills. The lack of triangulation points in this region rendered it impracticable to fix the position of the site more accurately. The directions given above are, however, quite sufficient to enable the site to be found.

Water for camp purposes, fresh and of good quality is obtainable from a small offshoot of the Mangola stream. The Mangola flows along the south-eastern flank of the Mumba Hills and is permanent.

GEOLOGY.

(a) *Stratigraphy*.—Apart from the exposures of gneissose granite and intruded basic schists in the tors of the Mumba Hills, an almost complete absence of natural sections in the lake deposits renders an accurate interpretation of the geology of the region somewhat difficult. Erosion gullies are to be found, but the average depth of these is seldom greater than one foot. One such gully about a hundred yards east-south-east of the discovery site exhibited a section of approximately three feet depth for a distance of two to three yards only.

*In the course of an expedition to Lake Eyasi in 1934-36, Dr. Kohl-Larsen discovered parts of three fossil human skulls in association with stone artefacts and fossil mammalian remains. Of the three skulls represented, the partial reconstruction of one only was possible but the reconstruction was sufficient to indicate that the skull represents a low type of human with markedly anthropoid characters, while in other ways it approximates more to the *Sinanthropus* type. In a preliminary report by the late Prof. Hans Reck and Dr. Kohl-Larsen, it is attributed to the genus *Paleoanthropus* (sp. *njarasensis*). (See "Erster Ueberlick ueber die Jungdiluvialen Tier- und Menschenfunde Dr. Kohl-Larsen's im nordöstlichen Teil des Njarasa-Grabens (Ostafrika)." Von H. Reck and L. Kohl-Larsen. *Geologische Rundschau*, Nov., 1936). The associated culture and fossil fauna strongly suggest an Upper Pleistocene (early or middle Gamblian) date.

†All bearings given are magnetic.

There is a gradual fall from the western base of the Mumba Hills to the edge of the present-day lake but the slope in the actual vicinity of the site is so slight as to be indiscernible. Gentle undulations are observable owing to the accumulations of drifted sand but the differences in height are small. There are two raised beaches between the base of the Mumba Hills near the first cave and the present lake edge. The height of the floor of the trough at the point where the fossil skull was found is, as accurately as can be calculated, 3,410 feet above mean sea-level.

It may be noted that nothing could be ascertained from Kohl-Larsen's own excavations which, at his request, were left untouched. This place had obviously been submerged beneath the waters of the lake during the previous rainy season and is now filled with dry, cracked mud.

Pits and trenches were dug nearby and finally a section of about twelve feet of the underlying beds was exposed.

The thickness of the wind-drifted sand varies from a few inches to a foot or more. Where it is at a minimum, or where it has been completely removed from the surface of the underlying beds, the ground is strewn with mammalian bone fragments.

In several places in the neighbourhood are exposed surface outcrops of a dark red rock with a cellular and laterized appearance. These outcrops are small and sporadically distributed; in one or two places, they form low bars or "reefs." At the ground surface the rock is hard and compact and, as will be shown later, for a depth of not more than ten inches, the rock is a laterite. Below this depth, it becomes much less well-consolidated, distinctly sandy and loses its red colour to some extent. A pit (No. 2) was dug through one of these outcrops, three or four yards west of the point where the skull fragments were found. This revealed one foot six inches of the red bed, hard and compact on top, becoming softer in depth, somewhat sandy and much less consolidated, and underlain by greyish-green marl which is sharply distinguished from the overlying sandy portion of the red bed. A similar section was observed in a trench twelve feet in length by two feet wide, dug about ten yards west of Kohl-Larsen's excavation and a few feet from pit No. 2. In the trench, however, a thin band of four inches thickness, of greyish-green sandy marl with fossil fish-scales lies immediately below the sandy base of the red bed, followed by the same greyish-green marl as in pit No. 2. The thin, sandy marl band with fish remains is undoubtedly Kohl-Larsen's "Unterer Fisch-mergel."

Twenty yards south of the site of the skull find, the main pit, No. 1, measuring ten feet by six feet, was sunk to a depth of nine feet and exposed the following section, "A":—

11. Surface wind-borne sand	4-12 inches.
10. Reddish, ill-consolidated sandstone with mammalian remains. (Horizon in which skull fragments found by Kohl-Larsen)	±4 feet.
9. Thin layer of concretionary limestone	½-1 inch.
8. Greyish-green sandy marl with fish scales. ("Unterer Fischmergel" of Kohl-Larsen)	8-10 inches.
7. Greenish-brown, sandy marl	±5 inches.
6. Greyish-green clayey marl with abundant limey concretions	18 inches.
5. Sandy marl, greenish	6 inches.
4. Green clay	2½ inches.

3. Sandy clay, greenish	2½ inches.
2. Thin layer of beach sand	±1 inch.
1. Brown sand becoming earthy at depth, with abundant flakes of white mica. Ill-consolidated. Base not seen	+1 foot.

It is probable that beds 3 to 7 inclusive represent the "Hauptmergel" of Kohl-Larsen, the thickness of which he estimates at ± two metres. Here it is clearly divisible into the sections shown, the changes from one band to another being unmistakably defined in a clean section in the pit. Bed 8 would appear to be the equivalent of Kohl-Larsen's "Unterer Fischmergel" and 10 his "Hauptsandstein mit fossiler Fauna." The latter is the bed in which, in Kohl-Larsen's own excavation, the fragments of the human skull were found and in pit No. 2, a laterite capping covers the eroded surface of this bed. No sign of an upper fish-bearing marl was seen in this or in any other section exposed.

Approximately a hundred yards to the east-south-east, an erosion gully exhibits on its north-western bank a small section of about three feet in depth for a distance of two or three yards (Plate V). A second trench was excavated across this gully until a depth of seven to eight feet from the overlying sand to the base of the trench was reached. The following section was then noted, "B":—

8. Thin covering of wind-borne sand	±3 inches.
7. Ill-consolidated sandstone with mammalian remains. (Bed 10 of section "A")	4-5 inches.
6. Thin layer of concretionary limestone. Not strongly defined	±½ inch.
5. Greyish-green sandy marl with fish scales	±5 inches.
4. Greenish, sandy marl	±5 inches.
3. Green, clayey marl with numerous limey concretions	16 inches.
2. Thin layer of beach sand	1 inch.
1. Brownish-red clayey sand with abundant flakes of white mica. Base not seen.	

On the eastern side of this gully, a deeper hole was dug in the same trench and this opened directly into bed 1, showing well-stratified, slightly reddened modern sands underlain by two feet of red, sandy clay with three to four feet of brownish-red clayey sand below it. This is a continuation in depth of bed 1, and the high mica content is again conspicuous.

The sections "A" and "B" therefore correspond, "B" exposing a greater thickness of the basal red, sandy material. In "B," the sandstone with mammalian remains has been eroded, only a few inches appearing here as against four feet in pit No. 1. Here, too, the surface sand is very thin, in some places completely removed and the bone fragments are strewn about over the ground surface.

In a private communication to Dr. L. S. B. Leakey, Dr. Kohl-Larsen says that when excavating his "fossil mansite" he had just reached the lower fish-bearing marl before being compelled to suspend operations on that occasion. Simple levelling measurements on the spot demonstrate that the top of the fish-marl in pit No. 1 (bed 8 of section "A") is at exactly the same level as the caked mud surface of the shallow depression marking the site excavated by Kohl-Larsen and which, according to his own words, is the upper surface of the lower fish-bearing marl. Similarly the lower fish-bearing marl in the erosion gully a hundred yards east-south-east of the first pit, is at the same level. *There is no suggestion of dip of the beds, nor are there the slightest indications of disturbance in the way of folding, faulting or shearing.*

The presence of the thin band of concretionary lime between the lower fish-bearing marl (bed 8 of section "A") and the reddish, partly consolidated sandstone with mammalian remains overlying it, points to the existence of a land surface after the deposition and consolidation of the marly beds, the uppermost of which is the lower fish-bearing marl. This is either altogether absent from pit No. 2 or indistinguishable from the greyish-green marl below the red, sandy bed with lateritic capping (see page 45). The failure to observe any fish scales in that marl is not necessarily a proof that the lower fish-bearing marl is not represented there as the fish remains, though plentiful, are sporadically distributed.

Again, the presence of a thin layer of beach sand overlying the brownish-red clayey sand at the base of the sections "A" and "B" is indicative of the existence of an old land surface. This basal bed with its high content of white mica and its earthy nature is quite distinct from the rest of the overlying strata and is thought to be the old land surface on the primitive rock foundation. This foundation is here composed of gneissose granite which has intruded still older schists and gneisses, as the rock of the Mumba Hills and numerous smaller *inselberge* on the floor of this part of the Eyasi trough show. If this is the case, the sedimentation on the floor of the trough cannot have assumed any great proportions, even allowing for the subsequent processes of erosion. From the very nature of the floor, erosive processes must have been slow and poorly effective since its formation.

In an endeavour to adduce further evidence for the age of the Eyasi sediments, a petrographical examination was made of the material of the several strata. This was compared with rock samples from the Pleistocene beds in the Oldoway (Olduvai) gorge, which the writer, in company with Dr. Leakey visited before leaving the district.

(b) *Petrography*.—Possibly one of the most significant results of this examination lies in the fact that the material of the upper part of the red bed observed in pit No. 2 proves to be lateritic. A partial analysis of this material revealed the presence of 37.64 per cent. of Al_2O_3 . It is therefore an aluminous laterite and represents a stage in the formation of bauxite. A comparative analysis of high grade bauxite from the Gold Coast gave 70.84 per cent. Al_2O_3 .

The lower portion of this red bed is not lateritic. It is not nearly so red as the laterite, is very ill-consolidated and though no mammalian bone fragments were actually found in pit No. 2, the writer considers that this portion (about eight inches in thickness) represents the eroded bone-bearing sandstone as found in pit No. 1.

Microsections of the laterite from pit No. 2 show that it contains only minute amounts of detrital material, principally quartz grains. Similar material from a point about half a mile to the east-north-east contains more detrital material, the most prominent minerals being quartz, orthoclase, microcline, oligoclase, bright green hornblende, colourless pyroxene, biotite and muscovite. Numerous small, partly rounded lava pebbles are also to be seen.

In general, the material from both places appears to be in the nature of a detrital or low-level laterite formed by the denudation, transportation and deposition of rock fragments and cementation by lateritic material. In pit No. 2, all the Eyasi beds observed, lie below the laterite. The upper fish-bearing marl of Kohl-Larsen was not seen but it is probable that this, too, was eroded before the laterite formed. The presence of lava pebbles in the laterite of the second locality is also significant in connection with the date of the laterisation.

The general opinion is that laterite is formed under humid conditions with a well-marked, well-distributed seasonal rainfall accompanied by high temperature, extended over a lengthy period of time. Its origin appears to depend more upon climatic conditions than on the nature of the underlying rock. Thus in India, it

is found on basalts of the Deccan⁽¹⁾ but is also derived from granites and other rocks ; in West Africa it is observed on granites, norites and meta-sediments⁽²⁾ and in East and South Africa, on granite, on gneisses and on volcanic rocks⁽³⁾. The main point is that in this Eyasi locality, the presence of laterite indicates climatic conditions for its formation vastly different from those that prevail at the present time. It is impossible for the laterite to have formed under present day conditions ; it is *not* forming at the present time.

These rocks were compared with the red bed 3 of Olduvai (Oldoway) but the differences are sufficiently striking to convince one that the beds are not the same. Bed 3 of Olduvai is not lateritic ; it contains far more limey material and includes calcite, epidote and apatite which are absent from the Eyasi red bed. Biotite, which occurs in some abundance in the latter, is rare or absent in Olduvai bed 3 ; muscovite is entirely absent. Bed 5 of Olduvai is very different both in colour and texture from any of the Eyasi strata but contains minerals that are common to the latter. In particular, biotite is abundant in long, narrow flakes, much less so as basal sections. The commonness of the long, narrow flakes is peculiar as the rock does not show any particular structure or directional features. Microcline and green hornblende are also common. Bed 5 of Olduvai and the Eyasi sands and marls all differ from Bed 3 of Olduvai in the relative abundance of the green hornblende and biotite which are common alike in Bed 5 of Olduvai and in the Eyasi beds.

(c) *Paleontology*.—Little can be said here concerning the fauna of the Eyasi beds examined on the occasion of this visit beyond the fact that all the remains obtained by us from the sandstone in which the skull fragments were found by Kohl-Larsen in his excavation, appeared to be those of existing species, including bones or teeth of hippopotamus, rhinoceros, pig and monkey.* In the lower fish-bearing marl, fish scales only were found. All the bone fragments were in an advanced state of mineralisation though this fact cannot be considered of great value in determining their age. The mineralisation of the bones is manganiferous as tests on the material have proved and this may, conceivably, be connected with the process of laterisation, manganese oxide being a constituent which, along with the oxides of iron, titanium and aluminium, tends to be concentrated by the process of laterisation.

(d) *Archæology*.—This side of the investigation is dealt with more fully by Dr. Leakey, but it is of interest to note here that an implement found by him in the neighbourhood of the site, and belonging to a stage of Levalloisian culture, proved to be made from a fragment of lava which is of a distinctive type. It is a basic phonolite containing leucite in some quantity. As there appears to be very little feldspar it is between a leucite-nepheline-tephrite and a leucite-nephelinite. The curious feature of this rock is its rarity in this part of East Africa. Only one other specimen of this type of lava has been observed by any member of the Geological Survey ; this was a leucite-bearing nephelinitoid phonolite from south-east of Meru

(1) Fox, C. S. The Bauxite and Aluminous Laterite Occurrences of India : *Mem. Geol. Surv. India*. Vol. 49, Pt. I, 1923.

(2) Cooper, W. G. G. The Bauxite Deposits of the Gold Coast : *Gold Coast Geol. Surv. Bulletin*. No. 7, 1936 ; also Government of Gold Coast : *Rept. Geol. Surv.* 1917, 1919, 1921.

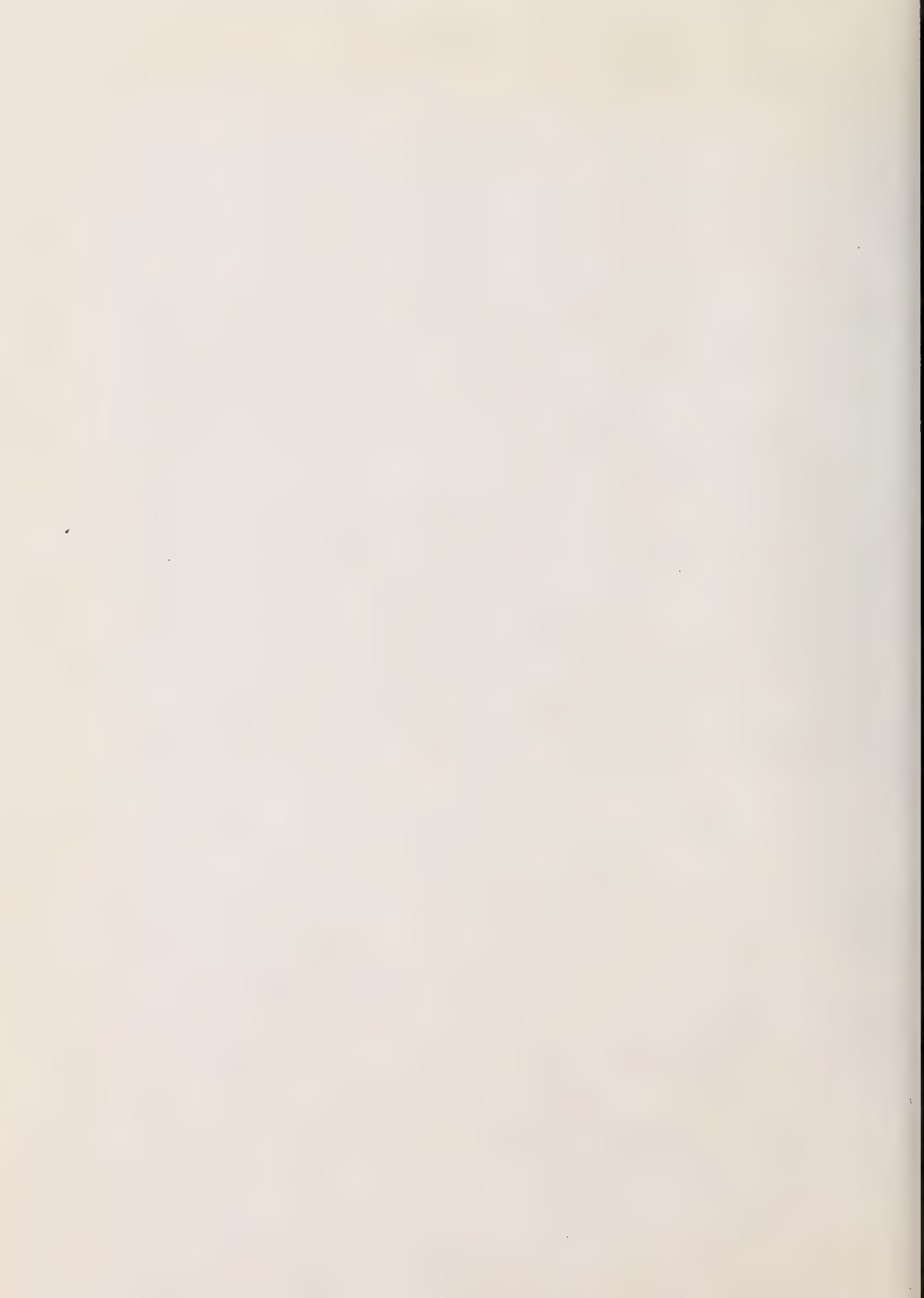
(3) Mennell, F. P. Mineral Resources of Rhodesia : *South African Journ. Indust.* Oct., 1918.

*The collection of fossil fauna made by the Kohl-Larsen expedition in 1934-36 included very rolled bones and teeth of such extinct genera as *Hipparion* and *Simopithecus* which are derived fossils, and unrolled fauna (that is, contemporary with the skull) including *Bos bubalus* which is extinct and which, in Kenya, S. Africa and N. Africa, is typical of Upper Pleistocene. None of these faunal types was found, however, on the occasion of the visit which forms the subject of this report.



PLATE V.

1. Basement Complex hills fringing the Eyasi trough.
2. Surface, wind-borne sand.
3. Reddish, ill-consolidated sandstone with mammalian remains.
4. Greyish-green, sandy marl with fish-scales. (Kohl-Larsen's "Unterer Fisch-mergel").
5. Greenish-brown, sandy marl.
6. Greyish-green clayey marl with abundant limey concretions.
7. Two-foot rule.
8. Bed of erosion gully.



collected and described by F. Oates (⁴), and was the only leucite-bearing lava out of seventy specimens from the eastern rift zone. Leucite is typical of the volcanic rocks of Bufumbira, Uganda Protectorate, situated in the western section of the Great Rift Valley where probably the largest concentration of that mineral in the world occurs.

As no time was available for a study of the lavas of this region, it has not been possible to make any pronouncement regarding the significance of the use of this type of lava in modelling a tool of Levalloisian culture.

SUMMARY AND CONCLUSIONS.

Summarising, it may be said that the Eyasi strata contain some minerals common to either one or other of the Olduvai beds but mainly to bed 5. Previously (p. 46), it has been stated that they do not show the least signs of disturbance whereas the Olduvai beds 1 to 4 are certainly faulted. Bed 5 of Olduvai lies unconformably upon the lower strata and, like the Eyasi beds, is undisturbed. There is a strong suggestion, therefore, that the Eyasi beds are younger than beds 1 to 4 at Olduvai. Lying as they do in one of the principal zones of recent disturbance, with the Eyasi scarp rising up to the west, the Hohenlohe rift valley (or Yaida depression) and the western branch of the Gregory rift valley to the east, and the great volcanic highlands to the north (Oldeani, Lemagrut, Ngorongoro, Ololmoti, etc.), it is inconceivable that the Eyasi beds, were they as old as the Olduvai beds 1 to 4, could have escaped the effects of these tremendous disturbances.

The Eyasi trough and the Balbal depression form a tectonic unit, the continuity of which is broken by the projecting volcanic mass of Lemagrut. The earlier-formed part of Lemagrut has suffered dislocation along the line of the trough and is therefore older than the Eyasi-Balbal depression. Oldeani, on the other hand, is in no wise disturbed. Its lavas have flowed over the floor of the Eyasi trough in the north-east; it is therefore younger than the formation of the trough. So are the youngest lavas of Lemagrut.

The Balbal depression is bounded by the strata of Olduvai which are confirmed by stratigraphical, paleontological and archæological evidence to be of Lower to Middle Pleistocene age (beds 1 to 4), the faulting and formation of the depression being placed somewhere between the Middle and Upper Pleistocene. The formation of the Eyasi trough is accordingly fixed here and its sedimentation, being post-faulting, must be either of Upper Pleistocene or Recent age.

The nature of the sediments suggests that there was a change of climatic conditions during the period of deposition. The lower strata overlying what is thought to be the old gneissic land surface, are lacustrine and were probably laid down in fairly calm, fresh water as the fine grain of the marls and the fish remains prove. At the top of these lake beds is a layer of concretionary lime, which suggests that they were exposed for some time as a land surface before the formation of the sandy bed with mammalian remains overlying them. The latter bed, from which Kohl-Larsen obtained the fragments of human skull, indicates a terrestrial formation laid down fairly quickly and by rapid disintegration of the rock of the neighbourhood, for its marked feature is the coarseness and angularity of the constituent grains.

Kohl-Larsen reports an upper fish-bearing marl overlying the sandy bone-bed, which would indicate a recrudescence of pluvial conditions and deposition of the succeeding strata under water. No trace of this upper marl was observed on this occasion, nevertheless, the view is probably correct and the red, sandy bed indicates the climax of a dry period intervening in a predominantly pluvial period.

(⁴) Oates, F. Collection of Tertiary lavas from the Northern Province : *T. T. Geol. Surv. Ann. Rep.* 1933, pp. 27-28.

In a private communication to the writer, Dr. Leakey states that the layer of concretionary lime separating the marls from the sandy bed with fossil remains suggests to him the pause in wet conditions between the first and second peaks of the Gamblian Pluvial period. Kohl-Larsen's *upper* fish marl would then represent the renewal of wet conditions in the Gamblian Second phase. Following this, he suggests erosion of the upper fish marl and the underlying bone-bearing sandstone in the dry period between the Gamblian Second phase and the Makalian wet phase, and laterisation during the latter phase.

The above suggestions appear to fit in fairly well with the observed facts, but upon one point, the writer feels rather in doubt. That is in regard to the laterisation being Makalian, Leakey puts the Makalian wet phase at circa 8,000 years B.C., the wet conditions lasting for about 1,000 years. The conditions may have been climatically suitable, but did they obtain over a sufficiently lengthy period? Could a laterite formation of even so restricted a thickness and extent as the Eyasi laterite have formed in a period of the order of 1,000 years? If this question can be answered in the affirmative, then the skull is very probably pre-Makalian in age. It is considered by most authorities on the formation of laterite that a long period of time is necessary during which the topographical and climatic conditions are steady and conducive to its formation. This would seem to rule out the Recent epoch* and therefore, in view of the doubt that exists regarding the Makalian age of the laterisation it can only be stated that the skull appears to be post-Middle Pleistocene and pre-Recent. In other words, a date somewhere in the Upper Pleistocene is indicated. It is not possible to be more precise than this.

DODOMA,

8/1/1938.

*The presence of *Bos bubalus* in the fauna contemporary with the skull, collected by Kohl-Larsen confirms this statement. This is extinct and in Kenya, South and North Africa is typical of Upper Pleistocene.

THE NATURE AND ORIGIN OF A SOAPSTONE FROM NEAR KISII.*

By William Pulfrey.

Visitors to Kenya soon learn of the occurrence near Kisii, in Southern Kavirondo, of rocks which are so easily carved that there has long been a native industry producing Kisiiware—ornaments and household articles which find their way into all parts of East Africa, and, as curios, abroad. In recent years other commercial outlets have been found for the stone, in a finely ground condition. The rock is the so-called Kisii-stone, or as one may prefer to call it, Kisii Soapstone. The term "soapstone" is generally applied to impure massive talc (hydrated magnesium silicate) rocks, but as it is possible for rocks of similar appearance to contain little or no talc (for example a rock consisting largely of pyrophyllite—hydrated aluminium silicate), it is perhaps preferable to extend the scope of the term to cover any massive, soft, and sectile rock, though it may contain little or no talc, and to name any talc-rich soapstone, "steatite."

For many years, largely on the grounds of hearsay, the Kisii Soapstone has been called pyrophyllite, and the assumption made that it consisted mainly, if not entirely, of that mineral. This identification has been attributed to the Imperial Institute, but I have been unable to trace any published reference, though it is probable that the erroneous opinion arose from a slip made by A. W. Groves† in describing a slide of the rock, when he stated, "The report of the Imperial Institute shows it to be a pyrophyllite." The Imperial Institute Report was made on a sample of the soapstone collected by E. J. Wayland, then Director of the Geological Survey of Uganda, during a journey through Southern Kavirondo in 1930. Through the kindness of Dr. K. A. Davies, Director of the Geological Survey of Uganda, I have been able to read the report, which is dated September 25th, 1930. There is in it no suggestion that the rock is a pyrophyllite, and an analysis (carried out by a commercial firm to which the Imperial Institute sent the sample) is quoted, followed by the statement, ".....the material approximates closely in composition to kaolin, but has slightly lower content of water. It apparently belongs to the kaolin division of aluminium silicates, but is probably not a definite mineral."

Recently I visited a few outcrops of the stone near Kamagambo, and later examined thin sections and studied chemical analyses of the rock. This work indicates that soapstone from the locality examined is largely a mixture of a kaolinitic mineral and a sericitic mica, derived by the hydrothermal alteration of a lava.

This view of its composition is not new, though being supported by three recent analyses it now has more force. The mode of origin now found has not, however, so far as I am aware, been suggested previously. Wayland giving an account‡ of the soapstone at Nagichenchi (Moguranga, E. 34° 39' 00", S. 0° 45' 30") described the site as consisting largely of altered siliceous sediments of the Kisii Series (Bukoban

*Published by permission of the Commissioner of Mines, Kenya.

The writer's thanks are due to the Directors of Messrs. Kenya Consolidated Goldfields, Ltd. for kind permission to use data from their company reports and maps: and to the Director of the Geological Survey of Uganda for allowing him to use data from a report in the files of that Survey.

†In E. J. Wayland, "Report on a Geological Reconnaissance of Southern Kavirondo, with appendices on the Petrology and Assaying by A. W. Groves," Government Printer, Nairobi, 1931. Notes on this work are also contained in the Annual Report of the Geological Survey of Uganda for 1930 (1931), p. 6 and pp. 30-38 (the latter being petrographical descriptions by Groves).

‡Loc. cit. p. 12.

System), resting on a dolerite sill and associated with intercalated contemporaneous lavas of amygdaloidal and rhyolitic types. He considered the soapstone, where quarried by natives, to lie between two sandstones, as a lenticular deposit of the nature of "a pure clay or pipe-clay," subsequently metamorphosed. From this it may be judged that Wayland believed the deposit to be sedimentary. He concluded that "it is not a true soapstone, but a pyrophyllite, or closely allied"—one gathers, on the grounds of his belief in its sedimentary origin.

Groves examined a thin section of Wayland's specimen (*loc. cit.* p. 54) and described it as "an extremely fine aggregate of sericite, talc or Kaolin,* or a mixture of these," continuing, "It appears to be derived from an extremely fine argillaceous rock by low grade metamorphism."

2. *Field Occurrence.*—There are several exposures of the soapstone in the Kisii District. A number were mapped by Messrs. Kenya Consolidated Goldfields some years ago,† of which twelve deposits, including at least four extensive ones, near to and south-east of Kamagambo Mission, and a large deposit at Samita Hill a little over seven miles south of Kisii (Fig. 1), are particularly notable. Several of the adjacent deposits south-east of Kamagambo Mission are the remnants of larger occurrences now divided by erosion.

All the deposits were considered by the Kenya Consolidated geologists as belonging to the middle portion of the Kisii Series, viz. :

Kisii Series	{	Upper	Andesites.
		Middle	(not always present) Quartzites, cherts and beds of massive soapstone.
		Lower	Basalts, often amygdaloidal.

They believed the middle division to have developed in isolated basins in the rolling upper surface of the Lower Lavas, and noted two kinds of deposits—short thick lenses of massive soapstone overlain by about 60 feet of massive clean unfossiliferous quartzites of sub-aerial origin, and cherts with concentric algal structures. It is evident that, like Wayland, they believed the soapstones (which were identified provisionally as pyrophyllite) to be of sedimentary origin. They recorded that the soapstone occurs in lenses up to 5,000 feet in length, with a maximum thickness of 50 feet.

I have had the opportunity to examine only the deposits occurring south-west of Nyamwai, on the ridge north of the R. Nyangore. A map was made of the westernmost of these occurrences (Fig. 1, inset). There is a lens-shaped outcrop of soapstone of which the margins cut markedly across the contours, so that it cannot be a sedimentary intercalation in the gently dipping Kisii Series. Closely associated with the soapstone are altered lavas, while above and below it are outcrops of the quartzitic sandstone which forms much of the western portion of the ridge.

The evidence shows that the soapstone is more closely associated with the altered lavas than with the sandstones, and the disposition in the field suggests that the lavas form an intercalation in the sandstone series, and that the soapstone is an alteration product of portions of the lavas. The latter is borne out by examination of thin sections of specimens of the soapstone.

*In the Annual Report of the Geological Survey of Uganda for 1930 (p. 37), which presumably appeared earlier than the report published in Kenya, he considered the minerals to be "sericite or talc, or a mixture of these."

†Shown on maps, prepared by A. A. Fitch, C. D. Hallam, W. Edgeworth-Johnstone and F. d'U. Burgess, of which copies were lodged with the Mining and Geological Department, Nairobi.

3. Petrography.

(a) *Lavas associated with the soapstone.*—Lavas outcropping on the eastern edge of the soapstone are propylitised. There are medium grey with rare pyrite specks, and contain whitish patches up to 10 mm. across. Some of the latter are hazy, but others are clots or vesicular infillings of a quartz-like mineral, which is sometimes banded and like agate. A thin section, IV, 214,* shows that the rock is porphyritic with phenocrysts up to 2 mm. in length, entirely replaced by chlorite and quartz, with some sericite. The matrix contains a large proportion of a flaky, occasionally coarse, penninite-like chlorite associated with sericite and leucoxene, and, interstitially, quartz. Scattered pseudomorphs of small felspar laths can be seen. A vesicle shows a core of penninite with a few grains of a colourless epidote (?), set in a granular quartz base.

The rock is so altered that precise identification is not possible, but it may have been an andesite or an intermediate hypabyssal type.

On the south-west edge of the soapstone other lavas (IV, 216) are exposed. These are markedly vesicular and as before, porphyritic and propylitised. The phenocrysts are prisms up to 1 mm. long, replaced by finely granular chlorite and quartz. The matrix contains abundant lathy felspar pseudomorphs, now consisting either of a light brown, weakly birefringent mineral (probably chlorite), or of glass-clear, finely granular aggregates of quartz or secondary felspar. The remainder of the matrix is made up of a brownish chlorite and small aggregates of leucoxene. The vesicles are up to 1 mm. across and usually contain zones of granular quartz, and chlorite sieved by quartz.

Near the eastern tip of the soapstone no outcrops of lava were seen, but blocks (IV, 215) of acid lavas and an intrusive rock were found. The intrusive type is highly altered but was probably originally a dolerite, while the lavas resemble altered rhyolites in which a little biotite is developed.

On the track a little under a mile east of the soapstone there are extensive outcrops of lava (IV, 217). These are vesicular and feebly porphyritic. They are highly altered, being replaced entirely by quartz, chlorite, epidote and leucoxene. They were probably originally andesites.

(b) *The Soapstone.*—In hand specimens the soapstone is a whitish to creamy-white, or slightly iron-stained, fine-grained soft rock. In exposures it is well jointed, the joint faces being coated by iron oxide films. In spite of the generally close jointing it is possible to extract sound blocks as large as $1\frac{1}{2}$ cubic feet. It can readily be cut with a knife, and in general fashioned like wood. The hardness of chips is slightly over 3 on Moh's scale. The specific gravity of the block stone is 2.66 (i.e. about 166 lbs. per cubic foot). From experiments it is known that when heated to about 1,300°C, the stone begins to soften and has a tendency to flow.

Examination of thin sections shows that the soapstone is a mixture of minerals, as Groves realised, and that even though pyrophyllite were present, it could not constitute much more than half of the bulk.

Thin sections of a specimen from the outcrop described above are particularly instructive. Viewed in ordinary light (Fig. 2a) it has the appearance of a lava—probably andesitic—which has been smeared so that outlines are a little hazy. With crossed nicols, however, there is no sign of this texture, and the whole slide appears as an aggregate of finely granular minerals and a finely flaky mineral (Fig. 2b). The texture seen in ordinary light is relict, the texture the rock had before it was completely replaced by the granular and flaky minerals of which it is now entirely constituted.

*Numbers IV, 214, etc., refer to specimens and thin sections in the Museum of the Mining and Geological Department, Nairobi.

Minerals identified are : sericitic mica, kaolinite, leucoxene and limonite. In the field the soapstone is seen to contain also sporadic knots and streaks of quartz. Marginally, where the soapstone probably merges into the propylitised lavas, it is to be expected that some specimens will in addition contain chloritic minerals and perhaps epidote.

Sericitic mica occurs in colourless flakes up to about 0.05 mm. long, and is scattered with all orientations throughout the rock. It has refractive indices lying between 1.570 and 1.584, and birefringence about 0.017. The extinction is straight, and the elongation positive.

These properties, except for the birefringence, are indicative of a white mica with the habit of sericite. From experience of sericite in many other rocks it is known that the birefringence of sericitic micas is often much lower than that of ordinary muscovite, of which sericite is a variety. Further confirmation that the mineral is a potash-soda mica is afforded by chemical analyses of the rock, dealt with below.

Kaolinite forms the bulk of the remainder of the rock and is present as a colourless granular matrix to the sericite flakes. The refractive indices lie between 1.558 and 1.700, and the birefringence is about 0.005, though often grains appear to be almost isotropic. The optical sign is negative. The mineral absorbs ink readily and becomes stained.

These properties, while not sufficient to identify the mineral positively, are a strong indication that it is kaolinite or a closely allied mineral. Consideration of the chemical analyses lends confirmation to this suggestion.

Leucoxene, and perhaps sphene, are present as minute grains and aggregates scattered through the slides, and owing to their opacity appear much more abundant than the analyses show can be possible.

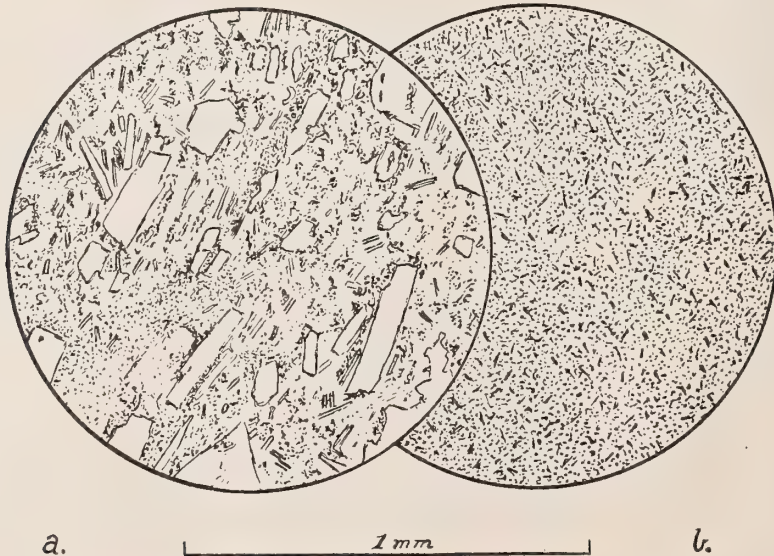


FIG. 2.

- (a) Drawing of a thin section of soapstone (IV.213/1) as seen under the microscope using ordinary light. The texture is that of a larva.
 (b) The same microscope field as in (a) seen with crossed nicols.

Limonite occurs as a cluster of small pseudomorphs in slide IV, 213/2. The original mineral was cubic, and was probably pyrite.

A slide of soapstone (B. 20) from Samita Hill (Fig. 1, south-east), presented to the Mining and Geological Department by Messrs. Kenya Consolidated Goldfields, Ltd., differs considerably from the rock described above. It is somewhat more coarse-grained, and contains abundant epidote. Sericite and kaolinite are also present but except in their larger grain size do not differ from the same minerals in slides IV, 213/1 and 2.



FIG. 3.

Drawing of thin section of epidotic soapstone, Samita Hill, slide B20.

The *Epidote* occurs as scattered crystals, and loose or packed aggregates. The crystals usually show long "prismatic" sections with blunt, pointed, or forked terminations, but squarish clinopinacoidal sections are also seen. Some are cruciform twins (Fig. 3). The prismatic crystals range up to about 0.25 mm. in length, and are colourless or slightly yellowish or brownish, though when coloured they exhibit little pleochroism. They are positively elongated, and of negative optical character. The refractive indices are high, probably somewhat over 1.7, while the birefringence was determined as 0.27.

These optical properties indicate that the mineral is epidote, while the birefringence shows that it is an iron-poor variety containing about 80% of the clinzoisite molecule. The general lack of colour supports the suggestion of a low iron content.

4. *Chemical Analyses.*

Three new analyses are available—all of material from the outcrop on the ridge north of the R. Nyangore. These are quoted below, together with the analyses reported to the Uganda Geological Survey by the Imperial Institute and two old analyses of somewhat similar rocks.

	1.	2.	3.	4.	A	B
SiO ₂ ...	46.59	46.42	49.53	46.78	48.60	45.66
Al ₂ O ₃ ...	36.83	37.00	35.73	39.70	32.82	35.10
Fe ₂ O ₃ ...	0.67	0.59	0.29	0.35	—	—
FeO ...	n.d.	n.d.	n.d.	n.d.	2.76	1.11
MgO ...	0.10	0.14	0.05	n.d.	2.37	0.85
CaO ...	0.04	0.12	0.17	0.29	0.84	—
Na ₂ O ...	0.66	0.94	0.64	n.d.	1.32	4.39
K ₂ O ...	5.07	4.87	3.81	n.d.	4.08	2.30
H ₂ O ...	7.70	8.62	8.48	10.96*	8.83	11.68
TiO ₂ ...	2.23	1.99	1.67	1.32	—	—
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	99.89	100.69	100.37	99.40	101.62	101.09
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*Loss on ignition.

1. Sample of ground soapstone, supplied by Messrs. Kenya Consolidated Goldfields, Ltd. Analyst: Miss A. F. R. Hitchins.
2. A second sample of ground soapstone supplied by the same Company. Analyst: Miss A. F. R. Hitchins.
3. Sample of soapstone collected by Dr. C. S. Hitchin. Analyst: Miss A. F. R. Hitchins.
4. Analysis of sample of soapstone collected by E. J. Wayland, quoted from a report supplied by the Imperial Institute to the Geological Survey of Uganda. Published by permission of the Director of the Geological Survey of Uganda.
- A. A pinitic alteration product from Wildschapbach (Killing, quoted by Sandberger, 1882), quoted from Dana's System of Mineralogy, 1914, p. 622.
- B. Restormelite, Restormel Mine, Cornwall (Church, 1870), quoted from Dana's System of Mineralogy, 1914, p. 710, "A massive greyish-green agalmatolite-like mineral. . ."

It is obvious from the new analyses that the soapstone is a rock of variable composition—as might be expected in a replacement product. It is equally obvious that talc plays no part in it, and that pyrophyllite if present could form only a variable portion, not the whole.

The two last quoted analyses are clearly of comparable rocks, and there is a general closeness to several other analyses of pinitic "minerals" quoted by Dana. True pinite (a pseudomorph of cordierite) consists almost entirely of a potash mica but it is evident that many pinites are actually mixtures of potash mica with other minerals. Perhaps the pinitic rock most closely allied to the Kisii Soapstone is the agalmatolite of China or Nagyág in Roumania. "Agalmatolite" is, however, a sack name which has been applied to pinites, compact pyrophyllite and steatite, and has no more value than the general term "soapstone."

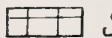
The analysis reported by the Imperial Institute presents difficulties. The balance required to bring the summation to 100% may perhaps be regarded as alkali, and there is a marked difference in its proportion compared with those in the three new analyses. There can be little mica in Wayland's sample. On the other hand, while silica and alumina are close to the values required for a rock composed almost entirely of kaolinite, the value for loss on ignition, presumably water, is unduly low. This might be caused by the presence of a second aluminium silicate with lower water content in association with kaolinite, or alternatively by the predominant mineral in the rock being a kaolin mineral with somewhat lower water content than normal kaolinite.



MAP OF
OF SOA



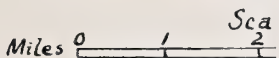
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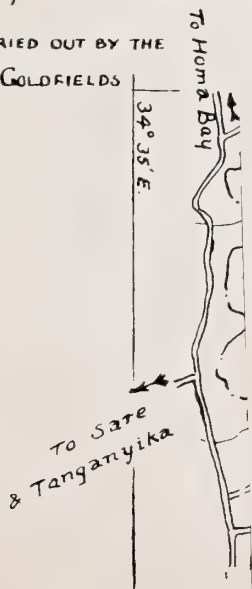


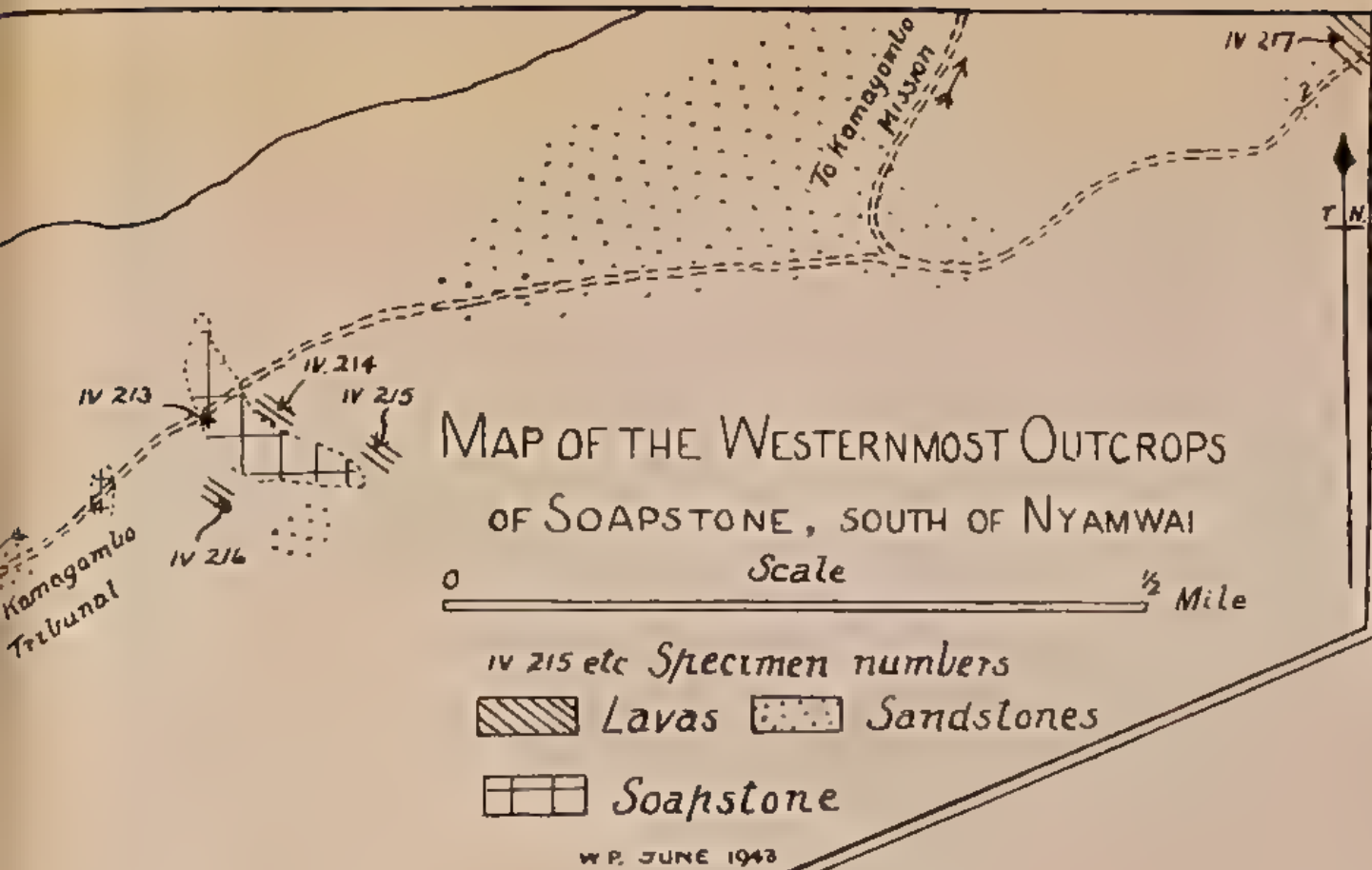
Sketch map of
showing
Loc



- x Soapstone Localities
- Boundary of Kisii Series

BASED ON WORK CARRIED OUT BY THE
KENYA CONSOLIDATED GOLDFIELDS
GEOLOGISTS IN 1936.





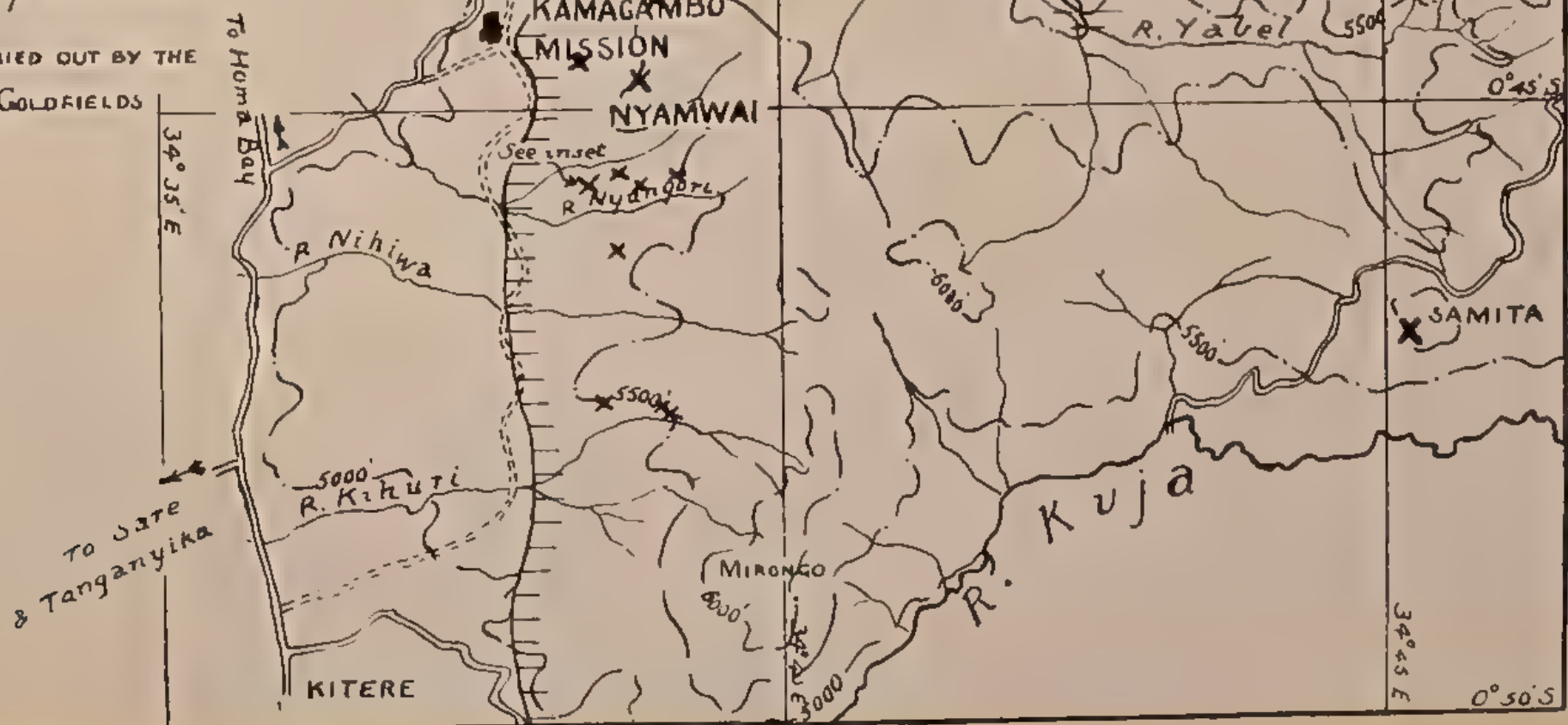
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Sketch map of the Kisii District showing Soapstone Localities

Scale 0 1 2 3 4 Miles

X Soapstone Localities
 [Dashed Line] Boundary of Kisii Series

BASED ON WORK CARRIED OUT BY THE
 KENYA CONSOLIDATED GOLDFIELDS
 GEOLOGISTS IN 1936



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5. *Calculation of Possible Mineral Constitutions.*

If it is assumed that the microscope determinations of the minerals are correct, mineral constitutions can readily be calculated from the new chemical analyses.* The results are :

	1.	2.	2.
Ilmenite $\text{FeO} \cdot \text{TiO}_2$	1.27	1.12	0.55
Sphene $\text{CaO} \cdot \text{TiO}_2 \cdot \text{SiO}_2$	0.14	0.42	0.59
Rutile TiO_2	1.50	1.23	1.14
Potash mica $\text{K}_2\text{O} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 2\text{H}_2\text{O}$	42.95	41.27	32.28
Soda mica $\text{Na}_2\text{O} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 2\text{H}_2\text{O}$	8.15	11.67	7.90
Kaolinite $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$	43.12	41.47	50.95
Quartz SiO_2	3.24	2.90	7.35
MgO	0.10	0.14	0.05
Water	—	0.41	—
	100.47	100.63	100.81
Less water added for kaolinite	0.65	0.65	0.47
	99.82	100.34	

The supposed titanium minerals are probably all contained in the leucoxene of the rock, while the potash and soda micas should be understood as contained in the sericitic mica.

The fact that the analyses can be so reasonably calculated to mainly micas and kaolinite is some confirmation of the identifications of the minerals in the thin sections. If the calculation is carried as far as the micas (in analysis No. 1 for example) and then it is assumed that the remaining alumina is in pyrophyllite, it is found that there is a deficiency of 16.84% of SiO_2 and an excess of 2.38% H_2O . Attempts to extract pyrophyllite first, before dealing with the alkalis, are similarly foiled, there being immediately a deficiency of silica.

Re-calculation of the analysis reported by the Imperial Institute is more difficult. If alkali is assumed to be 0.6% K_2O and the calculation is made on the lines indicated above, after the abstraction of titanium minerals and mica, amounts of silica, alumina and loss on ignition (assumed to represent water) remain which cannot be combined to give kaolinite or any other standard hydrated aluminium silicate, owing to a deficiency of water. A few calculations also show that though a mixture of kaolinite and pyrophyllite can be found which contains the amount of water available, the

*The method of calculation is as follows :—standard molecules are assumed, and magnesia is neglected ; Fe_2O_3 is recalculated as FeO and combined with a portion of the TiO_2 to form ilmenite ; more TiO_2 is absorbed in combination with the total CaO and part of the SiO_2 to give sphene ; the balance of the TiO_2 is then expressed as rutile ; the total K_2O is combined with opposite amounts of Al_2O_3 , SiO_2 and H_2O to give potash mica, and Na_2O treated similarly for soda mica ; the balance of the Al_2O_3 is then combined with SiO_2 and H_2O for kaolinite, after which only SiO_2 (quartz) and a small amount of water is left (or a small amount of water must be added to satisfy the kaolinite).

silica and alumina are widely in disagreement, and it may be considered as unlikely that pyrophyllite appears in the rock. The results of a calculation using a "kaolin" deficient in water is reported below :

Ilmenite $\text{FeO} \cdot \text{TiO}_2$	4.
Sphene $\text{CaO} \cdot \text{TiO}_2 \cdot \text{SiO}_2$	0.66
Rutile TiO_2	1.01
Potash Mica $\text{K}_2\text{O} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 2\text{H}_2\text{O}$	0.56
"Kaolin mineral" $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 1.61\text{H}_2\text{O}$	5.09
Water	92.86
	0.04
	100.22
Less SiO_2 added to form "kaolin mineral"	0.26
	99.96

No mineral, so far as I am aware, has the composition of the "kaolin mineral" quoted, and as the analysis varies so widely from the three recent analyses of similar rocks, it is perhaps preferable at present not to place emphasis on it. In the discussion below only the modern analyses are considered.

6. *Origin of the Soapstone.*—The Kenya Consolidated Goldfields geologists could devote little time and attention to the soapstone, but it seems clear that they considered it a sediment with sedimentary associates. The present work indicates however that the soapstone occurrence described is more closely associated with lavas than with the sandstones, and that it is in fact itself a highly altered lava. The Samita stone, though not exhibiting relict volcanic textures, may from its mineral constitution be inferred to have a similar origin. It is not suggested that all the soapstones are necessarily altered lavas, but it is evident that all should be examined before a sedimentary origin is ascribed to them.

The soapstone described occurs in association with lavas which are highly altered or propylitised, a hydrothermal change which is usually ascribed to the action of hot carbonated waters rising from volcanic foci, altering already consolidated lavas or shallow intrusives as it passes through them. There is no direct evidence that the waters which altered these lavas were carbonated, or at least, no carbonates were precipitated, but the alteration may be ascribed to hot ascending aqueous solutions, while the presence of carbonic acid would afford an agent which it is known could produce the leaching effects required. The soapstone, appears to form a core to the normally propylitised lavas and may be considered as a zone or pipe in the lavas in which the alteration was either more prolonged or more intense.

The production of sericite and kaolinitic minerals by hydrothermal action is well known in ore deposits. (Ore deposit kaolinites are usually identified as dickite or nacrite, but the mineral of the present rock is optically negative and so cannot be dickite, while the ease with which it absorbs ink suggests that it is not nacrite. It is not impossible however that original nacrite or dickite may have been converted to kaolinite by weathering). Many years ago Lindgren* found that supposed talcose material in veins and in rhyolites associated with them consisted of mixtures of mica and kaolinite varying from almost pure potash mica to almost pure kaolinite. Later,† from a locality where alteration by hot uprising fluids could be proved, he showed that alteration patches in a granite consisted of sericite, kaolinite, fibrous

*"The Gold and Silver Veins of Silver City, De Lamar and other Mining Districts in Idaho." *U.S. Geol. Surv.* 20th Ann. Rep., 1898-9, Pt. III, p. 65 (p. 171).

†In W. H. Weed, "Mineral Vein Formation at Boulder Hot Springs, Montana," *U.S. Geol. Surv.* 21st Ann. Rep., Pt. II, 1899-1900, p. 227 (pp. 252-3).

silica and rutile. Many other occurrences are known where the sericite-kaolin association occurs, particularly in connection with ore deposits formed at shallow depths.

Without porosity determinations and analyses of fresh rocks similar to that from which the soapstone was formed, it is not possible to gain much information of the nature of the fluids which caused the alteration, or of the materials which were removed from the fresh lava. Comparison, however, of a soapstone analysis and computed average analyses for andesites and basalts are instructive:

	1.	C.	D.	1a.	Da.
SiO ₂	46.59	59.59	48.80	124.1	142.0
Al ₂ O ₃	36.83	17.31	13.98	98.1	40.7
Fe ₂ O ₃	0.67	3.33	3.59	1.8	10.5
FeO	n.d.	3.13	9.78	—	28.5
MgO	0.10	2.75	6.70	0.3	19.5
MnO	n.d.	0.18	0.17	—	0.5
CaO	0.04	5.80	9.38	0.1	27.3
Na ₂ O	0.66	3.58	2.59	1.7	7.5
K ₂ O	5.07	2.04	0.69	13.5	1.8
H ₂ O	7.70	1.26	1.80	20.5	5.2
TiO ₂	2.23	0.77	2.19	6.0	6.4
P ₂ O ₅	n.d.	0.26	0.33	—	1.0
	<u>99.89</u>	<u>100.00</u>	<u>100.00</u>	<u>266.1</u>	<u>290.9</u>

- 1. Soapstone repeated from above.
- C. Average andesite, quoted from R. A. Daly "Igneous Rocks and the Depths of the Earth," 1933, p.16.
- D. Average plateau basalt, quoted from Daly, op. cit. p. 17.
- 1a. Calculated proportions of oxides of analysis 1 contained in 100 cc. of the rock.
- Da. Calculated proportions of oxides of analysis D contained in 100 cc. of the rock.

Assume first for convenience that the parent rock was an andesite, as appears most likely from the associated rock types. As the specific gravity of the soapstone is 2.66 and the average specific gravity of andesites is about 2.65, and as no marked porosity changes accompanied the formation of the soapstone, the figures of analyses 1 and C can for present purposes be discussed as they stand. Thus the change andesite—soapstone was probably accompanied by considerable losses of iron, magnesia, lime and soda, and by a moderate loss of silica, but on the other hand by considerable gains of alumina, potash and water, with a moderate gain of titania. The gain in alumina is of particular interest as in many cases of hydrothermal alteration, except where intense silicification or impregnation by sulphides occurs, alumina remains a more or less stable factor. Cases are known however where alumina has been added.* In many cases of hydrothermal alteration gains in silica are evident, but several cases where losses occur are known and are quoted by Schwartz,† though often an apparent silica loss is caused by the introduction of large volumes of carbonates, a factor which does not operate in the case of the

*"Hydrothermal Alteration of Igneous Rocks." G. M. Schwartz. *Bull. Geol. Soc. Amer.* Vol. L, 1939, p. 181 (p. 217).

†Loc. Cit. pp. 215-217.

soapstone. On the whole the changes described are such as agree well with evidences of world-wide nature which are accepted as indications of hydrothermal alteration. The gain in titania is perhaps an exception, titania being more usually lost in hydrothermal alteration, though it is frequently "gained" in rocks produced by weathering processes, *e.g.*, lateritic deposits.

In the case of the Samita Hill rock the changes may have been different, *e.g.*, there may have been a gain in lime, while the accession of alumina was certainly much less, or it may even have been subtracted. The propylitised lavas again show different changes *viz.*, possible enrichment in magnesia and ferrous iron. These varying changes are probably attributable to differences in temperature and the chemical nature of the reacting fluids during the period or periods during which hydrothermal action continued.

If it is assumed that the parent rock was basaltic, an idea of the changes during alteration can be gained from the results of calculations (made to neutralise the effect of differences of specific gravity, the average specific gravity of basalt being taken as 2.91) reported in columns 1a and Da above. Quantitatively the gains and losses, with the exception of titania which remains almost constant, are those found for the andesite—soapstone change. There are, however, quantitative differences, *viz.*, the basalt—soapstone change implies, as would be expected, much greater accessions of potash, while there is a slightly greater gain of alumina but considerably less gain in water. On the losses side there is little difference except in the iron, where naturally the basalt would have to lose a considerable proportion of its original content.

It is possible that the silica removed during alteration was later redeposited as the cherts which occur locally in the Middle Kisii Series. In addition some of the iron may have been precipitated and concentrated as oxides in the overlying sandstones. Such concentrations were first observed many years ago in Kisii sandstones.*

The nature of the acids or bases combined with the migrant radicles is not known, but it is usually considered that acid conditions are required for the formation of kaolinite, while weakly acid or alkaline conditions are required for the precipitation of sericite. The latter are known in epithermal ore deposits to follow primary acidic stages and it is perhaps admissible to consider that in the soapstone the order of formation was first kaolinite and then sericite, the formation of the latter being overlapped by the propylitisation of the non-kaolinised lavas. This sequence implies a primary removal of alkalies (mainly soda) during the acidic kaolinite-forming phase, followed by the introduction of alkalies (mainly potash) during the sericite-forming phase. In addition the propylitic alteration of the external lavas may have been in part caused by the reception of the magnesia and lime displaced from the lavas altered to soapstone.

The formation of sericite perhaps indicates the presence of fluorides in the attacking fluids.†

The fact that kaolinite was formed in the lavas yields some idea of the temperature at which the reactions took place. It has been found experimentally that with appropriate mixtures kaolinite forms under moderate pressures at temperatures

*F. Oswald, "The Miocene Beds of the Victoria Nyanza and the Geology of the Country between the Lake and the Kisii Highlands." *Quart. Journ. Geol. Soc.*, LXX, 1914, pp. 128-198 (p. 152).

†A. J. Leonard, "The Hydrothermal Alteration of certain Silicate Minerals," *Econ. Geol.*, XXII, 1927, p. 18.

between 400°C and 200°C. With similar systems pyrophyllite forms at temperatures above 400°C.* Temperatures between 400 and 200°C would be amply sufficient for the formation of sericite.†

No evidence has been obtained of the depth at which the alteration took place, but it was probably shallow and may even have been near surface. Consideration of the pressures used by Noll indicates that burial at depths of about 200 to 400 feet would have been sufficient to allow the formation of kaolinite and sericite.

7. Summary.

A soapstone from the Kisii district is shown to consist mainly of sericite and kaolinite. It is associated with highly altered lavas and was itself originally a lava, converted to its present state by hydrothermal action. A second soapstone from Samita Hill, is, by analogy and on its mineral constitution, similarly considered to be a hydrothermally altered rock, though not necessarily a lava.

*W. Noll. "Ueber die Bildungsbedingungen von Kaolin, Montmorillonit, Sericit, Pyrophyllit, und Analcim," quoted in G. W. Morey and E. Ingerson, "The Pneumatolytic and Hydrothermal Alteration and Synthesis of Silicates," *Econ. Geol.*, XXXII, Supplement, Aug. 1937, p. 746.

†Noll, quoted by Morey & Ingerson, loc. cit. pp. 721-2.

THE ANT MIMIC *MYRMARACHNE PLATALEOIDES*.

By J. E. Marson, F.R.E.S.

The ant, *Ecophylla smaragdina*, is common in most tropical countries. I have found it in East Africa, Burma, and Ceylon. Its nest of woven leaves is very conspicuous at the ends of the boughs of such trees as the Mango. The method used by these ants in making their nests is very interesting to watch. A group of ants hold the edges of two adjacent leaves, and slowly draw them together. In order to do this the ants form parallel rows at right angles to the leaf edge. When the edges of the leaves are in contact, other ants, holding ant larvae in their jaws, "sew" the leaves together with the silk spun by the larvæ.

This ant has many spider mimics. Hingston comments upon the mimics *Amycioea forticeps* and *Myrmarachne plataleoides* in India, and gives a full ecological description of the former. In East Africa this ant has *Myrmarachne fœnissex* as its mimic. The following description applies to both species of *Myrmarachne*, but not to *Amycioea*.

The mimicry of these spiders is remarkable, not so much because of the ant-like form but because of the ant-like movements and posture. The spider's abdomen is elevated and is held at an angle similar to that of the ant's abdomen, and the first pair of legs, held forward, are waved about very much like the antennæ of the ant. Only three pairs of legs are used for walking. This waving of the first pair of legs is not peculiar to this genus of the *Salticidæ*, as it is only a more highly developed form of the slight waving of the forelegs which I have observed in other *Salticidæ*. In such cases it appears that the forelegs have a sensory function. If one of the ant mimics is held on your hand and the tip of your finger placed in front of it, it will stand still putting its forelegs on your finger and moving them over it. The ant-like walking of these spiders is however quite remarkable, as the jumping and rapidly moving habit, so characteristic of the *Salticidæ*, is fully suppressed when the spider is moving normally. When the spider is disturbed however, it moves rapidly to the lower surface of the leaf in a most un-ant-like manner. This is the movement which normally distinguishes the spider from its model in the field.

After the fifth moult, the spider is almost a perfect mimic of the red ant, the male resembling the female in form, no sexual dimorphism being apparent at this stage. They both run amongst the ant columns, showing no antagonism for the ants. Hingston states that the mimic *A. forticeps* attacks its model and use them as food. Bhattacharya states that the small jumping spider *Marpissa melanognathus* rests at the side of the ant columns and periodically falls upon the ants robbing them of the food or eggs which they are carrying. From my observations of *M. plataleoides*, this species does not interfere with the red ant in any way. The fact that this species does not use the ants as food is illustrated by the following experiment, carried out by Lieut. Barnley and myself at Toungup, Burma.

Two cellophane bags were made and a mango leaf with a pair of *M. plataleoides* were placed in each. Into one, two red ants were introduced and into the other, two small frog-hoppers. After a few hours both frog hoppers were killed and eaten but after two days the red ants were still alive, the male spider having eaten the female.

Small insects, Diptera, Hemiptera, etc., seem to form the main food of these spiders at all stages of development.

Before the sixth moult the female spins a fine cover web on the upper surface of a leaf. She retreats beneath it and moults for the last time. This last moult is not accompanied by any external change in form in the female.



J.E.M.
24.5.45.

♂

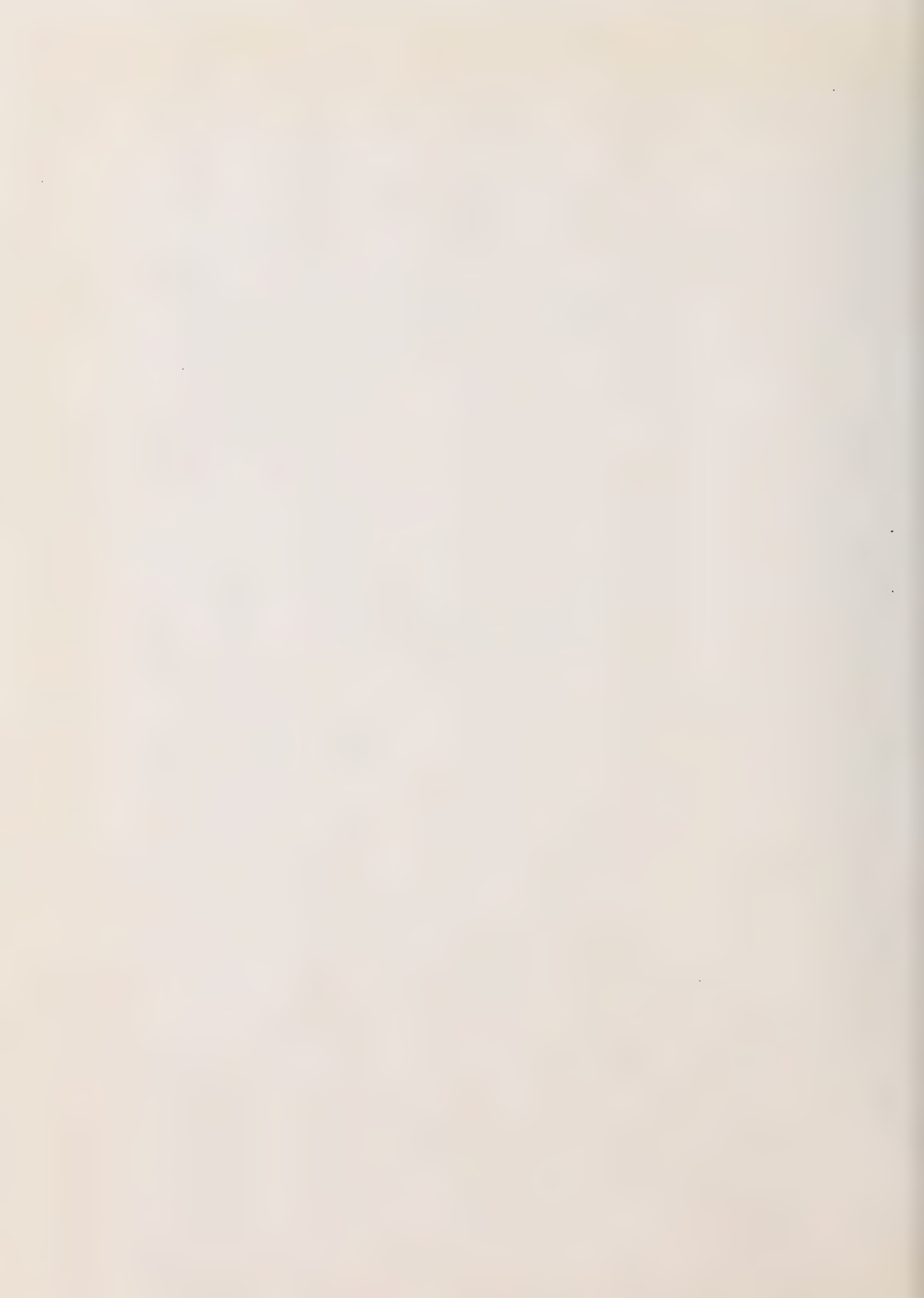
Myrmarachne
Platalcoises.



♀



Ecophylla
Smaragdina



In the last moult of the male however, a very definite change occurs. Instead of the chelicerae being small as in the mature female, they are very much developed being as long as the cephalothorax. The moulting of the male is very fully described by Bhattacharya. I have noticed a similar change in the size of the chelicerae in certain species of the Genus *Tetragnatha* but in this case the change in size occurs in both male and female.

Mating occurs after this sixth moult and after mating the female re-enforces the cover web with patches of closely woven white webbing. She then lays eight to twelve eggs, white or yellow in colour, which are covered with two other layers of protective webbing. She remains under the cover web until she dies a few days later. The male stands on guard at the side of the web. The young hatch after five or six days and emerge after a similar period.

The young spiders change considerably in colour during the first four moults, being similar to different ants at different stages. Bhattacharya gives the following information on this species in India. "I have noticed *M. platalaeoides* at their first, second and third stages to mimic *Selenopsis geminata* and after the fourth moult the ant *Plagiolepis longipes*. After the fifth moult both male and female mimic *Ecophylla smaragdina*." My observations are that at these stages the immature spiders are like the ants named in form and colour but I do not consider that they can be considered as true "ecological" mimics as they do not live in the same habitat as these ants. I will refer to this point later in the article.

The sixth moult is accompanied by a change in attitude to the ant model. The female remains hidden under the cover web and when she does come out to catch food she immediately runs back to the cover web, when an ant approaches. This is the opposite of the male's reaction because he now stands on guard and chases any ants which may approach the web. The ants usually flee rapidly from the male and I have not yet seen a male do any other but chase the ant intruder.

I think that the ant mimic genus *Myrmarachne* should be divided into two groups which I prefer to call "ecological" and "physical" mimics. My reasons for this are as follows.

M. platalaeoides is an "ecological" mimic as I have never found this spider on trees where ant colonies were not present. This "ecological" mimic therefore obtains a double protection from its mimicry. Firstly the physical difference from spiders protects it from the normal spider enemies which do not attack ants. Secondly the fact that the spider runs with the red ants protects it from the enemies of the ants, as the law of chance comes into action; the possibility of the spider being picked out from the large number of ants is slight.

At higher altitudes in Burma black shiny species of *Myrmarachne* are fairly common. These mimics are not however found running with any ant colonies. An ant which is similar to these spiders may be found but these cannot be "paired" ecologically. These species of *Myrmarachne* are "physical" mimics as they only obtain the first part of the protection which the "ecological" mimic does. I do not think that this aspect of mimicry can be neglected in any discussion of mimetic forms.

LITERATURE.

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 Idem, 1936. Observations of some peculiar habits of the spider *Maripissa melanognathus*. *J. Bombay N. H. Soc.*, 39.

The first of these articles by Bhattacharya contains a very complete literature reference on this spider.

I wish to acknowledge the help and facilities extended to me by University Ceylon during my stay in Ceylon and whilst on leave from Burma.

The help and encouragement extended by Prof. Burt, Zoology Department, University Ceylon and by Prof. Hale Carpenter, University Museum, Oxford, has helped me considerably in my work.

A NOTE ON THE FOOD OF YOUNG BLUE GILL SUNFISH, *LEPOMIS
MACROCHIRUS*, IN KENYA COLONY.

by Vernon D. van Someren, M.B.E., Ph.D.

INTRODUCTION.

The American Blue Gill Sunfish, *Lepomis macrochirus* (Centrarchidæ), was first introduced into Kenya Colony in 1940 by the Game Department. The original stock was brought up from South Africa, to which country they had been imported previously from America, and the introduction was undertaken in order to provide a sporting and edible fish suitable for cultivation in dams in Kenya. These Blue Gills have since bred well, and are being distributed to various part of the Colony.

Like their near relatives among the Percidæ, Blue Gills in their native country of North America are known to be mainly carnivorous, but their food in Kenya Colony has hitherto not been determined. Examinations of the types of food eaten by any introduced species of fish are however, valuable in so far as they provide an indication of where such non-indigenous fish will take their place in the ecology of the other indigenous animals present in the waters.

In several instances, these Blue Gills have been placed in dams already stocked with the indigenous Athi River "Carp," *Tilapia nigra*, which in the past has been the species most used for stocking dams in Kenya. The question of a possible food competition thus arises. Stomach examinations of *T. nigra* from a few waters have shown that this species, like many of the other cichlid fish widely distributed in East and Central Africa, is almost exclusively vegetarian; their staple foods are algal, though at certain seasons they may be caught readily on rod and line baited with a worm, or on trout flies.

In December, 1944, Mr. H. Copley of the Kenya Game Department, kindly gave me 12 fingerling Blue Gills (3-4 inches in length) with which to stock a small dam in the grounds of the Veterinary Laboratory at Kabete. These were liberated in this dam on 12/12/44.

During dry seasons this dam is not more than half-an-acre in extent, the deepest portion being about $3\frac{1}{2}$ feet. The water has become progressively more turbid during the last few years, because the dam is used for watering stock. At the time of writing (22/1/46) it is impossible to see through the water for more than an inch or so. The bottom is composed of a thick chocolate-coloured mud which is very fluid in places. Aquatic vegetation is very scanty; there are two small beds of floating *Nymphaea*, and the western edge is fringed with a small bed of emergent *Typha* and *Cyperaceae* sp. reeds.

The aquatic fauna is likewise scanty. There is a sparse plankton fauna of Cladocera and Copepoda, with occasional Hydracarina. Among aquatic insects, only *Dytiscus* and chironomid larvæ are at all abundant, though aquatic Hemiptera such as notonectids are also present, together with a few surface-dwelling Hydrometridæ. In sheltered spots among the reeds, where there is no disturbance by cattle, there is a fairly rich microflora and microfauna of protozoa, rotifers and algæ. The Clawed Frog *Xenopus* is seasonally abundant.

In January, 1938, the dam was stocked with a few *Tilapia nigra* which have since multiplied greatly. The average size of these is about 2-3 ozs. only, though the biggest reach $\frac{3}{4}$ -lb. A short time prior to introducing the Blue Gills, about 200 *Tilapia* were trapped out to destock the dam and improve the growth rate. The stomachs of some of these *Tilapia* were examined and all contained vegetable matter only, mainly euglenids.

In January, 1946, it became apparent that the dam might dry up completely before the long rains set in. Orthodox fishing for Blue Gills had proved fruitless, and it was decided to net the pond and remove whatever head of fish might still be present to dams elsewhere, to prevent losing the whole lot during the drought period.

Accordingly, on 13/1/46, the pond was netted by four hauls with a 100 yard, 1 inch mesh seine. This resulted in the capture of about 80 lbs. of *Tilapia* of all sizes, and 54 young Blue Gills about 3-4 inches long.

Of these Blue Gills, 24 died within twenty-four hours of capture before they could be transferred elsewhere. After slitting the abdominal wall, these dead fish were preserved in 5% formalin, and at a later date they were dissected, the stomachs being cut out for examination of the food contents.

The stomach contents were washed on to a slide, sorted under a low-power binocular microscope and assessed according to Frost's (1943) modification of the method used by Swynnerton and Worthington (1940). In this method, points are allocated according to the frequency and bulk of the various food organisms present in the stomach, having regard to the fullness of the gut. It is in effect an assessment of bulk, and has been found in nearly 300 stomach examinations from Kenya Rainbow Trout to give a very satisfactory estimate on a percentage basis (van Someren, unpublished results).

In this study no attempt has been made to give other than a very generalised classification of the food present. Such a classification is sufficiently informative for all practical purposes and the food material, which has been preserved, will allow of a more detailed study of species later when more is known about the freshwater invertebrates of East Africa.

RESULTS.

Table I summarises the results obtained, and it will be seen that Blue Gills of this age (about 6-9 months) are exclusively carnivorous; no vegetable matter was found in any of the stomachs.

TABLE I. Food of 24 young Blue Gill Sunfish at Kabete, 13/1/46.

<i>Food animal.</i>	<i>No. of points.</i>	<i>% proportions.</i>	<i>% of stomachs in which occurring.</i>
<i>Cladocera</i>	43	34.0	87.5
<i>Copepoda</i>	32	25.3	75.0
<i>Hemiptera</i> (sub-aquatic)	31	24.7	54.0
<i>Ostracoda</i>	12	9.6	46.0
Chironomid larvæ	5	4.0	8.3
<i>Hydracarina</i>	2	1.6	8.3
<i>Nematoda</i> (free-living)	1	0.8	4.2
Total	126	100.0	

Average size of fish 8.1 cms.

Range of size of fish 6.1-9.6 cms.

The main food of this age-class in the Kabete dam at this time of the year is cladoceran and copepod animals (water fleas), these two types being found in greatest bulk in the greatest percentage of the stomachs examined. Cladocera are more commonly eaten than copepods, perhaps because they may be more common in the water; these Cladocera are all of the one species, characterised by a slightly sculptured carapace with a very long posterior spine. The Copepoda are of at least two free-swimming species.

Aquatic Hemiptera of various types (corixid, notonectid, and micronectid "water boatmen") are a close second to copepods as an article of diet, but are grazed upon by fewer fish. Blue Gills feeding upon these hemipterans are those mainly of the longer length-groups; this might be expected because such hemipterans are larger animals than water fleas.

Small ostracods (another type of water flea), come fourth on the list, but are much more scanty in the stomachs than the first three types of food animals. Chironomid (midge) larvae, and hydracarine water mites are present in two stomachs only in small numbers, and one stomach contains a small free-living nematode worm.

The interesting feature of these results is that most of the food taken consists of midwater and planktonic animals. No stomachs contained any aerial or terrestrial food animals, and bottom-dwellers such as midge larvae, nematodes and to a large extent the ostracods, are taken in very small quantities only. The water mites may be planktonic, but are scanty in the pond. Midge larvae are however very numerous in the bottom mud and it would appear that the feeding habits of Blue Gills of this age are selective; the fish choose mainly the midwater food available, and are not "bottom-grubbers" to any extent as are their relatives among the Cyprinidæ and Cichlidæ.

It is evident also that such Blue Gills are not in any way directly competitive for food with the *Tilapia* in such a dam, and there is no doubt that the two species should thrive together in the same water, as long as physical overcrowding does not occur.

More information is, however, still required on the food of adult Blue Gills in this Colony before it can be shown that they are not, for example, directly predatory upon *Tilapia* fry. That they are carnivorous fish, should also be a warning that if Blue Gills are accidentally or deliberately introduced into any of the rivers stocked with trout in this Colony, they may cause an upset in the present food supply in these rivers if they are able to establish themselves. Every precaution should be taken to ensure that this does not happen except as a controllable experiment.

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CORRIGENDUM.

Vol. 18, Nos. 1 and 2, p. 84, Line 17: "Two mole-rats, *Otomys* . . ." should read "Two Groove-toothed Rats, *Otomys* . . ." Line 19: "A Groove-toothed Rat, *Tachyoryctes rex*" should read "A mole-rat, *Tachyoryctes rex*."

OCCASIONAL NOTES.

OTTER WANDERING AWAY FROM WATER IN DAYLIGHT. At 5.15 p.m. on October 10th, 1945, a hot afternoon, we were driving over to see friends near here. Near the bridge over a dry gully, an otter came on to the road from the long grass bordering it, obviously with the intention of crossing. On seeing the car it turned away up the road for a few yards and then disappeared the way it had come. It was about 10 yards from the car so that we had a close view of it. I got out and examined the tracks which showed plainly in the soft dust: they were undoubtedly those of an otter. The exact locality is quite two miles from the Nairobi river and one mile from the nearest point on the Thego. I believe that this otter was travelling between the two rivers, or else had been on a foraging expedition from our water here. It was obviously moving along the line of the gully, a line which would afford maximum cover and shade as well as rain-water pools and a permanent spring where it could refresh itself en route. One would have expected it to have moved by night.

This is the fifth time this year that I have had a close and charming view of an otter, so that I have been very lucky.

MAJOR J. H. KINGDON,
Thego Ford, Nyeri Station.

EUROPEAN WIGEON, *ANAS PENELOPE* Linn. Five examples of the European Wigeon were obtained at Taveta on December 10th, 1945, by R. W. Foster. All the birds were in female plumage and one mature of skin has been placed in the study collection at the Coryndon Museum. No recognisable males were observed on this date; but on December 21st, a male in full plumage was obtained by H. J. Lewis in the same locality. This is the most southerly range yet recorded for the Wigeon in Kenya.

D. G. MACINNES.

STOMACH CONTENTS OF A FEMALE ANT-EATER FROM NAIROBI. The animal was quite fresh when brought in to the Museum on September 1st, 1945. Putrefaction had not begun when the stomach was opened and digestion had not proceeded far enough to affect the mass of food ingested, so that a fairly accurate estimate of the stomach contents was possible.

The total volume of these contents was 1,045 cc. of which whole, or partly digested insects amounted to 834 cc. and grit and small chitinous fragments 211.2 cc. By counting the number of recognizable specimens in 9 cc., a rough estimate of their total number was obtained. The result was as follows:—

<i>Dorylus helvolus</i>	118891	} True ants.
<i>Pheidole crassinoda</i>	4356	
<i>Camponotus rufoglaucus</i>	a few	
<i>Megaponera foetens</i>	a few	
<i>Microcerotermes</i> (?) and <i>Termes</i> (two species, ordinarily associated in the same nest)	7,042	} White ants.

These figures can be increased safely by one third taking into consideration the large quantity of chitinous remnants of digested insects mixed with the gritty sediment. The *Dorylus*, *Pheidole* and *Termes* were in all stages of development, showing that their nests had been plundered. *Megaponera* is a well-known termite raider and may have been picked up inside or near the termitarium. *Camponotus rufoglaucus* is a very ubiquitous species of ant.

The relatively small number of termites is rather remarkable considering the vast numbers available for the Ant-bear, once it had broken into the nest. There was no trace whatever of termite fungus-gardens (ant bread); but three or four seeds of a Cucurbitaceæ and a few leaflets of *Albizzia* were present in the stomach.

A few excremental pellets which I collected at Eldoret appear to be composed mainly of clay and show the remnants of ants, mostly of a small species of *Dorylus*, which the Ant-eaters can pick up only by deep and hard digging. On the veld around Eldoret these animals seem to pay no attention to the innumerable grass-covered mounds of *Cubitermes* which would appear to offer them a bellyful of food with little or no toil. Neither I, nor any of my colleagues, have ever found an ant-hill showing signs of having been raided by an Ant-eater, an animal which is exceedingly abundant there and which burrows everywhere for a food which in our judgment, would appear to be much less palatable.

The above observations are in disagreement with those of the distinguished naturalist, Herbert Lang, who writes (*Bull. Amer. Museum N. H.* 45, 327) "their (Aardwarks') food consists of white ants (termites), and true ants are only incidentally taken as they often inhabit termitaria." Further field notes are necessary and the greatest caution should be exercised when generalizing about habits which may vary considerably from place to place (Lang's observations were made in the Belgian Congo).

Also the presence of stone and grit, the latter found in large quantity in the Nairobi specimen, is denied by Lang as follows (l.c.) "The absence of stone and grit also indicates that the gastric juices play the most important rôle in the disintegration and digestion of food and are sufficient to assimilate the soft-bodied termites but not the well-chitinized ants. Numerous parasitic worms are thus enabled to live in the stomach."

Not a single parasite was found in the stomach of the Nairobi specimen: whether the presence of grit may be held responsible for this, however, is doubtful.

S. PATRIZI,
Coryndon Museum.

THE OCCURRENCE OF RAINBOW TROUT IN LAKE VICTORIA. Two Rainbow Trout have been caught and recorded from Lake Victoria, in the water between Kisumu and Kendu, Lat. 0° 15' S., Long. 34° 45' E. (approx.). Both of these fish were snared in the course of ordinary fishing operations with 5" Flax Gill nets by Luo fishermen, the nets being used as set nets and anchored to the bottom in about 12 feet of water.

The first of these fish was brought to me on October 29th, 1937, and was 17½" in length, a female fully ripe and about to spawn. Weight was 2¼ lbs., and the fish was put into spirit and sent to the Coryndon Museum during November, 1937.

The second was brought to me in October, 1945, but unfortunately I was away. One of my staff skinned it, and it measured 15", but was not weighed. This fish was also ripe, and the eggs were shown to me on my return. The skin is also in the Coryndon Museum.

There are three possible ways in which these fish could have got into Lake Victoria, if we preclude the supposition of anyone having introduced trout directly into the Lake; namely from the Mt. Elgon rivers, some of which are tributary

to the River Sio which enters the Lake at the north-eastern corner, but is about 90 sea miles from where the fish were caught. Secondly from the River Kibos, which runs through the Kano swamp and plains and is fed from streams starting in the Nandi Hills, and lastly from the Miriu starting in the Kericho hills.

The latter supposition would appear the more likely, as the higher stretches of this river are known as the Sondu, and among other streams feeding into it is the River Itare, a well-stocked trout stream.

It is possible that other Rainbow of smaller size are caught by the natives, but as these would pass through the 5" mesh it would be unlikely that they would be reported as that would be an admission of using illegal gear.

STEPHEN DEATHE,
Fishery Control Officer, *Kisumu*.

Note.—Through the kindness of Mr. Deathe and the Coryndon Museum authorities, I have been able to examine both the trout recorded in the above note, and to take scale samples from them for study.

The 1937 trout is much shrunken in preservation, having lost about 4" off its previous length, but is obviously a well-formed female with the small shapely head characteristic of the species of this sex. The markings have unfortunately faded completely, and the scales are unreadable, all having the degenerated centres found so often in Kenya Rainbow. The Corbett condition factor is 42, a fair average for this species in Kenya.

The 1945 trout is interesting in several ways. It is a small-headed shapely fish, very heavily spotted with black especially on the tail, though the red markings have all faded. This very heavy close spotting is not uncommon in several Kenya rivers, particularly in the Suam on Mt. Elgon (a tributary of the Turkwell flowing N.E., not to the Lake). Secondly the scales are very easy to read compared with most Kenya Rainbow. Thirdly it is one of the oldest Rainbow I have yet examined in this Colony, being 5+ years old; most Kenya Rainbow rarely live to more than 4 or 4+ year old. The scales show no spawning mark in any year, though this is not of course an indication that the fish has not spawned during its lifetime.

The growth rate is most interesting, the following age/lengths having been calculated from the scale readings.

<i>Years.</i>	<i>Length (inches).</i>	<i>Annual increment (inches).</i>
1	3.3	3.3
2	9.0	5.7
3	10.7	1.7
4	12.5	1.8
5	14.3	1.8
+	15.0	0.7

Thus the fish shows the marked second year increment characteristic of most Kenya Rainbow, which is probably correlated with downstream migration from the spawning reaches to richer feeding; but thereafter the annual increments are remarkably even, very unlike other Kenya Rainbow which show a progressive decrease from 2 year old onwards. These annual increments are not large, but I have never before recorded any Rainbow Trout from rivers in this Colony which show such even growth over a period of years; it is a feature more characteristic of Brown Trout.

Whether this even growth is a result of a long stay in the Lake is difficult to determine, though I would have expected the increments to be greater and the winter bands to be much less well defined in the rich feeding and equable temperature of Victoria Nyanza. It seems more likely that this trout was a fairly recent arrival in the Lake, though I have been unable to correlate its growth rate with any trout I have examined from the higher reaches of rivers flowing into the Lake. As the weight was not recorded, the condition factor of the fish cannot be calculated.

Hen fish seem more common than cocks in nearly all Kenya Rainbow rivers, hence it is not surprising that both these fish were hens. Any spawning however in the Lake would have been unsuccessful owing to the high temperatures prevailing, and there is little chance of Rainbow being established as a resident breeding species in Victoria Nyanza.

VERNON D. VAN SOMEREN.

BIRDS ATTACKING SNAKES. On December 12th, 1945, in the Liwale District a male *Thamnotlaea arnotti* was seen with a small specimen of *Philothamnus semivariiegatus*, about 12 inches long, in his beak. The bird was in a bush and dropped the reptile and made off on my approach. The reptile was still alive when picked up, but died a short time later from the injuries that it had received on the head.

On November 22nd, 1945, two *Tchagra senegala* were seen to be fluttering excitedly about some object in a tree. A few moments later, a large *Thelotornunis kirtlandii*, about 40 inches in length, fell to the ground. The snake had injuries to the head and was bleeding from the eyes and mouth. It died in about 10 minutes. This occurred in Liwale.

C. H. IONIDES.

LARGE PUFFBALLS. The photograph (Plate VII) illustrates a type of large puffball found on the upper edge of the forest (wet!), at an altitude of 11,000 feet on Mt. Kenya. These fungi are eaten by the natives.

JOY ADAMSON.

ROCK ENGRAVINGS NEAR LAKE RUDOLF. On a foot safari to Lake Rudolf in August, 1944, we camped near Surima water-hole, about seven miles away from the southern end of the Lake. While walking in the deeply eroded river-bed, I noticed, on the smooth surface of the basalt cliff, faint rock engravings of camels and of cattle brands. (Site 1. See Plates, VIII, X, XI, Figs. 1, 2, 6 & 9).

Very excited by this discovery we explored also the side channels and found, in an amphitheatre-like bend about 700 yards from the water-hole, very many engravings of men and of animals resembling giraffe, oryx, buffalo, flamingo and small gazelles. The drawings were in rather exposed positions on the upper parts of the cliffs and in order to trace them on cellophane with Chinese ink, we had to balance on ledges only a few inches wide and about 40 feet above the present bottom of the gorge. The lower portions of the site must have fallen since the engravings were made. (Site 2. See Plates IX, X, XI, Figs. 3, 4, 6, 7 & 8). The amphitheatre looks like a meeting place, well protected and about 50 feet across. There are many different engravings, often several of one animal; but owing to shortage of materials, only a few examples could be traced.

A few weeks later, on our return journey, we passed a rock bend, also in a river-bed, about 12 miles from Teleki's Volcano and four miles inland from the S.E. corner of Lake Rudolf (Site 3. Plates IX, X, XI, XII, Figs. 5, 7, 9, 10 & 11). Here on a rock-band of basalt about 100 yards long were engravings, the lowest two to three feet from the ground, the highest about 12 feet up. These engravings appeared to show a more developed and a greater variety of technique than those at Sites 1 and 2. There was also a greater variety in the subjects (elephant, rhino, buffalo, giraffe, several types of long-horned antelope, etc.). In the case of giraffe three different types of drawing are apparent. Figs. 7 and 11 illustrate two of these.

All the engravings are cut about 1-3 mm. deep and were probably done with a harder stone. As an experiment I tried to engrave a similar animal with a piece of quartz and found that this took about 10 minutes only. No attempt had been made to colour them. At all the sites figures of giraffe predominate.

At present the district is extremely inhospitable and contains neither game nor human inhabitants. None of the nearest natives know anything of the origin of the engravings—some suggested that they might have been cut by South African troops!

The illustrations on Plates VIII and IX shew Sites 1 and 2 and actual engravings (outlined in ink in order to photograph better). Plates X, XI and XII are photographs of tracings.

On the same journey we were able to excavate some fragments of pottery from tuff near Loioangallam, about two miles from the Lake. This material has been deposited at the Coryndon Memorial Museum for detailed study.

JOY ADAMSON,
c/o The Game Department, Nairobi.

TANGANYIKA RECORD OF BAR-TAILED GODWIT, *LIMOSA LAPPONICA LAPPONICA* (LINNAEUS). I saw five of these birds at Dar-es-Salaam on October 18th, 1945, just after half-past five in the evening. The habitat was a system of sandbanks and mudflats at the mouth of the Msimbazi Creek, with the tide on the ebb leaving the mudflats exposed. Two birds were feeding on an open mudflat among large crowds of small waders, while the other three were some distance off on a sandbank, resting and preening among a good-sized flock of curlew and whimbrel. There was no trace of the breeding plumage, but the flesh-coloured bills were easily picked out through binoculars.

So far as I have been able to trace, there is no published record of the appearance of this species on the eastern seaboard of Africa since Dr. van Someren's record from Kismayu (quoted in Jackson's *Birds of Kenya & Uganda*, Vol. I, at p. 392, and in Archer's *Birds of British Somaliland*, Vol. II, at p. 465) and a record from Durban (Roberts, *Birds of South Africa*, p. 109).

A. F. MORRISON,
Dar-es-Salaam.

NEST OF THE GREY-CAPPED SWAMP WARBLER. The nest of *Eminia lepida* Hartlaub is as a rule so placed as to be well concealed by the surrounding foliage, and Mr. A. J. Wiley's note in this Journal (*E.A.N.H.S. Journal*, 1945, 18, p. 162) with its accompanying excellent photograph illustrates very well the usual type of nest site chosen, several examples of which are described by Jackson in *Birds of Kenya & Uganda*, 2, p. 1067.

On May 24th, 1944, at Nairobi, I found a nest in a rather exceptional situation in this respect. It was in the valley between Muthaiga and High Ridge, about thirty yards from the stream. There was a large tree flanked by some pollarded saplings, whose branches bent over and met the foliage of the former, making a wide archway whose summit was about 12 feet from the ground. The nest was suspended from the end of a thin bare branch in the middle of the arch, and was conspicuous at a distance of well over a hundred yards. It was of the usual type and very untidy. There was no foliage near it.

I was unable to identify the owner on that day, as I only had the briefest glimpse of the bird disappearing into the dense foliage of the large tree, but four days later I took up a position behind a nearby bush, and after some minutes was rewarded by an excellent view, putting the identification beyond doubt. The bird first appeared in the branches of the large tree, where it moved about carefully scanning

the surroundings. It then made its way through the branches towards the nest, keeping to the thickest available cover. The last three feet of the journey was across the open, owing to the situation of the nest. A whitish object was carried in the bill and delivered into the nest, while the bird clung to the outside. The route away from the nest was the same as that for the approach. In the meantime another bird had been flitting about in the large tree and both left together.

The nest was plentifully lined with vegetable down, loosely put in, and there was a single nestling, partly feathered.

A. F. MORRISON,
Dar-es-Salaam.

CHARAXES LICHAS BEBRA ROTHSCH. AND *CHARAXES PAPHIANUS SUBPALIDA* JOICEY & TALBOT. On a recent visit to England, I had occasion to visit the Hope Museum of Entomology at Oxford, and while looking through the collection of *Charaxes* there, I noticed the two species which form the subject of this note. They have been described by Dr. V. G. L. van Someren, Butterflies of Kenya and Uganda, Part VIII, and figured therein on Pl. XCVI, Figs. 5-7 and 1-3 respectively. In the interests of collectors, I feel it my duty to point out that the species described in that paper as *Ch. lichas bebra* Rothsch is actually *Ch. paphianus subpalida* Joicey and Talbot, and vice versa, and the same applies to the figures. The species figured as *lichas bebra* is *paphianus subpalida*, while that figured as *paphianus subpalida* is *lichas bebra*. This error was confirmed by Prof. Carpenter, of the Hope Museum, whom I consulted before assuming that there was an error.

R. TENNIEL EVANS.

USEFUL HINT FOR MOUNTING LITTLE EGRET AND ITS ALLIES. I have mounted many and, to set effectively the beautiful plumes, found the following method very easy and quick. When the bird has been mounted it is fixed to a board in the desired position. The board (with bird) is then turned over so that the bird hangs upside down. When the skin is dry and well set, the specimen is turned up. The plumes will then be seen to advantage.

HAROLD M. MILLER,
Rukera.



PLATE VII.
Large Puffballs on Mt. Kenya.



Rock Engravings near Lake Rudolf.
Fig. 1. Site 1.

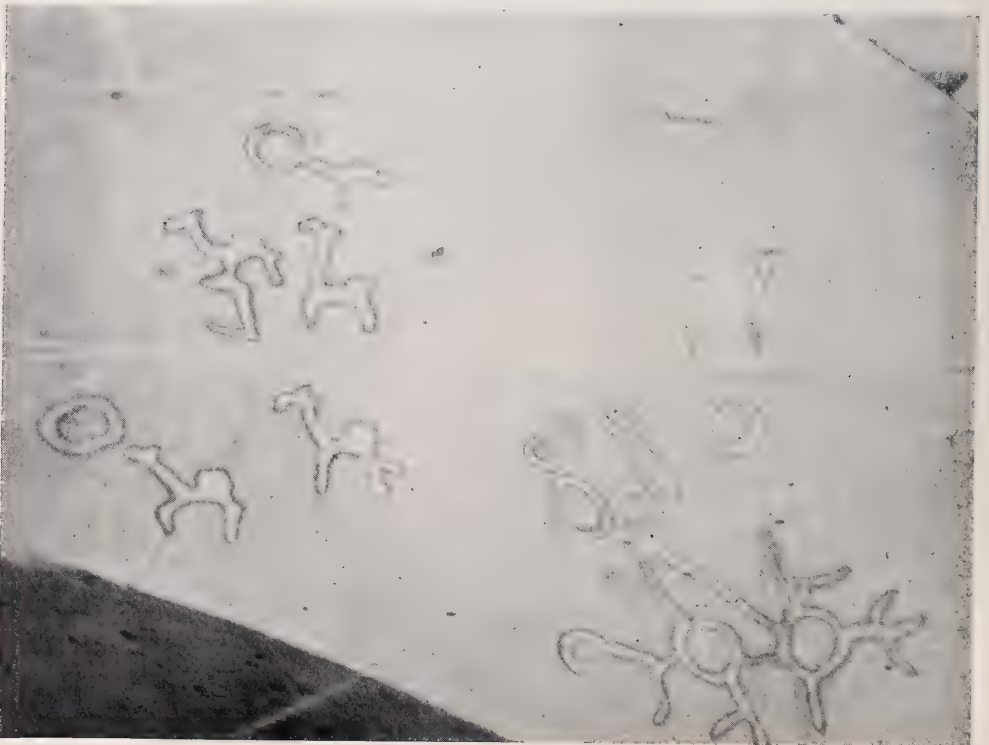


Fig. 2. Site 1, rock engravings *in situ*.

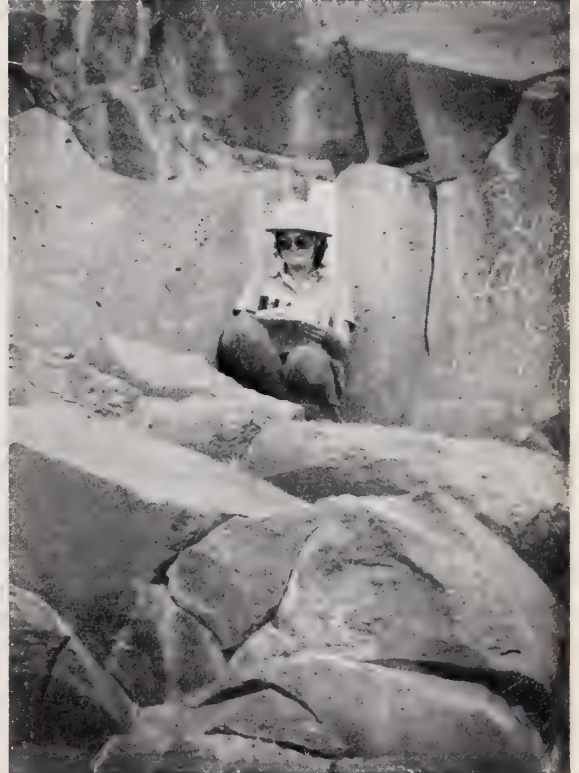


PLATE IX.

Rock Engravings near Lake Rudolf.

Figs. 3 & 4. Site 2.

Fig. 5. Site 3, rock engravings on right of photograph.

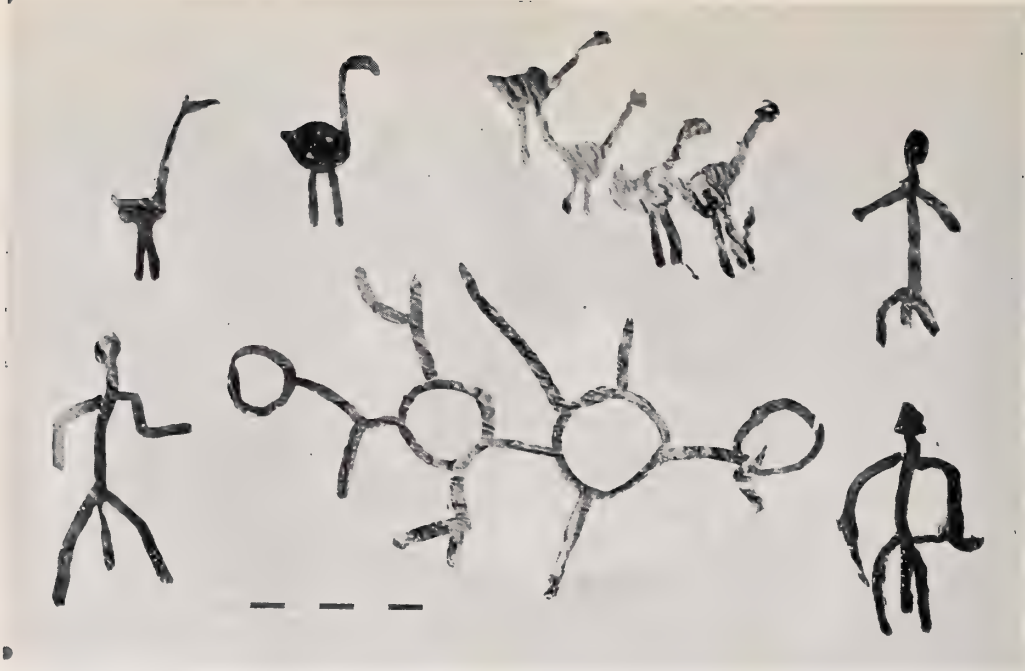


PLATE X.

Rock Engravings near Lake Rudolf.

Fig. 6. Tracings. Cattle brand from site 1, birds and men from site 2.

Fig. 7. Tracings. Outline giraffe from site 2, full-bodied giraffe from site 3.



Fig. 8. Tracings from site 2.



PLATE XI.
Rock Engravings from Lake Rudolf.

Fig. 9. Tracings. Small camels from site 1, large camel from site 3.

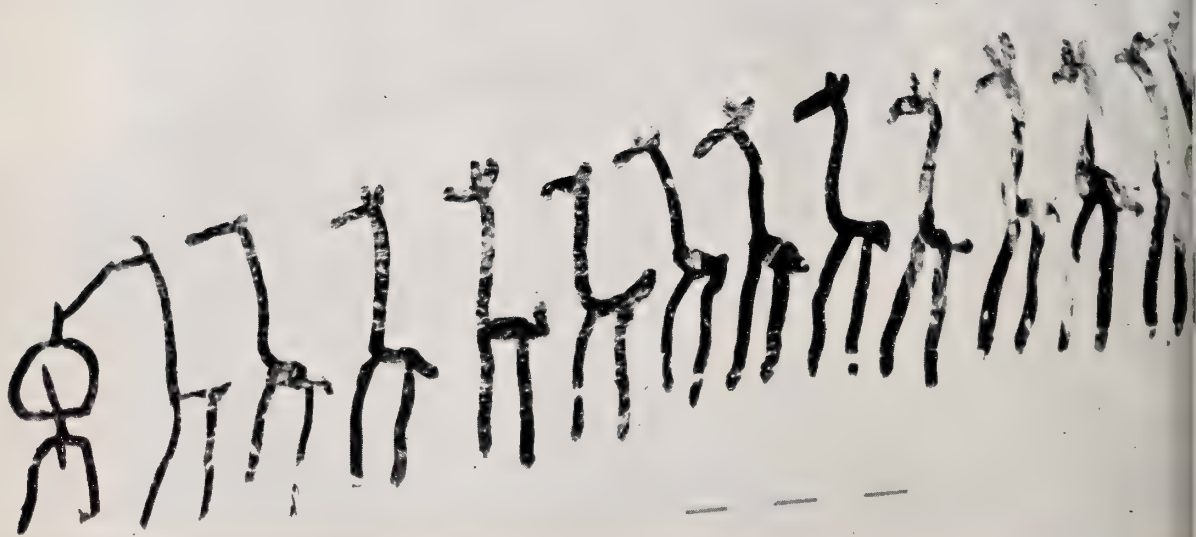


PLATE XII.
Rock Engravings from Lake Rudolf.
Figs. 10 & 11. Tracings from site 3.

OBITUARY.

THE LATE W. L. SCLATER. W. L. Sclater, who was killed by a flying bomb in July, 1944, was a more remarkable man than some of us had realized, for to an enviable extent, he had defied time. When I saw him last, in 1939, he was the same courteous, interested, companionable, hard-working person as he had been ten years earlier, and no one would have guessed—I certainly did not—that he was getting on for eighty years old.

His connection with Africa, and in particular with African ornithology, lasted for most of his long life. In 1896, he became Director of the South African Museum at Cape Town, where he wrote most of what had been Stark's "Birds of South Africa." At the beginning of this century he returned to England, with his wife by way of Mombasa and the Nile route; and I remember them giving me their impressions of that grilling walk from Nimule to Rejaf.

From 1909 until his death Sclater worked at the British Museum, specializing for many years on African birds. Anyone who had interest in this group inevitably turned to Sclater for help, either by letter, or personally, when they were in London. He was one of those men who have many offices and many interests, but are always able to give time and a welcome.

He performed a most valuable service when he compiled the "Systema Avium Aethiopicarum" (1924-1930), a work that has provided a basis for so much that has been done since. Later, on the death of Sir Frederick Jackson, he was asked to complete the unfinished "Birds of Kenya Colony and the Uganda Protectorate," by which he will be most generally known in East Africa. In his unobtrusive way he contributed a great deal to this book as he had to Stark's. He was very conscious of the wide gaps in the information at his disposal. A great many of them still exist, but some could, he knew, have been filled if he had had a free hand in obtaining collaboration.

It is characteristic of him that in his last years, when the British Museum had more need of workers on South American than on African birds, he turned with zest to a field with which his first paper had dealt over fifty years before. Through the war he continued his work at South Kensington, which was essentially voluntary, unintimidated and without intermission.

R.E.M.

THE LATE VENERABLE W. E. OWEN, ARCHDEACON OF NYANZA PROVINCE, KENYA. The Venerable Archdeacon W. E. Owen, who passed away at Limuru on the 22nd September, 1945, has been a keen member of the East Africa Natural History Society for many years, and his death leaves a big gap in the ranks of the field naturalists of Kenya.

Although Archdeacon Owen was best known to the public in Kenya for his bold and outspoken defence of native rights, he will long be remembered both in Africa and in Europe for his contributions to the study of the archæology and

palaeontology of Kenya. His work on the Tumbian culture, published in conjunction with Dr. Leakey in 1945, added a very important chapter to the story of Kenya's past, a chapter which could never have been written but for Archdeacon Owen's important discoveries. At the time of his death, he had just passed the typed proofs of another important contribution to pre-historic study, a paper on the hitherto unrecorded dimple-based pottery of Nyanza Province.

In the field of palaeontology, Owen was responsible for some remarkable discoveries of Miocene fossils at Ombo and at Kiboko Island, and his collection from these areas is in England. His generous gifts of specimens have enriched many Museums, including the principal Museums in England and South Africa, as well as the Coryndon Museum, Nairobi, to which he gave the greater part of his best material.

To his widow and his three sons, the Society extends the deepest sympathy.

L.S.B.L.

FIFTH ANNUAL CONVERSAZIONE, 1945.

From October 26th-29th, the fifth Annual Conversazione, sponsored by the E. A. Natural History Society and Coryndon Memorial Museum Staff, was held in the main hall of the Coryndon Museum by kind permission of the Museums Trustees of Kenya Colony.

This annual function has become one of the most popular social features of Nairobi life, and this year was no exception. On the evening of October 26th, 321 members and their guests, including guests officially invited by the Society, attended; and the Society was again honoured by the presence of H. E., the Acting Governor, Mr. G. M. Rennie.

Nineteen special exhibits were arranged in the main hall, which was most tastefully decorated with flowers and plants, some generously given by Sir Charles and Lady Belcher for the occasion, and others lent by the Municipal Gardener.

The morning of Saturday, 27th, and the whole of Monday, 29th, was devoted to conducting parties of school children from 12 different schools round the exhibits, and it is pleasant to record the great interest shown by the children in all the exhibits, and the co-operation shown by the Education Department in arranging for these parties to attend. This annual Conversazione fulfils a real educational as well as a social function. Altogether 903 school children saw these special exhibits.

The afternoon of Saturday, 27th, and the whole of Sunday, 28th, were public days, and during this period 1,525 adults (European, Asian and African), visited the show. As usual a Guessing Competition was run during the three and half days of the Conversazione, and this raised the good sum of Sh.215/-, which was donated to the Red Cross.

It is a pleasure to record the enthusiasm with which all the exhibitors co-operated, not only in arranging their various exhibits in a clear and interesting manner, but also in explaining them time and again to interested visitors and school children. Without this personal touch about the show, the exhibits would have been much less attractive.

Last, but not least, the Society is most grateful to all those ladies who generously gave their time and help to arranging the decorations and running the Guessing Competition; to Mrs. Stanborough, Mrs. Purchase and Mrs. Leakey for the attractive decorations, and to Mrs. Little and the Misses Lankester, Keyser, Eiglaar, Bennett and Beauchamp for supervising the Guessing Competition.

This year made it even more clear that the Museum is now too small to house any more large exhibits, or to accommodate the number of people who now attend this annual function. Many of the exhibits shown at this year's Conversazione could well be given a permanent place if the Museum were enlarged, and the crowded hall on Members and Guest's night showed clearly that more spacious accommodation is necessary. The Conversazione has become such a successful feature of the Society activities that we hope by this time next year some positive progress will have been made towards enlarging the Museum, use of which has so kindly been permitted for these functions in the past, and, we hope, will be again in the future.

A Financial Statement on the Conversazione is appended, and the following is a brief account of the various exhibits displayed.

MAGADI SODA PRODUCTS.

The Magadi Soda Coy. gave an interesting display of the various products which they manufacture from the crude soda found in such abundance in the natural soda lake at Magadi in the Rift Valley. This exhibit showed step by step how the crude trona is purified to produce all the by-products used by the housewives of Kenya, from Magadi Household Soda to bath salts. A short cinematograph film, partly in colour, showing the various processes in the manufacture of these products was also run from time to time and proved a great attraction.

E. A. INDUSTRIAL MANAGEMENT BOARD.

Shortage of imported goods during the war years has given a great impetus to local production, and this was well illustrated in this exhibit which showed the great improvements which have been made in the local manufacture of pottery. The cups, saucers and other crockery articles which were on display were of beautiful workmanship and finish. Other local industries such as the manufacture of fire-bricks, vegetable oils and their by-products, and sulphuric acid were also fully displayed.

E. A. INDUSTRIAL RESEARCH BOARD.

The numerous problems requiring research which arise from the setting up of local industries were explained by this exhibit, which consisted of a series of photographs illustrating the laboratory activities of the Board in studying the local production of fertilisers, tiles and ceramics. A beautifully-made, scale-working model of the latest type of rotary kiln for calcining rock phosphates was the chief attraction of the display.

E. A. VENEERS, LTD.

Plywood products made from local timbers were shown by E. A. Veneers, Ltd., together with specimens explaining how these products are made from the original tree trunks; this showed step by step how the wood strips are cut and glued together to form the finished article, and it is interesting to record that all the machinery used is locally made.

MEDICAL RESEARCH LABORATORY.

Penicillin, that wonderful chemical produced by a mould and which effects such dramatic cures in diseases caused by various bacteria, is very much in the public eye these days. This exhibit showed how the Medical Laboratory is producing it locally. Cultures of *Penicillium notatum* were shown growing, followed by exhibits explaining the various stages necessary for the extraction and purification of the crude penicillin secreted into the culture fluid by the mould. Finally the dramatic effect of penicillin in inhibiting the growth of the bacterium *Staphylococcus aureus* was demonstrated by cultures on agar plates.

NAIROBI WATER SUPPLY.

A military Water Supply Coy., put up this most interesting exhibit on the geological aspects of Nairobi's water supply, illustrating by maps, diagrams and rock samples where in the vicinity of Nairobi, water is most likely to be found by boring.

BOOKS FOR AFRICANS.

The C.M.S. Bookshop put up a display of recent books which they have produced for Africans, written not only in Kiswahili, but also in other languages, such as Dholuo and Kikamba. The educational value of such literature can hardly be over-stressed. Among the interesting features of this exhibit was a series of remarkably fine pen and ink drawings (to be used as book illustrations), by an African at Maseno C.M.S. School.

EAST AFRICA'S SNOW-CAPPED MOUNTAINS.

Mr. Arthur Firmin had a magnificent display of his own photographs taken on Ruwenzori, Kenya and Kilimanjaro, and for sheer artistry and technical excellence this series would be hard to beat.

THE STONE AGE IN EUROPE AND EAST AFRICA.

Dr. Leakey's exhibit showed by specimens, maps and a series of copies of rock paintings beautifully executed by Mrs. Leakey, the comparison between the Stone Age Cultures in Europe and East Africa. He also gave an interesting demonstration of how Stone Age man made his tools such as handaxes and scrapers; starting with the crude blocks of obsidian or other stone and shaping them, not as might be expected with another stone, but with much softer material such as bone or wood. The angle at which the stone is struck is the whole secret.

VETERINARY RESEARCH LABORATORY.

A gigantic scale model of *Glossina pallidipes*, one of the tsetse fly carriers of trypanosomiasis in cattle, was the central feature of an exhibit by the Veterinary Laboratory. This was made by Lt. Patrizzi of the Museum staff, and was magnified 8,000 times the volume of the original tsetse fly. A map showed the distribution of the fly belts in Kenya Colony, diagrams illustrated the small protozoans carried by this fly and inoculated by them into the blood of healthy cattle to infect them with trypanosomiasis, and photographs showed the methods of controlling the fly. Specimens of Stibophen tablets and Phenanthridinium drugs used to cure the disease in cattle completed the picture.

TRIONYX TRIUNGUIS.

A magnificent plaster cast by Mr. Allen-Turner of the first living specimen of this giant mud tortoise ever to be sent from Lake Rudolf was on view. This will be placed among the permanent exhibits of the Museum.

PLASTER CASTING.

Mr. Allen-Turner also let the public into a few of his trade secrets in showing step by step how a plaster cast is made from the original specimen of a snake. Exhibits showed how the negative wax mould is melted off the plaster cast, the final cast being then painted to represent the original. Specimens of casts of snakes made in this manner were also shown.

HOW TO IDENTIFY SNAKES.

Snakes were the subject of another instructive exhibit by Dr. Toschi of the Museum staff, who showed by diagrams how snakes are classified according to the arrangement of their teeth. Specimens were on view of the different types of snakes, together with information about their poisonous or non-poisonous nature, and this exhibit attracted a good deal of attention throughout the show.

RARE KENYA MAMMALS.

Dr. Toschi also gave an exhibit of rare Kenya mammals such as the Yellow-backed Duiker, Golden Cat, and Brazza's Monkey; previously these were known only from the Congo Forests and West Africa, but have recently been found living in forests on the Mau and Cherangani Hills in Kenya. The exhibit consisted of skins and some superb paintings by Dr. Toschi.

WHITE ANTS AND THEIR GUESTS.

One of the most fascinating exhibits on show, this was constructed by Lt. Patrizzi and will be placed on permanent exhibition in the Museum. Scale models showed a highly magnified portion of the fungus gardens cultivated by white ants in the termitary, in which the temperature, humidity and aeration is carefully controlled as in the growing of mushrooms by human beings. In this garden could be seen the young white ants and one of their strange beetle guests. Other models showed the various forms of the other castes, such as soldiers and the flying stage; while actual specimens of these other castes and various guest insects completed the picture.

FROM SUNSHINE TO ANGLER.

The story of river life in a Kenya trout stream was shown by Dr. Vernon van Someren, illustrated by diagrams, photographs and specimens. From the microscopic algae growing on the stones of the river bed, and the insect larvae which feed on these, the food cycle was followed through to the trout which is caught by the angler. Specimens of trout stomach contents showed how most of the food of the trout is found underwater, and how Kenya trout differ hardly at all from trout in other parts of the world in their feeding habits. A very fine plaster cast of a dissected trout made by Mr. Allen-Turner, showed where to find the stomach for examination of the food, and the position of the various other internal organs.

NATURE PHOTOGRAPHS.

Dr. V. van Someren also showed some of his nature photographs, ranging from butterflies in flight to elephants; and also a series of bird photographs taken in Kenya Colony without the aid of a hide, using the "wait and see" method.

EDIBLE AND POISONOUS MUSHROOMS.

The recent outbreak of "mushroom" poisoning in Nairobi was the subject of a very popular exhibit by a Society member, Dr. Rayner. Specimens and a fine series of paintings by Mrs. Rayner showed which are the edible and which the poisonous types to be found round Nairobi. Their differences were clearly explained.

NOXIOUS AND OTHER WEEDS.

The recent promulgation of the Noxious Weeds Ordinance was the main theme of an exhibit by the Museum botanist, Mr. Bally, who showed actual specimens and paintings of the various weeds which require to be dealt with under this Ordinance, such as *Datura stramonium* and *Striga*. The history of the introduction of various weeds into Kenya was explained by various other specimens, and a series of Mr. Bally's own paintings illustrated other types to be found in the Colony. Not all of these are "noxious" since many are used as food by the natives.

 FINANCIAL STATEMENT ON THE CONVERSAZIONE, 1945.

RECEIPTS.		EXPENSES.	
	Sh. Cts.		Sh. Cts.
Door receipts, Oct. 27th-29th ...	434 60	Printing of Invitations and Members' Notices ...	32 50
		Postage of above ...	48 25
		Printing of Programmes ...	50 -
		Typing for Broadcast ...	13 50
		Envelopes — (Dr. Leakey for Invitations) ...	7 -
		Envelopes — (Hon. Treasurer for Members' Notices) ...	4 90
		Advertising—E. A. Standard ...	70 -
		„ —Sunday Post ...	21 -
		Express Transport Co. (Hire of tables and chairs) ...	72 -
		1 year's Subscription to winner of Guessing Competition ...	20 -
		To balance of Cash in Hand ...	95 45
TOTAL ...	<u>434 60</u>		<u>434 60</u>

Guessing Competition—Total receipts given to Red Cross Sh.215/-

V. H. M. BLOOD, *Hon. Treasurer.*

V. D. VAN SOMEREN, *Hon. Secretary.*

THE THIRTY-FIFTH ANNUAL REPORT OF THE EAST AFRICA NATURAL HISTORY
SOCIETY FOR THE YEAR 1945.

1. *Officers.* The following Members of the Society served as Office-Bearers and members of the Committee during 1945 :—

R. Daubney, Esq., President.
H. J. Allen-Turner, Esq., Vice-President.
Miss V. M. Blood, Hon. Treasurer.
J. R. Hudson, Esq., Hon. Editor.
Hugh Copley, Esq. }
Dr. V. D. van Someren } Hon. Secretaries.
Mrs. V. Purchase, Hon. Librarian.
Dr. L. S. B. Leakey.
Dr. A. Jex-Blake.
Dr. D. G. McInnes.
F. B. Hannam, Esq.
Sir Charles Belcher.

There were several changes during the year in Committee membership. Owing to pressure of other work, Mr. Hugh Copley resigned from the Secretaryship in July, 1945, and Dr. V. D. van Someren was elected in his place. It is a fitting place here to pay tribute to the hard work put in by Mr. Copley as Hon. Secretary of the Society for four years. The Society is most grateful to him for the energy and time he so unstintingly gave to the executive affairs of the Society during these difficult war years, and to him is due much of the credit for the present healthy state of the Society's affairs. Mr. Copley remained as a member of the Executive Committee after his resignation from the post of Hon. Secretary.

During the latter part of the year, Mrs. Purchase very kindly accepted the post of Hon. Librarian to the Society, and has already given much of her time to putting the Library in order and bringing Library affairs up to date.

In December, the Committee lost a valued member by the resignation of Sir Charles Belcher, who has left the Colony for South Africa. We owe him grateful thanks for his many services to the Society, and wish him and Lady Belcher a pleasant stay in their new home.

Owing to the fact that war duties and other business kept several members of the Committee away from Nairobi or out of the Colony altogether, the Committee exercised its constitutional powers and co-opted Mrs. Purchase and Mr. A. Gedye to be members as from December, 1945, though Mr. Gedye was unfortunately unable to return to the Colony before the end of the year.

The Executive Committee held 12 meetings during the year.

2. *Membership.* At the end of the year, the Society membership stood at the good total of 431, this including only those persons whose subscriptions were up to date.

During the year the following new members were elected to the Society :—

Life Members	2
Junior Members	5
Ordinary Members	80

making the total of 87 new members for 1945. It is pleasing to record how many members of H.M. Forces have found it worth while to join the Society during their stay in the E.A. Command. One previous member was elected an Honorary Member, and there were four resignations during the year. Several subscriptions remain outstanding, and we would again point out that such members whose subscriptions are in arrears, cannot expect to enjoy the privileges of membership such as receipt of the Journal or free use of the Coryndon Museum.

3. *Obituary.* The Society records with regret the passing of two of its oldest members, Archdeacon Owen and Capt. J. T. Oulton, both of whom had always taken a keen interest in Society affairs and had done much valuable work to further the knowledge of Natural History in this Colony. Appreciations of each will appear in due course in the Journal, and to the families of each we extend our sympathy.

4. *Finance.* A Financial Statement for 1945 has been prepared by the Hon. Treasurer and will be presented before this meeting.

5. *Conversazione.* The 1945 Conversazione held in October was a most successful function as have been its predecessors, and attracted over 2,000 members of the public during the 2½ days it was open, in addition to 321 members and their guests on the opening night. As a result of the Guessing Competition, Sh. 215/- was donated to the Red Cross. A full report of this Conversazione will appear later in the Journal.*

6. *Journal, Publications and Library.* It has again been a most difficult year for the production of the Journal, and although one number was sent to press in May, 1945, owing to printing delays this has still not been published. This delay has resulted in the accumulation of yet further material for publication, and already the Editor has in hand more than enough for another number which cannot yet be sent to press.

The Committee feels that regular publication of the Journal is one of the most important of its functions, since the Journal serves as the only link between the headquarters of the Society here in Nairobi and its up country and overseas members who do not have the opportunity to visit the Museum. The Committee are fully aware also that many members who have joined during the year must feel that they are not getting full value for their subscriptions, particularly if they cannot visit the Museum. With these in view therefore, the Committee is again making every effort to have future numbers of the Journal printed quarterly if possible in England where they hope that the delays experienced with the local printing will not occur.

The sale of brochures and article reprints from the Journal has been well maintained, though the stocks of many more of the reprints are now finished.

There have been few additions to the Library in 1945 except for books purchased by the Trustees, owing to the difficulties and delays in obtaining books from overseas, but considerable progress has already been made in binding and labelling books and journals already in the Library. Exchange publications are now arriving more regularly than before.

7. *Other activities.* The Society has been actively concerned with the proposals to set up National Parks in East Africa and two members of the Committee have served on the Board of Trustees for this project during the year.

The Society has also been most active in urging that the final choice for a War Memorial in Kenya should take the form of expansion of Museum Services, because we believe that a Museum is the only type of Institution which can cater without fear or favour for every race, sex and age in the community, from the highest to the lowest in the land. The recently published figures of over 89,000 admissions to the Coryndon Museum during 1945 are sufficient indication of the popularity of such institutions, while their educational value cannot be too highly stressed; the numbers of conducted parties of school children of all races and ages who visit the Museum during term time are convincing proof of this latter. During the year also, over 1,000 visits to the Museum were paid by members of the Society.

We record with appreciation the continued goodwill between the Museum authorities and the Society who were its founders; the attractions of the Museum are to a large extent responsible for the expanding membership of the Society. Recently a showcase has been placed at the entrance to the Museum setting out in detail the activities of the Society, and this has proved an added incentive to membership.

The Committee has recently revised and brought the Constitution of the Society up to date and this revision will be placed before this Annual General Meeting for approval.

*See page 75.—*Editor.*

East Africa Natural History Society

The following reprints of articles which have appeared in the *Journal* are available on application to the Coryndon Museum or to the HONORARY SECRETARY, P.O. Box 658, Nairobi. They are priced at 50 cents each with the exception of those which are priced individually. All correspondence in connection with the publications of the Society should be addressed to

THE HONORARY SECRETARY,
EAST AFRICA NATURAL HISTORY SOCIETY,
P.O. Box 658, NAIROBI,

and (except when returning proofs) not to the Editor.

The Honorary Secretary will be glad to receive copies of articles for consideration by the Committee with a view to publication in the *Journal*.

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Luo Customs with Regard to Animals	Odede
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Chyulu Hills, Botanical Notes	Baly
Chyulu Hills, Vegetation	Baly

Journal

OF THE

East Africa Natural History Society

OFFICIAL PUBLICATION OF THE CORYNDON MEMORIAL MUSEUM
(MUSEUMS TRUSTEES OF KENYA)

December 1946.

Vol. XIX.

Nos. 3 & 4 (87 & 88)

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Journal

of the East Africa Natural History Society

DECEMBER, 1946

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CORYNDON MUSEUM EXPEDITION TO THE MAU FOREST.

I. BOTANIST'S DIARY.

By P. R. O. Bally.

The primary object of the trip was to obtain specimens of the Yellow-backed Duiker, *Cephalophus silvicultor* (Afzelius), and the Golden Cat, *Profelis aurata* Temminck, two game animals well known from West Africa, but whose presence in Kenya has been reported comparatively recently.

It would be interesting to compare the habitat of the East African Duiker with that of the West-African form, and thus it was decided to obtain as complete ecological notes of the area as a month's stay during the driest season of the year would permit.

The expedition was led by Mr. C. J. P. Ionides, Assistant Game Warden from Tanganyika Territory, a keen sportsman and hunter of the rarer African game, who very generously offered to donate any game shot on the expedition to the Coryndon Museum and, in addition, to bear half of the cost of the trip. Mr. Ionides' generosity is greatly appreciated by the Museum Trustees. Signor F. Meneghetti, temporarily attached to the Museum as preparator and collector, was to supervise the skinning and treatment of the skins, and also to collect smaller mammals, birds, reptiles, insects, etc.

Two African collectors, Opiko and Andiu accompanied the expedition to collect insects and birds and to assist generally with skinning, etc.

The collection of plants naturally fell to me, and the following pages are a diary giving a general account of the progress of the safari.

Appended are separate notes by Mr. Ionides on the subject of game, by Prof. A. Toschi on the birds and by myself on the vegetational and botanical side which summarize the results obtained in the course of the expedition.

Preliminary preparations had been made over several months; the Museum is much indebted to Mr. R. M. Graham, Asst. Conservator of Forests in Londiani not only for one of the first authentic records of the Yellow-backed Duiker in Kenya, but also for selecting for us the area in which to hunt.

For months past Mr. Graham had set a number of his forest guards to the task of locating duikers and the same guards were placed at our disposal for the duration of the expedition.

Mr. Graham and Mr. MacIntyre, also of the Forest Department, arranged that we should recruit porters from the local Kikuyu squatters and it is largely due to their careful preparations that our safari was crowned with success.

We are also most grateful to Mr. MacGregor of the Mount Blackett sawmills for supplying us with posho and other victuals, for sending us mail at intervals and for posting our letters.

January 9th, 1946. We left for Molo in two cars ; first went Mr. Ionides and I in my private car ; Signor Meneghetti, the Museum boys and Mr. Ionides' trackers, cook and personal boys followed with the safari outfit in a hired lorry. On arrival in Molo we were met by a forest guard, sent by Mr. Graham, to serve as a guide to Sitoton forest hut, 23 miles S.W. of Molo, which was to be our base camp.

The lorry arrived about six p.m., and we proceeded at once to Sitoton on a road which was excellent as far as Mt. Blackett sawmills but which then degenerated into a dusty track with the dust so deep that the cars swayed and swerved in it. It had not rained for a considerable time and we passed a large grassfire at 8,000 ft. altitude.

We arrived in Sitoton after dark and settled in the forest hut for the night. We were met by a head forest guard but found no porters had arrived.

January 10th. In the morning there were still no porters, but Mr. MacIntyre appeared and promised us forty for the following morning, as well as some Dorobo guides and trackers. Thus there was nothing to do but a little collecting in Sitoton. Ionides is a keen collector of snakes, in the past year he had sent a great many live specimens from Tanganyika to the Museum, he sent some boys out to locate some, and soon one returned to say that he had spotted a snake in a rat hole in a field. Ionides and I went at once to dig it out.

When the head appeared and looked rather like that of a cobra, Ionides pressed it down with a forked stick and grasped the snake round the neck with his hand and pulled it out. It was about three feet long, very fat and quite vigorous. We soon saw that it was a harmless molesnake ; it was quite tame and Ionides carried it in his pocket, to the horror of the natives. I too played with it ; it was very gentle, never tried to bite or to escape.

January 11th. In the early morning the porters began to dribble in, all Kikuyu squatters from the neighbourhood, but only thirty-five instead of forty ; and rather weak porters they looked too. In order to help them on, I carted most of the loads along a logging track which we had to follow for $4\frac{1}{2}$ miles, doing three journeys. The lorry had left us immediately after our arrival on the ninth.

Then I returned to Sitoton alone, left the car beside the hut where it was to be guarded by a forest guard, and followed the safari on foot. On that day we did not proceed much further than about eight miles and I reached the camp site, Sigutioi, together with the last stragglers. It was a lovely place, a clearing in tall forest, the edge fringed with bamboo, and traversed by a beautiful, clear, but icy-cold stream.

Just as we started to pitch our tents it started to rain and we got a thorough soaking ; soon however we had roaring fires going, and occasionally the segments of burning bamboo exploded like rifle shots. We were forced to forbid the boys to burn bamboo, lest the noise scare the game away for miles around.

The afternoon was spent collecting and looking for places likely to be haunts of the Forest Hog, Bongo, and Yellow-backed Duiker. All these are to be found in these forests, as our guides attested, but the Golden Cat, our other objective, was unknown to them. The skin which we brought from the Museum was something they had never seen before.

We could find no spoor of any of the game we were after, and the trackers too thought that we should push on further into the forest to another place where there were several salt-licks known to be visited by Bongo and Duiker. The unexpected rain would make it more difficult however, they said, to spot the game, which, becoming less dependent for water on the streams would roam further afield.

January 12th. Ionides and I pushed on early in the morning, leaving Meneghetti in the camp to follow later. For the longer trek of this day the 35 porters were quite insufficient to carry all our loads. As it happened, they proved rather ineffective, and we camped near a stream about 12-14 miles further on, at a place called Bondui. It was just as well we did not attempt to go further, for a storm was threatening and it broke with lightning and thunderclaps just as we had pitched one tent. I had still not unpacked mine, for as long as we were on the move, we found one tent sufficient for the two of us. In the evening, to Ionides' horror, I had a refreshing bath in the stream; he has spent many years in the lowlands of Southern Tanganyika and the cold climate was rather a trial to him. He is a good companion and we get on very well together.

January 13th. We made an early start so as to reach the place near the salt-licks, which was going to be our permanent camp, in good time to settle in. In places, we had to hack our way through dense bamboo, secondary growth about three years old, our guides said, regenerated after a large forest fire.

One large clearing showed by its vegetation and by the remains of cattle bomas that it had been inhabited. At present, all the forest country which we passed S.W. of Sitoton is uninhabited forest reserve. The former Lumbwa inhabitants were moved to the lower country west of the Mau about five years ago.

Again, our path led through cathedral-like *Podocarpus* forest, interspersed with large *Conopharyngia* with their sweet-scented, frangipani-like flowers lying on the ground.

Masses of a white-flowering shrubby *Grumilea* and of the bright blue, flowering spikes of *Acanthus eminens* grew under the canopy of this forest. Later, Ionides learned to detest the ubiquitous *Acanthus* with its spiny leaves which scratched him badly when he followed spoor.

After walking about five miles only we reached Endabarrà, a small clearing near a stream in mixed forest in which *Podocarpus*, *Macaranga* and bamboo dominated. Our guides suggested that we made this place our permanent camp. We pitched our tents, built a kitchen shelter with bamboo and grass and settled in generally. The porters were sent back to Sigutioi, where Meneghetti was waiting for them. They left at noon and they had sufficient time to walk back, especially as they were carrying no loads.

January 14th. Ionides started off with his guides and trackers early in the morning; everything was wet with dew and I built drying trestles with the help of the boys, for drying bird skins and plant specimens. In the early afternoon Meneghetti arrived with our remaining loads; the traps which he had set in Sigutioi had already yielded some rats and a genet cat, and he and Opiko had shot some birds.

January 17th. For the past few days we all have been hard at work, collecting in the vicinity of the camp. Ionides' trackers are out every day trying to locate Duiker, Bongo and Forest hog. Fresh spoor is seen every morning, and the Dorobo as well as Ionides have encountered Bongo and Duiker but the Bongo had poor horns and the Duiker escaped in the undergrowth before Ionides could place a shot; it is difficult to get a good view of the game in bamboo forest.

Meneghetti and Opiko had made a good start shooting birds and trapping rats, mice and a genet cat ; but Ionides feared that the noise would frighten the bigger game away, and so the collecting of birds was stopped and for the time being they concentrated on trapping and collecting insects. To-day he is preparing his fishing tackle before going fishing along the stream.

Fortunately my own collecting does not interfere with our main objective, and I have already got 130 plant specimens, many of them with Lumbwa names obtained by the Dorobo trackers.

We have rain every day, usually in the late afternoon, and it is very damp in the forest. The plants dry quite well in the sun in the morning ; but in the afternoon, when the sky is overcast, I dry them over the fire on the little scaffolding which I have built.

One of my self-imposed tasks is to prepare the menu and to give this out to the cook, so as to get some variation into our meals. At first I left everything to the cook, but he invariably served up tinned sausages, fried potatoes and coffee for every meal. As we have a good selection of tinned food, ham, eggs, fruits, etc., we can afford to make out meals more interesting than that.

Ionides' birthday dinner today was quite opulent, consisting of

Entrée.

Sardines on toast

Soup

Spinach (tinned) with vermicelli

Main Course

Roast chicken (a few live ones Ionides brought with him from Tanganyika)

Roast potatoes

Fresh tomatoes

Dessert

Tinned peaches

Coffee, cheese and a bottle of Sauvignon blanc.

Table decorations : Wild flowers in bamboo vases.

At an altitude of 7,300 ft., the present camp is very cold in the morning. We have no thermometer, but I think it is only a few degrees above freezing and it requires quite an effort to leave one's warm sleeping bag and one's three blankets at 7 a.m.

The forest around the tents consists mostly of bamboo, *Macaranga*, and tall *Podocarpus* trees. Flocks of the Kikuyu White-headed Wood Hoopoe (*Phaeniculus bollei jacksoni*) are quite tame, flitting from tree to tree and searching the bark for insects in the manner of woodpeckers. They are beautiful birds with a metallic blue-green body, a fairly long steel-blue tail, a white head and throat and a red, slender, curved beak. At night we hear the cry of a tree hyrax, occasionally that of a galago and the dog-like bark of bushbuck.

Even here, however, far from everything man-made, the roaring of 'planes and the occasional boom of artillery practice, near Nakuru, the boys tell us, remind us that civilisation is somewhere around the corner.

Before we came here, there had been a long dry spell and the daily afternoon showers started only on the very day when we began our safari.

Accordingly there is not much in flower now, and since specimens without either flower or fruit are worthless, I have to give many plants a miss. For instance, though there are many orchids on the trees, none of them is flowering which is a pity, and there are few herbs in flower in the grassland or in the swamps.

The locality in which we are camped is not continuous forest, for there are large clearings of grassland scattered in it. The top of the Mau is hilly and intersected by many clear streams along which grow many ferns, even the graceful slender-stemmed tree ferns, and the branches of the trees overhanging the water are heavily festooned with mosses. The bottom of the streams consists of black, waterworn stones, phonolite of the Losaguta type.

January 20th. We have had no rain for two days and it is surprising how quickly the ground has dried, even in the forest. Ionides finds the dry state of the ground a great hindrance when tracking and stalking: fresh spoor is not visible in the morning, and the rustling noise of the bamboo sheaths on the ground and the snapping of brittle twigs make it almost impossible to approach any game.

This morning he tries another line: He is taking all available men, including six porters who arrived from Sitoton yesterday with posho, to use them as beaters in a drive for the Duiker; but late in the afternoon he returns again empty handed; he had had a glimpse only of one of the shy animals, but no opportunity to place a shot.

With the dry weather of the last few days and thanks to my drying platform I have my first consignment of dried plants ready to go to Nairobi, a porter's load out of the way which is always a good thing.

My "bag" has been quite satisfactory so far, although so few plants are in flower: 173 plant specimens and a list of over 70 Lumbwa names and notes on the uses of many of the plants.

In the Podo tree under which I have pitched my tent some wood hoopoe are nesting and the pretty birds are continually around my tent, getting tamer every day. I have asked the bird collectors to leave the birds undisturbed just around the camp; later I hope to get photographs of these hoopoes by their nest.

Although Ionides' drive with the porters brought no results he is by no means discouraged. Bongo and Yellow-backed Duiker are known to be among the most difficult game in Kenya; Bongo is usually hunted with hounds—a method which Ionides considers unsporting, and the few Yellow-backed Duiker shot in this country were chance encounters.

Late at night a heavy thunderstorm came down, much needed to freshen up the vegetation and welcomed by Ionides for it washed out all previous scents of himself and of his beaters and it permitted them next morning to find fresh spoor.

January 21st. This morning I had to arrange with Ionides to permit Meneghetti to resume shooting birds; the poor man had not enough to do, for the traps, of which he put out more than a dozen every night yielded only a few mice, shrews and rats, together with two swamp mongoose. After this the local population of smaller mammals round the camp seemed to have become exhausted. In addition Meneghetti caught frogs, lizards, insects, etc., but of these too, the variety and number is very limited at this time of the year. It is the same with the vegetation: there are few flowers to attract insects and sunbirds, and few trees are in fruit to attract birds, rodents, monkeys, etc. There are blue monkeys about; but very few and I have not seen them yet.

On this day I spent several hours making new boxes from broken old ones ; later I collected a number of interesting plants in a swamp and I added to my list of native names.

Ionides returned in the evening, having seen two Bongo, but they had too poor heads to make satisfactory trophies.

January 22nd. I walked to Bondui, about two hours' walk away, where Ionides and I had camped on our way to Endabarrà. I had noticed a giant *Lobelia* there with its flowers not fully out. This time it was in full bloom and proved to be *Lobelia Gibberoa* the commonest Giant *Lobelia* in the Highlands

The stream runs through an open glade in Bondui and the vegetation on its banks yielded a number of plants I had not collected before, among them a species of *Drosera*, a small insect-catching plant very similar to its English relative, the "sundew." Although varieties of *Drosera* are known from Uganda and from Tanganyika, we have no record of its occurrence in Kenya Colony. It grew in dense clumps on wet, lichen-covered soil, together with an *Utricularia*, one of the smallest and daintiest flowering plants.

There was a strong wind all day, drying up the soil even in the forest ; in the evening rain threatened, but only a few drops fell.

On my way back I put up two Bushbuck ; otherwise there seems to be very little game about.

Ionides returned with the notion that there are two separate herds of Bongo in the area, two fairly good males and another herd of about eight, consisting of females and young males, none of them worth shooting.

January 23rd. We all had a day in camp : Ionides wanted to give the game a rest, and he himself certainly deserved a day's rest too.

The day was spent therefore labelling and classifying specimens and writing up notes. The weather was fine with a high wind, excellent for drying my plants.

January 24th. Having by now collected practically all the plants in flower for miles around, my "bag" now numbering 224 specimens, I decided to go further afield. As soon as the dew had disappeared and my presses were spread on the grass in the clearing, I went past Bondui and Kapioto to Sigutioi, our first camp-site after leaving Sitoton, about 15 miles away. I prefer these lonely walks on which one can observe so much more than when accompanied by boys ; for a long time I watched a Bushbuck grazing peacefully near a stream ; I tried to get within snapshot distance, but he got my wind and went off, barking.

The vegetation between Kapioto and Sigutioi, though uninhabited for the past five years, showed numerous signs of former human influence. Many of the large clearings were not natural ; they had been caused by fire to increase the grazing area, and the site of old cattle bomas was marked by the Castor oil plant and Mexican Marigold and other weeds quite foreign to the uninhabited parts of the Mau.

On my tramp back to the camp—in a forest clearing quite near Sitoton I ran into a pack of Wild Dogs, about 24 of them. They let me come quite close, uncomfortably so I thought, for I was unarmed, some of them rearing up on their hindlegs so as to get a better view of me over the high grass. They made off only after I had come up to them to about 20 yards, and when I brandished my bamboo stick at them they bounded away often stopping to look back at me and giving a few short barks. They were magnificent specimens with white, bushy tails and a thick coat, much more beautiful than the mangy animals one finds on the low plains. I was

surprised too, to find them in forest country and at an altitude of 7,500 ft. Their presence here is a possible explanation for the shyness of the game, for they are tireless trackers of all antelopes and very likely it was they who were responsible for the remains of a Waterbuck which I had found earlier in the day.

Just about sunset I arrived back in camp after having covered almost thirty miles through broken country in ten hours.

Ionides' renewed drive with the porters and all available trackers and guides again produced no results; half of the men got lost, the others were too noisy, the beater's chain was broken and the game allowed to escape without giving Ionides the opportunity to shoot.

January 26th. The day was devoted to packing specimens for Nairobi; Meneghetti too had a box-full of skins of birds and small mammals ready to go with the porters returning to Sitoton and Londiani. Another box, containing the large molesnake collected on the first day in Sitoton, went with them. Although completely harmless, in addition to being sewn up in canvas, the porters first refused to touch it, until one of them could be persuaded by "baksheesh" to carry it to Londiani to be posted.

The weather is getting ever drier and warmer and we no longer need to wear all our available clothing when gathering for dinner, though we always enjoy the warmth of our camp fire.

January 27th. Again I walked about half the distance to Sitoton, profiting by the porters' and forest guides' return trip; on the way I questioned them about plant names and uses, and again I added 24 new specimens to my collection.

Ionides' usual report on the day was that he had been near his quarry, but that it had broken away before he could place a shot.

He is as keen as ever, but this continued failure begins to tell on him a little. He sees the main difficulty in the dry ground which makes it impossible to move through the forest without noise; but he is also inclined to put some blame for his failure on the activities of the other members of the safari which, he says, disturb and alarm the game all around. In order to do everything to further his interests, and incidentally our own too, for the Yellow-backed Duiker is after all our main objective, I agree with him that for the next two days none of the collectors will go beyond the perimeter of the camp itself.

January 28th. I spent all morning in camp, sorting out and labelling plants and questioning the trackers on names and uses. In the evening we had the first shower for many days; but although it seemed heavy, it always does when you are under canvas, it did no appreciable good.

January 29th. Ionides went out early, again in vain, while we others got rather fed up with doing nothing. I then hit on a compromise which would suit all parties: To-morrow, our two Museum Boys will move to Sitoton with traps and collector's guns: there they can shoot and trap all day without disturbing Ionides' game. Meneghetti who will be required to take measurements, make casts of the head and skin the Duiker, if we get it eventually, will remain with us and concentrate on insects, while I, whose plant-collecting is not likely to cause much of a disturbance, go on as usual. Naturally, as time goes on, my day's harvest becomes smaller, for, although another season will bring out many plants of which there is no trace now, there is little left of the present vegetation which I have not collected.

January 30th. As arranged, our two native collectors, heavily loaded with guns, traps and their kit, accompanied by two Lumbwa boys as porters, left for

Sitoton ; they need no tent there as they can stay in the forest hut. I joined them with a forest guard for I wanted to collect in the forest around Sigutioi, where we arrived about noon. The camp site looked very much changed for the grass had been burnt since my last visit and Mr. MacGregor's cattle had been all over it.

On our way we saw Bushbuck and Forest Duiker and one Waterbuck, the latter very close, only a few yards away, hiding in a deeply cut stream bed which we crossed. The forest guards are armed with bows and arrows, supposedly for self defence only, for they are not allowed to kill game. It was, however, very interesting to watch our man's reactions whenever he saw game at close range. In a second, the quiver was open, an arrow in place in the bent bow and he was ready to let fly : he would have done so, had I not been present. As they do not carry poisoned arrows, in most cases they only wound the game which may die days afterwards. And as for self-defence, they would stop neither charging buffalo nor pouncing lion !

Without resting for more than 10 minutes I returned to Endabarrà alone, again saw several Bushbuck grazing peacefully at the forest edges, had my usual cold bath in the stream at Bondui and arrived in camp just before dark, rather dragging my legs after my long march. However, again I had collected a few new species of plants.

In camp, I found Ionides again without either Duiker or Bongo ; he now tries another method of hunting : the Yellow-Backed Duiker usually lies up underneath a fallen tree and returns to the same shelter or " nest " quite regularly, spending the hotter part of the day there. Ionides sends his scouts out to locate as many of these nests as possible. He then has them surrounded and approaches them in broad daylight in the hope of surprising the Duiker as it gets alarmed. With the dry ground however, even this method is difficult and so far all the shelters he has tried have been empty.

Now, towards the end of our trip, we must leave for Nairobi on the 9th of February at the latest, our fare is becoming more monotonous.

We have no fresh vegetables or fruits and except potatoes only tinned food. Still, when one lives out of doors with plenty of exercise one can live, and thrive, on almost anything ; I believe when living in towns and offices, one needs more vitamins in one's food to keep fit.

There are no native plants around which could serve for spinach ; it is far too dry now.

January 31st. I spent all day in camp, making packing cases and writing up notes. The forest guides whom I ask to bring in any new plants say that I have got practically everything around here.

Ionides' new method has failed again ; Meneghetti goes around grumbling with his net and tries to collect a few butterflies and insects near the camp. He has dug up a termites' nest and found in it some ants which live symbiotically with the termites.

February 1st, 1946. Spent the morning catching crabs in the stream ; Meneghetti had only got one so far and we want a whole series for our collection. I got eight big specimens.

In the evening when I returned from my afternoon ramble, Ionides appeared to be quite relieved. He too, had been out with two of his trackers who had seen a large lion, a male with a short mane, not very far from camp.



Fig. 1. Ionedes displaying a Mole snake.



Fig. 2. Natural *mbuga* in Mau Forest. The grass is almost pure *Themeda triandra* Forsk.



Fig. 3. Camp in the Forest. The botanist classifying specimens. Note the *Acanthus* in front of the tree on the right.



Fig. 4. *Themeda* grassland in foreground, bamboo on hill in distance merging at the back into *Macaranga-Podocarpus* forest.

PLATE XV.



Fig. 5.



Fig. 6.

Interior views of the bamboo forest.

Fig. 5. Bamboo on the Endbarra River.

Fig. 6. In the shade of the giant grass.

PLATE XVI.



Fig. 7. Female Yellow-backed Duiker.



Fig. 8. Head of female Yellow-backed Duiker.

February 2nd. I went to Bondui again to collect along the stream. I was late for lunch and the others were having theirs.

Ionides had been out too, but he made no comment on his prowl; then, in the course of our meal he asked me if I would be good enough to take a photograph for him. I said: "Yes, of course, what is it to be?" And, typical for the restraint one is apt to show after having satisfied an obsession, he replied with as casual a voice as possible: "The Duiker which I shot this morning."

Thus, at last, on the 20th day of our stay in the Mau forest, he had got a large female Yellow-backed Duiker! Meneghetti had already taken a plaster-cast of the head, otherwise the animal was still intact.

After I had taken a number of photographs, the first ever taken of this species in Kenya, Meneghetti and two natives started skinning at once.

From now on we would have delicious venison for our meals, a very welcome change after the last few days of Oxford sausages from tins.

We took the undercut and the liver for ourselves, the Dorobo and Lumbwa got the remainder! Ionides' poor servants had to give it a miss, for the Duiker had not been "chinja-ed" and, being Mahomedans, they would not touch it: they were very sorry for themselves.

Sunday, February 3rd. Ionides is taking a well-deserved rest while he watches the skinners at their tedious work of paring down the skin and cleaning it from all traces of fat. I too am taking it easy, straightening out the safari accounts.

In the afternoon Ionides goes out to try to get the kid which had accompanied the female; but it is probably sufficiently grown to fend for itself; the mother's udder was quite dry.

We now hope that Ionides will get the male which is still near the camp. This family seems to be the only one in the neighbourhood. If we can get it complete it will make a very fine group for the Museum.

I am starting to make a sketch for the background of the proposed group.

February 4th. While Ionides goes again in search of the male duiker, one of his trackers takes me to the "nest" of a Yellowback, a fallen tree trunk half buried under rotted bamboo. I make a rough sketch of it.

Ionides' method of getting the Duiker by surrounding the nests and of trying to get it as it is driven out has proved successful in the case of the female and he tries it now on the male. But either the male is much more on his guard than his mate, or the ever drier ground makes silent moving and stalking in the bamboo an impossibility: all the nests are empty, the quarry has cleared out.

In the afternoon I begin on a colour sketch of bamboo forest for our group; I find it very difficult to capture the effect of the sun slanting through the bamboo and am rather dissatisfied with my sketch.

February 5th. Our meat and potato diet, coupled with the last two days' lack of exercise make me feel liverish and I take a good walk as far as Bondui. Returning, I see a curious sight. On the wooded slope opposite the path the tree tops are alive with what appears to be monkeys, but of a very unusual colour; in the light of the afternoon sun which falls upon them they appear pale sand-coloured; there must be over a hundred of them, and the strange part about them is that while I look at them, they disappear with one accord. The distance, at least half a mile, is too great for them to have taken alarm at my sight and while I am still

watching, they become visible again, all in one simultaneous movement. I wish I had field-glasses to settle this strange phenomenon ; but although I strain my eyes to discover more about these animals, which continue to appear and to disappear with such perfect unanimity, I fail to make out any details. The distance between them and me is so great that I cannot think of approaching them ; and if I could do so, it would be impossible to see them in the dense forest. I explain the alternating visibility and disappearance with their having light undersides and dark backs, but, even so, their simultaneous movements and a curious rhythmical swaying remain mysterious, and I have to tear myself away reluctantly so as to get back to camp before dark. The Dorobo whom I question later are quite unhelpful ; I don't think they really know what I am talking about.

February 6th. This is our last full collecting day, for to-morrow we must begin to pack. I devote it to visiting a place about an hour from camp to collect the berries of a *Rapanea* which are now ripe, a native tapeworm remedy said to be very efficacious and which may well be worth closer investigation.

As I return to camp, a tracker brings in a young Duiker, the offspring of the one shot by Ionides ; it was caught while hiding in the very nest near which his mother had been shot. We hope to bring it to Nairobi alive. Although it does not seem very shy and quite resigned to its fate, we appreciate how difficult young Duikers are to rear. It is about half grown.

February 7th. Ionides has only this day left in which to get the male.

As for myself, I collect in the morning only and in the afternoon I begin to pack up, and with sorrow I see our mess tent disappear and our camp shrink gradually to a heap of porters' loads.

Fifty-five porters arrive in the afternoon with much noise and shouting : they build two large fires and soon settle down to a big meal of posho ; they have had a long day, and to-morrow, burdened with their loads, will be more strenuous still. They all crowd round the poor little Duiker ; but even their nearness does not seem to upset him much. He drinks water from a bowl I hold, and he takes food, branches and leaves, out of our hands. He actually seems to prefer to eat while we stroke or pat him.

We have our last dinner under the trees ; Ionides' day was without result and he has come to the conclusion that to stay on in this dry weather will only be a waste of time ; after all we have got one full grown adult in excellent condition and a young, and we ought to be pleased.

Ionides' tent is the only one standing for the night ; I sleep under a starry sky so as to enjoy the last night to the full, and until late I can see the flickering reflections of the porters' fires ; they keep them at full blast to keep warm and there is much joking and laughter.

February 8th. Shortly after five we get up and while our personal boys pack our beds and the remaining equipment, the porters have another meal prior to their march. About half-past seven I start at the head of the safari ; I hope to arrive in Sitoton early enough to get the car started and meet the porters for the last stretch on the forest track.

After a very fast march without a single stop I arrive at the forest hut at one o'clock. The car stands there, apparently in good order ; Opiko had pumped the tyres, checked water and oil ; but when I try the starter, nothing happens. Then I find that during our absence some mischievous "totos" must have had a thoroughly good time with the switches ; they must have had a gala night. I find all the light switches and the wiper switch turned on. No manner of cranking or pushing will

start the engine. Soon the first porters were coming in ; some of them had taken hardly more time than I had in spite of their heavy loads ; but I was sorry for the weaker ones who struggled in about tea-time, and whom I had hoped to relieve for the last few miles.

Opiko and Andiou have done good work in Sitoton ; they have collected about 40 birds which they showed us with pride, neatly skinned and spread out in the sun to dry.

Just as I was sending a boy to the sawmill to ask for assistance with the car, much to our relief the lorry arrived, a day earlier than we expected. The driver, an Italian mechanic who knew his job, got my car started with the help of the battery from the lorry and I went to the sawmill under my own steam to settle our accounts with Mr. MacGregor and to enjoy home-made cake and a cup of tea served in dainty china out of a silver teapot, a real treat after a month's life in the forest.

We spent the night in Sitoton ; we still had to pay our porters' and guides' wages and we had yet to wait for the arrival of the little Duiker. We had made special provision for his transport fearing that the journey in the heat of the day on a porter's back might prove too much for the little forest creature. Ionides had detailed two of his men and a forest guard to stay behind in Endabarra until late afternoon.

They arrived at Sitoton about 10 o'clock at night ; but the Duiker was dead ! They said that as soon as they had tied him up in a blanket he had begun to struggle convulsively and had died after a few minutes ! It must have been shock which killed the poor little beast.

During our last night in Sitoton, with natives crowding round us from nearby villages, with dogs barking and cocks crowing from dusk to dawn, we felt that we had already returned to civilisation and we remembered regretfully the unspoiled peace of our forest camp.

February 9th. While Ionides and I drove on to Londiani Forest Station to see Graham and to thank him and MacIntyre for all they had done to make our expedition possible, and to tell them of our satisfactory results, the lorry left for Nairobi with Meneghetti in charge.

When we arrived in Nairobi the little Duiker was already skinned.

A month of interesting and profitable collecting had ended. Ionides left soon again for the Thomson's Falls District to try again for Bongo. For me, many weeks of work on the collected plant material lay ahead.

II. NOTES ON THE YELLOW-BACKED DUIKER.

By C. J. P. Ionides.

DESCRIPTION. The Yellow-backed Duiker, *Cephalophus silvicultor*, is a large, thick-set duiker with a big head and a thick, heavy neck. The general colour is a dark, blackish-brown with a tuft of long reddish hair between the horns and a patch of yellowish-white hairs starting in a point a little in advance of the middle of the back and continuing as far as the hips, broadening out until it covers most of the rump. Under the chin is whitish and the eye is dark brown. There are big face-glands in front of the eyes. In the forest the Yellow-back shows up very clearly and the stocky build combined with the low carriage of the head gives a rather porcine appearance to the animal.

HABITS. This beast is mainly nocturnal, moving and feeding in the late evening, night and early morning and lying up as soon as the sun is well up, usually under a log or in a patch of thick bush in which it makes a nest. It feeds on leaves and, at certain times of the year, on the fallen berries of certain trees such as *Podocarpus Milanjanus* (Kipsigis-sabdet) and *Syzygium* sp. (Kipsigis-emeyuet).

It appears to be very wary and shy and, when disturbed, will move off either in bounds or in a creeping attitude and is likely to cover some distance before stopping in thick cover. It is not likely to halt for a moment to look back as many other animals do.

METHODS OF HUNTING. Walking quietly round in the early mornings and late evenings in likely places was unsuccessful owing to the scarcity of the animal, its alertness and the difficulty of moving quietly through the bamboo forest during the dry weather. Advantage was taken of the presence of a large number of porters to attempt drives on two occasions; but the porters could not be induced to co-operate properly and in any case it was difficult to drive up to one gun in fairly dense forest, so this method was abandoned. Success was eventually obtained by quietly stalking fallen logs and likely bits of cover with half a dozen men and, when fairly close, sending the men to make a detour to windward and then walking slowly up to the cover in line.

Received 12/2/46.)

III. BIRDS COLLECTED ON THE EXPEDITION.

By Augusto Toschi.

- Falco tinnunculus carlo* (Hartert and Neumann). African Mountain Kestrel.
 Sitoton, ♂ February 7th, 1946.
- Buteo rufofuscus augur* Rüppell Augur Buzzard.
 Sitoton, ♂ February 1st, 1946.
- Colomba arquatrix arquatrix* Temminck and Knip. Olive Pigeon.
 Mau Forest, 2 ♂♂ January 13th and 23rd, 1946, ♀ January 21st, 1946.
- Turturæna delagorguei* ? *sharpi* Salvadori. Bronze-naped Pigeon.
 Mau Forest, 4 ♂♂ January 24th, 25th and 27th, 1946, 2 ♀♀ January 22nd and 27th, 1946.
- Streptopelia lugens funebrea* van Someren. Dusky Turtle-dove.
 Sitoton, 2 ♂♂ February 1st, 1946.
- Turacus hartlaubi* (Fischer and Reichenow). Hartlaub's Lourie.
 Mau Forest, 2 ♀♀ January 11th, 1946.
- Poicephalus guilhelmi massaicus* Fischer and Reichenow. Masai Red-headed Parrot.
 Sitoton Camp, ♀ February 8th, 1946.
- Phæniculus bollei jacksoni*. (Sharpe). Kikuyu White-headed Wood-hoopoe.
 Mau Forest, ♂ and ♀ January 12th, 1946.
- Pogoniulus bilineatus jacksoni* (Sharpe). Mau Golden-rumped Tinker-bird.
 Sitoton, ♂ February 8th, 1946. Mau Forest, ♀ January 22nd, 1946.
- Indicator indicator indicator* (Sparrmann). Black-throated Honey-guide.
 Mau Forest, ♂ January 22nd, 1946.
- Indicator minor subspecies?* Lesser Honey-guide.
 Mau Forest, ♀ January 12th, 1946.
- Campelthera tæniolaema tæniolaema* Reichenow and Neumann. Fine-banded Woodpecker.
 Mau Forest, 2 ♂♂ January 16th and 25th, 1946.
- Thripias namaquus schænsis* (Rüppell). Abyssinian Bearded Woodpecker.
 Mau Forest, ♀ January 23rd, 1946.
- Motacilla cinerea cinerea* Tunstall. Grey Wagtail.
 Mau Forest, ♂ January 28th, 1946.
- Anthus rufogularis* Brehm. Red-throated Pipit.
 Mt. Blacket, ♂ January 23rd, 1946.
- Pseudoalcippe abyssinicus abyssinicus* (Rüppell). Abyssinian Hill-babbler.
 Sitoton, ♂ February 4th, 1946. Mau, ♀ January 15th 1946.
- Pycnonotus tricolor minor fayi*. Brown-capped Bulbul.
 Mau Forest, 2 ♂♂ January 13th and 28th, 1946.
- Arizelocichla tephrolæma kikuyuensis* (Sharpe). Kikuyu Grey-throated Bulbul.
 Sitoton Camp, ♂ February 8th, 1946. Mau Forest, 5 ♂♂ January 16th, 20th, 22nd and 24th, 1946. Two juveniles January 22nd and 24th, 1946.
- Alseonax minimus subspecies?* Pigmy Flycatcher.
 Mau Forest, 2 ♂♂ January 16th and 26th, 1946, juv. ♂ January 26th, 1946, ♀ January 12th, 1946. Sitoton Camp, ♀ February 7th, 1946, juv. ♀ February 2nd, 1946.
- Dioptrornis fischeri fischeri* Reichenow. White-eyed Slaty Flycatcher.
 Mau Forest, ♂ January 12th, 1946.
- Parisoma lugens jacksoni* (Sharpe). Kenya Brown Tit-babbler.
 Sitoton, ♂ February 5th, 1946.
- Batis molitor puella* Reichenow. Kenya Chin-spot Flycatcher.
 Mau Forest, ♂ January 26th, 1946. ♀ no date, juv. January 12th, 1946. Sitoton, ♂ February 3rd, 1946.
- Trochocercus albonotatus albonotatus* Sharpe. White-tailed Crested Flycatcher.
 Mau, ♂ January 27th, 1946.
- Turdus olivaceus elgonensis* (Sharpe). Kenya Olive Thrush.
 Mau Forest, ♂ ♀ January 15th, 1946.
- Saxicola torquata axillaris* (Shelley). Kilimanjaro Stonechat.
 Mau Forest, ♂ January 12th, 1946, ♀ January 21st, 1946. Sitoton, January 21st, 1946.
- Cossypha caffra iolema* Reichenow. Kenya Robin Chat.
 Mau Forest, ♂ ♀ January 13th, 1946. Sitoton, juv. ♂ February 7th, 1946.
- Pognocichla stellata keniensis* Mearns. Kenya White-starred Bush-rob-in.
 Mau Forest, 2 ♂♂ January 20th and 25th, 1946, 4 ♀♀ January 22nd and 27th, 1946 and February 3rd, 1946.
- Sylvia atricapilla* (Linn.). Blackcap.
 Mau 2 ♂♂ January 27th, 1946 and February 3rd, 1946, ♀ no date.

- Seicercus umbrovirens mackenzianus* (Sharpe). Kenya Brown Flycatcher-warbler.
 Sitoton, ♂ February 7th, 1946. Mau, ♂ January 16th, 1946, ♀ January 26th, 1946.
- Apalis melanocephala nigrodorsalis* Granvik. Nairobi Black-headed Forest-warbler.
 Sitoton, ♀ February 2nd, 1946.
- Sylvietta leucophrys leucophrys* Sharpe. White-browed Crombec.
 Mau Forest, ♂ January 16th, 1946.
- Camaroptera brevicaudata subspecies?* Grey-backed Glass-eye.
 Sitoton, ♂ February 2nd, 1946.
- Cisticola ayresii mauensis* van Someren. Kenya Striped Grass-warbler.
 Mau Forest, ♂♂ January 13th, 1946.
- Cisticola hunteri pyrnoides* Neumann. Mau Highlands Grass-warbler.
 Sitoton Camp, 2 ♀♀ January 31st, 1946 and February 9th, 1946.
- Coracina caesia pura* (Sharpe). Elgon Grey Cuckoo-shrike.
 Mau Forest, 2 ♂♂ January 22nd, 1946 and February 4th, 1946, ♀ January 16th, 1946.
- Dryoscopus gambensis nyanzae* Neumann. Uganda Puffback Shrike.
 Sitoton, ♂ February 2nd, 1946.
- Antichromus minutus minutus* Hartlaub. Blackcap Tchagra.
 Mau Forest, ♂ January 10th, 1946.
- Telephorus dohertyi dohertyi* (Rothschild). Doherty's Bush-shrike.
 Sitoton, ♀ January 4th, 1946. juv. ♂ January 31st, 1946.
- Parus albiventris albiventris* Shelley. White-breasted Tit.
 Mau, ♂ January 27th 1946, ? sex, January 28th, 1946. Sitoton Camp ♂ ♀ February 8th, 1946.
- Pholia sharpii sharpii* (Jackson). Sharpe's Starling.
 Mau Forest, ♂ January 23rd, 1946.
- Lamprocolius chalybeus chalybeus* (Hemprich and Ehrenberg). Blue-eared Starling.
 Mau Forest, ? sex, January 16th, 1946. Sitoton Camp, ♂ February 7th, 1946.
- Zosterops virens jacksoni* Neumann. Jackson's White-eye.
 Mau Forest, 2 ♂♂ January 20th and 30th, 1946, 2 ♀♀ January 13th and 22nd, 1946.
- Nectarinia famosa aeneigularis* Sharpe. Kenya Malachite Sunbird.
 Sitoton, 2 ♂♂ February 1st and 7th, 1946.
- Nectarinia tacazze jacksoni* Neumann. Tacazze Sunbird.
 Mau Forest, ♂ February 7th, 1946.
- Drepanorhynchus reichenowi* Fischer. Golden-winged Sunbird.
 Sitoton, ♂ February 1st, 1946. Mau, juv. January, 10th, 1946.
- Cyanomitra olivacea ragazzii* (Salvadori). Shoa Olive Sunbird.
 Mau Forest, ♀ January 26th, 1946.
- Passer griseus ugandæ* Reichenow. Uganda Grey-headed Sparrow.
 Sitoton, ♂ January 31st, 1946.
- Ploceus (Othyphantes) reichenowi reichenowi* (Fischer). Reichenow's Weaver.
 Mau Forest, ♂ February 7th, 1946.
- Cryptospiza salvadorii ruwenzori* W. Sclater. Elgon Crimson-wing.
 Mau Forest, ♂ February 5th, 1946, ♀ January 26th, 1946.
- Estrilda astrild massaica* Neumann. Masai Yellow-bellied Waxbill.
 Sitoton Camp, ♂ and 2 ♀♀ February 5th, 1946.
- Poliospiza striolata striolata* (Rüppell). Elgon Streaky Seed-eater.
 Sitoton, ♂ February 1st, 1946.

IV. PLANTS COLLECTED ON THE EXPEDITION.

By P. R. O. Bally.

BOTANICAL NAME.	VERNACULAR : (LUMBWA)
<i>ACANTHACEÆ</i>	
<i>Acanthopale albosetulosa</i> C.B.Cl.	turkwat
<i>Acanthus eminens</i> C.B.Cl.	kegeldet
<i>Dicliptera laxata</i> C.B.Cl.	
<i>Hypoestes verticillaris</i> R.Br.	turkwat
<i>Isoglossa Gregorii</i> (S. Moore) Lindau.	turkwat
<i>Justicia striata</i> Bullock.	turkwat
<i>Mimulopsis</i> sp. (B 4791)	setiot
<i>AMARANTHACEÆ</i>	
<i>Achyranthes aspera</i> L.	
<i>Cyatula Mannii</i> Bak.	namgueit
<i>AMPELIDACEÆ</i>	
<i>Cissus</i> sp. (B 4942).	sume-etet
<i>APOCYNACEÆ</i>	
<i>Conopharyngia Johnstonii</i> Stapf.	therendet
<i>APONOGETONACEÆ</i>	
<i>Aponogeton</i> sp.	
<i>AQUIFOLIACEÆ</i>	
<i>Ilex mitis</i> (L) Radlk	tangotuet
<i>ARALIACEÆ</i>	
<i>Polyscias kikuyuensis</i> Summerhayes.	aonet
<i>Schefflera Volkensii</i> Harms.	tinet
<i>ASCLEPIADACEÆ</i>	
<i>Asclepias Phillipsiae</i> N.E.Br.	
<i>Asclepias physocarpa</i> Schltr.	yapiringuet
<i>Periploca linearifolia</i> Dill. et Rich.	sinendet
<i>BALSAMINACEÆ</i>	
<i>Impatiens</i> sp. (B 4786)	dyaboinet
<i>Impatiens</i> sp. (B 4786)	djeboliot
<i>BORAGINACEÆ</i>	
<i>Lithospermum officinale</i> L.	
<i>CAMPANULACEÆ</i>	
<i>Canarina elegantissima</i> Th.Fr.	
<i>CELASTRACEÆ</i>	
<i>Gymnosporia luteola</i> Loes.	eburuet
<i>Gymnosporia</i> sp. (B 4848)	igoruet
<i>COMPOSITÆ</i>	
<i>Adenostemma mauritianum</i> DC.	
<i>Berkheya Spekeana</i> Oliv.	takuyot
<i>Bidens palustris</i> Scherff	yakwe itaniet
<i>Carduus kikuyorum</i> R.E.Fries	dekweyot
<i>Carduus Schimperii</i> Sch. Bip.	cadet
<i>Conyza ruwenzoriensis</i> N.E.Br.	
<i>Conyza stricta</i> Willd.	diesagetiet
<i>Conyza subsepalosa</i> O. Hoffm.	yaboitamet
<i>Dichrocephala chrysanthemifolia</i> DC.	araruriet
<i>Dichrocephala latifolia</i> DC.	eraguyet
<i>Echinops angustilobus</i> S. Moore.	takuyot ya mbugani
<i>Erlangea cordifolia</i> S. Moore.	mososiat
<i>Gerbera abyssinica</i> Sch. Bip.	
<i>Gnaphalium uniois</i> Sch. Bip.	

<i>Guizotia oblongifolia</i> Hutch.	.	.	.	.	jomesiat
<i>Gynura crepidioides</i> Benth.	.	.	.	.	.
<i>Gynura vitellina</i> Benth.	.	.	.	.	kwamamayet
<i>Helichrysum argyranthum</i> O. Hoffm.	.	.	.	.	desameshiet dawek
<i>Helichrysum cymosum</i> Lon.	.	.	.	.	ivugeyet
<i>Helichrysum formosissimum</i> Sch. Bip.	.	.	.	.	.
<i>Helichrysum gerberaeifolium</i> Sch. Bip.	.	.	.	.	.
<i>Helichrysum globosum</i> Sch. Bip.	.	.	.	.	yelelmetiet
<i>Helichrysum Hochstetteri</i> Hook f.	.	.	.	.	bugeyet, vugeyet
<i>Helichrysum Schimperi</i> Sch. Bip.	.	.	.	.	.
<i>Helichrysum</i> sp. (B 4971)	.	.	.	.	vugeyet
<i>Hoehnelia veronioides</i> Schweinf.	.	.	.	.	.
<i>Inula macrophylla</i> Sch. Bip.	.	.	.	.	moyabeyet
<i>Lactuca capensis</i> Thunb.	.	.	.	.	djepteganisiek
<i>Laggera elatior</i> R. E. Fries	.	.	.	.	yasamisiet
<i>Melanthera</i> sp. (B 4902)	.	.	.	.	.
<i>Mikania scandens</i> Willd.	.	.	.	.	imumuriet
<i>Senecio Moorei</i> R. E. Fries.	.	.	.	.	.
<i>Senecio</i> sp. (B 4900)	.	.	.	.	.
<i>Senecio</i> sp. (B 4983)	.	.	.	.	serenguet
<i>Siegesbeckia abyssinica</i> Oliv. et Hiern.	.	.	.	.	.
<i>Sonchus Bipontinii</i> Oliv. et Hiern.	.	.	.	.	tiroronet
<i>Sonchus Schweinfurthii</i> Oliv. et Hiern.	.	.	.	.	.
<i>Tagetes minuta</i>	.	.	.	.	nasoriet
<i>Vernonia auriculifera</i> Hiern.	.	.	.	.	tebengeriet
<i>Vernonia syringifolia</i> O. Hoffm.	.	.	.	.	wambereriet
<i>Vernonia</i> sp. (B 4843)	.	.	.	.	jomesiat
CONVOLVULACEÆ					
<i>Convolvulus kilimandschari</i> Engl.	.	.	.	.	manguanyet
CRASSULACEÆ					
<i>Crassula abyssinica</i> A. Rich.	.	.	.	.	mindeyuet
<i>Crassula Wrighteana</i> Bullock.	.	.	.	.	djeboinet
<i>Kalanchoe Petitiana</i> A. Rich.	.	.	.	.	kusernet
<i>Sedum ruwenzoriense</i>	.	.	.	.	kusernet ya miti
DIPSACACEÆ					
<i>Scabiosa columbaria</i> L.	.	.	.	.	sogwort
<i>Scabiosa</i> sp. (B4782)	.	.	.	.	.
DROSERACEÆ					
<i>Drosera</i> sp. (B 4940)	.	.	.	.	getigabi
EUPHORBIACEÆ					
<i>Clutia robusta</i> Pax.	.	.	.	.	gurbaniat
<i>Clutia</i> sp. (B 4899)	.	.	.	.	gurbaniat
<i>Euphorbia longecornuta</i> Pax.	.	.	.	.	davgarasiet
<i>Euphorbia Schimperiana</i> Pax.	.	.	.	.	davgarasiet
<i>Euphorbia</i> sp. (B 4768)	.	.	.	.	davgarasiet
<i>Macaranga kilimanscharica</i> Pax.	.	.	.	.	logomeita
<i>Phyllanthus Fischeri</i> Pax.	.	.	.	.	manjeyuet
<i>Phyllanthus nummulariifolius</i> Poir.	.	.	.	.	segetiet
<i>Phyllanthus odontadenius</i> Muell. Arg.	.	.	.	.	kwaibeyot
ERICACEÆ					
<i>Agauria salicifolia</i> Oliv.	.	.	.	.	ordtet
<i>Blaeria</i> sp. (B 4898)	.	.	.	.	kwabeyot
<i>Erica arborea</i> L.	.	.	.	.	goiveyat
FLACOURTIACEÆ					
<i>Dovyalis abyssinica</i> Warb.	.	.	.	.	nokiat
GENTIANACEAE					
<i>Chironia</i> sp.?	.	.	.	.	.
<i>Sebaea multinodis</i> N.E. Br.	.	.	.	.	.
<i>Swertia Lugardae</i> Bullock	.	.	.	.	ngruietet

GERANIACEÆ

Geranium simense Hochst.

HYPERICACEÆ

Hypericum lanceolatum Lam. virgororget

Hypericum peploidifolium A. Rich donodonio

LABIATÆ

Aeolanthus heliotropoides Oliv. useruet

Calamintha simensis Benth. sureit

Geniosporum paludosum Bak. yelemetiet

Leonotis mollissima Guerke. mossipiot

Leucas calostachys Oliv. nejepiat

Micromeria biflora Benth. yevsagitiet

Plectranthus sp. (B 4820)

LENTIBULARIACEÆ

Utricularia exoleta R. Br.

LOBELIACEÆ

Lobelia feyuens Thunb.

Lobelia Gibberoa Hemsl. serenguet

Lobelia Holstii Engl. marura

Lobelia stellaroides Benth.

LOGANIACEÆ

Buddleia salviiifolia Lam. tharuet (th. nyeupe).

Lachnophyllis congesta R. Br. tharuet (th. nyusi)

LORANTHACEÆ

Loranthus sp. (B 4938) mandayuuet

MELIACEÆ

Ekebergia Rueppeliana A. Rich. araruet

MELIANTHACEÆ

Bersama sp. cheptoroguet

MENISPERMACEÆ

Stephania abyssinica Walp. davarariet

MIMOSACEÆ

Albizia gummiifera C. A. Sm. set (soft "s", longdrawn "eh")

Acacia sp. chevitet

MONIMIACEÆ

Xymalos monaspora Baill. seweruweriet

MYRICACEÆ

Myrica kilimandscharica Hochst. gabugunuet

MYRSINACEÆ

Maesa lanceolata Forsk. djabelbait

Myrsine africana L. sagateti, sagatetiet

Rapanea rhododendroides Mez. sitotuet

MYRTACEÆ

Syzygium sp. ? emeyuet

OCHNACEÆ

Ochna sp. lagatanet

OLEACEÆ

Jasminum abyssinicum R. Br. moinet

Olea chrysophylla Lam. emitiot

OXALIDACEÆ

Oxalis stricta L. nyanya-ek

PLANTAGINACEÆ

Plantago palmata begaboinet

PRIMULACEÆ

Anagallis sp.

PAPILIONACEÆ

Adenocarpus Mannii Hook. burguriet
Autopetiia sp. jebkecheyat
Crotalaria intermedia Kotschy. burguriet
Desmodium scalpe DC. dyaboinet
Eriosema parviflora E. Mey. burguriet kidogo
Eriosema sp. (B 4885) dyaboinet
Indigofera alboglandulosa Engl. mendieyuet
Tephrosia atrovioleacea Bak. f. gururiet
Trifolium polystachium Fres.

PIPERACEÆ

Perperomia reflexa Dietr. gusuruet
Perperomia Stuhlmannii C.DC. gusuruet

POLYGALACEÆ

Polygala quartiniana A. Rich yatigamà, gâetheyà,
 yabgetyeyat
Polygala sp.

POLYGONACEÆ

Rumex abyssinicus Jacq. var. *angustisectus* Engl. mindeyuet
Rumex nepalensis Spreng chavsereyuet

PROTEACEÆ

Protea rubrobracteata Engl. sumeiot

RANUNCULACEÆ

Delphinium macrocentron Oliv. jujuniá
Ranunculus pubescens Taub. begawoinet
Thalictrum rhynchocarpum Dill et Rich. iro-ondet

RHAMNACEÆ

Rhamnus prionites L'Herit. osisitet
Scutia myrtina Kurz var. *oblongifolia* Engl. simbeyuet

ROSACEÆ

Alchemilla Linderi Mildbr. yapteiwet
Alchemilla mukuluensis De Willd.
Hagenia anthelminthica J. F. Gmel. bondet
Pygeum africanum Hook. f.
Rubus dictyophyllus Oliv.
Rubus inedulis Rolfe. dageimamet

RUBIACEÆ

Anthospermum muriculatum Hochst. djalevgonya
Borreria Princeae K. Schum. murguiet
Canthium Guienzii Sond. jilekwelet
Galinieria coffeoides Del. kombionet
Galium mollugo L. kiesaleit, jesaleit
Grumilea exserta K. Schum. gombeita
Grumilea platiphylla K. Schum. gombeita
Grumilea sp. (Museum 5124) gombeita
Lasianthus kilimandscharicus K. Schum. monyoget
Oldenlandia violacea K. Schum.
Pentas Schimperiana Vatke. jeroriet
Rubia longipetiolata Bullock. jesaleit, manerería

SAMYDACEÆ

Casearia Battiscombei Fries. chepchawayet

SCROPHULARIACEÆ

<i>Alectra communis</i> Hemsl.	.	.	.	.	.
<i>Halleria lucida</i> L.	.	.	.	.	talokiat
<i>Veronica</i> sp. (B 4867)	.	.	.	.	.
<i>Veronica</i> sp. (B 4894)	.	.	.	.	.

SOLANACEÆ

<i>Solanum anolum</i> Schum. et Thonn.	.	.	.	.	kejejuet
<i>Solanum duplosinuatum</i> Kl.	siyameli
<i>Solanum indicum</i> L.	lavotuet

THYMELÆACEÆ

<i>Gnidia fastigiata</i> Rendle.
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TILIACEÆ

<i>Sparmannia vicinocarpa</i>
<i>Triumfetta</i> sp. (B 4875)	mesuá

UMBELLIFERÆ

<i>Alepidea massaica</i> Schlt. et Wolffe	.	.	.	.	.
<i>Heteromorpha arborescens</i> Ch. et Sch.	.	.	.	.	kombeita (gombeita ?)
<i>Peucedanum</i> sp. (B 4853)	.	.	.	.	iro-ondet
<i>Sanicula europaea</i> L.	.	.	.	.	.

URTICACEÆ

<i>Elatostemma orientale</i> Engl.	.	.	.	.	.
<i>Fleurya aestuans</i> Gaud.	.	.	.	.	dovitiet
<i>Pilea Johnstonii</i> Oliv.	tuvitet

VERBENACEÆ

<i>Clerodendrum Johnstonii</i> Oliv.	singaruet
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VIOLACEÆ

<i>Viola abyssinica</i> Steud.
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AGAVACEÆ

<i>Dracaena reflexa</i> Lam.	levekwet
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CYPERACEÆ

<i>Bulbostylis atrosanguineus</i> C.B.Cl.
<i>Bulbostylis capillaris</i> Kunth. var. <i>trifida</i> C.B.Cl.
<i>Carex arvensis</i> A. Rich.	.	.	.	.	sawaset
<i>Carex echinochloëi</i> Kuntze.	.	.	.	.	sawaset
<i>Cyperus aterrimus</i> Steud.	.	.	.	.	sawaset
<i>Cyperus denudatus</i> Steud.	.	.	.	.	sawaset
<i>Cyperus dichrostachyus</i> Hochst.	.	.	.	.	sawaset
<i>Cyperus latifolius</i> Poir.	.	.	.	.	mai-ig
<i>Cyperus sesquiflorus</i> var. <i>major</i> Kerenth.	.	.	.	.	mai-yat
<i>Cyperus</i> sp. (B 4872)	.	.	.	.	.
<i>Scirpus corymbosus</i> Rottb. forma	.	.	.	.	.

GRAMINEÆ

<i>Agrostis</i> sp. (Museum 2738)	.	.	.	.	susué (blanket name for grasses)
<i>Andropogon canaliculatus</i> Schum.	.	.	.	.	.
<i>Arundinaria alpina</i> K. Schum.	.	.	.	.	tégat
<i>Avenastrum elongatum</i> Pilg.	.	.	.	.	solia
<i>Bromus runsoriensis</i> K. Schum.	.	.	.	.	.
<i>Calamagrostis epigeios</i> Rottb.	.	.	.	.	.
<i>Eragrostis tenuifolia</i> Hochst.	.	.	.	.	.
<i>Hyparhenia collena</i> Pilg. et Stapf.	.	.	.	.	.
<i>Hyparhenia</i> sp. (B 4779)	.	.	.	.	.
<i>Ischaemum glaucostachyum</i> Stapf.	.	.	.	.	.
<i>Oplismeuum</i> sp. (B 4870)	.	.	.	.	.
<i>Panicum parvifolium</i> Lam.	.	.	.	.	diamurut
<i>Panicum</i> sp. n ^r <i>calvum</i> Stapf	.	.	.	.	.

<i>Pennisetum clandestinum</i> Hochst.	. . . . .	seretiot
<i>Setaria sphacellata</i> (Schum.) Stapf et Hubbard	. . . . .	.
<i>Setaria trinervia</i> Stapf.	. . . . .	.
<i>Sporobolus indicus</i> R. Br.	. . . . .	.
<i>Themeda triandra</i> Forsk.	. . . . .	susué
IRIDACEÆ		
<i>Aristea alata</i> Bak.	. . . . .	landosiet
JUNCACEÆ		
B 4833, B 4910, B 4985	. . . . .	.
LILIACEÆ		
<i>Asparagus racemosus</i> Willd	. . . . .	tavletit
ORCHIDACEÆ		
<i>Disa Dechenii</i> Rehb. f.	. . . . .	chirungut
<i>Disa</i> sp. (B 4904)	. . . . .	.
<i>Polostachya</i> sp. (B 5016)*	. . . . .	sigotiet (blanket name for epiph. orchids)
<i>Satyrium crassicalle</i> Rendle	. . . . .	makwanda
XYRIDACEÆ		
<i>Xyris indica</i> ?	. . . . .	sawaset
TAXACEÆ		
<i>Podocarpus Milanjanus</i> Rendle	. . . . .	sabdet
FILICES		
<i>Asplenium theciferum</i>	. . . . .	biriruet
<i>Asplenium</i> sp. (B 4858)	. . . . .	biriruet
<i>Blechnum attenuatum</i> (Sw.) Matt.	. . . . .	biriruet
<i>Cheilanthes multifida</i>	. . . . .	biriruet
<i>Cyathea</i> sp. (B 4815)	. . . . .	samseyuet
<i>Dryopteris</i> sp. (B 4859)	. . . . .	biriruet
<i>Elaphoglossum conforme</i> (Sw.) Schott.	. . . . .	biriruet
<i>Osmundea regalis</i> L.	. . . . .	biriruet a biereret
<i>Polypodium excavatum</i> Bory.	. . . . .	biriruet
<i>Pteridium aquilinum</i> Kuhn.	. . . . .	biriruet
LYCOPODIACEÆ		
<i>Lycopodium clavatum</i> L.	. . . . .	.
<i>Lycopodium</i> n ^o r L. <i>dacryoides</i> Bak. (B 4855)	. . . . .	maasé
<i>Lycopodium</i> sp. (B 4911)	. . . . .	maasé
SELAGINELLACEÆ		
<i>Selaginella Kraussiana</i> A. Br.	. . . . .	.
<i>Selaginella</i> sp ? (B 4911)	. . . . .	.
MUSCINÆ		
<i>Hymenophyllum</i> sp. (B 4797)	. . . . .	susué (id. w. word for "grass")
<i>Psilotrichella profusicaulis</i> (CM) Par	. . . . .	.
<i>Rhodobryum spathulifolium</i> Broth.	. . . . .	.
LICHENS		
<i>Anaptychia</i> sp.	. . . . .	.
<i>Pulmonaria lobata</i> O. Hoffm.	. . . . .	.
<i>Stictina tomentosa</i> Nyl.	. . . . .	.
FUNGUS B 4985	. . . . .	buavat ya miti (buavat is blanket name for fungi)

Number of specimens not generically identified : 23

* Many epiphytic orchids were seen; but only B5016 was found flowering in January.

A NEW RAT FROM ABYSSINIA.

By Dr. Augusto Toschi.

Professor in the Bologna University.

NEANTHOMYS, gen. nov.

TYPE : *Neanthomys giaquintoi*.

A Rat (*Murinae*) distinguished by its rather slender, not very thick skull with nasals narrow and long, supraorbital region of skull normal, crests very slightly marked, brain-case medium, anteorbital width reduced, orbital plate about half the height of the muzzle and with anterior border not concave, incisive foramina long reaching the tooth-row, bullae rather large. Ungrooved incisors lightly pro-odont showing a subapical notch, teeth-row short, teeth generally small and reduced especially third molar. First molar longer than broad, second molar about as broad as long : M1 longer than M2 + M3, anterior lamina of M1 not reduced.

Limbs and hind feet very short. Tail short (shorter than body without head). Fur thick, but not very harsh or bristly, not showing any body stripe in the known species.

Neanthomys shares with the *Aethomys* Group the character of the 5th digit of the anterior feet reaching the base of the 4th and the 5th digit of the hind feet longer than the great toe.

Neanthomys differs ; from *Zelotomys* Osgood (the genus of the *Aethomys* group showing pro-odont incisors) by its shorter tail, its less soft fur, its skull without considerable interorbital constriction, its cheek-teeth not so strongly cuspidate and broad, its narrower nasals and lower orbital plate ; from *Dasymys* Peters, *Stenocephalemys* Frick, *Oenomys* Thomas, *Rattus* Fischer, *Aethomys* Thomas, *Mastomys* Thomas, *Praomys* Thomas, *Sylvaenus* Ognev, *Myomys* Thomas, *Ochromys* Thomas, *Stochomys* Thomas, by its rather pro-odont incisors and many other characteristics ; from *Arvicanthis* Lesson by its slender and lower skull, narrower and pointed nasals, more reduced anteorbital plate, slender pro-odont incisors and comparatively shorter teeth-row and more folded lamina, less harsh fur and shorter tail ; from *Lemniscomys* Trouessart, as well by its narrow nasals and incisors, longer fifth finger and by the not striped fur ; from *Pelomys* Peters by the less thick skull and non-grooved incisors ; from *Mylomys* Thomas and *Desmomys* Thomas by its non-grooved incisors and many other characteristics.

Neanthomys is distinct from all the genera and subgenera mentioned above having shorter limbs and feet. The length of the hind foot of the type of *Neanthomys* reaches hardly 14.5 per cent. of head and body length, while in *Pelomys* and *Arvicanthis* etc. this percentage is usually higher.

The differences between *Neanthomys* and the other genera of the *Murinae* subfamily are greater.

NEANTHOMYS GIAQUINTOI, sp. nov.

TYPE : adult ♀, Reg. n. 3207, Index No. 1511, Coryndon Museum, collected by Mr. F. Meneghetti at Addis Abeba, 10/7/1941.

Description : Body rather thick and short-limbed. General colour of the dorsal surface yellow-buffy, lined black with a reddish wash all over the head and back. Ears short, brown-blackish in colour with some whitish hairs, posterior base of the ears light buffy like the belly ; chin, throat, neck, white-yellowish ; ventral surface yellowish-buff ; colour rather sharply defined on the sides : fore feet blackish-brown

above, yellowish-white below; hind feet on average the same colour but strongly suffused with yellowish-buffy. Tail short, blackish on the upper surface, whitish below.

Skull: Characters given above as those of the Genus.

Measurements of the type: Head and body 135 mm.; tail 63 mm.; ear 18 mm.; anterior feet 12 mm.; hind feet 21 mm.

Skull: greatest length 30.5 mm.; condylo-incisive length 30.4 mm.; basal length 28 mm.; zygomatic breadth 16 mm.; interorbital constriction 6 mm.; squamosal breadth 13 mm.; length of nasals 10.8 mm.; greatest width of nasals 3.4 mm.; palatal length 13 mm.; length of the palatal foramina 6.5 mm.; length of the upper molar series 5.5 mm.; length of the alveolar series 6 mm.; width of M3 0.9 mm.; length of M3 0.85 mm.; height of the skull (from the end of palate to the vertex of frontals) 8.2 mm.

This Rat belongs to a group of Rodents collected at Addis Abeba at the request of Prof. Giaquinto Mira, Director of that Sanitary Laboratory, during the British occupation (1941-1942) in order to investigate some plague occurrences. The specimens were examined by Marquis S. Patrizi, but the lack of references and collections for comparison did not permit them to be classified. For this purpose a small group of different kinds of Rodents collected at Addis Abeba was sent to E.A., but the identification was not satisfactory at all, being for the most part wrong. About 2 years later when I came to work at the Coryndon Museum Dr. L. S. B. Leakey asked me to classify the mammal collection among which were the specimens sent from Abyssinia, which I can now work out by the aid of the rather rich collections of the Coryndon Museum and the recent references.

In the Coryndon Museum there is only the type of *Neanthomys giaquinto*, but other specimens have been seen by me at Addis Abeba, being part of a small lot of Rats in the Prof. Giaquinto collection.

This *Neanthomys giaquinto* was trapped in the gardens and fields all around and inside the town of Addis Abeba and brought alive to the local Sanitary Laboratory.

This Rat seems to show most of the habits of Grass Mice (*Arvicanthis*, *Lemniscomys*, etc.) but no particular field researches were made in order to investigate this subject. The short limbs and feet with rather strong claws support the idea of a digging, ground, Rat.

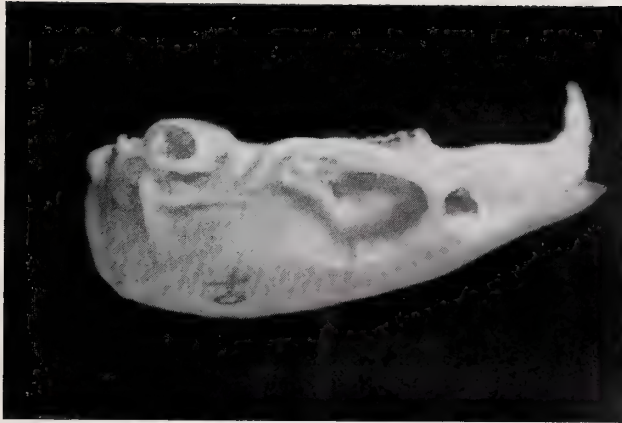
I name this genus after Addis Abeba (Amharic translates as "New Flower") and this species after Prof. Giaquinto Mira to the interest of whom is due the finding of this very peculiar and interesting mammal.

(Received for publication July, 1945).

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PLATE XVII.



Skull of type of *Neanthomys giaquintoi*.



SOME RECENT UGANDA BIRD RECORDS.

By G. H. E. Hopkins.

The records given below were based on obtained specimens unless otherwise stated. Most of the skins are now in Makerere College or in the Coryndon Museum. Where the note is followed by "v.S." in square brackets, the identification was made by Dr. V. G. L. van Someren, others are my own unless otherwise specified. Previous records are taken as given in Jackson (Birds of Kenya and Uganda, 1938) and Chapin (Birds of the Belgian Congo, 1932, *Bull. Amer. Mus. nat. History*. 65. 1-756 and 1939 *idem*. 75. 1-632).

Plegadis f. falcinellus (Linn.).

Glossy Ibis.

Not previously recorded. I shot one on a mud-bank in Lake Kyoga (at a point just north of Kaswama) in December, 1932; Mr. G. L. R. Hancock and I obtained two more at the same place in March, 1934.

Platalea alba Scopoli.

African Spoonbill.

Dr. W. J. Eggeling obtained a specimen at Butiaba, January 20th, 1941. On two occasions I have seen an unmistakable Spoonbill flying over Kampala.

Torgos tracheliotus nubicus (H. Smith).

Northern Lappet-faced Vulture.

Jackson (p. 137) gives as sole Uganda locality Lyantonde ("Leyantondo") in the extreme west of Masaka district. In March, 1942, Mr. T. W. Chorley and I saw half a dozen specimens (one of which Mr. Chorley obtained) in Jie county, Karamoja. Mr. Chorley obtained a second in the same county in February, 1942.

Falco n. naumanni Fleischer.

Western Lesser Kestrel.

One was obtained by myself in Jie county, Karamoja, May 20th, 1941. Not previously recorded from Uganda, though known to winter in Kenya and the Belgian Congo. [v.S.]

Falco biarmicus abyssinicus Neumann.

Abyssinian Lanner.

One specimen obtained by me just outside Kabale, Kigesi district, August 1940, was in moult from immature to adult. The Lanner, much the largest of our Falcons, has a reputation for boldness; but the bird in this case was being harried by two kites (*Milvus migrans parasitus*). It returned within a few minutes after having been twice shot at and missed.

Falco ardosiacus Bonnetterre and Vieillot.

Grey Kestrel.

Four specimens obtained, one at Busingiro, between Butiaba and Masindi, September 13th, 1932, Dr. W. J. Eggeling; two near Kampala, May 6th, 1934, Dr. A. W. Williams; one at Gulu, June 29th, 1936, myself. [v.S.]

Machaeramphus alcinus anderssoni (Gurney).

Bat-eating Buzzard.

No certain previous Uganda record. Mr. T. W. Chorley shot two specimens at Katera in Masaka district in January, 1934, and I am certain that a hawk that I saw at Port Bell (near Kampala) but failed to obtain was of this species. It feeds on bats and only comes out at dusk, so is very easily overlooked. [v.S.]

Hieraaëtus ayresi (Gurney).

Ayres' Hawk-eagle.

Mr. G. C. Ishmael obtained a specimen just outside Kampala, December 1st, 1936, and Mr. T. W. Chorley shot another at the same place, May 4th, 1937. [v.S.]

Circaëtus cinereus Vieillot.

Brown Harrier-eagle.

Father F. J. Straeter kindly brought me a freshly-killed specimen obtained at Namiryango, about 12 miles east of Kampala, January 15th, 1939. [v.S.]

Circaëtus pectoralis A. Smith.

Black-breasted Harrier-eagle.

I obtained one 15 miles east of Mbarara on January 14th, 1939. [v.S.]

- Circaetus cinerascens* Müller. Smaller Banded Harrier-eagle.
Masaka district, February 11th, 1938, G. H. E. Hopkins. [v.S.]
- Gypohierax angolensis* (Gmelin). Palm-nut Vulture.
There is only one previous Uganda record of this species. Dr. A. J. Haddow finds it not uncommon in Bwamba (eastern extension of the Ituri Forest, in Western Toro, N.W. of Ruwenzori) at times when the nuts of the oil-palm are ripe. He has obtained two specimens, May and October 1943, and I have also shot two (July 31st, 1945 and June 6th, 1946).
- “Vulturine Fish-eagle” is so inapt a name for a bird which is not an eagle, but is closely associated with the oil-palm (the fruit of which is its main food) that I have adopted the name proposed for it by Chapin (1932, p. 522).
- Accipiter minullus intermedius* Erlanger. Abyssinian Little Sparrow-hawk.
Mr. G. C. Ishmael obtained a specimen just outside Kampala on August 18th, 1933, and I shot another near Amar, Gulu district on May 20th, 1936. [v.S.]
- Accipiter ovampensis* Gurney. Ovampo Sparrow-hawk.
I obtained two specimens at Kampala, December 5th and December 9th, 1939. [v.S.]
- Accipiter r. rufiventris* A. Smith. Rufous-breasted Sparrow-hawk.
Not previously recorded from Uganda. A juvenile specimen obtained by me near Kampala, February 8th, 1940. [v.S.]
- Francolinus clappertoni gedgei* O. Grant. Gedge's Striped Francolin.
Mr. T. W. Chorley obtained three birds of this very local form in Jie county, Karamoja district, September 5th and October 9th, 1941. [C. R. S. Pitman.]
- Ptilopachus petrosus emini*, Neumann. Lado Stone-partridge.
One at Juli Hill, Patiko, Gulu district, March 23rd, 1941. [T. W. Chorley.]
- Numida meleagris toruensis* Neumann. Toro Guinea-fowl.
This form, though described from Uganda, is not mentioned by Jackson even as a synonym of one of the sub-species that he recognises. Chapin (1932, p. 680) gives records from the northern shore of Lake Edward and the southern base of Ruwenzori. I have also obtained it in this area and can confirm the characters of the subspecies.
- Crecopsis egregia* (Peters). African Crake.
Three specimens, one slightly immature, were obtained by Mr. T. W. Chorley at Mukuna on the coast of Busoga district, August 15th, 1937. [v.S.]
- Microparra capensis* (A. Smith). Lesser Lily-trotter.
Two obtained by Dr. W. J. Eggeling on Lake Chahafi in Kigezi district and a third by myself on a large pond near Masaka. [v.S.]
- Neotis caffra jacksoni* Bannerman. Rufous-necked Bustard.
Mr. T. W. Chorley obtained a pair near the river Unyama, December 14th, 1937, and one near the river Kibaa, in the Anaka area, January 3rd, 1938, all in Gulu district.
- Charadrius (Afryoxechus) forbesi* (Shelley). Forbes' Three-banded Plover.
An adult obtained at Butiaba, July 13th, 1936, by Dr. W. J. Eggeling. This specimen has already been recorded (Chapin, 1932, p. 71); but represents such a considerable extension of the known range of the species that it seems worth mentioning again. [v.S.]

Tringa totanus totanus (Linn.). Redshank.

Mr. Hancock saw a Redshank, either this species or the Spotted, at Kayanja, on the north shore of Lake Edward near Katwe, in February, 1933. I saw two more at the same place on April 28th, 1944.

Numenius p. phaeopus (Linn.). Whimbrel.

I shot a specimen on the shore of Lake Nabugabo, Masaka District, September 16th, 1934. [v.S.]

Chlidonias leucopterus (Temminck). White-winged Black Tern.

Many seen at Katwe (north shore of Lake Edward) at the end of April, 1944, were in breeding plumage and one such was collected.

Cercococcyx m. montanus Chapin. Mountain Long-tailed Cuckoo.

One obtained by my African collector, E. Nsubuga, at Bufundi, on the shore of Lake Bunyonyi, Kigezi District, November 12th, 1940. [v.S.] There are only two previous Uganda records, one from the Mubuku Valley, Ruwenzori and the other from Kigezi.

Clamator glandarius (Linn.). Great Spotted Cuckoo.

At Moyo, West Madi District, March 3rd, 1937, a small party settled for the night in a tree near the rest-camp and I obtained two of them. The following day I shot another at Laropi, about 12 miles east of Moyo, on the Nile. [v.S.]

Ruwenzorornis johnstoni kivuensis Neumann. Kivu Red-naped Touraco.

Not previously recorded from Uganda, the type occurs on Ruwenzori and the present form was described from the Kivu volcanoes in Congo Belge. A pair was obtained by E. Nsubuga in Maizimeru Forest, Kigezi district, October 29th, 1940.

Poicephalus robustus suahelicus Reichenow. Grey-necked Green Parrot.

New to the Uganda list, though previously recorded from the Kivu area. Mr. T. W. Chorley collected one from a party of three in Kinkizi county, Kigezi district, July 5th, 1940.

Halcyon senegalensis cyanoleuca (Vieillot). Southern Grey-breasted Kingfisher.

I am able to add a third to Jackson's two occurrences: one was obtained in Kigezi district, November, 1940, by A. Ntensibe. It was caught in a rat-trap baited with sweet-potato.

Melittophagus gularis australis Reichenow. Congo Black Bee-eater.

New to the Uganda list and now only brought forward on the strength of sight-records. It is, however, a quite unmistakable species. Dr. Haddow has seen it in Bwamba, where it is to be expected to occur as it was already known from the Semliki Valley.

Ceratogymna atrata (Temminck). Great Black Hornbill.

A male obtained by Dr. Haddow in the forest along the Semliki, Bwamba, Toro, Uganda, April 6th, 1944, constitutes a new record for Uganda. Dr. Haddow states that the species turns up in Bwamba only occasionally when some big fig-tree is in fruit and that they are very cautious birds and frequent only the tallest trees. The male obtained was in the company of a female.

Lophoceros c. camurus (Cassin). Red-billed Dwarf Hornbill.

Not previously recorded from Uganda although known from the Ituri Forest. A specimen was obtained by my Collector in Bwamba, April, 1940. [v.S.]

Cosmetornis vexillarius (Gould). Pennant-winged Nightjar.

This bird was extremely common in Gulu district in late July and early August, 1936, when all males had long and unbroken pennants. On one occasion, just after

sundown, I saw a party of about a dozen flitting low over a small area of open ground among bushes. They persisted in doing this even after several of their number had been shot. Food was hardly the attraction since all the specimens were males. I think that there must have been a female on the ground.

Micropus melba melba (Linn.). European Alpine Swift.

Jackson only gives two Uganda records so it seems worth adding a third. From a flock of several hundreds at Moyo, West Madi District (extreme north-west corner of Uganda) on March 10th, 1937, I shot several of the type form. [W. L. Sclater.]

Indicator minor teitensis Neumann. East African Lesser Honey-Guide.

On my return to the laboratory in Kampala after lunch on October 5th, 1934, I found a living specimen tethered to the leg of my chair. I never learned its origin, but presumably it came from near Kampala. There are no other records for Buganda Province; but it occurs in Karamoja, Lango and on Ruwenzori (Jackson, 1938, p. 735). [v.S.]

Yungipicus obsoletus nigricans Neumann. Omo River Brown-backed Woodpecker.

Three records: Oraba, West Nile District, February 19th, 1934, W. J. Eggeling; Paminjaa, Paranga, Gulu district, March 14th, 1936, G. H. E. H.; Aiyinyokiwia, Alero, Gulu district, April 5th, 1936, G. H. E. H. My two specimens were in rather open bush-country. [v.S.]

Pitta reichenowi Madarasz. Reichenow's Pitta.

A single specimen was obtained by Dr. Haddow near the Semliki River in Bwamba, May, 1943.

Sigmodus rufiventris mentalis Sharpe. Bohndorffs' Red-billed Helmet-Shrike.

Only two previous Uganda records. I obtained a specimen in the Budongo Forest, Bunyoro District, April 9th, 1939.

Malaconotus p. poliocephalus (Lichtenstein). Grey-headed Bush-Shrike.

Not uncommon near Kampala, where E. Nsubuga collected five specimens December, 1939 and January, 1940.

Stilbopsar stuhlmanni Reichenow. Stuhlmann's Glossy Starling.

The only previous Uganda records are from Ruwenzori and Mount Elgon. E. Nsubuga obtained two specimens in the Kayonza Forest, West Kigezi, October, 31st, 1940.

Sitagra nigriceps graueri Hartert. Grauer's Spot-backed Weaver.

Jackson (1938, p. 1420) states that this form "probably extends into Kigezi and Ankole." I can confirm this statement so far as Kigezi is concerned, for I shot a specimen at Kabale, August 8th, 1940.

Euplectes franciscana (Isert). Orange Bishop-bird.

Although Jackson (1938, p. 1451) states "Senegal and Cameroon east to the Nile Valley and south to northern Uganda and western Kenya" the Uganda localities he mentions are all east of the Nile. I obtained five specimens in West Nile District in June, 1937, and E. Nsubuga collected two in Bwamba, western Toro, in April 1940.

FIELD NOTES ON STAPELIEÆ COLLECTED IN THE LAIKIPIA-SAMBURU
DISTRICT OF KENYA.

By R. O. Hennings.

The following notes refer to stapeliæ collected by the writer and his wife, or by Mr. and Mrs. E. H. Rundgren of the Game Department during 1945 and 1946 in Laikipia-Samburu District, or, in a few cases, in the adjoining region of Mukogodo. Some of the specimens were collected in the course of day or week-end outings, but most were found on safari, in strolls round camp, or in roadside halts for lunch or for mending punctures. Indeed the most fertile periods for finding succulents, so far as the writer is concerned, have been while punctures were being mended.

These notes of course, make no pretence to being scientific, but it is hoped that the descriptions, based on Mr. Bally's pamphlet on Stapeliæ (June 1942) may be of interest to collectors. No less than 21 different species were collected, of which five do not seem to be recorded by Bally (Nos. 2 with 3 varieties, 5 and 11 below); two others have not yet flowered and remain unidentified. (Nos. 3 and 18).

CARALLUMA.

Group *Eucaralluma.*

1. *Caralluma* sp. nov. near *prigonium*, similar to Bally's Fig. 3. A most attractive flower, $\frac{3}{4}$ inch across; corolla lobes curving back like a miniature Martagon lily, maroon darker at base; tube pure white with maroon spots; corona yellow with white centre. Plant stems up to 9 inches with flower stalks rising to 24 inches. Fifteen or more stems growing upright from the single root. Collected by the writer on 25/4/46 on rocky ground a few miles north of the Seya Drift in Samburu Low Country, altitude about 4,500 ft. Cuttings sent to Coryndon Museum.

2. *Caralluma* sp. nov., near Bally's S.63, three "spidery-flowered" species. All three varieties were collected within a ten miles radius of the junction of the Uaso Narok and the Uaso Nyiro in North Laikipia, by Mr. and Mrs. Rundgren. The form of the flower is of the "spidery" type like Bally's S.63. To the lay eye the shape appears the same in all three species, but the colouring in the three is quite distinct, although they grow close together.

Species A; corolla lobes maroon in front and plain greenish white at back, corona maroon.

Species B; corolla lobes maroon in front and greenish white speckled with maroon at back; corona maroon but with inner horns white.

Species C; corolla lobes pale yellow in front and greenish-white at back.

In all three the corona is set on an elongated pedestal, and the inner horns of the corona are elongated.

The plants grow in low clumps, much branching and procumbent, usually in the partial shade of thorn bushes, or entangled in clumps of grass or herbage, in the manner of *Edithcolea*, so that they may pass unnoticed unless one actually pries into the clump. Stems with many branches, each one being seldom over 9 inches long. The writer collected several plants apparently similar at Dadavu, below the Leroghi Escarpment, which have not yet flowered. Specimens sent to Coryndon Museum.

3. *Caralluma* sp. nov. habit similar to Bally's S.27. Has not flowered yet. Twenty stems up to 6 inches high growing upright from one root. A single plant was collected by the writer on 25/3/46 on a rocky kopje some miles south of the Seya Drift in Samburu Low Country, altitude about 4,500 ft. A *Eucaralluma* similar in habit, perhaps the same, was collected in June 1946, by Mr. Rundgren in North Laikipia. Cuttings sent to the Coryndon Museum.

4. *Caralluma* sp. nov. near Bally's S.61. Single plant collected by Mrs. Rundgren in Mukugodo in April 1946, altitude about 5,000 ft. Flowers distinctive in shape, similar to Bally's S.61. Found half way down the Mukogodo Escarpment. Plant growing well at Kampi-ya-Simba, near Rumuruti.

5. *Caralluma* sp. nov. not described by Bally. Oddly shaped and brightly coloured, perhaps nearer to Bally's S.61 than to any other species in shape of corona and corolla. The corolla lobes dangle loosely like S.61, but are doubled back longitudinally to form a double thickness demilune in shape, showing the front or inner surface of the lobes, yellow speckled with maroon. Corona yellow with staminal apertures red. Collected by Mr. Rundgren in June 1946 near Soisian springs in North Laikipia.

Group *Umbellata-Europeæa*.

6. *Caralluma retrospiciciens* found at scattered localities throughout the area and quite common in some places. The writer collected one plant some ten miles from the shore of Lake Rudolf in the Sirima area, growing in a sandy pan among lava ridges. When dug up, it was sheltering a snake, fortunately somnolent, among its roots, which called to mind the old print reproduced as the frontispiece of the one-volume White and Sloane.

- | | | |
|---|---|---|
| <p>7. <i>Caralluma tombuctuensis</i>
8. <i>Caralluma speciosa</i>
9. <i>Caralluma foetida</i></p> | } | <p>Differences between these three species are not very obvious and identification is made more difficult by variations between neighbouring plants. But pretty certainly all three have been collected in the area. Most of them seem markedly and unpleasantly smelly. This characteristic is not mentioned by Bally but might provide an easy means of identification.</p> |
|---|---|---|

Group *Ango*

10. *Caralluma Dummeri*. Found throughout the area from Rumuruti to El Barta. Next to *Huernia keniensis*, the commonest stapeliad in the district.

11. *Caralluma* sp. nov., apparently between *C. subterranea* and *C. Baldratii*. The flowers are bright, gem-like, and a dozen or more may come into bloom together on one small plant. Corolla lobes crimson up to an inch in diameter; corona golden-yellow with white centre. The flowers are indistinguishable in photograph from Bally's fig. 14 *C. Baldratii*, but the habit of the plant is quite different, being not more than 3 inches high. In shape and mottling the plant is similar to *C. subterranea* as illustrated by Bally, but no underground rhizomes have been noticed. Collected in May 1945 by Mrs. Hennings a few miles north of Rumuruti, growing in loose moss under a thick bush; collected again by the writer growing in full sun in open grassland further north, and again at Sugota Naibor in North Laikipia, in stony ground. It seems to be widespread in North Laikipia and if unrecorded it might suitably be named "Laikipiensis." Specimens sent to Coryndon Museum.

12. *Caralluma vibratilis* collected among grass in vlei-land near Rumuruti and on farms towards Nanyuki.

13. *Caralluma tubiformis*. Known previously only from Archer's Post, this species was collected by the writer in April 1946 in Samburu Low Country on the road between Swiyan and Barsaloi, altitude about 4,500 ft. Stems with roots, freshly pulled and in flower, were found strewn along the road evidently by some child from the solitary manyatta in the neighbourhood, a reminder that the Samburu, Dorobo and kindred tribes habitually eat some species of stapeliæ.

EDITHCOLEA.

14. *Edithcolea grandis*, collected in areas as wide apart as Lower Narok farms (altitude 5,500 ft.) and El Barta (altitude about 4,000 ft.), and in some localities extremely common. Passing in a lorry through a region of *Edithcolea* at certain seasons, the traveller may be startled by what appear to be the pale ears of scores of rabbits cocked up among the low bushes. Closer inspection will reveal that these are the fully developed seed-pods of *Edithcolea*.

STAPELIA.

15. *Stapelia semota*. The writer found the dark maroon variety flourishing in the garden at Rumuruti, but has so far failed to find it growing wild in the district.

HUERNIA.

16. *Huernia keniensis*. Undoubtedly the commonest stapeliad in the district and can be found on almost any patch of rocky ground from Rumuruti to El Barta. The large variety *nairobiensis* abounds, with trailing stems three feet and more in length, and flowers over an inch across, bowl-shaped rather than bell-shaped, pale greenish with raised veins outside.

ECHIDNOPSIS.

17. *Echidnopsis Sharpei* is growing in the garden at Maralal, where it was presumably planted by H. B. Sharpe in 1937. The writer has searched in vain for it near the camp at Baragoi where it was originally found.

18. *Echidnopsis* sp. unidentified, stems upright, up to three inches high, with ten angles; possibly *E. angustiloba*, but has not flowered yet. Collected by the writer on 6/6/45 growing by the roadside in the shade of a stone on the North Marte (Lava) Plateau north of Maralal, altitude about 5,000 ft. Specimen sent to the Coryndon Museum.

19. *Echidnopsis* sp. nov. pretty certainly the same as Bally's S.49. Collected on the northern escarpment of the North Marte (Lava) Plateau north of Maralal altitude about 5,000 ft., perhaps forty miles from the locality previously recorded, Mt. Nyiro. A dozen or more plants were found growing among lava boulders within a radius of a hundred yards. Most were in flower, and the purplish-red tube and lemon-yellow lobes shaped as shown in Bally's Fig. 30 make it pretty certainly the same plant. Full grown stems about the same size and proportions as a man's finger.

NOTE: In addition to specimens sent to the Coryndon Museum, most of the above plants are established in the District Commissioner's garden at Rumuruti and in Mr. Rundgren's garden at Kampi-ya-Simba, a few miles to the south.

(Received for publication 17/6/46).

NEW SPECIES OF *PARASPHERA* BOLIVAR 1884 (*ORTHOPTERA*,
ACRIDIDÆ, *PYRGOMORPHINÆ*) FROM EAST AFRICA.

By D. Keith McE. Kevan, B.Sc., A.I.C.T.A., F.R.E.S.

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This interesting genus of grasshoppers enjoys a wide distribution in Africa south of the Sahara, from Angola and the Transvaal to Eritrea and the Cameroons, but, with the exception of two species from the Yemen, is not known outside the Ethiopian region.

All the species appear to have a limited distribution, however, occurring at relatively high, and sometimes very high altitudes (except *P. picta* Bol., from Massaua, Eritrea, and the exactness of this locality which is at sea-level might possibly be queried in the light of the present knowledge of the genus). Some of the species are apparently limited to single mountain ranges, Kilimanjaro, the Chyulu Hills and the Teita Hills, for instance, all having their own particular forms, although not being more than one hundred miles apart.

Rehn (1942) describes or cites the literature of all the species previously known with the exception of *P. boranensis* Salfi, and the total to date stands at twenty-two species, to which must be added nine more which are described herein, making thirty-one in all, twenty-four of which are from Eastern Africa.

The species fall into two groups; those which possess slip-like rudimentary tegmina, and those which are apterous. The first two species described here belong to the former group, and the remaining seven to the latter.

All the types, allotypes, paratypes and other material described herein are at present in the possession of the Coryndon Memorial Museum, Nairobi, Kenya.

It will be noticed in the following descriptions of new species that the female has been selected as the type in preference to the male. The reason for this was that in the majority of cases more material of the former sex was available and also for the sake of consistency. The females also are often more readily distinguished from each other than are the males.

A note is not out of place on the terminology used for the sulci of the pronotal disc. In the following descriptions, the first pronotal sulcus is taken as being an extension of the anterior sulcus of the pronotal lobes across the disc. This sulcus is obsolete on the disc in many species, but indicated though obsolescent in others. What has sometimes been called the first sulcus of the pronotal disc by previous authors is here termed the interstitial sulcus since it has no counterpart on the pronotal lobes and therefore cannot be considered to be the true first sulcus of the disc.

KEY TO THE SPECIES OF *PARASPHERA* FROM EASTERN AFRICA.

(Species which have been examined by the author are marked thus †.)

- | | |
|--|------------------------------|
| 1. Apterous | 2 |
| With slip-like rudimentary tegmina | 17 |
| 2. Fastigium of vertex distinctly longer than basal width, acute
(Virunga Mts., etc., Ruanda) | <i>ruandensis</i> Rehn, 1914 |
| Fastigium not distinctly longer than basal width, nor acute | 3 |

3. Sculpture of pronotal disc and lobes comprised of small, yellow, granular tubercles. Median carina of pronotum distinct 4
 Sculpture of pronotal disc not as above. Median carina of pronotum less distinct or obsolete 6
4. Red dorsal line of abdomen bordered yellow.
 Sculpture of pronotal lobes similar to that of disc, the granular tubercles not distinctly larger except along the lower margin. Supra-anal plate of male as wide basally as long. Meso- and metanota with a few scattered punctures only (Chyulu Hills, S.E. Kenya) †*chyuluensis* n. sp.
 Red dorsal line of abdomen not bordered yellow.
 Sculpture of pronotal lobes comprised of distinctly larger granular tubercles than on the disc. Meso- and metanota distinctly punctured laterally 5
5. Size larger, ♀, 21-30 mm., ♂, 18-21 mm. Pronotal carinae distinct, red. Anterior margin of pronotum red. Four front legs largely red. Lateral yellow spots on abdominal terga well-defined (Teita Hills, S.E. Kenya) †*teitensis* n. sp.
 Size smaller, ♀, 20-25 mm., ♂, 13-19 mm. Pronotal carinae not very distinct nor red. Anterior margin of pronotum not red. Four front legs not largely red. Yellow spots on abdominal terga obsolete (?) (Mt. Meru and Kilimanjaro, N. Tanganyika) *meruensis* Sjöstedt, 1909
6. Sculpture of pronotal disc comprised largely of coarse punctures which may be deep or shallow. Lateral pronotal carinae indistinct, median carina obsolete. Lateral plate of ventral ovipositor valve rather narrowly triangular 7
 Sculpture of pronotal disc comprised of medium to fine punctures sometimes rather irregular 9
7. Pronotum shallowly punctured, smooth appearance (Aberdare Range, etc., C. Kenya) †*kinangopa* Uvarov, 1938
 Pronotum deeply punctured, rugose appearance 8
8. Fastigium of vertex very broad and blunt. Cheek tubercles well developed. Interstitial sulcus of pronotal disc present, distinct. Meso- and metanota not distinctly punctured laterally (Imatong Mts., Sudan-Uganda border) *imatongensis* Rehn, 1942
 Fastigium normal shape for genus. Cheek tubercles poorly developed. Interstitial sulcus of pronotal disc absent or very indistinct. Meso- and metanota distinctly punctured laterally. Colour dark green often with much blue or purple suffusion (Kilimanjaro, Kenya-Tanganyika border) †*pulchripes* (Gerstaecker), 1869.
9. Sculpture of pronotal disc comprised of very fine close regular and rather shallow punctures giving a smooth, dull or "matt" appearance almost devoid of wrinkles of any sort (Uasin Gishu Plateau, W. Kenya) †*kaburu* n. sp.
 Sculpture of pronotal disc not as above. [If punctures fine, regular and rather shallow (*mauensis*), then rather scattered and not giving a "matt" appearance (a small species)] 10
10. Meso- and metanota distinctly punctured. It laterally only, then strongly 11
 Meso- and metanota with a few scattered punctures only 11
 If more so laterally, then not strongly 13
11. Mesosternal lobes quadrate, their interspace rectangular. Body fusiform. Punctures of pronotal disc, meso- and metanota fine and more or less regular. Fastigium of vertex almost as long as wide basally. Lateral plate of ventral ovipositor valve rather broadly triangular. Interstitial sulcus of pronotal disc obsolete (Rift Valley, C. Kenya) †*naivashensis* n. sp.
 Mesosternal lobes broader at apex, truncate, their interspace trapezoidal. Body more robust, slightly depressed. Punctures of pronotal disc, meso- and metanota coarser and more irregular. Lateral plate of ventral ovipositor valve rather narrowly triangular 12

12. Larger, ♀, 20-26 mm., ♂, 18-22 mm. Fastigium of vertex almost as long as wide basally. Interstitial sulcus of pronotal disc obsolescent or absent (Ngong Hills, S. Kenya) †*ngongensis* n. sp.
 Smaller, ♀, 17-22 mm., ♂, 15-16 mm. Fastigium of vertex distinctly shorter than wide basally. Interstitial sulcus of pronotal disc present (Mt. Kenya, C. Kenya) †*keniensis* Sjöstedt, 1912
13. Interstitial sulcus of pronotal disc present 14
 Interstitial sulcus of pronotal disc absent 16
14. Size small, ♀, 17-23 mm., ♂, under 17 mm. Puncturation of pronotal disc fairly regular 15
 Size larger, ♀, 24-30 mm., ♂, 19-23 mm. Puncturation of pronotal disc rather irregular. Median carina of pronotum present, indistinct, usually red (Nairobi area, etc., S. Kenya) †*nairobiensis* Sjöstedt, 1933
15. Puncturation of pronotal disc rather fine and not sharply impressed. Median pronotal carina absent or obsolescent. Head smooth. Cheeks with rather poorly developed tubercles (Mau Highlands, S.W. Kenya) †*mauensis* n. sp.
 Puncturation of pronotal disc rather dense and sharply impressed. Median pronotal carina present, indistinct. Head wrinkled. Cheeks with well developed tubercles. (Nanyuki Plains, C. Kenya) †*campestris* Rehn, 1942
16. Dorsal stripe of abdomen yellow. Interspace between mesosternal lobes narrower, in ♂, less than width of a lobe. Supra-anal plate of ♂ broadly triangular, as wide at base as long; subgenital plate obtuse (Cherangani Mts., etc., W. Kenya) *cheranganica* Uvarov, 1938
 Dorsal stripe of abdomen yellow. Interspace between mesosternal lobes wider in ♂, a little greater than the width of a lobe. Supra-anal plate of ♂ longer than broad basally; subgenital plate sub-acute (Mt. Elgon, Kenya-Uganda border) †*elgonensis* Sjöstedt, 1933
 Dorsal line of abdomen red, only faintly bordered yellow. Interspace between mesosternal lobes wider, in ♂, a little greater than the width of a lobe. Supra-anal plate of ♂ almost as wide basally as long; subgenital plate sub-obtuse (Kamasia Hills, W. Kenya) †*hamasiensis* n. sp.
17. Size large, ♀, over 35 mm. (up to 44 mm.), ♂ 23 mm., normally much more. Tegmina reaching to posterior margin of first abdominal segment 22
 Size moderate or small, ♀, less than 35 mm., ♂, 23 mm., or less 18
18. Tegmina 6 times as long as broad, almost as long as pronotum, reaching beyond first abdominal segment (S.E. Ethiopian Highlands) *gallæ* (Rehn), 1901
 Tegmina shorter than above 19
19. Tegmina reaching hind margin of metanotum 20
 Tegmina not extending to hind margin of metanotum 21
20. Size smaller, ♂, *c.* 15 mm., ♀, *c.* 23 mm. Pronotum markedly wrinkled all over, very coarsely anteriorly. Hind tibiae olivaceous (Chillalo Mts., C. Ethiopia) *montana* Uvarov, 1934
 Size rather larger. Pronotum granulate, not markedly wrinkled all over. Hind tibiae red (Livingstone Mts., S.W. Tanganyika) * *dubia* Bolívar, 1904
21. Fastigium not quite as long as broad basally, divergent posteriorly. Pronotum somewhat wrinkled as well as punctured. Supra-anal plate of male narrowly triangular, not as wide basally as long. Cerci a little shorter than the supra-anal plate (C. Ethiopian Highlands) *abyssinica* Uvarov, 1934
 Fastigium as long as broad basally, scarcely divergent posteriorly. Pronotum punctured but only slightly wrinkled. Supra-anal plate of male broadly triangular, as wide basally as long. Cerci rather more than half as long as the supra-anal plate (S. Ethiopian Uplands) †*iavellens* n. sp.

* Sjöstedt (1909) reports this species from the neighbourhood of Mt. Meru, Northern Tanganyika, but says that the specimens differ from *P. dubia* in the colour of the hind tibiae and in the posterior margin of the pronotum being rather straight or only slightly excised. Considering the local distribution of the species of *Parasphena* and the considerable distance between the type locality of *P. dubia* and the Meru area it is likely that a re-examination of Sjöstedt's material would show it to be a distinct species or even a species of *Pyrgomorphella* and not a *Parasphena*.

22. Size rather larger, ♀, 38-44 mm., ♂, c. 32 mm. Stouter; head, breadth to dorsal length, 6:7, pronotum, greatest breadth to greatest length, 10:10. Puncturation of meso- and metanota distinctly weaker than that of pronotal disc. Male with interspace between mesosternal lobes distinctly wider than the width of a lobe; tegmina reaching just beyond the posterior margin of the first abdominal tergum; supra-anal plate distinctly longer

than wide basally (Marsabit Mt., N. Kenya)

† *maxima* n. sp.

Size rather smaller, ♀, 37-40 mm., ♂, 23-32 mm. Less stout; head, breadth to dorsal length, 5:7, pronotum, greatest breadth to greatest length, 9:10. Puncturation of meso- and metanota almost as strong as that of pronotal disc. Male with interspace between mesosternal lobes less than the width of a lobe, or at most equal to it; tegmina not reaching beyond the posterior margin of the first abdominal tergum; supra-anal plate not normally distinctly longer than broad basally (Moyale Escarpment, Kenya-Ethiopia border)

† *boranensis* Salfi, 1939.

Map I shows the known distribution of the species of *Parasphena* in Eastern Africa. The following occur outside the East African Area:—

P. picta Bolívar, 1884 (Eritrea); *P. nigropicta* Bolívar, 1889 (Angola); *P. picticeps* Bolívar, 1904 (Transvaal); *P. carinata* Bolívar, 1909 (Eritrea); *P. yemenita* Uvarov, 1937 (Yemen); *P. tewfiki* Uvarov, 1938 (Yemen); and *P. uwarovi* Rehn, 1942 (British Cameroons).

AFFINITIES OF EAST AFRICAN SPECIES.

From what is known of the genus at the present time, it would appear that the evolutionary trend towards an entirely apterous condition has proceeded further in the central zone of the distribution of the genus than either to the north or south, which would indicate that the focal point from which the genus originated was in this zone, and since more species are known from the East African area than from elsewhere it seems not unlikely that East Africa gave rise to the genus.

All the species known from West, Central and British East Africa, with the exception of *P. dubia* in the extreme south, and *P. maxima* and *P. boranensis* in the extreme north, are apterous. *P. dubia* is presumably most closely related to species from Southern Africa, although Bolívar (1909) states that it is very near to *P. carinata* from Eritrea. *P. maxima* an isolated species from Northern Kenya shows a very close relationship with *P. boranensis* from the Kenya-Ethiopia border, and, like it, has affinities with *P. iavellensis* and *P. abyssinica* which occur further north. *P. gallæ* and *P. montana* are the only other brachypterous members of the genus in Eastern Africa and Rehn (*loc. cit.*) considers *P. gallæ* to be intermediate in position between *P. abyssinica* and *P. montana*. These northern species form a distinct group, not associated with the true East African species and their affinities are probably more with those from Eritrea and the Yemen.

Of the apterous species, *P. nairobiensis* would appear to occupy a more or less central position among the truly East African species, being related through *P. ngongensis* to the Central Highland group including *P. keniensis*, *P. campestris* and *P. kinangopa*, which in turn seems allied to *P. elgonensis*, *P. kamasiensis* and *P. cherranganica* from the west, and to the south-western group through *P. naivashensis* to *P. mauensis* and *P. kaburu*. *P. chyuluensis* also shows certain characters in common with *P. nairobiensis* but definitely belongs to the south-eastern group containing *P. teitensis*, *P. meruensis* and *P. pulchripes* which is less closely related.

P. ruandensis does not show any close affinities with East African species and, as would be expected, shows a closer relationship with the West African fauna, its nearest known relative being *P. uwarovi* from the Cameroons (Rehn, *loc. cit.*)*

* *P. granulata* Chopard 1945 (Rev. Fr. Ent. II; p. 176) from French Cameroons seems to be a synonym of *P. uwarovi*—Syn. Nov.—from the description.



MAP I. - DISTRIBUTION OF *PARASPHENA* IN EASTERN AFRICA.

P. imatongensis from its description (Rehn, *loc.cit.*) is not closely related to any other known species and, as far as is at present known, is geographically isolated.

PARASPHERA MAXIMA n. sp. (Fig. 1).

TYPE : ♀, Chopa Gof, Marsabit, Northern Province, Kenya, (02° 25' N. 38° 03' E) 3,010 ft., 29/11/1944, (D. K. Kevan).

Antennæ : Somewhat shorter than head and pronotum together, filiform, somewhat depressed basally.

Head : Face very oblique, concave. Frontal carina sulcate throughout, reaching almost to clypeus. Fastigium of vertex at least as long as broad basally, semi-circular anteriorly, emarginate laterally, sides divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head somewhat wrinkled. Cheeks covered with small tubercles, a line of large tubercles running diagonally downwards from the eye to the lateral margin of the pronotum.

Thorax : Pronotum at widest point equal to its length. Pronotal disc finely punctured. Lateral lobes of pronotum covered with small tubercles, a line of large tubercles being present along the lateral margin. First pronotal sulcus obsolete on disc; second, sinuous, placed before the middle; third at about two-thirds. Interstitial sulcus on the pronotal disc before the second sulcus moderately distinct. Median carina distinct, lateral carinæ virtually absent, indicated only by a pair of irregular elongated impressions on each side, situated before and behind the second sulcus of the pronotal disc, and bounded laterally by a series of small raised tubercles. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum only half as long as metanotum, both together less than pronotum behind second sulcus. Puncturation shallower than on pronotum. Metanotum emarginate posteriorly, mesonotum scarcely so. Prosternal tubercle low. Mesosternal lobes slightly longer than broad, quadrate, their interspace one and three-quarter times the width of a lobe.

Tegmina and Wings : Tegmina five times as long as broad, equal in length to pronotum behind first lateral sulcus; reaching to posterior margin of first abdominal tergum. Wings absent.

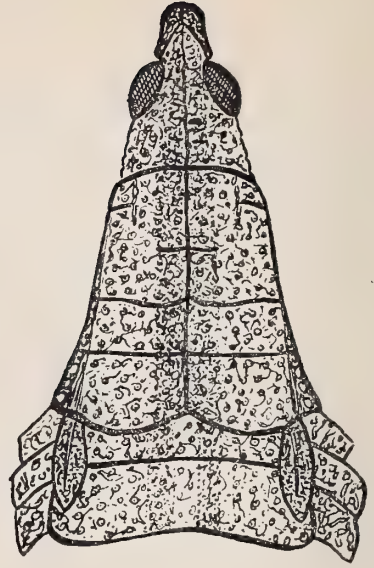
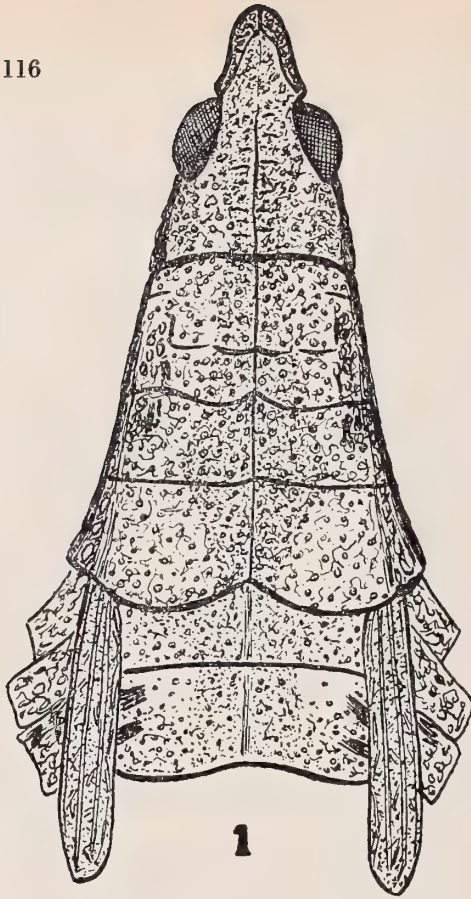
Abdomen : Terga only very faintly punctured. Posterior margin of last tergum slightly sinuous. Supra-anal plate broadly triangular, scarcely longer than its width at base. Cerci conical, less than half as long as supra-anal plate. Subgenital plate with the median projection of the distal margin acute, lanceolate, the proximo-lateral angles being right-angles. Exposed base of dorsal ovipositor valves (lateral aspect) about half the exposed length. Ventral valves with well developed apical hooks, exposed base scarcely half the exposed length; lateral plates rather broadly triangular.

ALLOTYPE : ♂ (Same locality as Type), 13/6/1946 (D. K. Kevan).

Agrees with the type in all essentials. Differs in that the fastigium is less strongly emarginate laterally and less divergent posteriorly, the mesosternal lobes are more elongate and their interspace is much narrower, being rather wider than the width of a lobe, the tegmina reach beyond the posterior margin of the first abdominal tergum, the posterior margin of the last tergum is deeply emarginate, the supra-anal plate is distinctly longer than its width and the cerci are over half as long as the supra-anal plate. Subgenital plate sub-acute. A more slender insect than the female.

COLOURATION : The general colour of the type and allotype is grass-green, suffused yellow. In the single paratype (same data as type) it is olive-brown. Antennæ, dull red. In the type, the fastigium, vertex, occiput and pronotum in region of median carina, and in the allotype, the whole of the dorsal aspect of head and pronotum are dull red, continuing to a lesser extent along the dorsal line of the abdomen. The dorsal line itself is of a rather brighter red. The larger tubercles forming a line from the eye along the cheek and continuing along the lateral margin of the pronotal lobe, yellow. Smaller tubercles in region of lateral pronotal carinæ, also yellow. Tegmina and hind tibiæ and tarsi, dull red. Each abdominal tergum with a lateral, oblique, black-bordered, yellow mark.

HABITAT : This species occurs on the isolated mountain of Marsabit in the Northern Province of Kenya. Marsabit forms a green island rising to about 5,000 ft. in the midst of the desert, and its summit is covered with a mountain vegetation



2



3



4



5

Head and Thorax, Dorsal, Female Holotypes (except Fig. 3, Allotype)

Fig. 1. *Parasphena maxima* n. sp.

Fig. 3. *Parasphena naivobiensis* Sjöstedt.

Fig. 2. *Parasphena iavellensis* n. sp.

Fig. 4. *Parasphena naivashensis* n. sp.

Fig. 5. *Parasphena mauensis* n. sp.

consisting largely of olive forest, the grass-land ceasing at about 4,500 ft. Chopa Gof (the type locality) is some ten miles north of the Government Station and is an extinct volcanic crater 3,010 ft. high. *P. maxima* was taken on sparse scrubby bushes growing among short grass and lava boulders around the rim of the crater. It does not appear to be a common species, since originally only two females and one nymph were taken, several subsequent visits during 1944-1946 yielding no further specimens until the allotype was obtained after a prolonged search.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind femur	Length of Tegmen
♀ Type	44	9	17.5	7
♀ Paratype	38	8	15.5	6
♂ Allotype	32	6	16	6.5

AFFINITIES: This species can be distinguished from all others except *P. boranensis*, to which it is very closely related, by its very large size. From that species it differs from the original description (Salfi, 1939) in the somewhat larger size and the shape of the fastigium of the vertex. A series of specimens of *P. boranensis* collected by the author (Moyale, Northern Province, Kenya, 03° 31' N. 39° 03' E., c. 4,000 ft., among rough grass and herbage, 15/6/1946, 7 ♀♀, 11 ♂♂) showed these characters unreliable as a means of distinction. The species are very closely allied and it is not impossible that *P. maxima* is but a race of *P. boranensis* that has only recently evolved in an isolated locality. It may be distinguished, however, by its rather more robust appearance, the sculpture of the meso- and metanota and, in the male, by the slightly longer tegmina and wider interspace between the mesosternal lobes as well as by the rather narrower supra-anal plate (see Key), although two specimens of *P. boranensis* have the supra-anal plate almost comparable.

PARASPHENA BORANENSIS. Salfi, 1939.

Since Salfi described the colouration of *P. boranensis* from alcohol-preserved material only, the colour of the living insects can now be recorded. This varies from pale olivaceous to bright grass-green, suffused yellow, the yellow markings and reddish suffusion being identical with those described for *P. maxima*.

The measurements given for Salfi's type and allotype from Ethiopian Moyale are, particularly in the case of the male, below the average. The series collected by the author shows the length of the female to vary between 38 and 40 mm., and of the male, between 25 and 32 mm., except for one dwarf of 23 mm. This last is mentioned specially since the tegmina are remarkably short, barely reaching beyond the metanotum. There does not appear to be any gradation among other specimens down to this small size of tegmen and the example is probably aberrant.

PARASPHENA IAVELLENSIS n. sp. (Fig. 2).

TYPE: ♀, Yavello, S. Ethiopia (04° 55' N. 38° 06' E., about 7,600 ft.), May, 1941 (A. F. G. Gedye).

Antennae: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face very oblique, concave. Frontal carina deeply sulcate to clypeus. Fastigium of vertex as long as wide basally, semi-circular anteriorly, sides almost straight, only slightly emarginate, scarcely divergent posteriorly. Median carinula fairly distinct on occiput and vertex. Upper surface of head somewhat wrinkled. Cheeks covered with small tubercles, a row of larger tubercles running diagonally downwards from the eye to the lateral margin of the pronotum.

Thorax : Pronotum at widest point equal to its length. Pronotal disc finely punctured. Lateral pronotal lobes covered with coarse shallow punctures, a row of large tubercles present on lateral margin. First pronotal sulcus obsolete on disc; second, sinuous, placed about the middle; third at beyond two-thirds. Interstitial sulcus on the pronotal disc before the second sulcus present but very indistinct. Median carina, distinct, rather irregular; lateral carinae, obsolete except anteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum only half as long as metanotum, both together equal to pronotum behind second sulcus. Punctuation as on pronotum. Both meso- and metanota emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrate, as long as broad, their interspace being almost twice the width of a lobe.

Tegmina and Wings : Tegmina three times as long as wide, equal to metazona of pronotum in length and reaching only to middle of metanotum. Wings absent.

Abdomen : First and second abdominal terga finely punctured, other terga only faintly so. Posterior margin of last tergum sinuous. Supra-anal plate broadly triangular, almost as broad at base as long. Cerci conical, half as long as supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate, the proximo-lateral angles being slightly greater than right-angles. Exposed base of dorsal ovipositor valves (lateral aspect) about half as broad as exposed length. Ventral valves with well developed apical hooks, exposed base scarcely half the exposed length; lateral plates rather broadly triangular.

ALLOTYPE : ♂ (Same locality as Type), June, 1941 (A. F. G. Gedye).

Agrees with the type in all essentials. Differs in that the antennae are as long as head and pronotum together, the frontal carina barely reaches the clypeus, the pronotum at its widest is slightly less than its length, and the interstitial sulcus between first and second pronotal sulci is obsolete. The mesosternum is damaged, but the interspace between the lobes is narrower than in the type. The tegmina extend slightly beyond the middle of the metanotum, the last abdominal tergum is deeply emarginate medially. Subgenital plate sub-acute. A more slender insect than the female.

COLOURATION : General colouration grass-green, suffused yellowish. Antennae (type and one paratype) black or (allotype and one paratype) dull red. Fastigium, occiput, disc of pronotum in region of median carina, tegmina and hind tibiae and tarsi, dull red. Median line of mesonotum, metanotum and abdomen, also dull red (allotype) with a central yellow stripe (type and paratypes). The large tubercles from the eye along cheek and lateral margin of pronotum, yellow. Each abdominal tergum with a lateral oblique, broad, black-bordered, yellow mark (somewhat obsolete in the allotype).

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur	Length of Tegmen
♀ Type	32	5.5	13	2.5
♂ Allotype	23	4.5	11.5	2.5
♀ Paratype	33	5.5	13	2.5
♀ Paratype	32	5.5	13	2.5

The paratypes have the same data as the allotype.

AFFINITIES: *P. iavellensis* is allied to *P. abyssinica* but differs from the original description of that species (Uvarov, 1934) in the shape of the fastigium, the sculpture of the pronotum and the supra-anal plate and cerci of the male.

PARASPHENA NAIROBIENSES Sjöstedt, 1933. (Fig. 3).

NEALLOTYPE : ♀, Only the male of *P. nairobiensis* has been described; the following is a description of a topotypic female from Nairobi, Kenya, Nov., 1937 (M. Mallett).

Antennæ : Shorter than head and pronotum together, filiform slightly depressed basally.

Head : Face oblique, concave. Frontal carina sulcate, not reaching the clypeus. Fastigium of vertex slightly shorter than wide basally, parabolic anteriorly, sides slightly convex, divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head with small tubercular wrinkles. Cheeks with small indistinct tubercles, those in a line running diagonally from the eye to the lateral margin of the pronotum more pronounced.

Thorax : Pronotum at widest point greater than its length. Pronotal disc and lateral lobes somewhat coarsely, shallowly and irregularly punctured, some of the punctures coalescing to form small irregular tubercles; lateral lobes with a row of tubercles along the lower margin. First pronotal sulcus very indistinct on disc; second, sinuous, placed slightly behind the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus present, distinct. Median and lateral carinae of pronotum present but not markedly distinct. Lateral carinae sub-parallel anteriorly, divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum over half as long as metanotum, both together equal to the pronotum behind the first sulcus. Puncturation obsolete on meso- and metanota. Meso- and metanota both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrate, as long as wide, their interspace one and three-quarter times as wide as a lobe.

Tegmina and Wings : Absent.

Abdomen : Abdominal terga with a few minute scattered punctures only. Posterior margin of last tergum almost straight. Supra-anal plate broadly triangular, almost as broad basally as long. Cerci conical, slightly more than half as long as supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate, the proximo-lateral angles being almost right-angles. Exposed bases of dorsal and ventral ovipositor valves (lateral aspect) half as wide as exposed length. Ventral valves with well-developed apical hooks; lateral plates broadly triangular.

MALE TOPOTYPE : A male from Nairobi, May, 1937 (Van Someren), differs from the above description as follows:—

Sides of fastigium not divergent posteriorly, cheek tubercles more distinct, pronotum at widest scarcely more than its length, meso- and metanota finely punctured laterally, mesosternal lobes with their interspace scarcely wider than a lobe, posterior margin of last abdominal tergum deeply emarginate medially, supra-anal plate narrower, longer than its width basally, cerci almost as long as the supra-anal plate. Sub-genital plate acute. A more slender insect than the female.

COLOURATION : General colouration dark olive or grass-green, the pleuræ suffused yellow, terga sometimes suffused dull-purple. Antennæ black except basally. The following parts red:—Bases of antennæ, edges of fastigium and carinula of vertex and occiput, lateral pronotal carinae, anterior and posterior margins of pronotal disc, the four front legs above, and the hind tibia and tarsi. The dorsal line of the pronotum and abdomen is only faintly red in all specimens examined. The following are yellow:—A median dorsal stripe on the mesonotum, metanotum and abdominal terga (present to a lesser extent on the pronotal disc), the row of larger tubercles from the eye along the cheek and lateral margin of the pronotum, and a series of oblique, black-bordered spots on each side of the abdominal terga.

MEASUREMENTS : (in millimetres) :

	Length	Length of Pronotum	Length of hind Femur
♀ Neallotype	30	5	12.5
♂ Topotype	21	4	11

The maximum size of all material examined (see p. 120, footnote) is, for the female, 32 mm., and for the male, 23 mm. The minima are 24 mm. and 19 mm., respectively

NOTES: This species was described from a single, presumably discoloured, alcohol-preserved specimen from Nairobi (Sjöstedt, 1933), and specimens from the Chyulu Hills were subsequently referred to it by Uvarov (1941). Van Someren in the same paper notes, however, that the Chyulu specimens do not agree with material from Nairobi, and suggests that they may belong to a distinct species or race. The writer agrees with this view after comparing a series* from Nairobi, Thika, Yatta and Kabete with Chyulu specimens examined by Uvarov, for although the type specimen is not available, the material from the Nairobi-Thika area agrees with the description given by Sjöstedt, while the Chyulu specimens show at least two characters, *viz.*, the number of distinct pronotal sulci and the yellow granulation of the pronotal disc, in which they differ both from Sjöstedt's description and the Nairobi material. Other characters also differentiate the Chyulu material from that from Nairobi, and the former is herein described as *P. chyuluensis*.

PARASPHENA NAIIVASHENSIS n. sp. (Fig. 4).

TYPE: ♀, Naivasha, Kenya (00° 40' S. 36° 28' E., 6,230 ft.), July, 1937 (H. J. A. Turner).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, somewhat concave. Frontal carina sulcate almost to clypeus. Fastigium of vertex shorter than broad basally, parabolic anteriorly, sides slightly convex, divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of the head somewhat wrinkled. Cheeks with small tubercles, a row of larger tubercles extending from the eye to the lateral margin of the pronotum.

Thorax: Pronotum at widest point greater than its length. Pronotal disc and lateral lobes fairly regularly punctured; lateral lobes with a row of tubercles along the lateral margin. First pronotal sulcus obsolete on the disc; second, sinuous, placed slightly beyond the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus obsolete. Median and lateral carinae of the pronotum present but not markedly distinct; lateral carinae sub-parallel anteriorly divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum slightly more than half as long as metanotum, both together equal to the pronotum behind the first sulcus. Meso- and metanota distinctly punctured; both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrate, not longer than broad, their interspace twice the length of a lobe.

Tegmina and Wings: Absent.

Abdomen: Abdominal terga with a few minute scattered punctures only. Posterior margin of last abdominal tergum somewhat emarginate. Supra-anal plate triangular, slightly longer than wide basally. Cerci conical, slightly more than half as long as the supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate, the proximo-lateral angles being almost right-angles. Exposed base of dorsal ovipositor valves (lateral aspect) half as wide as exposed length. Ventral valves scarcely so, with well-developed apical hooks; lateral plates rather broadly triangular.

ALLOTYPE: ♂ (Same data as Type).

Agrees with the type in all essentials. Differs in that the pronotum at its widest point equals its length, the mesosternal lobes have their interspace scarcely wider than a lobe, the posterior margin of the last abdominal tergum is deeply emarginate medially, and the cerci are considerably more than half as long as the supra-anal plate. Subgenital plate acute. A more slender insect than the female.

*Nairobi (5,500 ft.), August and November, 1937 (M. Mallett), 2 ♀♀; and May, 1937 (Van Someren), 2 ♂♂.

Athi Plains near Nairobi (5,000 ft.), 20th June, 1946 (D. K. Kevan), 1 ♀, 1 ♂.

Thika (01° 03' S. 37° 05' E., 4,890 ft.), May, 1940 (M. Mallett), 5 ♀♀, 5 ♂♂.

Yatta (J. S. Marson), 2 ♀♀.—These specimens came from Yatta Military Camp, approx. 01° 10' S. 37° 37' E., about 4,500 ft., probably in 1942; they did not come from the Yatta Plateau to the South.

Kabete (01° 15' S. 36° 43' E., 6,200 ft.), Dec., 1940, (Van Someren), 1 ♂.

COLOURATION: The general colouration is olive-green, dark-green or grass-green. The antennæ are black, their bases being usually (though not always) red, at least below. The edges of the fastigium, the median carina of the head and pronotum, the anterior and posterior margins of the pronotal disc, the lateral pronotal carinæ and the hind tibiæ and tarsi are red. The dorsal line of the abdomen is only faintly red, as in *P. nairobiensis*. The following are yellow:—A narrow median dorsal stripe on the meso- and metanota and abdominal terga and the row of tubercles running from the eye along the cheek and lateral margin of the pronotal lobe. The series of oblique, black-bordered, yellow spots on each side of the abdominal terga, found in most of the species, are obsolescent in all the specimens examined.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	24	4.5	11.5
♂ Allotype	18	3.5	10

The maximum size for the eight paratypes in the Coryndon Museum (3 ♂♂ and 5 ♀♀, same data as type and allotype) is, for the female, 27 mm., and for the male, 19 mm. The minima are 21 mm. and 16 mm. respectively.

AFFINITIES: A species allied to *P. nairobiensis*, but differing from it in being rather smaller, in the rather finer and more regular puncturation of the pronotum and in the more distinct puncturation of the meso- and metanota. The face is rather less concave in all the specimens examined and there is no interstitial sulcus before the second sulcus on the pronotal disc.

Rehn (*loc. cit.*) notes that Bolívar reports *P. pulchripes* from Naivasha, the type locality of the present species, but questions the identification or the locality. If the latter be correct, it may be that Bolívar's record is referable to *P. naivashensis* although the resemblance of this species to *P. pulchripes* cannot be regarded as being close when compared with material from Kilimanjaro in the Coryndon Museum.

PARASPHERA MAUENSIS n. sp. (Fig. 5).

TYPE: ♀, Itare River, Kericho, Kenya (South-western Mau, 00° 36' S. 35° 17' E), 6,300 ft., Oct., 1943, (H. Copley).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, somewhat concave. Frontal carina sulcate, not reaching the clypeus. Fastigium of vertex almost as long as wide basally, parabolic anteriorly, sides almost straight, divergent posteriorly. Median carinula of occiput and vertex obsolescent. Upper surface of head very weakly wrinkled. Cheeks very weakly wrinkled and with a few small, low tubercles in a row from the eye to the lateral margin of the pronotum (reminiscent of *P. kinangopa* Uv.).

Thorax: Pronotum at widest point greater than its length. Pronotal disc rather finely and regularly punctured, the punctures being rather scattered. Lateral pronotal lobes covered with small tubercles, those on the lateral margin not forming a very definite row. First pronotal sulcus obsolete on disc; second, sinuous, placed beyond the middle; third slightly beyond three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus present, fairly distinct. Median carina of pronotum virtually absent, lateral carinæ only faintly indicated, irregular. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum half as long as metanotum, both together somewhat less than the pronotum behind the first sulcus. Metanotum excised posteriorly, mesonotum truncate. Puncturation of meso- and metanota only weakly defined. Prosternal tubercle low. Mesosternal lobes square, not longer than broad, their interspace almost twice the width of a lobe.

Tegmina
and *Wings*: Absent.

Abdomen: Abdominal terga with a few minute scattered punctures. Posterior margin of last tergum somewhat sinuous. Supra-anal plate triangular, rather longer than broad basally. Cerci conical, more than half as long as supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate, the proximo-lateral angles being right-angles. Exposed base of dorsal ovipositor valves (lateral aspect) about half the exposed length. Exposed base of ventral valves less than half exposed length, with well-developed apical hooks; lateral plates rather broadly triangular.

The single paratypic female [four miles N.W. of Mau Summit, Kenya (North-western Mau, 00° 08' S. 35° 42' E.), c. 8,500 ft., 15/5/1946, high grassy downs, (D. K. Kevan)] differs from the type in that the median carina of occiput, vertex and pronotum is a little more distinct, though still obsolescent and the row of tubercles from the eye across the cheek is rather more pronounced and continues more definitely along the lateral margin of the pronotum.

COLOURATION: Apart from the type and paratype, only three nymphs (2 ♀♀ and 1 ♂, same data as type) are represented in the Coryndon Museum collection. The general colouration of the adults is grass-green, darker above in the type. The antennæ are black, red basally. The edges of the fastigium, the posterior margin of the pronotal disc, the dorsal line of the abdomen (very faintly so), the median carina of the pronotum (in the paratype only) and the hind tibiæ and tarsi are light-red. The row of tubercles from the eye along the cheek and lateral margin of the pronotum is yellowish in the nymphs and paratype, but not in the type, while the row of oblique, black-bordered, yellow spots on each side of the abdominal terga is obsolescent in all.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	19	3.5	8.5
♀ Paratype	17	3	8

AFFINITIES: A small species, probably more closely related to *P. naivashensis* than to any other, but differing from it in its small size, rather longer fastigium, the sculpture of the head, pronotal disc and meso- and metanota being less distinct, and an interstitial sulcus on the pronotal disc before the second sulcus being fairly distinct and not obsolete. The lateral lobes of the pronotum, as seen from above, diverge rather more sharply behind the second sulcus than in allied species.

PARASPHENA KABURU* n. sp. (Fig. 9).

TYPE: ♀, Eldoret, Uasin Gishu, Kenya (00° 31' N. 35° 17' E.), 6,800 ft., 14/5/1946 (D. K. Kevan).

Antennæ: Somewhat shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face very oblique, rather concave. Frontal carina sulcate throughout, reaching almost to clypeus. Fastigium of vertex a little shorter than broad basally, parabolic anteriorly, sides slightly convex, divergent posteriorly. Median carinula of occiput and vertex weakly defined, obsolescent. Upper surface of head very weakly wrinkled. Cheeks almost smooth except for a row of tubercles extending from the eye to the lateral margin of the pronotum.

Thorax: Pronotum at widest point greater than its length. Pronotal disc with very fine, close, regular and rather shallow punctures which give it a smooth, dull appearance. Pronotal lobes finely granular, a row of tubercles being present along the lateral margin. First pronotal sulcos obsolete on the disc; second sinuous, placed behind

the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus, present, fine. Median and lateral pronotal carinæ only faintly indicated; lateral carinæ fairly regular, gradually divergent posteriorly from the anterior margin of pronotum. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum more than half as long as metanotum, both together equal to pronotum behind the first sulcus. Meso- and metanota with a few fine punctures only, both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrate, not longer than broad, their interspace about one and three-quarter times the width of a lobe.

Tegmina

and Wings: Absent.

Abdomen: Abdominal terga with a few minute scattered punctures only. Posterior margin of last abdominal tergum somewhat sinuous. Supra-anal plate triangular, as broad basally as long. Cerci conical, half as long as supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate, the proximo-lateral angles being right-angles. Exposed base of dorsal and ventral ovipositor valves about half the exposed length. Ventral valves with well-developed apical hooks; lateral plates broadly triangular.

ALLOTYPE: ♂ (Same data as Type).

Agrees with the type in all essentials. Differs in that the fastigium is blunter, the pronotum at its widest point equals its length, the interstitial sulcus of the pronotal disc is obsolete, the mesosternal lobes are slightly longer than wide, their interspace being about equal in width to a lobe, and the last abdominal tergum is deeply emarginate medially, while the supra-anal plate is longer than wide basally and the cerci are almost as long as the supra-anal plate. Subgenital plate acute. A more slender insect than the female.

COLOURATION: The general colouration is grass-green, or olive-green (a single ♂ paratype), paler below, usually darker above, the upper surface of the head and pronotum and the abdominal terga frequently being suffused dull purplish-red to a greater or lesser extent. Antennæ black, red at the base. The following parts are red or purplish-red:—the edges of the fastigium, the posterior and (usually) the anterior margin of the pronotum, the pronotal carinæ (sometimes; the median one usually, at least in part) and the posterior tibiæ and tarsi. The dorsal line of the meso- and metanotum and abdomen is narrow, red, sometimes only faintly so, and narrowly bordered with pale yellow. The row of tubercles from the eye along the cheek and lateral margin of the pronotum is yellow but the oblique, black-bordered, yellow spots of the abdominal terga are obsolescent in all specimens examined. The final instar nymphs, of which a series of twenty-three was collected (four of which, 3 ♀♀ and 1 ♂, were bred through to the adult stage a week later*) vary greatly in colour, being anything from pale grass-green to straw-brown or almost black, paler below, and usually with a dark dorsal line. The whole dorsum was purplish-red in two examples. The antennæ in all have the basal half bright orange, and the row of tubercles along the cheek and lateral margin of the pronotum yellow.

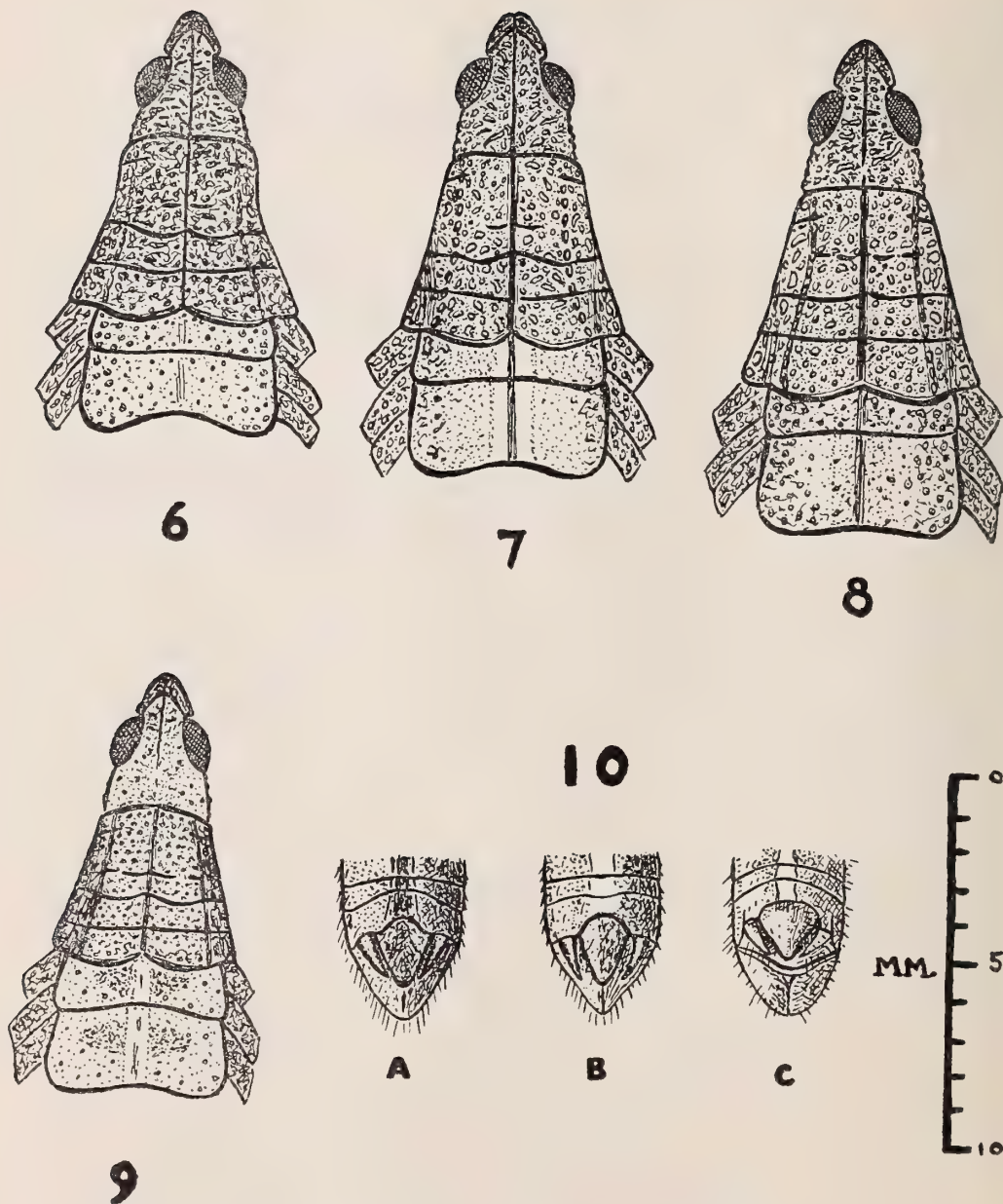
HABITAT: The material described herein was all collected in fairly short grass within the municipal area of Eldoret, the surrounding country being largely rolling downland. Nymphs were abundant but adults rather scarcer.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	22	4	10
♂ Allotype	18	3.5	10

*Swahili, a snail—The name used by natives for the South African "Dutch" who have settled extensively on the Uasin Gishu Plateau.

*These are not included among the paratypes.



Head and Thorax, Dorsal, Female Holotypes (Fig. 10 Tips of Abdomen, Dorsal, Male)

Fig. 6. *Parasphena ngongensis* n. sp.

Fig. 8. *Parasphena teitensis* n. sp.

Fig. 7. *Parasphena chyuluensis* n. sp.

Fig. 9. *Parasphena kaburu* n. sp.

Fig. 10 a. *Parasphena kamasiensis* n. sp.

b. *Parasphena elgonensis* Sjötedt.

c. *Parasphena cheranganica* Uvarov.

The maximum size for the thirteen paratypes collected (10 ♂♂ and 3 ♀♀; same data as type and allotype) is for the female, 25 mm., and for the male, 20 mm. The minima are 20 mm. and 17 mm. respectively.

AFFINITIES: This species is allied to *P. mauensis* and *P. naivashensis*. It can be distinguished from both by the very fine, close, regular and rather shallow puncturation of the pronotal disc which give it a smooth, dull or "matt" appearance not found in other species. From *P. naivashensis* it differs also in that the meso- and metanota are only very indistinctly punctured and the sculpture of the head is very weak, while an interstitial sulcus is usually present on the pronotal disc; from *P. mauensis* it differs also in its larger size, colouration and more distinct median pronotal carina, while the line of tubercles from the eye along the cheek and lateral margin of the pronotum is better developed and the divergence of the lateral pronotal lobes behind the second sulcus is more gradual.

PARASPHERA CHYULUENSIS n. sp. (Fig. 7).

TYPE: ♀, Chyulu Hills, Kenya (approx. 02° 40' S. 37° 55' E.), 5,400 ft., April, 1938, (Coryndon Museum Expedition).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, concave. Frontal carina sulcate, stopping considerably short of the clypeus. Fastigium of vertex slightly shorter than wide basally, parabolic anteriorly, sides slightly convex, divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head with small tubercles and a few small wrinkles. Cheeks with small tubercles, those in a line from the eye diagonally to the lateral margin of the pronotum larger.

Thorax: Pronotum at its widest point greater than its length. Pronotal disc and lobes covered with small granular, yellowish tubercles, a row of large tubercles on the lateral margins of the lobes. First pronotal sulcus obsolescent on the disc; second, sinuous, placed slightly behind the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus obsolescent. Median carina of pronotum distinct, lateral carinae distinct but rather less so than the median, sub-parallel anteriorly, divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum barely half as long as metanotum, both together almost equal to the pronotum behind the first sulcus. Puncturation on meso- and metanota more or less obsolete. Meso- and metanota both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrangular, very slightly longer than wide, their interspace one and three-quarter times the width of a lobe.

Tegmina and Wings: Absent.

Abdomen: Abdominal terga with a few minute, scattered punctures only. Posterior margin of last tergum slightly sinuous. Supra-anal plate broadly triangular, as broad basally as long. Cerci conical, slightly more than half as long as supra-anal plate. Subgenital plate with median projection of distal margin acute, lanceolate-triangular, the proximo-lateral angles being greater than right-angles. Exposed bases of dorsal and ventral ovipositor valves (lateral aspect) half as wide as exposed length. Ventral valves with well-developed apical hooks; lateral plates broadly triangular.

ALLOTYPE: ♂ (Same data as Type).

Agrees with the type in all essentials. Differs in that the pronotum at its widest point is equal to its length, the interstitial sulcus of the pronotal disc is obsolete, the mesonotum is over half as long as the metanotum, the meso- and metanota are finely punctured laterally, the inter-space between the mesosternal lobes is scarcely wider than a lobe, the posterior margin of the last abdominal tergum is deeply emarginate medially, and the cerci are almost as long as the supra-anal plate. Subgenital plate acute. A more slender insect than the female.

COLOURATION: The general colouration in the four specimens examined is blackish olive, the pleuræ suffused yellow. The antennæ are black except basally. The following parts are red:—Bases of antennæ, edges of fastigium, the anterior and posterior margins of the pronotal disc, the mid-dorsal line from the vertex almost to the anus and the hind tibiæ and tarsi. The lateral pronotal carinæ are also red anteriorly except in the type. The following parts are yellow:—The row of tubercles running from the eye along the cheeks and lateral margin of the pronotum, and a row of oblique, black-bordered spots on each side of the abdominal terga. Uvarov (1941) states that these spots are sometimes obsolete. The red dorsal line of the abdomen is widely bordered with yellow also in all the specimens examined.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	26	5	12
♂ Allotype	22	4	11
♂ Paratype	21	4	11
♂ Paratype	20	3.5	10.5

The paratypes have the same data as the type and allotype.

AFFINITIES: This species is related to *P. meruensis* but disagrees with the original description (Sjöstedt, 1909) in colouration, in the sculpture of the lateral pronotal lobes which is more or less uniform with that of the disc, and in the meso- and metanota not being distinctly punctured laterally. It is also related to *P. teitensis*, differing as mentioned under that species. From *P. nairobiensis* (under which name it was first recorded—see p. 120) it differs in that the median pronotal carina is more distinct and that the sculpture of the pronotal disc appears as small, raised, yellowish tubercles rather than punctures—the original puncturation having coalesced almost completely. The colouration, particularly of the dorsal line of the abdomen, also shows a difference in all specimens examined, the dorsal line being distinctly red, while in *P. nairobiensis* the red is indistinct or almost altogether lacking. The supra-anal plate of the male, unlike *P. nairobiensis*, is broadly triangular, not longer than broad basally. The presence or absence of a distinct interstitial sulcus on the pronotal disc is also of some value as a diagnostic character when compared with *P. nairobiensis*.

PARASPHERA TEITENSIS n. sp. (Fig. 8).

TYPE: ♀, Teita Hills, Kenya (approx. 03° 23' S. 38° 23' E.), 4,500-5,500 ft., 24/12/1945 (D. K. Kevan).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, somewhat concave. Frontal carina sulcate, reaching almost to clypeus. Fastigium of vertex slightly shorter than broad basally, parabolic anteriorly, sides convex, divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head covered with small tubercles and a few small wrinkles. Cheeks covered with small tubercles, a line of larger tubercles extending from the eye to the lateral margin of the pronotum.

Thorax: Pronotum at widest point greater than its length. Pronotal disc and lobes covered with small, yellow granular tubercles, those on the lobes being rather larger; a row of large tubercles on lateral margin of lobes. First pronotal sulcus obsolete on disc; second, sinuous, placed slightly beyond the middle; third at about three-quarters. Interstitial sulcus before the second sulcus of the pronotal disc present but very indistinct. Median and lateral pronotal carinæ distinct, the lateral carinæ sub-parallel anteriorly, divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum barely half as long as metanotum, both together less than pronotum behind the first sulcus. Puncturation on meso- and metanota coarse laterally, obsolescent medially. Meso- and

metanota both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes quadrate, not longer than wide basally, their interspace almost twice the width of a lobe.

Tegmina and Wings: Absent.

Abdomen: Abdominal terga with a few scattered minute punctures only. Posterior margin of last tergum emarginate. Supra-anal plate triangular, slightly longer than broad basally. Cerci conical, slightly more than half as long as supra-anal plate. Subgenital plate with the median projection of the distal margin acute, lanceolate, the proximo-lateral angles being almost right-angles. Exposed bases of dorsal and ventral ovipositor valves (lateral aspect) half as wide as exposed length. Ventral valves with well-developed apical hooks; lateral plates broadly triangular.

ALLOTYPE: ♂ (Same data as Type).

Agrees with the type in all essentials. Differs in the antennæ being almost equal to the head and pronotum together, the pronotum at its widest being equal to its length, the interstitial sulcus on the disc of the pronotum being obsolescent, the interspace between the mesosternal lobes being scarcely wider than a lobe and the cerci being almost as long as the supra-anal plate. Subgenital plate sub-acute. A more slender insect than the female.

COLOURATION: The general colouration is olive-green, emerald-green or grass-green above, paler ventrally. The dorsal aspect is usually dark olive; the pleuræ are suffused yellow, and the discs of the head and pronotum are suffused red. The antennæ are black except basally. The following are deep red:—The bases of the antennæ, the edges of the fastigium, the median carina of head and pronotum and the dorsal line of the abdomen, the lateral pronotal carinæ, and the legs (except for the hind femora) at least above. The following are yellow:—The line of tubercles from the eye along the cheek and lateral margin of the pronotum, and a series of oblique black-bordered spots on each side of the abdominal terga.

HABITAT: The species has been observed by the writer in several parts of the Teita Hills (which rise to over 7,000 ft.), where it seems to favour shrubby vegetation in small clearings and open spaces such as roadsides in the forest and in plantations, rather than the completely open grass and heath land in which it also occurs. It has not been observed below 4,000 ft. nor above 6,000 ft. The specimens collected with type and allotype (10 ♀♀, 5 ♂♂ and 3 nymphs) were all taken between 4,500 and 5,500 ft., and three females already in the Coryndon Museum came from the centre of the area covered by the writer (Wundanyi, 5,000 ft., March, 1939). All these are paratypes.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	25	5	13
♂ Allotype	21	4	12

The maximum size of the paratypes mentioned is, for the female, 30 mm., and for the male, 21 mm. The minima are 21 mm. and 18 mm. respectively.

AFFINITIES: Without specimens for comparison, it is not certain that *P. teitensis* might not prove to be a sub-species of *P. meruensis*, but it differs sufficiently from the description of that species given by Sjöstedt (1909) to be described herein as distinct.

It is very closely related to *P. meruensis*, differing from Sjöstedt's description in its somewhat larger size, its more distinct pronotal carinæ and in its colouration—particularly of the pronotal carinæ which are very distinctly red. It is also allied to *P. chyuluensis*, agreeing with it in the form of the sculpture of the pronotal disc, but differing in the shape of the supra-anal plate, in the more distinct lateral carinæ of the pronotum, the slightly longer hind femora, the longer antennæ of the male, and the more distinct, coarser puncturation on the meso- and metanota which together are considerably shorter in comparison with the pronotum in the present species. The colouration in all specimens examined differs from *P. chyuluensis*, particularly in the dorsal line of the abdomen being very distinctly red and not bordered with yellow.

PARASPHERA NGONGENSIS n. sp. (Fig. 6).

TYPE: ♀, Ngong Hills, Kenya (01° 25' S. 36° 38' E.), 8,000 ft., May 1939, (Coll. ?).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, concave. Frontal carina sulcate, almost reaching clypeus. Fastigium of vertex slightly shorter than wide basally, parabolic anteriorly, sides slightly emarginate, divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head with small tubercular wrinkles. Cheeks with small tubercles, three or four larger ones in a line from the eye to the lateral margin of the pronotum.

Thorax: Pronotum at widest point greater than its length. Pronotal disc somewhat irregularly punctured; lateral lobes covered with small tubercles, not larger along the lateral margin and not forming a distinct row. First pronotal sulcus obsolete on disc; second, sinuous, placed slightly beyond the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus, obsolescent. Median and lateral carinæ of pronotum present but not markedly distinct; lateral carinæ sub-parallel anteriorly, divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum half as long as metanotum, both together equal to pronotum behind first sulcus. Puncturation of meso- and metanota distinct. Meso- and metanota both emarginate posteriorly, the metanotum more so than the mesonotum. Prosternal tubercle low. Mesosternal lobes distinctly wider apically than basally, truncate, as long as wide, the interspace at the base being almost twice the width of the base of a lobe, and at the apex, only about one and a half times the width of the apex of a lobe.

Tegmina and Wings: Absent.

Abdomen: Abdominal terga with a few minute scattered punctures only. Posterior margin of last tergum broadly emarginate. Supra-anal plate broadly triangular, scarcely longer than its width basally. Cerci conical, about half as long as the supra-anal plate. Median projection of the distal margin of the subgenital plate acute, lanceolate, the proximo-lateral angles being almost right-angles. Exposed base of dorsal ovipositor valves (lateral aspect) about half as wide as the exposed length. Exposed base of ventral valves less than half as wide as exposed length, with well-developed apical hooks; lateral plates rather narrowly triangular.

ALLOTYPE: ♂ (Same data as Type).

Agrees with the type in all essentials. Differs in that the pronotum at its widest point is equal to its length, the tubercles on the lateral margins of the pronotal lobes are more distinct and form a more definite row, the lateral carinæ of the pronotum are rather less distinct, the last abdominal tergum is deeply excised medially and the cerci are almost equal in length to the supra-anal plate. Subgenital plate acute. A more slender insect than the female.

COLOURATION: The general colouration is olive-green, grass-green or yellow-green, sometimes dark olive dorsally. Antennæ black except at base, the upper surface of the head and the four front legs may be suffused red (type only). The bases of the antennæ, the edges of the fastigium (usually), the posterior margin of

the pronotal disc (in all but one) and the hind tibiae and tarsi are red. The pronotal carinae and the anterior margin of the pronotal disc may sometimes be red also. A rather narrow dorsal stripe on the abdominal terga and sometimes the pronotum is yellow (occasionally obsolete), and there is a row of oblique, black-bordered, yellow spots on each side of the abdominal terga which may or may not be obsolete. The row of tubercles running from the eye along the cheek and lateral margin of the pronotal lobe may be yellow or not (usually depending on the extent to which the tubercles are developed).

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♀ Type	25	5	12
♂ Allotype	19	3.5	10

The maximum size for the thirteen paratypes in the Coryndon Museum (5 ♂♂, 8 ♀♀, same data as type and allotype) is, for the female, 26 mm., and for the male, 20 mm. The minima are 22 mm. and 18 mm. respectively.

AFFINITIES: This species is somewhat similar to *P. nairobiensis* on the one hand, and to *P. keniensis*, to which it seems to be most closely related, on the other. It differs from the latter when compared with specimens from Mount Kenya*, which agree with the description given by Sjöstedt (1912), by its larger size and longer fastigium. The interstitial sulcus of the pronotal disc is obsolescent or absent, while in all the specimens of *P. keniensis* examined, it is more or less distinct. From *P. nairobiensis* it differs in colouration, in the narrower lateral plates of the ventral ovipositor valves the shape of the mesosternal lobes, the more tuberculate sculpturing on the lateral lobes of the pronotum with the row of tubercles on the lateral margin less distinct or even obsolete, and the distinct puncturation of the meso- and metanota.

PARASPHERA KAMASIENSIS n. sp. (Fig. 10A).

TYPE: ♂, Kabarnet, Baringo District, Kenya (Kamasia Hills, 00° 30' N. 35° 33' E., 7,070 ft.), January, 1944 (Museum Staff).

Antennæ: Shorter than head and pronotum together, filiform, slightly depressed basally.

Head: Face oblique, concave. Frontal carina sulcate, almost reaching the clypeus. Fastigium of vertex slightly shorter than wide basally, semicircular anteriorly, sides almost parallel, not divergent posteriorly. Median carinula distinct on occiput and vertex. Upper surface of head somewhat wrinkled. Cheeks with a series of tubercles from the eye to the lateral margin of the pronotum.

Thorax: Pronotum at widest point equal to its length. Pronotal disc shallowly punctured; lateral lobes with small irregular tubercles, a row of larger tubercles along the lateral margin. First pronotal sulcus obsolete on the disc; second, slightly sinuous, placed beyond the middle; third at about three-quarters. Interstitial sulcus on the pronotal disc before the second sulcus, obsolete. Median and lateral pronotal carinae obsolescent; lateral carinae parallel anteriorly, divergent posteriorly. Posterior margin of pronotum with an obtuse excision whose sides are broadly convex. Mesonotum two-thirds as long as metanotum, both together slightly less than pronotum behind first sulcus. Puncturation of meso- and metanota shallow, scattered. Meso- and metanota both emarginate posteriorly, the mesonotum to about the same degree as the metanotum. Prosternal tubercle low. Mesosternal lobes a little longer than broad, their interspace slightly greater than the width of a lobe.

*Mount Kenya, 10,500 ft., Nov., 1943 (J. & P. Bally), 8 ♂♂, 14 ♀♀, 2 juv., and Jan., 1944 (J. Bally) 1 ♂, 3 ♀♀.

Marana, (N. slopes of Mt. Kenya, c. 8,000 ft.), May 1944 (J. Adamson), 3 ♂♂, 7 ♀♀.

Thiba Camp (S. slopes of Mt. Kenya), 6,800 ft., Jan., 1943 (H. Copley), 3 ♂♂, 9 ♀♀.

Tegmina
and *Wings*: Absent.

Abdomen: Abdominal terga with a few minute scattered punctures only. Posterior margin of last tergum deeply emarginate. Supra-anal plate broadly triangular, almost as wide basally as long. Cerci conical about two-thirds as long as supra-anal plate. Subgenital plate slightly obtuse.

COLOURATION: The general colouration of the type is dark olive-green above, paler below. Antennæ black. The following parts are red:—The bases of the antennæ, the edges of the fastigium, the anterior and posterior margins of the pronotal disc, the median pronotal carina, the tip of the supra-anal plate, the dorsal line of the abdomen and the hind tibiæ and tarsi. The dorsal line of the abdomen is narrowly and faintly bordered yellowish. The oblique lateral spots of the abdominal terga are obsolete.

MEASUREMENTS (in millimetres):

	Length	Length of Pronotum	Length of hind Femur
♂ Type	16	3	9

AFFINITIES: This species is closely allied both to *P. elgonensis* and to *P. cheranganica*. It differs from specimens of the former from Mount Elgon (kindly lent for study by the Entomology Section of the Uganda Department of Agriculture—Fig. 10B) in the rather wider supra-anal plate of the male, which is, however, narrower than that figured by Uvarov (1938) in his description of *P. cheranganica* (Fig. 10c). From the male of the latter species the type of *P. kamasiensis* also differs from Uvarov's description in that the interspace between the mesosternal lobes is rather wider than, and not narrower than the width of a lobe, in which it agrees with *P. elgonensis*. The bright red dorsal line of the abdomen also distinguishes this species from both. The type is unique.*

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* Since the above went to press a single female topotype (some data as type) has come to light.

OCCASIONAL NOTES.

PRELIMINARY REPORT ON BREEDING *NOTHOBRANCHIUS TAENIOPYGUS* IN CAPTIVITY. On April 18th, 1942, ten specimens of *Nothobranchius* came into my care. The fish had been sent to Nairobi from Old Shinyanga in Tanganyika. There were one adult cock, and two young ones and of the seven hens only one was fully grown.

The cocks are strikingly coloured fish, blue being the dominant hue. The throat and lower part of the gill plates are pale blue shading into a dark blue towards the back and caudal fin, each scale, which is large for the size of the fish, approximately 3 inches, being edged with black. The pectorals are edged for about 1/10th of an inch with a bright iridescent blue which is very striking as the fish continually waves them. The anal fin is edged with a black band and in contrast with this is a band of bright yellow, this black and yellow is carried out also in the pelvic fins which are very small. The dorsal and caudal are dark blue showing greenish spots in a good light.

The hens are not brightly coloured, being olive green on the back shading into silver underneath.

On taking over these fish the adult cock was placed in an aquarium together with the adult hen and three young hens which were about half-grown. The aquarium was 20 inches long, 10 inches wide and 8 inches deep having glass in the front only and being covered by a piece of glass painted green as the situation caught the direct sun for about two hours each morning. The bottom of the aquarium was covered with sand and planted with anacharis and had been standing for some months so the water was well aged. This latter point is considered important as other fish placed in newer water showed definite signs of discomfort.

Chopped earth worms were fed and taken readily by the fish, some young *Lebistes* were also fed but except for one which was snapped up on being put in the aquarium the remainder were ignored and ultimately removed. Mosquito lava are eaten but it appears that the fish consider them rather too much trouble to bother about and at times houseflies are taken from the surface, but the popular food is worm.

On May 1st the fish commenced spawning, the glass front had become covered with algae and half was scraped to allow a clear view and it was noticed that all spawning took place at the cleared end so the balance was removed and the fish spawned the full length of the tank.

The cock spent his time over the clear patch of sand in front of the aquarium and did not appear to make any effort to drive the hens towards the spawning bed. When a hen was ready to lay, and the adult and two of the young ones started together, she swam down to the bottom and chose a place, the cock then swam beside her and bent his large dorsal fin over her back, it does not seem to matter which side the hen may be. The hen then works her anal fin into the sand and remains in this position for a moment and then a distinct downward thrust is given. Although the fish laid many times close against the glass it was not possible to see if there was any form of ovipositor brought into action. It was noticed however, that the three hens that were spawning developed a white patch that looked like fungus at the lowest point of the anal fin, this may be unnatural and brought about by the sand being too coarse and hard, although it was noticed that the fish avoided spawning in the patches of soft sediment at the bottom of the aquarium.

Spawning which started on May 1st is continuing each afternoon between 2 p.m. and 6 p.m. until to-day, May 12th, and as three hens are at work there must be a large number of eggs buried in the sand.

Major Cade.

SOME INTERESTING MAMMALS FROM THE MAU. Whilst arranging the Mammal collections of the Coryndon Museum my attention was drawn to some good skins of the Yellow-backed Duiker (*Cephalophus silvicultor*). Unfortunately most of these skins have no data regarding the original locality where they were collected. For this reason their identification was always doubtful.

Lately Mr. R. M. Graham of the Forest Department, Londiani, sent to this Museum a skin with horns (but lacking the skull) of the Yellow-backed Duiker collected on the Mau. This record is very interesting because it shows a very eastern distribution of the species. In fact the Yellow-backed Duiker was known as a western Antelope, represented by two forms only. According to modern mammalogists (G. M. Allen: A check list of African Mammals, *Bull. Mus. Comp. Zool.* 83, Feb. 1939) there are the typical one *Cephalophus silvicultor silvicultor* (Afzelius) and the eastern race (*Cephalophus silvicultor ituriensis* M. de Rothschild and Neuville). The type of the former comes from Sierra Leone but it is distributed according to Miss J. St. Leger (St. Leger, Species and sub-species of the sub-genus *Cephalophus*, *Proc. Zool. Soc. London*, April, 1936) throughout Sierra Leone to Gaboon and Angola: Congo forests to Northern Rhodesia. The Ituri Yellow-backed Duiker is a sub-species differentiated from the typical one by its smaller size; three specimens having been collected on Mt. Sabinio and in British Ruanda (Phillips). The geographical distribution of this race has been indicated by Miss J. St. Leger as Ituri Valley to British Ruanda. No specimens have been quoted as far eastward as the Mau in Kenya Colony.

The systematical position of the Mau Yellow-backed Duiker is a mammalogist's task and will be worked out when good series of skins complete with skulls are secured; but the occurrence of this antelope on the Mau is very interesting both for the geographical and ecological problems which are concerned. These problems could be discussed together with those referring to another very rare and large mammal showing a very analogous and similar distribution, the Golden Cat (*Profelis aurata*). Also the Golden Cat was sub-divided into two forms: the typical one (*Profelis aurata aurata* Temminck) from the Sierra Leone and the other, the Cotton's Golden Cat (*Profelis aurata cottoni* Lydekker), considered by G. M. Allen as a valid race, from the Ituri Forest, Belgian Congo.

The Golden Cat is about the size of a Dwarf Leopard but with upper parts uniform in colour and the underside spotted. This animal shows a singular dichromatism appearing in different coloured phases in both its races, ranging from a dark brown and red phase to a grey one.

In the Coryndon Museum Collection there is one skin of the Golden Cat from the Mau and another one is in the Game Department Office of Nairobi, from the same locality. Both are devoid of skulls. The occurrence of the Golden Cat in Kenya was unknown except to the Kenya Game Authorities. Mr. H. Copley was interested in securing good specimens and skulls in order to send them to the British Museum for identification but his efforts have not been successful up to the time of writing. The Golden Cat seems to be a very rare animal on the Mau and very difficult to collect being known only to very few native chiefs. At present it is therefore impossible to say if the Golden Cat from the Mau belongs to the Ituri race (*Profelis aurata cottoni*) or to a distinct one. Both the skins in Nairobi show the reddish phase. Apart from the systematical importance of these records I want to allude to their zoo-geographical and ecological value as I have pointed out above.

In the main the East African fauna is regarded as more related to the South African one than to that of West Africa. The affinities between the West and the East African forms are relatively scarce, particularly when we consider Kenya territory. In this case the geographical problem is so strictly linked with the ecological one that we must deal with them close together.

Both the Yellow-backed Duiker and the Golden Cat are animals inhabiting the tropical rain forests of Western Africa and of the Congo, which in general do not

occur in East Africa. Pitman (1938) writes that "A hundred years ago the 'Rain' influence was predominant in the great part of Uganda south and west of the Victoria Nile, as well as in the coastal forests of Busoga, extending easterly as far as the Kakamega Forest, south of Mt. Elgon, in Kenya Colony." But the Mau, I suggest, may be a more important "forested island of western influence." In fact the Mau forest is probably one of the largest remnants of the primeval forest in Kenya where some forms of the typical rain-forest and of the temperate one, offering the typical habitat occurring in the West, may again be found. In this environmental live, though in small numbers and probably decreasing, the remainder of a fauna of wet and forested country once more widely spread.

The study of these forms is therefore of the utmost interest and merits thorough examination in such a place as the Mau forest.

A. TOSCHI,
Coryndon Museum.

ON THE RACES AND THE GEOGRAPHICAL DISTRIBUTION OF THE EAST AFRICA AND UGANDA SERVALS. It is generally thought by mammalogists that there are two species of African Servals (Sub-genus *Leptailurus* Severtzow): the Small-spotted Serval (*Felis brachyura*) and the Large-spotted one (*Felis serval*), both sub-divided in a certain number of forms; although some suggest that the Small-spotted Serval may be "possibly merely an alternative form of Serval rather than a distinct species." This opinion may be supported or disproved according to the occurrence in the same locality, or in very near ones, of Small-spotted Serval together with Large-spotted ones.

As a matter of fact the geographical distribution of Servals is not well known especially the Small-spotted ones. Three races of the Small-spotted Serval are actually recognized: the typical one (*Felis brachyura brachyura* Wagner) from West Africa (type from the Sierra Leone); the Uganda Small-spotted Serval (*Felis brachyura pantasticta* Pocock); and *Felis brachyura liposticta* Pocock. The former was described by Pocock; (P.Z.S., London, Oct., 1907) as showing small spots on the upper parts and streaked neck over a rich yellow ground colour, from a specimen from Entebbe, Uganda. *Felis brachyura liposticta* was described by the same author as distinct from the former because of the evanescence of the spots on the dorsal area, nearly uniform in colour. The type locality is said to be Mombasa; but, as supports G. M. Allen (1939) "Mombasa is merely the port of shipment, hence the type may have come "perhaps from some B.E.A. place on the Mombasa and Uganda Railway." The exact type locality of this form and its range were therefore unknown.

In the Coryndon Museum Collection there are some Small-spotted Serval skins. Two of them refer to *Felis brachyura pantasticta* from Uganda (Mubendi; Mguzi, Buhengere) and another to *Felis brachyura liposticta* from Toro, Uganda.

I will not discuss here the validity of *Felis brachyura liposticta* as distinct from *Felis brachyura pantasticta*, but I think that the record of the former from Toro throws light on the possible range of this form and is the first sure record known regarding the true distribution of this race.

I suggest that the general arrangement of the E. African and Uganda Servals may be as follows: The Large-Spotted Serval with two recognised races in Kenya: *Felis serval hindei* inhabiting the eastern parts of the Colony and *Felis serval kempfi* the western ones. Possibly in some north-eastern parts of Kenya other races such as *Felis serval ferrarii* de Beaux may occur, but we have at present very few records from those Districts. Yet it is necessary to add that the Large-Spotted Serval is subjected to a great deal of individual variability and that in the Coryndon Museum collection there is a skin from the Mau showing smaller spots than is usual in this species. In Uganda the two species may occur: the Small-spotted Serval with the two races mentioned above: the wide-spread *Felis brachyura pantasticta* and *Felis brachyura liposticta* possibly inhabiting the more westerly parts of Uganda,

bordering on the Congo. Probably in the north-eastern districts of Uganda some races of the Large-spotted Serval occur as well, such as *Felis serval kempi*; but, as far as I know, no Small-spotted Serval has been found in Kenya, and this species must be regarded as a western form.

A. TOSCHI,
Coryndon Museum.

THE SAW-SCALED VIPER (*Echis carinatus*) IN KENYA. Among a collection made by the Coryndon Staff at Garissa K.C., in 1943, there is an interesting snake belonging to the family, Viperidæ, which I identified as *Echis carinatus* Schn. after a close examination.

It is a rather short specimen measuring 420 mm. in length (40 mm. belonging to the tail). The head, beginning with a very short and round snout is rather distinct from the body, which is cylindrical, ending with a short tail, and is covered with small embricate scales. 8-10 scales across from eye to eye; 15 scales surround the moderate eyes showing a vertical pupil. A narrow and long supraocularis is present. The nostrils are opened into nasals divided by two shields in contact with the rostral; 10 upper labials and three lower labials in contact with the chin-shields. Midbody scalerow 27; (the scales are keeled with apical pits; the lateral ones being smaller and oblique). Ventrals 179. Anal entire. Subcaudals 29. This specimen is pale buff-reddish in colour above with three series of whitish dark-edged spots and some dark zig-zag spots running along each side. Two Y-shaped superimposed markings are present on the head; the lower parts are uniformly whitish. This description corresponds on the whole with that given by Boulenger except that this specimen seems rather smaller compared with the measurements reported by him.

The Saw-scaled Viper is said to inhabit desert and sandy districts of Africa north of the Equator and Southern Asia. *Echis carinatus* has been reported from North Africa, Persia, India and Somaliland. In his Check list of Reptilia recorded from East Africa (1924) Loveridge did not include this snake as occurring in Kenya and I don't find this species in the reports of his other expeditions in East Africa; but Pitman (1939) states: "It is through the desert zone or along its borders that a distinct asiatic influence, well instanced by the Saw-scaled Viper (*Echis carinatus*) . . . has crept into North-Eastern Africa . . . species which have been obtained in adjacent Turkana . . . include the Saw-scaled Viper." Yet the record from Garissa enlarges southwards the range of this very interesting asiatic form and is, until now, the most southern one ever reported (1°, 30' S.) in Africa.

Practically this Viper is very little known in Kenya, but possibly more widespread than one may suppose especially in the low north-eastern districts. It is worth while to remember that the northern and eastern parts of the Colony show clear affinities with the Somali fauna and that the Saw-scaled Viper is very common and characteristic of the sand desert and thorn bush country of Somaliland. The limits of the diffusion of this fauna are very interesting from the zoogeographical point of view.

The Saw-scaled Viper or Carpet Viper is a very offensive snake. According to Corkill report (1935) "In only 15, out of 235 cases of snake-bites were the offending snakes secured and identified, the Carpet Viper comes first with 10 cases . . ."

The Garissa specimen, cast in plaster by Mr. H. J. Allen Turner, is on view in the Snakes Exhibit of the Coryndon Museum Hall.

A. TOSCHI,
Coryndon Museum.

NOTES ON SOME LITTLE KNOWN NESTING BIRDS FROM OLORGASAILIE. During the Easter Holiday 1945, at Dr. L. S. B. Leakey's Excavation Camp of Ologasailie (Masai Reserve) I got the opportunity of some observations and remarks on the local nesting birds. Birds living in the low parts of the Masai

Reserve are generally less known, from the biological point of view than those inhabiting the near highlands and the Nairobi neighbourhood and I think it will be useful to give a short account of some of them.

The Kenya Scarlet Sunbird (*Chalcomitra senegalensis lamperti* Reichenow) is a common bird at Ologasailie where I collected some specimens in 1943 and 1944. When I visited the place in April, 1945, spending a fortnight there, my friends, Italian Co-operators working there, showed me a nest of a Sunbird hung up on the kitchen roof of the Camp. Looking at it, after a short wait, I recognized a female Kenya Scarlet-breasted Sunbird entering it and its mate waiting near there. Asking my friends I perceived that this bird had built up a nest on the small acacia tree very close to the kitchen on the northern side. From this side the prevailing wind blew boisterously and the nest fell down. It was for this reason that the bird started to build the new nest inside the kitchen itself, sheltered from the wind. The kitchen of the Ologasailie Camp is a clumsy building of poles and branches covering about six square yards and two yards high covered with oil-cloth suspended and kept in place by poles and wires. The nest was built and attached to one of these poles below the roof and just a few feet above the fire-place on the southern side. It was an oval-shaped structure, 175 mm. high and 100 mm. wide, with an entrance at one side opening laterally and showing a major vertical diameter of 48 mm. The nest was suspended and attached by a short peduncle 65 mm. long. No beard was present as in other Sunbird nests. The materials used in construction were dry grasses, leaf blades, bark fibres, dead leaves, cotton threads, woven together with cobwebs and cotton silk. The inside was very soft, lined with papus of Compositæ such as *Notonia* or *Senecio*.

In spite of the fact that the nest was situated in a very conspicuous place the birds always seemed rather shy, preferring to visit it when the cook was absent from the kitchen. On 30th March there were two spotted eggs inside the nest and the bird was sitting. I did not touch them because I did not wish to interfere with the normal breeding; but a week after I was very sorry to notice that no eggs were in the nest and that it showed a gap opposite to its entrance. I supposed the nest was raided by some snake preying on bird eggs. About a fortnight later specimens of the following snakes were collected in the Camp: *Eryx colubrina loveridgei*, *Rhamphiophis rostratus* and *Naia nigricollis* probably attracted by the breeding Domestic Pigeons upon which they were observed to prey. To one of these Snakes I attribute the destruction of the nest of the Kenya Scarlet-breasted Sunbird.

I don't find either in Jackson (1938) nor in van Someren nor in any other authors' writing about E.A. birds any notes on the nesting habits of this bird, but only some records concerning the allied Uganda Scarlet-breasted Sunbird (*Chalcomitra senegalensis equatorialis* Reichenow) and the East Coast one (*Chalcomitra senegalensis inaestimata* Hartert).

Records of Sunbirds nesting inside human buildings are very rare.

The East African Sparrow-lark (*Eremopteryx leucotis madaraszii* Reichenow) is plentiful in the Masai Reserve including Ologasailie Camp, where it is met with during most of the year congregated in flocks and, being very tame, feeding among the tents and the small wooden huts, quenching its thirst at the watering-troughs of the Camp. At the end of March, 1945, the flocks were broken down into pairs and the birds were fully displaying and giving vent to harmonious song on the wing or on some conspicuous perching place. The females appeared to be good songsters. In spite of the fact that round the Camp in the open grass-lands scattered with thorn bushes the nesting East African Sparrow-larks were very plentiful, only after some days of search did I find a nest, about fifty yards from the tents. It was a cup-shaped structure placed on the ground very near to a path leading to the Camp and just close to a tuft of dry grass. It was not very easy to see it. Its size was rather small; the inner diameter measuring about 65 mm., the outer one 75 mm. The nest was about 35 mm. deep. The materials used in the nest construction consisted

of dry grass and leaves, the inner ones particularly fine and thin but it did not appear especially lined. At the base I recognised some cotton threads. Two eggs were inside the nest when the sitting hen flew away. They were whitish in ground colour slightly washed with green-grey and spotted brown and grey-mauve especially round the thick end. They measure respectively 19.4 x 12.8 mm. and 19.2 x 12.8 mm. I collected the eggs and brought them in the Coryndon Museum, being the first eggs of *Eremopteryx leucotis madaraszii* in the Collection. I did not find in Jackson any data or reference about the nesting habits of this species, but what little is known concerning the allied species, *Eremopteryx leucopareia* Fischer and Reichenow, does not seem to differ very much from the above account.

Some ornithologists, such as van Someren, recognize about three races of the Masked Weaver (*Ploceus intermedius* Rüppell) in Kenya. The Olorgasailie birds belong probably to *P. i. littoralis* or are intermediate between this and *P. i. kisumi*. I will not discuss the question of the systematic position of this bird but rather give some notes about its biology which seem to be very scarce.

In fact, looking for references concerning this bird, I read only that "Dr. Van Someren found this Weaver nesting in June alongside *S. spekei* near Kisumu, but gives no further details. Captain Pitman states (on the label of a pair sent to the British Museum) that he found a small breeding colony of about twelve nests at the top of a grassy hill by a rock pool in otherwise waterless country. This was on 20th October between Katona and Magabbi in southern Ankole" (Jackson, 1938).

The Masked Weaver did not seem to me a very common bird during my preceding visits at Olorgasailie in August 1943 and August 1944, but at the end of March 1945 I found a rather big nesting colony comprising about 60-70 nests hanging from the bush branches over some water pools. These pools were the remains of the stream near the Camp which had been running a fortnight before, but at that time (29th March) drying up. The nests were at a variable height from the ground because the bushes of *Salvadora persica* to which they were hung grow on the escarpments of the river and were for the most part difficult of access when the stream was running. When at first I examined the colony the breeding birds were at the end of their task, all the eggs having hatched, and I found only some shells on the ground, undoubtedly belonging to this bird. They were pure white in colour. Some nests were empty and showing traces of the ended brood; some others half-built and probably not used. In most cases two or three nestling birds were inside, well covered with feathers, only a few nests contained nearly naked birds.

I want to point out also the particular nest building about which I don't find any notice in the literature. The heart-shaped nests showed an outer structure with a major diameter of 127 mm.; the entrance being from below at one side protected by a vestibule about 25 mm. long. Sir Charles Belcher told me that this vestibule is usually longer; but in the Olorgasailie colony it was rarely longer than 25 mm. and generally shorter. We can find an explanation of this fact in the hot and dry country with shortage of temporary water and, in consequence, hurry on the part of the building birds to bring to an end the brood before the complete drying up of the pools. In fact when I started from Olorgasailie on 12th April the pools had just dried up, the end of the nesting colony having exactly coincided with the vanishing of the water to which it was connected. Inside the outer heart-shaped structure of interweaved grasses (principally Gramineæ such as *Setaria* sp., etc.) the nests showed an inner cup-shaped one of soft pappus placed in the closed bottom.

The colony was always a very noisy one with plenty of birds, not only belonging to the nesting species but also to other different birds attracted to the water as well as by the nesting population. Some large flocks of the Chestnut Weaver (*Ploceus rubiginosus* Rüppell) resting among the branches to which the nests of the Masked Weaver were hung were apparently not attacked by the nesting birds, showing little intolerance or aggressiveness. Close to the colony I met with a certain number of preying specimens living and feeding on the eggs, nestling birds, fallen and dead

birds and other refuse of the colony. I observed a snake probably a Sharp-nosed Snake, *Rhamphiophis rostratus*, entering a nest and gliding away at my sight, taking refuge in the thick bushes covering the sides of the stream. One day I surprised a Crowned Hornbill (*Lophoceros melanoleucos* A. H. Licht) flying away and carrying a nestling Masked Weaver in its beak. Twice I watched a troop of about 8-9 Dwarf Mongoose (*Helogale undulata rufula*) running along the slope of the stream just below the hanging nests and I observed fresh tracks of some Genet, probably the Maned Genet (*Genetta genetta neumanni*) on the mud of the stream bed.

A. TOSCHI,
Coryndon Museum.

BLACK HYRAX. On June 1st, 1945, a black skin arrived in a consignment of hyrax skins from a local furrier. Comparing it carefully with the others, I saw that the head-shape, nose, ears and whiskers conformed with those of a hyrax: also the gland in the middle of the back was clearly indicated. The fur was jet-black all over with a very fine lustre, particularly on the top hair. The owners of the skin informed me that it came from somewhere in the neighbourhood of Moshi; but could not be more definite.

Before making it the subject of a note to the Journal, I took the skin to the Coryndon Museum and to the Game Department in order to obtain expert opinion and I found that nobody had ever seen a black hyrax. Most of those who examined the skin agreed with me that there were strong indications that the skin was that of a hyrax: but that without a skull it was not possible to identify the specimen with certainty. I was still considering the advisability of publishing a note when a second black skin made its appearance, this time July 23rd, 1945, from Lushoto. Like the first, it was lustrous, jet-black, but with indications of pure white underneath.

It is suggested that readers should look out for the occurrence of further black hyrax and, should any be discovered, send the skin and the skull to the Coryndon Museum. For the guidance of such as may not know how to prepare the skin for transit:—

- i. shade dry the skin.
- ii. after removing brain, eyes, tongue and cheek muscles, place the skull in a cigarette tin, pour dry dairy salt over it and fill the tin. Do not dislocate the jaws. Both skin and skull should be labelled with the date, locality, sex of animal and collector's name.

M.A.B.

NOTES ON SNAKES. On two occasions specimens of Bibron's Burrowing Viper (*Atractaspis bibroni*) when captured, attempted to use their fangs. Their method was as follows. The snake placed its throat upon the object of attack with its head overlapping. It then drew its head sharply downwards and backwards and the fangs, which were protruding downwards and slightly backwards on each side of the lower jaw, which appeared to be contracted inwards, were thus driven into the object of attack.

The Black-necked Cobra (*Naja nigricollis*) does not always rear up and spread its hood before "spitting" though it frequently does this. It may "spit" from any position and when doing so does not seem to open its mouth very wide; but rapidly opens and closes it, ejecting its venom as it does so.

The Common Mamba (*Dendroaspis angusticeps*) does not seem to be normally aggressive in the Southern Province of Tanganyika Territory. They can usually be tackled and caught without attempting to attack and even when penned-up in a hole and unable to escape, have allowed themselves to be noosed and pulled out without showing fight. On one occasion three large specimens were caught in this way and

on another occasion one large specimen. As regards colour, the lighter coloured specimens seem frequently to run larger than the darker forms, unlike what appears to be the case in South Africa.

C. J. P. IONIDES.

ALSEONAX MINIMUS PUMILUS AND LAMPROMORPHA KLAASI.

The cuckoo was calling for some time in the vicinity of the flycatcher's nest before the eggs were taken. The flycatcher's nest was placed near the end of a low branch of a *Grevillea* tree about ten feet above the ground. The nest itself was a small cup-shaped structure made of dry grass, dead *Grevillea* leaves and lichen. It was lined with white feathers and down. The little cup in which the eggs lay had a few curved feathers covering the eggs. The eggs were three in number, two flycatcher's and one cuckoo's. The flycatcher's eggs are very pale green with a cap, at the blunt end, of very fine, light red-brown spots and they measure 16.9 x 12.0 and 16.2 x 12.0 mm. The cuckoo's egg is white in ground colour streaked with dark brown forming an irregular, thick band at the blunt end with a few streaks at the pointed end and measures 17.5 x 12.1 mm. The flycatcher's eggs were fresh; the cuckoo's very slightly advanced. The eggs were taken at Kampala on April 27th, 1946.

NIGEL WILLIAMS,
Kampala.

CINNABAR AT MAGADI. Two African laboratory assistants were making a bonfire to burn rubbish on 16th May, 1945, and cut some fuel from a nearby tree of the species *Calotropis procera*. They stated that when breaking one of the branches a small dark red stone fell from the pith hole in the centre of the wood, and not knowing what this material was, they brought it to me. The piece weighed nearly 50 grammes and had an overall specific gravity of 8.0. It was friable and had one large flat smooth surface perpendicular to the grain of the crystal which resembled Edinburgh Rock in appearance. On the side of the lump opposite to the large flat surface was a small flat surface approximately parallel to the large one. Dr. Pulfrey of the Kenya Mines Department suggested that the lump was cinnabar or mercuric sulphide, the chief ore of mercury, and a variety of tests amply confirmed this diagnosis.

Magadi is a likely place for cinnabar to be found, but of course its presence inside a tree branch is inexplicable. There seems no reason to doubt the truthfulness of the two Africans who found the lump, though their observations may have been incorrect. The branch containing the hole from which the lump is alleged to have fallen had unfortunately been burnt by the time I came on the scene, but it is perhaps worth mentioning that two rusty iron nails were found hammered into the tree just below the broken branch. Subsequently another branch was cut to pieces bit by bit under close supervision but no more cinnabar was found, and the occurrence remains a mystery. It is interesting to note that J. W. Mellor in his *Comprehensive Treatise on Inorganic and Theoretical Chemistry*, Vol. IV, p. 942, says "Pliny in his *Historia Naturalis*, written at the beginning of our era, also speaks of the confusion between the mineral cinnabar, which he called *Minium*, and Indian Cinnabar, the dried juice or resin known as Dragon's Blood—*Sanies Draconis*—probably obtained from the calamus palm, or *Pterocarpus draco*."

J. A. STEVENS,
Magadi.

A FEW NOTES ON THE BONGO, *BOOCERCUS EURYCEROS*, BASED ON A HUNTING EXPEDITION IN THE MAU FOREST.

Herd Habits: Bongo seem to go in fairly large herds, consisting of females, young, and a herd bull, who generally seems to be a young animal. This herd bull

would sometimes leave the herd and wander off by himself, and occasionally join up with a really big bull. The latter, while usually found in the vicinity of the herd never seemed to join it.

Feeding : Young bamboo shoots were the favourite food. The leaves of fairly low bushes were also eaten. The Bongo also sometimes broke off the branches of trees with their horns, to get at the tender leaves. This is also the habit of the Giant Eland. The Bongo frequented salt licks fairly regularly.

General Habits : During heavy rain the Bongo remained sheltered in the thick parts of the forest and did not go into the more open bamboo to feed at night, as they normally do.

It was noticed that the Lumbwa Wanderobo guides were very cautious of even unwounded Bongo, and while following a wounded bull they always held their spears ready, and plainly expected a charge. In fact, they warned me to expect such a charge and to have my rifle ready.

Visibility : The white stripes on the dark background make these animals definitely conspicuous in the forest, and their stripes can be seen in bamboo before the actual shape of the animal is visible.

Alertness : All Bongo seem to be very alert, and to have most accurate hearing. The solitary bulls, however, were more difficult to approach than the animals comprising a herd.

C. J. P. IONIDES.

SOME NATIVE BELIEFS CONCERNING ANIMALS.

Elephant :

In the Southern Province, Tanganyika Territory, it is generally believed that if, while a hunter is hunting elephant or any other dangerous animal, his wife is unfaithful to him, he will either be killed, or narrowly escape being killed by his quarry. Therefore if a game scout has a narrow escape from an elephant, he usually gives his wife a sound thrashing on return to his hut—and usually this thrashing is richly deserved.

In Mahenge district the Wapogoro believe that anyone having connection with a woman while out on an elephant-hunting trip will be caught by an elephant. In this area, therefore, women must never accompany a hunter on a trip after elephant.

The Bankusu of the Ombwe district of the Manyema Province of the Congo believe that the lives of certain men are closely connected with those of certain individual elephants, almost always big bulls. If one of these elephants is killed, the man dies simultaneously.

Lion :

(a) Lycanthropy :

There are three different types of "were lion" in the Southern Province :

- (i) A Wizard can change into a lion at will, and after killing an enemy can transform himself back into human form. He is called a "gluka simba."
- (ii) A Wizard can take two sticks, go into the bush, perform spells, and convert the two sticks into a lion and lioness. In some cases only one stick is taken and transformed into a lion. These lions can be distinguished from ordinary lions in that they are nasty looking, mangy brutes. They do the bidding of the wizard, and they may be called back to the place where they were transformed and converted into sticks again. They can only be killed if the wizard can be induced to perform the necessary spells. In the case of bad man-eaters, suspected wizards may have a rough time.
- (iii) Sometimes when a man dies his corpse will be flaccid and limp. In this case it is necessary to visit his grave a few days after his burial. If this is done, it will probably be found that he has emerged from the grave in

the form of a lion which is still feeble and can easily be killed. If he is not killed he will quickly gain strength and, having the knowledge and intelligence of a man, will find his way into huts and eat the occupants. He is called "gluka simba."

(b) Presiding Deity :

The "simba mwenyeji" or "simba malaika" is a big male lion who protects an area from other lions and kills any man-eater invading his territory. It is useless hunting this animal as he is invulnerable to human weapons. He is actually a big male in the prime of life who fights and occasionally kills a rival in mating fights.

(c) The Wamachinga of Lindi District may not assist in hunting a lion or even touch the body or skin of one. If they do so they have to be purified by a witch doctor, or they will gradually sicken and die. Needless to say, a good price must be paid for this purification.

Leopards : One of the baraza clerks in the Liwale District is a "were leopard" ("gluka chui"). He uses his powers to enable him to seduce the wives of the locals with impunity, as when confronted with an irate husband, he transforms himself into a leopard, upon which the husband retires in a panic.

Scaly Anteater : The appearance of this animal in Liwale Boma, a very rare occurrence, is the sign that a great catastrophe will fall upon the Wangendo people. It is stated that one entered the town before the Maji Maji rebellion, and another before the 1914 War. On its appearance it is caught and held, and in front of it on the ground are placed in line an "mbebeo" (the shawl used to carry children), a vessel of water, a vessel of millet, and an arrow. The animal is then released ; if it walks over the arrow, there will be war, if over the millet a famine, if over the water a drought, and if over the "mbebeo" child sickness.

Snakes : The Bird Snake (*Theloturus kirtlandii*) is a very dangerous reptile as, if angry, it will thrust its pointed head like a spear through the body of an enemy and transfix him. It is also a very bad omen to find one of these snakes on the ground, as anyone doing so will find on his return to his house that some calamity such as the death of a loved one has occurred.

At Lingenyeni in S.W. Kilwa District there existed as late as 1936 a sort of University for prospective wizards. A young man graduating from this was qualified as a wizard. Among other powers, these wizards were able to protect their houses from thieves in the following manner : A stick was hung above the door. This stick would allow the thief to enter the hut, but on his emerging with stolen property, would transform itself into a snake, which would enfold the intruder in its coils and hold him powerless until the return of the owner of the hut.

In parts of the Mahenge District, if a hunter meets a python with its head towards him, he will immediately return to camp, as this constitutes a bad omen, and should he continue with his hunt he will meet with an accident.

Striped Animals : In parts of the Rupigi District it is "mwiko" (forbidden) to eat eland, kudu or bushbuck, as anyone doing so will break out into stripes or spots like the skin of the animal eaten.

Chameleons : If a chameleon breathes in the face of a man, the victim's throat will swell like that of a chameleon.

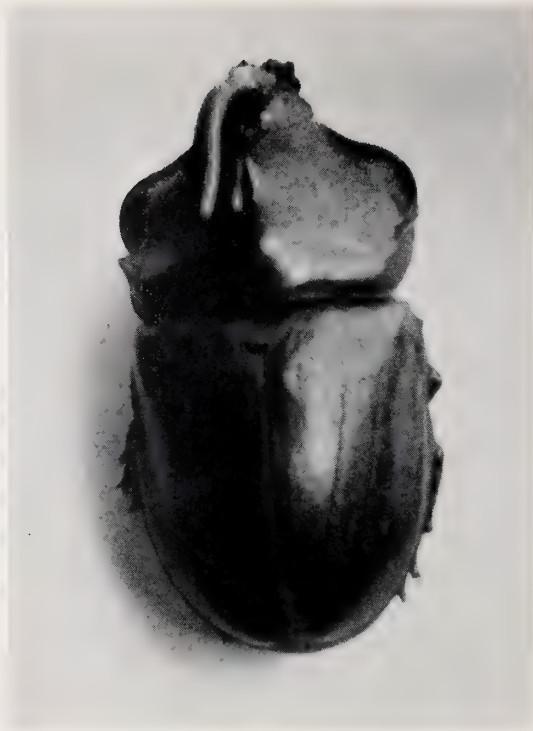
The Hammerkop (Scopus umbretta) : This bird is the king of birds, and to kill one is to court certain death. All other birds contribute a stick to his large nest. A snake always lives in the nest, and will bite anyone interfering with it.

Owls : All owls, but particularly Verreaux's Eagle Owl (*Bubo lacteus*) are evil birds. They are employed by wizards who send them to perch on the huts of their enemies, which is bound to result in the death of an inmate.

Crows : The flesh of the crow is considered deadly poison in the Southern Province.

C. J. P. IONIDES,
Assistant Game Warden, Tanganyika Territory.

PLATE XVIII.



An interesting Rhinoceros beetle. The illustrations show the beetle life size.

AN INTERESTING RHINOCEROS BEETLE. The beetle illustrated on the accompanying plate was recently discovered outside the Royal Naval Air Service mess at Mackinnon Road by Lt.-Commander C. A. N. Hooper. It was being attacked by ants and was in a weak state and, soon after its capture, died. This is the first specimen of this species to be sent to the Coryndon Museum and its identification has been determined by the British Museum (Nat. Hist.) as *Oryctes gigas* Cast. a species originally described in 1840 from Senegal. It has also been recorded from the Congo and Tanganyika. Mr. G. J. Arrow, of the British Museum, informs me *in litt.* that the National collection contains specimens from Nyasaland, Zanzibar and Madagascar. The species would therefore appear to be widely distributed. All the previous known specimens were taken many years ago and the species appears to be everywhere a rarity.

The interesting part of its occurrence is that although a great deal of collecting has been done in the Mackinnon Road area over many years this is the first time that this very conspicuous insect has been sent in to the Coryndon Museum. Like our common Rhinoceros beetle *Oryctes boas*, F. it probably feeds on decaying vegetation at the base of palm trees. Its length is 75 mm. and breadth 45 mm.

A. F. J. Gedye, F.Z.S., F.R.E.S.

A REQUEST FOR SPECIMENS OF EAST AFRICAN SPIDERS.

The Coryndon Memorial Museum is anxious to obtain specimens of any East African Spiders for identification by Mr. J. E. Marson, F.R.E.S., and would welcome any specimens which may be collected by members of the Society. Very little is known about East African spiders, and specimens of even the commoner ones will be valuable. Large spiders may be sent dry, packed in a tube or small box, but medium size and small ones should be preserved in spirit or 2% formalin. It is essential that full data as to locality, date, habitat, and name of collector should accompany each specimen, and tubes containing fluid should be securely packed to prevent breakage. Specimens should be addressed to the Curator, Coryndon Memorial Museum, P.O. Box 658, Nairobi, and marked "Spiders" on the outside.

CORRESPONDENCE.

THE EDITOR,

Journ. E. A. Nat. Hist. Society,

P.O. Box 658, NAIROBI, Kenya Colony.

DEAR SIR,—Mr. P. R. O. Bally, in his *East African Succulents* Part VI of your Journal, pp. 122 and 123 has got himself somewhat involved in his explanation of the "causes and effect" of botanical nomenclature.

Mr. Bally's example is singularly ill-chosen. It is one of quite unusual complication, calculated not to help the uninstructed reader, but to fill him with horror and loathing, and to convince him that botanical nomenclature is a mystery he cannot penetrate. He has the more excuse for this impression because the example defeats Mr. Bally himself, as he in part admits. Using Mr. Bally's complicated example :—

Senecio longiflorus (DC.) Oliv. and Hiern var. *violacea* (A. Berg) Hutch. and E. A. Bruce (not E. A. Bruce and Hutch.). *Senecio* is the generic, *longiflorus* the specific name, (DC.) in brackets is an abbreviation for De Candolle the botanist who first described the plant as *Kleinia longiflora* in 1837 in his *Prodromus Systematis Naturalis* 6: 357. In Oliv. and Hiern, Oliv. is an abbreviation for Oliver. These two botanists were joint authors for the Compositæ, who when preparing the *Flora of Tropical Africa*, considered that *Kleinia longiflora* D.C. was better placed in the genus *Senecio* to which they transferred it and published the name changed to *Senecio longiflorus* in the *Fl. Trop. Afr.* 3: 421 in 1877.

Var. is an abbreviation for variety, *violacea* is a variety name, (A. Berg.) in brackets again indicates that A. Berg. an abbreviation for A. Berger, founded the name *violacea*. This he did in 1905 in *Monatsschr. Kakt.* 1905, p. 38 when he made a change of name and used the generic

and specific name *Kleinia violacea* A. Berg. for a plant already described in 1867 by Schultz Bipontinus as *Notonia kleinioides* in Scheinfurth's *Beit. Flora Aethiopiens* p. 151. A. Berger's new naming *violacea* was quite illegitimate. The name *kleinioides* had not yet been used as a specific name in the genus *Kleinia* to which he transferred Schultz Bipontinus' *Notonia kleinioides*. It is the oldest published specific name which has to be retained whenever a species is transferred from one genus to another, unless the same specific name is already in use in the genus to which you are transferring the species, then an entirely new name has to be used, such for example as *violacea*. To continue, in Hutch. and E. A. Bruce, Hutch. is an abbreviation for Hutchinson. These two botanists are the authorities for the reduction of the name *Kleinia violacea* A. Berg. to that of varietal rank and again for its transference from *Kleinia* to that of *Senecio*.

The years of publication for the names in Mr. Bally's example are :—

Kleina violacea A. Berg. in 1905 ; *Notonia kleinioides* Schultz Bipontinus in 1867 ; *Kleinia kleinioides* (Sch. Bip.) M. R. F. Taylor in 1940. Miss Taylor did not do a revision ; she merely made a transference of *Notonia kleinioides* Sch. Bip. to the genus *Kleinia*, correctly retaining the oldest published specific name. It is incorrect to say that Oliver and Hiern *thereafter* (this would be 1941 according to Mr. Bally) incorporated the genus *Kleinia* into that of *Senecio* so that Mr. Bally's plant now became *Senecio kleinioides* (Sch. Bip.) Oliv. and Hiern. Oliver and Hiern's revision of the tropical African Compositæ was published in the *Flora of Tropical Africa* Vol. 3, pp. 253-411 in 1877, some sixty-three years before. In this revision they transferred both De Candolle's, and Schultz Bipontinus' plants to the genus *Senecio* but at the same time kept them up as separate species, *Senecio longiflorus* (DC.) Oliv. and Hiern, and *S. kleinioides* (Sch. Bip.) Oliv. and Hiern.

Again Hutchinson and E. A. Bruce in *Kew Bull.* 1941, p. 151 did not do a revision, they simply reduced a plant from specific rank to a varietal one, neither did they describe it, it was only a name change. In making this variety they quote *Kleinia violacea* A. Berg, and *Senecio kleinioides* (Sch. Bip.) Oliv. and Hiern as synonyms but they overlooked *Kleinia kleinioides* (Sch. Bip.) M. R. F. Taylor, a name change made a year earlier in the same journal. This too would be a synonym.

There is no reason to regard Prof. E. Chiovenda's use of the name *Kleinia polycotoma* as an "illogism." It did not come into Oliver and Hiern's monograph because the plant was not described by Chiovenda till July 1922, some fifty-two years after, in his *Flora Somalia* p. 205, with tab. 22 fig 4, where he says its affinity is with *K. Scottii* (Balf. f.) Chiov. based on *Senecio Scottii* Balf. f., a plant found in the island of Socotra.

Judging from other published work of Chiovenda's, he prefers to keep the genera *Kleinia*, *Notonia* and *Senecio* separate. The crux of the matter is whether to keep up the genera *Kleina* L. (first published in 1735) not of Crantz (1766), Jacq. (1763) or Juss. (1803) and *Notonia* DC. (1833) not of Wight & Arn. (1834) under the genus *Senecio* (Tourn.) L., published in 1753 and the starting point for the binomial system of scientific botanical nomenclature. Some authorities say all three should be kept separated, a matter of personal opinion as the generic differences are not clear cut.

Mr. Bally's confusion amply demonstrates the difficulties of botanical workers in East Africa. We have not the extensive botanical libraries and herbaria of Britain and the Continental countries, many of long standing and now of historical and international interest. For those of us in East Africa it is presumptuous on our part to try and discuss botanical synonymy or to attempt to describe new botanical species without at first getting our work fully verified by some authority at home and on the Continent. I myself would not attempt any serious systematic work here for publication without at first having my conclusions verified by the appropriate authorities at home and on the Continent or by doing so myself when I went home.

Yours faithfully,

P. J. GREENWAY,
SYSTEMATIC BOTANIST.

E. A. A. Research Institute,
Amani, Tanganyika Territory.

[The first part of Mr. Greenway's letter needs no comment. In his last paragraph he has put forward very ably the systematist's point of view. Unfortunately, however, the general worker and ecologist suffer if too close adherence is given to the rule that no species should be described as new until all authorities are absolutely satisfied that it has not already been named. A plant recorded, for example, as *Elaeodendron* sp. nr. *keniense* Loes., or *Elaeodendron* sp. No. 1234 cannot be identified. If described as a new species, the plant will always be identifiable even if the name should later be found to be a synonym. A responsible author is expected to take reasonable steps to ensure that he does not publish synonyms : indeed his reputation as a reliable worker, to a very great extent, depends upon his doing so. The large proportion of herbarium specimens in the Coryndon Museum collection determined as "species near." is most discouraging to all who are interested in our local flora.—J. Richard Hudson.]

EAST AFRICA NATURAL HISTORY SOCIETY.

SIXTH ANNUAL CONVERSAZIONE, NOVEMBER, 1946.

This year again the Annual Conversazione of the Society, the sixth in succession, was held in the Coryndon Museum, by kind permission of the Board of Museums Trustees of Kenya. In order to avoid the overcrowding of past years, this year there were two members' and guests' nights, on Friday 8th and Saturday 9th November. The public were admitted to the show on the afternoon of Saturday 9th and the whole of Sunday 10th, while as usual the morning of the 9th and the whole of the 11th November were devoted to conducting parties of school children round the exhibits.

Attendances were smaller than in previous years, probably because of the departure of many of the Military forces from Nairobi, but none the less the show was just as successful socially, and many people felt that the smaller numbers led to greater comfort and interest in the exhibits. On the opening night 116 members and official guests of the Society attended, and we were honoured by the presence of His Excellency the Governor, Sir Philip Mitchell. On the following night 38 members and guests attended, while the exhibits were seen by 848 members of the public during the three days of the show. Schoolchildren from fourteen different schools again attended this year, some 658 being conducted round the exhibits.

As usual, a Guessing competition was held, and the proceeds were devoted to the Kenya War Memorial Fund, which was launched on Remembrance Day, 10th November. This raised the sum of Shs. 72/-.

The decorations in the main hall were particularly cheerful this year, and it is a pleasure to record our appreciation of the work of the ladies who again helped willingly with these, in particular the Lady Muriel Jex-Blake, Miss Blood, Mrs. Copley, Mrs. Wilson, Mrs. Rayner, Mrs. Hudson and Miss Duthy. The assistance of the Forestry Department and the Municipal Gardener in providing the larger plants is also gratefully acknowledged.

The exhibits were simply and clearly arranged, and the Society again owes a debt of gratitude to all those responsible for these, not only in arranging them, but also in giving generously of their time during the three days in bringing a personal touch to explaining the exhibits to schoolchildren and the public. Schoolchildren, particularly of the African schools, paid the closest attention to the exhibits, and the educational value of the show was again fully justified.

To Miss Martin, Miss Duthy and Mrs. Rayner go our grateful thanks for looking after the Guessing Competition.

Exhibits were less in number than in previous years, giving more space in the Hall, which, it is felt, led to the greater comfort of all. The following is a brief review of each exhibit :

RELAPSING FEVER :

This was an exhibit contributed by the Medical Department, showing the causes of this tropical disease, a considerable epidemic of which recently occurred on the Kenya coast. Living ticks and lice, the two vectors of this disease, were shown, together with large-scale models of each, and considerable interest was shown in the two microscopes under which magnifications could be seen of the spirochaetes, carried by ticks and lice, which actually cause the disease. One of these showed the living spirochaetes in the blood of a mouse under dark-field illumination. A chart showed how the course of the epidemic on the coast, which was carried by lice, was controlled by the use of DDT powder dusted into the clothes of the natives, and photographs showed the dusting being carried out.

CORYNDON MUSEUM GORILLA EXPEDITION :

Mr. Williams, who was a member of the expedition to South West Kigezi to obtain an adult gorilla for the Museum, was responsible for this exhibit. Photographs showed the fine male Gorilla obtained, and other photographs illustrated very clearly the gorilla habitat, food, and other incidents of the expedition. This very good series of photographs was taken by Mr. Gocs, who accompanied the expedition. The party also took the opportunity of collecting other natural history specimens in this remote part of Uganda, and Mr. Williams showed some specimens of the birds collected, which included a *Geokichla* new to science, and specimens of the rare Red-faced Barbet amongst others. A specimen of the rare Nitzche's Tree Viper was also collected, a fine plaster cast of it, by Mr. Turner, being on view.

KENYA SUNBIRDS :

This attractive group of East African birds has been the subject of special study by Mr. Williams, the Museum Ornithologist, who arranged this exhibit. Beautifully skinned specimens of most of the Kenya Sunbirds were on view, with a map illustrating their distribution in the Colony, special emphasis being laid on those species which occur round Nairobi.

PREHISTORIC ART IN TANGANYIKA TERRITORY :

This exhibit was the work of Mrs. Leakey, and showed faithful reproductions of various cave-paintings executed by prehistoric man many thousands of years ago in Tanganyika. The sequences of style were very clearly set out, and the whole contributed a very graphic picture of one aspect of life in this ancient continent.

THE STONE AGE IN UGANDA :

At previous Conversazioni, Dr. Leakey has shown the various stone implements used by prehistoric man in Kenya and Tanganyika, and this year the series was completed by an exhibit of material found in Uganda. The whole showed part of the series of cultures made by Stone Age man in the Protectorate, the successive stages of perfection of the hand-axes and other tools over this period being clearly set out.

PREPARATION OF LEATHER AND PARCHMENT FROM GOATSKIN :

Contributed by the Veterinary Laboratory, this interesting exhibit showed in miniature the successive stages necessary in the preparation of parchment, and the tanning process required in making leather from goat skin. The solutions necessary, and the implements used, were all on view, together with specimens of the finished product.

BOOKBINDING FOR THE SOCIETY LIBRARY :

Musa s/o Oluga, the African bookbinder employed by the Society, arranged this instructive exhibit, to show how the periodicals received by the Society are bound into permanent book form, the bindings being made of the fine leather and parchment produced at the Veterinary Laboratory. The successive stages, from the first stitching to the final glueing were clearly demonstrated, and the exhibit aroused considerable interest, particularly among African school children.

FOREST ENTOMOLOGY :

The Forest Entomologist, Mr. Peake, arranged this instructive exhibit on some insect pests with which the Forest Department has to contend. First among these is the introduced Eucalyptus Weevil, *Gonipterus*, and the photographs showed the havoc it wrecked before its control by the introduction of a Myrmarid parasite. Specimens of, and the damage caused by, other insect parasites such as Buprestid and Longhorn Borer Beetles, and the Pine Emperor Moth, whose larvæ strip the leaves of pine twigs, were also clearly set out and explained.

FOREST TIMBERS :

The Forestry Department showed an exhibit of various indigenous and introduced timbers in Kenya Colony, together with living trees of the two main types, coniferous and broad-leaved. Photographs also showed types of forest found in this country.

METHODS OF BIRD STUDY AND BIRD PHOTOGRAPHY :

This exhibit was arranged by Messrs. Langridge, Wiley and V. D. van Someren. The "hide" used for photographing birds at the nest was on view, together with photographs of the hide in operation, and a series of photographs of various birds at the nest, taken by the use of this hide in the Nairobi district. Colour ringing of birds for individual recognition in the study of territories and movements was also explained; the spring-back trap used for catching insectivorous birds was demonstrated, together with a selection of the colour rings used, and the method of placing these on the birds' legs. The exhibit was completed by maps showing the distribution and movements of ringed Fiscal Shrikes in the Kabete district during 1945 and 1946.

TILAPIA OF KENYA :

The considerable interest being taken in the intensive farming of freshwater fish, to increase the food supply of the population, focusses attention on African indigenous fish which might be used for this purpose. Foremost among these are the fish of the genus *Tilapia*, and Mr. Copley arranged an exhibit showing various species of *Tilapia* to be found in Kenya Colony, a fine plaster cast of each species, made by Mr. Allen Turner, being on view. The ancient geological history of the *Tilapia* was explained by a map and a diagram, and a fossil *Tilapia* from Lake Victoria was shown. A plan of an experimental fish farm, which will be used in the cultivation of certain of the species, drawn by Mr. Copley, was also shown.

FREAKS :

Oddities of nature among big-game animals, were exhibited by the Game Department, and the specimens included elephants' feet with distorted and twisted nails, spiral elephant tusks, supernumerary tusks and toes, hair balls, three-horned rhino heads, "toothache" in elephants, and a deformity in a trout.

V. D. v. S.

East Africa Natural History Society

NOTICE TO CONTRIBUTORS.

The Society is prepared to consider articles dealing with Natural History for publication in the Journal. The articles should be concise and should be typed on one side of the paper only.

In accordance with the accepted practice scientific names are printed in italics. These should be underlined in the typescript. Names of new species described in an article when mentioned are printed in bold face. Such names should be underlined with an interrupted line.

It will be appreciated if references to literature are typewritten in the form customary in English scientific periodicals. Each reference to a periodical should begin with the writer's name and the references should be arranged in alphabetical order. The name is followed by the initials and then the year of publication. The name of the journal should be given next in italics, followed by the volume number in bold face and the page in roman. Standard abbreviations for the names of most journals are available and should be adopted when possible.

References to text-books should be similar in form to those for journals; but after the title of the book, volume number and page, the place of publication and publisher's name should be given.

The following examples illustrate these points:

Evans, R. T., 1947. *J. East Africa Nat. Hist. Soc.*, 19, 18.

Jackson, F. J., 1938. *The Birds of Kenya Colony and Uganda Protectorate*, 3, 1261. London. Gurney & Jackson.

In the text, references should be made to the bibliography by giving the author's name and the date in brackets, not by numbers or footnotes.

Illustrations should be in a form suitable for reproduction. The Editor cannot be expected to re-draw. Black and white illustrations should be in Indian ink on Bristol board or thick white paper. If drawn larger than it is intended that they should appear, reproduction is usually better. An indication of the degree of reduction is advisable. Photographs should be printed on glossy paper and should be the size of intended reproduction.

Articles should be submitted to the Secretary, P.O. Box 658, Nairobi, for consideration by the Committee. The Committee reserve the right to reject papers that it considers unsuitable. Authors may be asked to pay part of the cost of making blocks if the number of illustrations is large. The writer of an article is entitled to twenty-five offprints free of charge. Larger numbers can be supplied at cost if ordered when the article is submitted.

BACK NUMBERS OF THE JOURNAL.

The Committee is very anxious to obtain various back numbers of the Journal which are either in short supply or out of print. These are required for exchange purposes with scientific institutions or societies overseas, and if any members have back numbers which they would be willing to dispose of in this way, would they please notify the Hon. Secretary, P.O. Box 658, Nairobi. The numbers wanted in particular are :—Nos. 1-7, 9-13, 15, 16, 38/39, Vol. 12 No. 3/4, 75/76, 81/82, 83/84.

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and collaborators.

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The East African Standard, Ltd., Delamere Avenue, Nairobi.

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Journal

OF THE

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1947—1948

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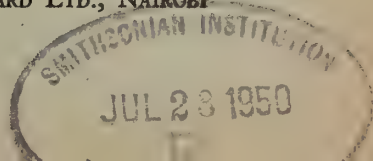
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Journal of the East Africa Natural History Society

1947—1948

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No. 5 (89)

NEW EAST AFRICAN CURCULIONIDÆ (COL.)

by Sir Guy A. K. Marshall, K.C.M.G., F.R.S.

The great majority of the species described below were received for identification from the Coryndon Memorial Museum, Nairobi. The types have been deposited in the British Museum (Natural History).

SUBFAMILY BRACHYDERINÆ

BLOSyrus LITORALIS, sp. n.

♂ ♀. Derm black, with dense brown scaling; elytra with an ill-defined oblique grey band from near the shoulder on interval eight to about the middle of interval two, and immediately behind it a very indefinite oblong dark patch, the suture fulvous.

Head with three parallel sulci, the middle one slightly wider and deeper than the others; eyes moderately prominent, highest behind the middle. *Rostrum* transverse (5:7), parallel-sided, the genae not projecting; dorsum flat, with a broad median depression containing a squamose carina, which ends in front in a deep bare transverse fovea, the lateral areas slightly uneven, with a faint trace of a longitudinal impression; the margin of the epistome sharply carinate and forming a rounded angle. *Antennæ* with the two basal joints of the funicle equal, the distal joints about as long as broad. *Prothorax* very nearly as long as broad, strongly rounded laterally, broadest beyond the middle, not constricted apically, deeply constricted at the base, which is truncate, the gular margin feebly sinuate; dorsum moderately convex longitudinally, highest at the middle, somewhat vermiformly wrinkled, with a broad smooth bare median carina which is only half as long as the pronotum and nearer to the base than to the apex, and two irregular transverse striæ at the base. *Elytra* of male subglobose, widest at one-fourth from the base, without any humeral or subhumeral tubercles, not constricted at the base, the basal margin very shallowly sinuate and not elevated, the line from the basal angle to the widest point slightly arcuate; the broad striæ with large punctures that are clothed with scales, the intervals rather narrower than the striæ, stria three very sinuous behind the middle; intervals four and six with a low elevation where the pale band crosses them, and another on three and five at the top of the declivity, a tubercle at the apex of five, a smaller one at the apical junction of three and seven, and a still smaller one at the extreme apex of two; all the dorsal intervals with short appressed setae only; elytra of female narrowly constricted at the base and all the elevations more pronounced, especially the two posterior ones on interval five, in addition intervals three, five, seven raised for short distance near the base, the elevations ceasing abruptly on the front margin of the pale transverse band, that on interval seven slightly projecting laterally. *Legs* with brown scaling, the femora with the usual pale band and a pale dorsal spot near the apex.

Length: 7.0 - 9.5 mm.; *Breadth*: 4.0 - 5.5 mm.

KENYA: Rabai, 1♀, viii, 1937 (*Dr. V. G. L. van Someren*); Kilifi, 9♂ 27♀, vii, 1946 (*V. G. L. v. S.*)

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Nearly allied to *B. angulatus*, Gerst., which was described from the male only and differs in lacking the two transverse striæ at the base of the pronotum, and the median carina is nearer to the apex than to the base; the elytra of the male have no tubercles, and those of the female are much smaller than in *litoralis*, except for a strong conical humeral tubercle on interval seven, and interval three and five are evenly costate behind the middle.

MOLYBDOTUS BRUNNEUS, sp. n.

♀. Derm black, with dense brown scaling, irregularly variegated with lighter brown and some whitish scales, which sometimes form small white spots in the striæ; prothorax with mostly paler scales and a large ovate darker area in the middle of the disk.

Head without a median stria, the frons very nearly as wide as the rostrum and strongly convex transversely; eyes convex, rather prominent. *Rostrum* longer than broad, parallel-sided, the epistome small and ill-defined; dorsum convex transversely, with a deep narrow median sulcus and a broader one on each side, the latter partly filled with scaling. *Antennæ* with the scape only slightly exceeding the front margin of the eye; funicle with joint one longer than two, three to six transverse, seven quadrate. *Prothorax* nearly as long as broad, moderately rounded laterally, widest at or beyond the middle, narrowly constricted at the apex; dorsum smooth in the middle of the disk, with a deep narrow median sulcus, becoming rugose laterally but the rugosities partly hidden by the dense scaling, with a deep transverse stria close to the base, the basal angles not projecting. *Elytra* broadly ovate in ♀ somewhat narrower in ♂, widest at about the middle, strongly constricted at the base, which is carinately raised and rather wider than the base of the prothorax; the deep striæ with rather wide'y spaced punctures which are partly covered by scaling, the intervals somewhat convex, without setae or with microscopic ones on the declivity only. *Legs* with dense brown scales above and grey beneath, the femora with an indefinite paler area near the apex.

Length: 11 - 14 mm.; *Width*: 4.5 - 6.5 mm.

SOMALILAND: Mandera, 2♂ 3♀, viii, 1942 (*Meneghetti*).

MOLYBDOTUS ALBONIGER, sp. n.

♂ ♀ Derm black, the underside and the inflexed margins of the elytra with dense whitish scales; prothorax with two ill-defined discal whitish stripes; elytra with variable whitish markings main'y between striæ two and five.

Head with the medium sulcus of the rostrum continued as a fine stria right up to the vertex; frons much flatter than in the preceding species, nearly as wide as the rostrum; eyes very convex. *Rostrum* longer than broad, parallel-sided, not widened at the apex; dorsum flat, the median sulcus much deeper than the indistinct lateral ones. *Antennæ* with the scape reaching the middle of the eye; funicle with joint one longer than two, four to six transverse, seven a little longer than broad. *Prothorax* as long as broad, rounded laterally, widest behind the middle, very shallowly constricted at the apex; dorsum rugose, smoother in the middle but subgranulate laterally, with a narrow median sulcus, the transverse basal stria rather shallow the basal angles not projecting. *Elytra* broadly ovate (♀), widest behind the middle, sharply constricted at the base, which is carinately raised and a little wider than the base of the prothorax; the striæ with strong close punctures, the intervals slightly convex and with microscopic setae on the declivity only. *Legs* with dense whitish to grey scales.

Length: 10 - 12 mm.; *Breadth*: 4.7 - 5.5 mm.

SOMALIA: Rocca, 2♀ viii, 1943 (*T. H. E. Jackson*).

These two species are mostly nearly allied to the genotype, *M. laxepunctatus* Fairm., a uniformly grey species, which differs from them both in having a sharp tooth on the front margin of the prothorax below the vibrissæ.

M. elongatus, Hust. 1938, differs in having the pronotum finely coriaceous; the elytral striæ are very fine and with very small punctures, and the scales are concave.

SUBFAMILY OTIORRHYNCHINÆ

SENECIOBIUS BASIRUFUS, sp. n.

♂ ♀ Derm shining black, entirely bare above, the elytra with an orange band at the base extending from the suture to stria seven, varying in depth and usually more or less denticulate on its posterior margin; this orange area is somewhat raised, but not formed of agglomerated pustules as is *basalis*, Hust.

Head with dense subconfluent punctures, the frons flat with a median fovea, the eyes strongly convex. *Rostrum* almost parallel-sided in the basal half, broadly dilated at the apex; dorsum quite flat, with dense shallow subconfluent punctation. *Antennæ* with the scape only gradually widening apically; funicle with joint one a little longer than two, four to seven not longer than broad. *Prothorax* a little wider than long, rather strongly rounded laterally, widest beyond the middle, broadly constricted near the base; dorsum opaque, bare, with dense subconfluent punctures and usually with an abbreviated smooth median line; pleurae finely granulate. *Elytra* rather broadly ovate, wider in ♀, jointly sinuate at the base; dorsum shiny and feebly coriaceous on the disk, with rows of small separated punctures which are sometimes larger and closer, the extreme lateral margins and the declivity rugose. *Legs* sparsely setose, the femora only finely striolate in the middle, the tarsi with joint two transverse.

Length: 11.0 - 13.5 mm.; *Breadth*: 5.0 - 7.5 mm.

KENYA: Mount Kenya, 9,500 ft., 1♂, iv, 1935 (*G. L. R. Hancock*); Mount Kenya, Sirumin, 12,000 ft., 3♂ 2♀, viii, 1942 (type); Mount Kenya, 10,500 ft., 1♂ 1♀, i, 1944 (*Mrs. Bally*).

In Hustache's key to the genus (*Mission Scientifique de l'Omo, Coleoptera*, 1939, p. 189) this species runs down to *S. basalis*, Hust. (Aberdare Mts.), but the latter differs in having the orange markings on the elytra formed of confluent pustules, the general surface of the elytra is rather coarsely alutaceous and the punctures are minute and difficult to see; the punctures on the pronotum are also fine and separated.

This is only the second species of *Seneciobius* recorded from Mount Kenya, whereas no less than ten are known from Mount Elgon and three from the Aberdares. In *Mrs. Bally's* specimens the basal orange on the elytra is much reduced.

SENECIOBIUS SEMILUCENS, sp. n.

♂ ♀ Entirely black, quite bare above with sparse short dark setae beneath a fringe of single pale scales in front of the hind coxae.

Head with dense subconfluent punctures, the frons flat with a median fovea, the eyes strongly convex, semi-circular. *Rostrum* longer than broad (14:11), gradually narrowing from the base to the antennæ and dilated at the apex; dorsum flat, punctured like the head, with a narrow smooth median line. *Antennæ* with the scape comparatively long and slender, rather abruptly clavate; funicle with the two basal joints equal, three to seven much longer than broad. *Prothorax* transverse (4:5), moderately rounded laterally, broadest at the middle, broadly constricted near the base; dorsum somewhat flattened in the middle with very shallow dense confluent punctures and small low granules and often a faint abbreviated smooth median line, the pleurae with small separated granules. *Elytra* rather narrowly ovate, similar in the two sexes, widest before the middle, obtusely acuminate behind, jointly truncate at the base; dorsum brilliantly shiny except for a broad sutural stripe that is finely granulate extending as far as stria four from the base to the middle, then narrowing to a point on the suture near the top of the declivity, the apical area and the apical half of the inflexed lateral margin also granulate, sometimes extending to the base of the latter; the punctures on the shiny part very small and widely spaced, those in the granulate areas rather larger and closer; the elytra of the female differ in having the humeral curve indented, there being small tubercles at or near the base of each interval. *Legs* rather slender, sparsely setose; femora rugosely granulate on the apical half, becoming smooth and sparsely punctate

towards the base; tibiae rugosely punctate, the hind pair with a few large teeth; tarsi comparatively narrow, joint two of the hind pair as long as broad.

Length: 10 - 12 mm.; *Breadth*: 4.5 - 5.5 mm.

UGANDA: Mount Elgon, 9,000 ft., 8♂ 1♀, iii, 1934 (*H. B. Johnston*).

The sculpture of the elytra, which seems unusually constant, is very characteristic. In *Hustache's Key* (l.c.) it runs down to *S. seriatus*, *Hust.*, in which the rostrum is tricarinate, the distal joints of the antennæ transverse, and the elytra bear geminate rows of punctures, the alternate intervals being wider.

SENECIOBIUS GEDYEI, sp. n.

♂. ♀ Derm dull black, entirely bare except for some very short inconspicuous setæ on the metasternum and basal ventrite, and a fringe of pale scales in front of the hind coxae.

Head with variable separated shallow punctures, the frons strongly convex transversely, with a deep median fovea; eyes not very convex. *Rostrum* shorter than usual, only as long as broad and only slightly dilated at the genæ; dorsum punctured like the head and with no smooth median line, slightly convex transversely; epistome forming a large raised smooth triangle with fine shallow punctures. *Antennæ* with the scape gradually widening to the apex; funicle rather stout, joint one longer than two, three to seven transverse. *Prothorax* transverse (4:5), rather strongly rounded laterally, widest before the middle, broadly constricted near the base; dorsum not flattened in the middle with larger separated punctures and minute ones in between, becoming subgranulate laterally, the pleuræ coriaceous with low separated granules. *Elytra* broadly ovate, much broader in ♀, widest at about the middle, acuminate behind subtruncate or very shallowly sinuate at the base; dorsum finely coriaceous, with well-marked striae containing close deep punctures which become much smaller behind, the intervals slightly convex. *Legs* almost bare, smooth, shiny and sparsely punctate; hind femora with small granules only; tarsi with joint two transverse. Venter with ventrites two to five shiny and sparsely punctate, ventrite five of ♀ without the usual median sulcus.

Length: 10 - 12 mm.; *Breadth*: 4.5 - 6.0 mm.

KENYA: W. Aberdare Mts., 10,000 - 11,000 ft., 1♂ 4♀, xi, 1934 (*A. F. J. Gedye*).

Most nearly allied to *S. nitens*, *Hust.*, also from the Aberdares, but in the latter species the rostrum is longer and narrower in the basal half, the frons is flat, the elytra are not striate but have rows of much finer punctures, the venter is rugulose, and ventrite five has a short median sulcus in the ♀.

NEMATOCERUS SUBTILIS, sp. n.

♂. ♀ Derm bronze, with very short sparse narrow whitish setiform scales above, and with a dense stripe of similar scales (sometimes yellowish) running from the front of the propleuræ along the outer margin of the elytra to beyond the hind coxae (as in *marginalis*, *Hust.*)

♂. *Head* with very shallow indefinite punctures; frons flat, with a faint median stria; eyes moderately convex. *Rostrum* a little longer than its apical width, shallowly sinuate laterally, moderately dilated at the genæ; dorsal area parallel-sided, flat, almost impunctate, shagreened, with a low narrow median carina and the margins carinate to the base. *Antennæ* slender, testaceous; scape somewhat dilated near the base; funicle with the joints long and clavate, one much longer than two (9:5), seven as long as three. *Prothorax* as long as broad or slightly broader than long, moderately rounded laterally, widest at the middle, feebly constricted at the apex, which is not narrower than the base; dorsum with dense small low transverse granules. *Elytra* narrowly ovate, widest at one-fourth from the base, rapidly narrowing behind, obtusely acuminate at the apex; dorsal outline rising steeply at the base then slightly convex to beyond the middle and rather

steeply declivous behind; the fine striæ with small separated punctures which diminish apically; the intervals flat or feebly convex, very finely aciculate, rather shiny, with very short fine recumbent setae. *Legs* with the femora blackish to red-brown, tibiae and tarsi reddish; tibiae with long erect setae, the hind pair moderately curved, with rather coarse granules on the inner face, the front pair obliquely truncate at the apex, so that the upper edge ends in a point.

Length: 6.0 - 7.5 mm.; *Breadth:* 2.0 - 2.5 mm.

♀. Differs in having the scape of the antennæ distinctly broader and more dilated near the base; the prothorax usually with the granules more flattened and sometimes partly obliterated; the elytra are much more broadly ovate and the intervals consequently also broader, the posterior declivity is more abrupt, becoming vertical at the apex.

Length: 5.5 - 7.0 mm.; *Breadth:* 2.5 - 3.0 mm.

KENYA: Kericho, Itare R., 6 300 ft. 10♂ 5♀, 1943 (*Hugh Copley*-type); Elburgon, 2♂ 3♀, iii, 1936 (*H. J. A. Turner*); Molo, 9,000 ft., 1♂ 1♀, iii, 1939 (*McInnes*) and 2♂, iv, 1939 (*Trench*); Ulu, 1♂, viii, 1939 (*Trench*); Yala R., S. edge of Kakamega Forest, 4,800 - 5,300 ft., 6♂ 3♀, v, 1911 (*Dr. S. A. Neave*); Nandi Plateau, 5,700 - 6,200 ft., 1♂ 2♀, v - vi, 1911 (*S.A.N.*); Upper Kuja Valley, S. Kavirondo, 4,200 ft., 1♂, v, 1911 (*S.A.N.*); Kaimosi, 1♂, iii - iv, 1934 (*H. J. A. Turner*).

The Kericho and Elburgon specimens are very similar, but the Molo examples have more numerous scales, which in the males tend to be denser on the alternate intervals; the specimens from the Yala R. and the following localities are generally rather larger, black without any brown sheen, and almost entirely bare above of either scales or setae.

Belongs to a difficult group of closely allied species some of which may prove eventually to be only local races.

N. marginalis Hust., from Molo, may be distinguished by the comparatively long erect setae all over the elytra. *N. elegantulus*, Hust., from Mount Kenya, lacks the dense lateral stripe of scales, the front tibiae of the male are rounded at the apex and not pointed, and the female is broader and more abruptly narrowed behind. In *N. glaber*, Hust., the front tibiae of the male are transversely truncate at the apex, and the female has the posterior declivity strongly arcuate so that it projects beyond the apex.

DIAECODERUS ARACHIDIS, sp. n.

♂. ♀ Derm black, rather shiny, with numerous small spots formed of a few narrow pale scales with a coppery reflection, and the three or four lateral intervals on the elytra with a dense stripe of similar scales.

Head with variable shallow punctures and sparse short setiform scales; frons flat, lower than the base of the rostrum, wider than the length of an eye (7:5), with a deep median stria; eyes moderately convex. *Rostrum* longer than its basal width (5:4), parallel-sided in the basal half, distinctly dilated at the apex; dorsum almost flat, with numerous setiform scales and a strong median carina which bifurcates in front round a smooth triangle that lies behind the curved margin of the epistome, the lateral carinae sharply defined and parallel, *Antennæ* piceous, with fine recumbent grey pubescence; funicle with joint two nearly or quite as long as one. *Prothorax* transverse (♂ 8:10, ♀ 8:11.5), rounded laterally, widest at or behind the middle, not constricted at the apex which is a little narrower than the base; dorsum convex longitudinally, highest far behind the middle and sloping rather abruptly and very steeply down to the base, the disk closely covered with flattened granules, with a trace of an irregular median stria and with sparse setiform scales. *Elytra* narrowly ovate in ♂, much broader in ♀, broadly rounded behind, truncate and immarginate at the base; dorsum steeply declivous at the base, and also at the apex in ♂, the declivity being vertical in ♀; the rows of punctures duplicated (sometimes rather irregularly), the typical intervals being much more regular than the accessory ones and alone bearing the rows of scale-spots and also a row of short erect setae, as well as a row of granules on the apical third typical interval seven usually

having a complete row of granules. *Legs* black to piceous, with coppery setiform scales; both femora and tibiae of ♂ with a fringe of setae beneath; the sinuation on the hind tibiae of ♂ shorter than half the tibia and without any angulation at its upper end.

Length: ♂ 6.5 - 7.0 mm., ♀ 6.5 - 8.0 mm.; *Breadth*: ♂ 2.5 - 2.7 mm., ♀ 3.0 - 4.0 mm.

TANGANYIKA: Kongwa, attacking ground-nuts, 3 ♂ 5 ♀, i, 1948 (*W. F. Jepson*).

Closely allied to *D. sobrinus*, Mshl. 1940 (*Systates*), from the Chyulu Hills, Kenya, which is a much larger species, but this and all other members of the genus differ from *D. arachidis* in having joint one of the funicle much longer than two.

SUBFAMILY TANYRRHYNCHINÆ

EPHIMEROSTYLUS DEBILIS, sp. n.

♂. ♀ Derm testaceous, the apical two-thirds of the elytra blackish in ♂ only; elytra with a dense sutural stripe of metallic green hair-scales and similar scales scattered over the sides of the elytra, being more conspicuous in ♂ than in ♀.

Head longer than the rostrum (4:3), rapidly narrowing from the base to the middle and then becoming parallel-sided and only as wide as the rostrum, the posterior part very finely striolate transversely, the anterior part shiny and sparsely punctate with a few recumbent setae dorsally and quite bare and impunctate laterally, the temples much longer than an eye; eyes oval, dorsal, closely approximated in ♀, subcontiguous in ♂, convex in lateral view, being much higher than the rostrum and slightly higher than the head. *Rostrum* longer than broad (3:2) parallel-sided, with the lateral areas bare, shiny and impunctate; dorsum strongly convex transversely, often with a feeble median carina and sometimes with a shallow punctate stria on each side of it, with very sparse transverse recumbent setae, the apical area forming a broad concave triangle; scrobes continued broadly and shallowly backwards nearly to the eyes, entirely bare. *Antennae* testaceous very long and slender, as in the other species. *Prothorax* transverse (4:5), strongly rounded laterally, widest at the middle, narrowly constricted at the apex with the constriction continued as a deep stria across the disk, truncate at the base; dorsum moderately convex longitudinally, highest at the middle, normally smooth and shiny with sparse minute punctures (occasionally with scattered larger punctures), with rather sparse recumbent submetallic setae and a few long erect setae. *Elytra* narrowly ovate in ♂, broader in ♀, widest at one-third from the base; the shallow striae with strong close punctures that do not diminish behind, the intervals broader than the striae, and each bearing a row of long erect setae, the metallic setiform scales not entirely concealing the integument. *Legs* testaceous, the underside of the femora and all sides of the tibiae with long erect setae in ♂, these setae being absent from the femora in ♀ and much shorter on the tibiae; front tibiae not incurved at the apex, the hind pair rather strongly curved in ♂, less so in ♀.

Length: 5.0 - 6.0 mm.; *Breadth*: 2.0 - 2.5 mm.

TANGANYIKA: Lake Rukwa area, 3,700 ft., 5♂ 4♀, iv. 1938; Mbeya, 4,500 ft., 1♂ 2♀, iii, 1938 (*D. G. MacInnes*).

Differs from its congeners, apart from its colouring, in its unusually long head (the eyes appearing to be on the base of the rostrum) and its closely approximated eyes.

EPHIMEROSTYLUS NYASICUS, sp. n.

♂. ♀ Derm black, with pale green, metallic green, blue-green or pale brassy scaling; rostrum with the dorsal surface only, the head entirely (except for a broad bare 'gular stripe), squamose; prothorax with rather thin scaling dorsally and three variable denser stripes, the pleurae with a broad bare stripe; elytra of ♂ with a tendency for the green scales to be less dense or entirely abraded on intervals two, four, six and eight, whereas in the ♀ the scales seem more evenly distributed, with small bare spots round the setae; but the scales are easily lost and many specimens are entirely bare.

Head shorter than the rostrum (3:4), subconical, with the eyes almost flat and rather closely approximated dorsally, the temples much shorter than an eye. *Rostrum* twice as long as broad, parallel-sided, with the lower surface below the scrobes bare, shiny, with very fine sparse punctures; the narrow dorsal area flat transversely, narrowing gradually from the base to beyond the middle, then widening again apically, carinate laterally and with a fine median carina that is sometimes obscured by scales; scrobes continued broadly and shallowly almost to the eyes and squamose throughout. *Antennæ* red-brown, very long and slender. *Prothorax* a little broader than long, moderately rounded laterally, widest beyond the middle, very shallowly constricted at the apex, the constriction not continued across the disk, truncate at the base which is narrowly carinate; dorsum moderately convex dorsally, highest at the middle, coriaceous, with low flattened separated granules, and without erect setae, *Elytra* narrowly ovate in ♂, broader in ♀, widest at or before the middle, constricted at the base, the constriction continued shallowly across the dorsum, the base jointly sinuate, with the margin narrowly carinate and the angles shortly projecting; the shallow striae with strong close punctures that greatly diminish behind, the intervals with small rounded scales and rather sparse stout erect setae. *Legs* black to red-brown; femora with dense green or coppery scales dorsally, without erect setae on the underside; all the tibiae of ♂ with a fringe of long setae on the underside only, the front pair strongly incurved apically, the hind pair sinuate, smooth and flattened on the inner face; tibiae of ♀ without the fringe of setae, the front pair much less incurved, the hind pair finely denticulate on the inner face. *Sternum* with a tubercle in the middle of the prosternum behind the coxae in both sexes.

Length: 6 - 7 mm.; *Breadth*: 2.2 - 3.0 mm.

NYASALAND: Blantyre, 3,000 ft., 3♂, 1910 (type); Ruo Valley, 1,000 - 2,000 ft., 3♂ 1♀, v, 1910; Mlanje to Zomba, 2,000 - 3,000 ft., 3♂ 1♀, v, 1910; Mlanje, 2♂ 4♀, ii - iv, 1913, 1♂ 2♀, i - ii, 1914; S.-W. of Lake Chilwa, 1♂, i, 1914 (all *Dr. S. A. Neave*); Cholo, 1♂ (*R. C. Wood*).

In general facies very similar to *E. elegans*, Mshl., from S. Rhodesia, but differing from it and all its congeners in the presence of a prosternal tubercle and also in the constricted and carinate base of the elytra. *E. elegans* differs further in having finer and much more numerous setae on the elytra.

SUBFAMILY CLEONINÆ

CALODEMUS ARMIPES, sp. n.

♂. ♀ Derm black with dense grey to pale brown setae; prothorax with a large dark brown bell-shaped area in the middle of the disk which is twice as broad at the base as it is on the apical margin and a narrow angulated stripe on the upper edge of the pleurae from the base to two-thirds; elytra with a short narrow oblique dark stripe on the basal third between intervals three and six, and a much broader, slightly oblique dark band behind the middle between intervals two and eight, widening outwardly and enclosing a pale spot near its anterior edge on stria five; underside with the usual brown markings almost obliterated.

Rostrum slightly dilated at the apex, with a strong median carina which starts from a large fovea at its base and expands at the apex into an elongate raised flat triangle; on each side of the carina on the basal half a broad deep sulcus which narrows in front and nearly reaches the antennæ with the two basal joints of the funicle equal. *Prothorax* about as long as broad, narrowing very slightly from the base to the middle with the sides straight, then curving in to the apex with a broad shallow apical constriction; dorsum with rather large separated punctures which are normally concealed by scales and without a trace of a median carina. *Elytra* broadly ovate, widest slightly behind the middle, jointly rounded at the apex; the broad striae with large punctures which are concealed by the dense setiform scales; the intervals much narrower than the striae, three and five being slightly higher than the others, and without any posterior callus on interval five.

Legs with dense uniform grey hair-scales; front tibiæ with a large tooth on the inner edge close to and about as long as the mucro but more triangular; hind tarsi with joint two longer than three. *Venter* of female with a large transverse oval depression on ventrite five and a short carina on each side of it.

Length: 12.0 - 14.5 mm.; *Breadth*: 5.0 - 6.5 mm.

KENYA: Olgasalic, 8♂ 7♀, v, 1945 (*Meneghetti*).

In Faust's Key to the genus (*Deut. Ent. Z.* 1904, p. 232) this species runs down next to *invidus*, Fst. (also from Kenya), which differs in having no fovea at the base of the rostral carina; the prothorax is much more abruptly narrowed in front more uneven dorsally and with a short median carina; but *armipes* differs from this and the other known species of the genus especially in the large triangular tooth near the apex of the front tibiæ and the carinæ on the fifth ventrite of the female.

SUBFAMILY ERIRRHININÆ

ECHINOCNEMUS CRASSUS, sp. n.

♂. ♀ Derm black, with dark grey scaling and brown markings; prothorax grey, with four small spots along the apical margin, a slightly oblique band on each side of the base, and a broad stripe on the pleuræ, dark brown; elytra with a macular brown stripe from the base to the declivity between striae one and four (enclosing a pale spot on interval three at the top of the declivity), a quadrate spot at the base of intervals five and six, a very indefinite macular stripe on intervals seven and eight, and a short lateral stripe below the shoulder, also dark brown; underside uniform pale grey. Normally the insects appear to be covered with a uniform earthy coat which entirely conceals the colouring.

Head with the frons a little broader than the base of the rostrum, strongly convex transversely, with a deep median fovea. *Rostrum* as long as the prothorax in both sexes, rather slender, moderately curved, slightly widening at the base, sparsely squamose; in ♂, parallel-sided, rather strongly and densely punctate throughout; in ♀, somewhat dilated at the apex, and more finely and sparsely punctate. *Antennæ* red-brown; funicle with joint one twice as long as two, the distal joints transverse. *Prothorax* transverse (7:9), strongly rounded laterally, widest at the middle, narrowly constricted at the apex, broadly arcuate at the base, the postocular lobes short, the front margin of the prosternum rather deeply sinuate; dorsum slightly convex longitudinally, with dense small punctures that are hidden by scaling and usually with a short bare median line. *Elytra* broadly ovate, gently rounded laterally, very broadly rounded behind, the base deeply jointly sinuate; dorsum gently convex longitudinally, becoming vertically declivous at the apex, without any posterior callus, the striae rather deep, but the punctures concealed by scales, interval three (and to a less extent five and seven) slightly higher than the others; intervals with very short appressed setae which are obliquely raised only on the declivity. *Legs* stout, with uniform grey scaling; tibiæ denticulate beneath but with only a sparse fringe of setae, the front pair straight on the dorsal edge; tarsi with joint three distinctly bilobate and shorter than two.

Length: 5.5 - 8.0 mm.; *Breadth*: 3.0 - 4.2 mm.

KENYA: Naivasha, 22 ♂ 12 ♀, v, 1940 (*H. J. Allen Turner*).

Much the largest and heaviest species described so far; the unusual shortness of the metasternum between the coxæ is characteristic, its length being only half that of a median coxa, as also is the broad convex frons.

ECHINOCNEMUS SILVESTRIS, sp. n.

♂. ♀ Very similar in general appearance to smaller specimens of the preceding species, but narrower, with the sides of the elytra parallel.

Head much narrower than the rostrum near its base and nearly flat with a much smaller median fovea. *Rostrum* a little shorter and stouter, constricted at the base, more

widened at the apex in both sexes, the punctures smaller in ♂ *Antennæ* more slender. *Prothorax* rather more narrowed behind, subtruncate at the base. *Elytra* distinctly narrower, parallel to beyond the middle, nearly truncate at the base, much less steeply declivous behind; the shoulders less oblique, the striæ finer and much more distinct, the intervals much less rugosely punctate and all of equal height. *Legs* with the front tibiæ much less deeply sinuate beneath on the apical half.

Length: 5.5 - 6.7 mm.; *Breadth*: 2.5 - 3.0 mm.

KENYA: Arabuko Forest, 1♂ 1♀, v, 1940 (T. H. E. Jackson).

SUBFAMILY COSSONINÆ

HIMATIUM TECTICEPS, sp. n.

♂. ♀ Derm uniform red-brown, sparsely covered with recumbent and erect setae.

Head deeply immersed in the prothorax, so as to be hardly visible from above in the normal position. *Rostrum* of ♂ stout, straight, 2.5 times as long as broad, two-thirds the length of the pronotum, coarsely punctate throughout with the punctures longitudinally confluent, without any basal incision or elevation, with sparse fine erect setae; rostrum of ♀ slightly shorter and rather less coarsely punctate on the apical half. *Prothorax* longer than broad (4:3), rather strongly rounded laterally in the basal half (greatest width at about one-fourth from the base) and narrowing rather rapidly in front, broadly and shallowly constricted at the apex, the constriction being continued rather deeply across the disk; dorsum somewhat flattened in the middle, with large reticulate punctures throughout without any median depression, and with numerous long broad transverse recumbent golden setae. *Elytra* elongate, a little wider than the prothorax, parallel to two-thirds, somewhat flattened on the disk, with a deep sub-apical depression on each side; the striæ with rather large subquadrate punctures, the intervals as broad as the punctures, with a single row of long stout recumbent setae which overlap one another so as to form a continuous line, and the alternate intervals with a single row of short broad curved erect setae.

Length: 2.5 - 2.7 mm.; *Breadth*: 0.6 - 0.7 mm.

. KENYA: Naivasha, 3♂ 3♀, vii, 1937 (H. J. A. Turner).

. Of the two other East African species, *H. exsculptum*, Voss, differs in having a deep depression at the base of the rostrum, the punctures on the pronotum are strong but separated, and the elytra lack the long recumbent setae.

H. coffeæ, Mshl., differs in its much longer and more finely punctate rostrum, which is separated from the head by a dorsal incision; the prothorax is subcylindrical; the intervals on the elytra are much narrower than the punctures, and the recumbent setae are very short and inconspicuous.

A SUMMARY OF THE BIRDS OF THE ADDIS ABEBA REGION, ETHIOPIA

by ~~W. H. Stanks, (British Embassy, Addis Abeba)~~ KENNETH M. GUICHARD

The material for this paper was compiled over three years, from July 1945 to July 1948, when the author was a locust officer in Ethiopia with headquarters in Addis Abeba.

No account of the ornithology of the region has yet appeared, and the present paper partly aims at providing a basis, such as the author himself has lacked and greatly desired, for a study of the bird life of the widely different types of country that surround Addis Abeba.

For obvious reasons, repetition of general information has been avoided and the notes under species have been kept as brief as possible unless they reveal new data. An apology is not given for another "list" as Ethiopia is still one of the most inaccessible countries in Africa, and Addis Abeba is the centre of the European population in a country where any scientific investigations, however harmless, are looked upon with suspicion and thwarted whenever possible.

Before the Italian conquest of Ethiopia a collection of birds, some of them from near Addis Abeba, was made by P. C. Zaphiro for W. N. McMillan of the British Legation and presented to the British Museum and described by O. Grant (3). A few birds from Addis Abeba were secured by the American Frick Expedition and described by Friedmann (2). Major R. E. Cheesman (1) also mentions a few species from the capital and his paper will be found the most useful to consult for habits, etc., of many of the common species.

During the Italian occupation, the Marquis S. Patrizi formed a collection of Ethiopian birds and they were listed privately by him up to 6th April 1941. Part of this collection is still in the capital but its condition, as might be expected, is rapidly deteriorating.

During the last war Dr. H. M. Woodman (5) (6) and (7) made a special study of the ducks, geese, and snipe of the region, and some fresh data is added in the present paper.

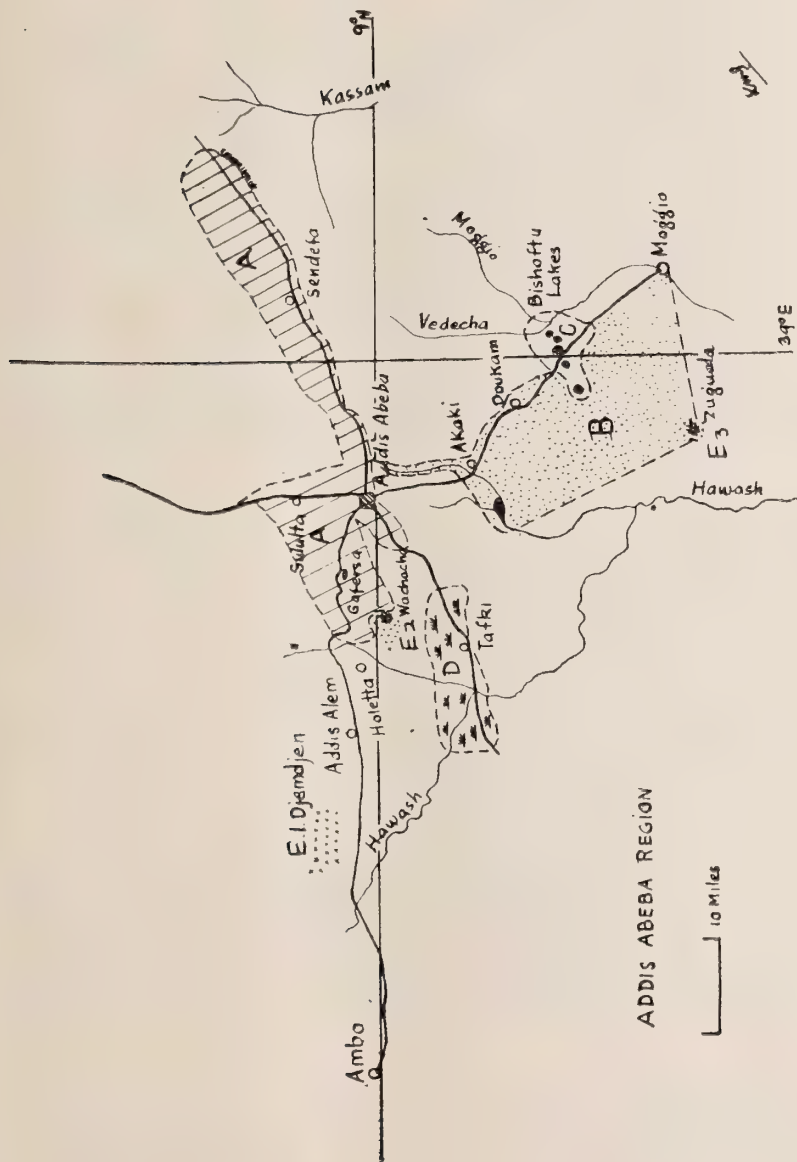
The map illustrates the extent of the different type habitats that have been visited personally, but does not show the total extent of (a) or (b) much of which remains to be explored within a fifty mile radius of Addis Abeba.

(a) THE HIGH PLATEAU

Most of this habitat lies between 8,000 and 10,000 feet. The highest area is Wachacha, 11,038 feet. At 9,000 feet bird life diminishes and no peculiar species are confined to above this altitude. The steep hills north of Addis Abeba form a barrier to species infiltrating from (b), and also mark the southern limit of some of the birds of the higher altitudes of the high plateau to the north.

Characteristic of much of (a) are the isolated stony-topped minor plateaux and elevations rising from the level plain. The distinctly palæartic vegetation differs from that of the lower, warmer, and drier thorn scrub in (b), and the larger elements of this flora are confined in patches to sheltered valleys and the southern slopes of the hills. The only trees at all common are small individuals of *Juniperus procera* and *Podocarpus excelsior*, and *Acacia abyssinica*. Much of the area is cultivated by the more homely Gallas, and barley and teff are grown extensively while cattle and horses find good pasturage.

The largest wild animals on the high plateau are the Madaqua Antelope (*Sylvicapra grimmii*), Spotted Hyena, Serval Cat, and Jackal (*Canis aureus*). Bird life is most abundant where shrubs and trees occur and here one finds the Brown Tit-Flycatcher, Dusky Flycatcher, Black-headed Fly-catcher, Cinnamon Warbler, Rüppell's Robin-Chat, White-backed Black Tit, Baglafaecht Weaver, Yellow-bellied Waxbill, African Citril, and Streaky Seed-eater, together with the more widely spread Olive Thrush, Ground-scraper Thrush, Stout Cisticola, Boubou, and Black-headed Bush Shrike. Typical



ADDIS ABABA REGION

10 MILES

of the open country above 8,000 feet are the Wattled Ibis, Blue-winged Goose, Red-wing Francolin, Abyssinian Long-eared Owl, Theck'la Lark, Red-capped Lark, Cloud-scraper, Hill Chat, Red-breasted Wheatear, Abyssinian Stonechat, Abyssinian Long-claw and Black-headed Siskin. During the winter many waders and duck appear on Sulula plain and at Gafersa.

One special area is found near the Dessie road along the edges of the precipitous cliffs and slopes overlooking the Cassam river valley thousands of feet below. This locality, comparable with the Blue Nile gorge, is the haunt of rare Chats, Swifts, Bearded Vultures, Lanners and Red-wing Starlings. The Klipspringer and Gelada Monkey are found here.

Thirty resident species of the high plateau never or very seldom descend below 8,000 feet and this may be due to the temperature varying little throughout the year. There is however, a pronounced wet and dry season in the whole region under discussion, the rainfall diminishing at lower altitudes. There are no noticeable vertical movements to or from the high plateau at any period. Between September and March about seventy migrants visit or pass through this part of Ethiopia, and only one, the Ortolan Bunting, seems confined to the higher altitudes.

The breeding season for the whole region coincides with the regular big rains from June to the middle of September, but there is some breeding activity in May. Practically no nesting takes place during the dry season when it happens that insect life is relatively scarce and made even scarcer by the presence of numerous palæartic migrants.

(b) UPPER THORN SCRUB

This habitat, lying between 6,000 and 7,500 feet, is typified by black cotton soil and the presence of Acacias other than *Acacia abyssinica*. *Ficus* sp. and *Cordia abyssinica* occur locally. The transition between (a) and (b) is very gradual and happens over a wide area of open cultivated land south of Addis Abeba. However, a useful boundary can be said to run through Akaki, south of which the introduced Eucalyptus becomes relatively scarce and the Acacias start to appear in goodly numbers. Akaki is noticeably warmer and drier than Addis Abeba and these conditions increase progressively towards the south where bird life becomes richer and more abundant. Sorghum and maize cultivations and the goat herds make their appearance. Near Moggio and Zuquala at about 6,000 feet there are many deep gullies fringed with impenetrable thickets. Common Bushbuck, Warthog, Leopard, Baboons, and Grivet Monkeys are found at these lower altitudes and the Reedbuck is not uncommon in the more open bush.

Ninety resident birds are confined to the upper thorn scrub and twenty of these appear only in the neighbourhood of Moggio and Zuquala. Typical of the entire habitat south of Akaki are such common species as the Spur-winged Goose, Ring-necked Dove Abyssinian Roller, Red-beaked Hornbill, Drongo, Grey-backed Fiscal and Black-headed Weaver.

The only temporary marshes created during the rains are near the Akaki river and reservoir and at Bishoftu.

(c) BISHOFTU LAKES

The chief features of this habitat, which is the richest of the whole region, are the four deep permanent crater lakes at Bishoftu. Until recently, a fifth crater contained a swamp three feet deep with a dense and varied flora round its edges. In November 1946, this swamp teemed with duck and water birds, but during 1947, probably due to volcanic action, the water disappeared and this promising locality is now a ploughed field.

Three of these lakes abound in fish and are fringed with bulrushes harbouring the Black Crake and Lesser Swamp Warbler. Grebes, Cormorants, duck and herons are common, and the steep sides of the craters are favourite haunts of many birds including swallows and hawks. To the east and south of Bishoftu, the Vedecha and Moggio streams wind through an attractive country of small gorges where vegetation is plentiful.

(d) COTTON SOIL MARSHES

This habitat which is traversed by the Jimma road has about the same altitude and climate as Akaki, but only becomes interesting and specialised when it is flooded from July to October by the overflowing of the Hawash and Holetta rivers. The marshes form the chief duck breeding area of the region in localities where a tall and dense aquatic vegetation springs up. It seems to be the only habitat visited regularly by the Wattled Crane and Lesser Moorhen.

(e) TEMPERATE RAIN FOREST

(e¹) Djemdjem forest, forty-five miles west of the capital, is the largest and most interesting forest area. Despite wanton exploitation which still continues, this forest still harbours a small specialised avifauna. The principal trees exploited for their timber are *Juniperus procera* and *Podocarpus excelsior* which attain to magnificent proportions in the remoter fastnesses. Thick undergrowth flourishes along the numerous streams and Leopard, Lynx, Black Bushbuck, Colobus Monkeys and Baboons are found in the forest. The rainfall and climate are similar to Addis Abeba while the lower parts of the forest harbour a richer flora and fauna than the higher and more sparsely covered slopes.

Some typical birds of this habitat are the Great Sparrow-Hawk, Abyssinian Goshawk, Harrier-Hawk, Olive Pigeon, Lemon Dove, Yellow-fronted Parrot, Narina's Trogon, Abyssinian Catbird, Grey Cuckoo-Shrike and the Black-headed Forest Oriole.

(e²) Wachacha forest on the western slopes of that mountain is colder and less luxuriant than Djemdjem but the flora and fauna appear to be essentially the same but less varied. It has the advantage of being an hour's car drive from Addis Abeba, but clashes occur with local officials unless one carries an Amharic charm which bears a large purple seal containing if possible the likeness of an animal wearing a crown.

(e³) represents a patch of stunted forest on the tope of Zuquala (9,900 feet) that surrounds an interesting crater lake. This perfectly shaped mountain stands isolated in a sea of thorn scrub with its summit often bathed in cloud. The Wattled Ibis, White-cheeked Turaco, and Tacazze Sunbird live here in comparative isolation separated from their nearest typical habitat by forty miles of unsuitable terrain. The duck on the lake are very tame, as the mountain is sacred to pilgrims and the use of firearms forbidden.

ACKNOWLEDGMENTS

The author wishes to thank Professor M. Giaquinto for allowing him to see Patritzi's notes and to copy certain records. He is also indebted to Monsieur Gajdacs, a Hungarian taxidermist resident in Addis Abeba, who has allowed him to examine a collection of local birds and has helped in the preparation of specimens that have been despatched to the British Museum. Monsieur Salim Abichacra has also secured some interesting species and has supplied useful information on the game birds. The author's sincere thanks are due to Mr. J. D. Macdonald and Captain Claude Grant of the British Museum Bird Room for their examination and identification of specimens.

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- (7) „ European Snipe in Abyssinia. *Ibis*, 1945, p. 468.

SYSTEMATIC LIST

The nomenclature in this list follows that adopted by Mackworth-Praed and Grant in their forthcoming African Handbook of Birds.

- Podiceps cristatus infuscatus* Salvad. Great Crested Grebe.
Common in pairs on Bishoftu lakes where it appears to breed. Eleven pairs counted on one lake during July 1948.
- Poliiocephalus ruficollis capensis* (Salvad.) Little Grebe.
Common in (b) and (c); young seen in July.
- Phalacrocorax carbo lugubris* Rüpp. White-necked Cormorant.
Phalacrocorax africanus africanus (Gmel.) Long-tailed Cormorant.
- Anhinga rufa rufa* (Lacep. and Daud.) Darter.
Widely distributed except in (a).
- Pelecanus rufescens* (Gmel.) Pink-backed Pelican.
Fairly common in pairs below 8,000 feet.
- Ardea cinerea cinerea* Linn. Grey Heron.
Ardea melanocephala Vig. and Child. Black-headed Heron.
Widely distributed.
- Ardea goliath* (Cretzsch.) Goliath Heron.
One visited a lake at Bishoftu for a fortnight during November 1947. In Ethiopia I have only seen the Goliath Heron a few times near Lake Bario in the Danakil.
- Pyrherodia purpurea purpurea* Linn. Purple Heron.
One record from Bishoftu, 31st October 1945.
- Casmerodius albus melanorhynchus* (Wagl.) Great White Egret.
Egretta garzetta garzetta (Linn.) Little Egret.
- Bubulcus ibis* (Linn.) Buff-backed Heron.
Widely distributed.
- Ardeola ralloides ralloides* (Scop.) Squacco Heron.
Uncommon in the bulrushes of Bishoftu lakes.
- Butorides striatus atricapillus* (Afzelius) Green-backed Heron.
Rare in (b).
- Nycticorax nycticorax nycticorax* (Linn.) Night Heron.
Several immature birds in a shady fig tree, Bishoftu lake, 12th May 1946.
- Scopus umbretta bannermanni* C. Grant. Hammerkop.
Widely distributed.
- Ciconia ciconia ciconia* (Linn.) White Stork.
Single birds on ploughed land in (b), February 1948. One near Ambo, 3rd August 1947, and one near Doukam, 28th October 1945.
- Ciconia nigra* (Linn.) Black Stork.
Various singles and a flock of five between 17/10 and 3/2 in (a).
- Dissoura episcopus microscelis* (Gray) Woolly-necked Stork.
One in (d), 27th October 1946.
- Sphenorhynchus abdimii* (Licht.) Abdim's Stork.
Singly and in flocks of about a hundred at Bishoftu between April and August, and a flock in February. Three on Sululta plain during January.
- Ephippiorhynchus senegalensis* (Shaw) Jabiru.
Several seen during July and August at Bishoftu and Tafki on flooded land. A single was hunting round the crater lake on Mount Zuquala during November.

- Leptoptilos crumeniferus* (Less.) Marabou.
A single near Bishoftu, June 1948.
- Ibis ibis* (Linn.) Wood Ibis.
Widely distributed.
- Threskiornis Aethiopicus Aethiopicus* (Lath.) Sacred Ibis.
Most abundant in flocks in (a).
- Comatibis eremita* (Linn.) Waldrapp.
Six seen near Sululta, 9th November 1945, and two in the same locality, 10th November 1946, and a single bird 17th November. Outside the region nine were observed near Debra Berhann on open land, 24th February 1947. Possibly these Ibis breed in cliffs in Ethiopia and migrate south over the high plateau during the dry season.
- Bostrychia carunculata* (Rüpp.) Wattled Ibis.
Common in flocks of up to twenty five in (a), but a few wander down to (b), and an isolated colony was found on the top of Zuquala.
- Plegadis falcinellus falcinellus* (Linn.) Glossy Ibis.
Seen at Bishoftu in May, and at Gafersa in June. Near Tafki in November a flock of several hundred dived to earth at tremendous speed scattering in all directions.
- Platalea alba* Scop. African Spoonbill.
March and May at Gafersa, and three at Tafki in August.
- Phoenicopterus ruber roseus* Pallas Greater Flamingo.
One obtained in (d), 27th October, and three seen at Gafersa, 2nd December.
- Phoeniconaias minor* (Geoffroy). Lesser Flamingo.
Flocks were seen at Gafersa during January and June, and at Akaki reservoir during February.
- Erismatura maccoa* (Eyton). Maccoa Duck.
Gafersa, September 1946. Green lake, Bishoftu, September 1946. Zuquala lake, October 1945.
- Thalassornis leuconotus leuconotus* Eyton. White-backed Duck.
Only seen on the Bishoftu lakes.
- Aythya nyroca nyroca* (Guld.) White-eyed Pochard.
Woodman records one at Tafki, 6th December 1941.
- Aythya erythropthalma* (Wied.) African Pochard.
Gafersa during May, June and December. Bishoftu lakes during September, November, January and July. From July to September common in (d) in pairs and probably breeds there.
- Aythya fuligula* (Linn.) Tufted Duck.
One of the latest ducks to arrive on migration and prefers the high plateau above 8,000 feet, but once abundant at Akaki reservoir, 10th February. Gafersa is a favourite locality and they have been shot there between 15th December and 22nd June, a flock of fifteen being seen on this last date.
- Spatula clypeata* (Linn.) Shoveler.
Common and widely distributed, the earliest record being 11th October. A pair, the male in breeding plumage, was seen at Akaki during June.
- Spatulcapensis* (Eyton). Cape Shoveler.
According to information given by Patritzi and Toschi to Woodman, a few Cape Shovelers remain in Ethiopia throughout the year but do not breed. Gajdacs has seen a Shoveler with young near Tafki many years ago but no specimens were obtained. *S. capensis* has the shafts of the primaries brown, while in *S. clypeata* they are white.
- There are no specimens to confirm that *Spatula capensis* breeds in Ethiopia. The birds recorded by Patritzi and Gajdacs are almost certainly European Shovelers, a

species which is found throughout the summer months, and probably breeds, on Lake Naivasha, Kenya Colony.—EDITOR.

Anas undulata ruppellii (Blyth.) Yellow-billed Duck.

This is the commonest and most widely spread resident duck in the region and occurs everywhere including Zuquala lake. It breeds extensively in the thicker swamp vegetation of (d). Pairing takes place in July, while fledglings occur in October. One was reported sitting on six eggs near Sululta on 27th August.

Anas sparsa leucostigma (Rüpp.) Black Duck.

Occurs on streams, usually in pairs, at Djemdjem, near Gafersa, and to the north of Addis Abeba, and occasionally to the south of the capital but not seen in (b), (c) or (d). A pair with four ducklings was observed on a stream 43 kms. north of Addis Abeba, 12th January 1946.

Anas strepera (Linn.) Gadwall.

An uncommon migrant in (a). Earliest arrival, Sululta, 3rd October. Exceptionally stout build noted in flight.

Anas penelope (Linn.) Wigeon.

One of the commonest palæartic migrants. Earliest arrival, Gafersa, 28th October; a few at Bishoftu lakes, 6th May. On 8th July, a ♀ in very worn plumage was shot at Gafersa.

Anas crecca (Linn.) Common Teal.

Widely distributed. Earliest record 8th November at Gafersa, and not seen after 27th April.

Anas querquedula (Linn.) Garganey.

Very large flocks of garganey were seen in (d), 21st September 1946. This is the first migrant duck to arrive in the region and remains widespread until the end of May. There are two records from Gafersa during June, a ♂ being shot out of a party of four on the 12th.

Anas capensis (Gmel.) Cape Wigeon.

Only seen on the green lake, Bishoftu, April and November. About forty birds were present in November, and two that were shot had dipterous larvæ adhering to their bills.

Anas punctata (Burchell.) Hottentot Teal.

Only seen in the once marshy crater at Bishoftu, parties of six and eight in May and November. Woodman records it from Tafki in June, and from Akaki reservoir.

Anas erythrorhyncha (Gmel.) Red-bill Duck.

Singles shot and a few seen at Gafersa during March, May, July, December and January. A single was shot near Sululta, 3rd November, and another on Akaki reservoir, 10th February. A pair was seen on a small pond between Doukam and Zuquala, 5th January. On 13th July they were fairly common in (d) where a flock of fifteen was seen, and on 31st July several pairs were noted. It appears that the Red-bill Duck is a resident and probably breeds in (d) during the rains and wanders further afield during the dry season.

Anas acuta (Linn.) Pintail.

Common and widely distributed, 7th November to 12th May.

Dendrocygna viduata (Linn.) White-faced Tree Duck.

Three seen on a waterlogged field in (d), 31st July. They are very common south of (b) at lower altitudes.

Dendrocygna bicolor (Vieill.) Fulvous Tree Duck.

Between July and October common in (d) where it breeds. On 27th October two birds of the year were shot and fledglings produced by locals who said these duck nested in the swamps. A single was shot near Sululta, 3rd November. During the dry season they probably go south to lower levels,



“Lammergeyer from the High Plateau overlooking
the Cassam River Gorge, *June* 1948.”



- Nettapus auritus* (Bodd.) Pigmy Goose.
Recorded by Woodman from Akaki reservoir and Bishoftu lakes.
- Sarkidiornis melanotos* (Pennant). Knob-billed Goose.
Widely spread below 8,000 feet, but two ♀♀ seen near Sululta, 10th November.
- Alopochen aegyptius* (Linn.) Egyptian Goose.
Widespread and very common. On Akaki reservoir during February many were moulting their primaries and were unable to fly.
- Plectropterus gambensis gambensis* (Linn.) Spur-winged Goose.
Common and widely distributed in open country, but not in (a) except once at Gafersa.
- Cyanochen cyanopterus* (Rüpp.) Blue-winged Goose.
Confined to the higher altitudes of (a) where it is common. In March a nest was found beside a stream on Sululta plain with five eggs (Abichacra).
- Sagittarius serpentarius* (Miller.) Secretary Bird.
During the Italian occupation twice seen during February east of Ambo (Abichacra).
- Gyps ruppelli erlangeri* (Salvad.) Ruppell's Griffon.
Occasionally seen in (b), and several were flying round the summit of Zuquala.
- Pseudogyps africanus* (Salvad.) White-backed Vulture.
Common and widespread.
- Torgos tracheliotus nubicus* (Smith.) Lappet-faced Vulture.
Widespread and fairly common.
- Trigonoceps occipitalis* (Burchell.) White-headed Vulture.
Widespread.
- Neophron perenopterus perenopterus* (Linn.) Egyptian Vulture.
Widespread but uncommon and only once seen above 8,000 feet. Reported as nesting in the cliffs of a Bishoftu lake.
- Necrosyrtes monachus pileatus* (Burch.) Hooded Vulture.
Common in Addis Abeba.
- Falco biarmicus abyssinicus* (Neum.) Abyssinian Lanner.
Common and widespread. At Bishoftu there were apparently several nesting pairs during November and December and in season they prey on the Common Teal. A dozen were observed catching and eating Desert Locust on the wing. Often seen flying in Addis Abeba.
- Falco subuteo subuteo* (Linn.) Hobby.
There is a ♂ labelled Addis Abeba, 22nd April 1939, collected by the Italians and Patritzi records four ♂♂ from Addis Abeba, 7th October 1939.
- Falco cucuieri* Smith. African Hobby.
Common and widely distributed. A pair observed feeding on flying white ants as noted by Cheesman.
- Falco cherrug cherrug* (Gray.) Saker Falcon.
There is a ♀ collected by the Italians, Addis Abeba, 27th December 1937. A large falcon with a slow flapping flight seen at Gafersa and twice at Bishoftu probably belonged to this species.
- Falco tinnunculus tinnunculus* (Linn.) Kestrel.
Common and widespread, kestrels arrive in the region at the beginning of October and pass northwards at the beginning of May.
- Falco tinnunculus carlo* (Hart. and Neum.) Abyssinian Kestrel.
A ♀ is recorded by Friedmann from Addis Abeba, 2nd January 1912.
- Falco neumanni* (Fleischer.) Lesser Kestrel.
A ♂ obtained near Addis Abeba in January 1948 is in Gajdac's collection.

- Falco ardosiaceus* (Bonn. and Vieill.) Grey Kestrel.
One seen near Addis Alem, 12th August, and a ♀ shot near Tafki, 8th September.
- Poliohierax semitorquatus castanonotus* (Heugl.) Pigmy Falcon.
One record near Moggio, but it becomes more frequent at lower altitudes.
- Milvus migrans tenebrosus* (Grant and Praed.) Tropical African Kite.
Between September and the beginning of June common in Addis Abeba, but rare during the big rains. Three times recorded at a nest in October, December, and January but no proof of eggs or young.
- Elanus caeruleus* (Desf.) Black-shouldered Kite.
Widespread in (a) and (d). Reported preying on chickens.
- Aquila rapax raptor* (Brehm.) Tawny Eagle.
Common and widespread.
- Hieratus pennatus* (Gmel.) Booted Eagle.
Patritzi records two ♂♂ from Addis Abeba on 17th and 18th January 1938.
- Lophæëtus occipitalis* (Daud.) Long-crested Hawk Eagle.
Prefers lower altitudes but is occasionally seen near Moggio and Zuquala.
- Circaëtus pectoralis* (Smith.) Black-chested Harrier Eagle.
One obtained near Akaki, 19th August 1945, and another seen at Bishoftu. A pair circled high over Bishoftu during July but they may have been Martial Eagles.
- Terathopius ecaudatus* (Daud.) Bateleur.
Widespread, but uncommon above 8,000 feet.
- Cuncuma vocifer* (Daud.) Fish Eagle.
Nests in a large fig tree beside one of the lakes at Bishoftu where three immature birds were seen in May. One recorded in (a).
- Gypaëtus barbatus meridionalis* (Keyse. and Blas.) Lammergeyer
Chiefly confined to the high altitudes of (a) where it haunts cliffs. It was regularly seen about some cliffs on the Dessie Road near Addis Abeba where it has been reported breeding. The long wedge-shaped tail distinguishes it from all other birds of prey.
- Buteo vulpinus* (Gloger.) Steppe Buzzard.
A ♂ was obtained near Ambo, 3rd August, and another in (b) 10th August. Both these birds appeared to be immature (together with a third from Jimma, 27th January). All three were brown birds, two with underside of primaries and secondaries white, tails with four dark bars and inner webs of tail feathers, except the central pair, whitish. In the Ambo and Jimma specimens the eyes were grey-brown.
- Buteo oreophilus* (Hart. and Neum.) Mountain Buzzard.
Patritzi records a ♂ from Addis Abeba, 12th November 1937.
- Buteo rufinus rufinus* (Cretzsch.) Long-legged Buzzard.
A ♀ is recorded by Patritzi from Addis Abeba, 5th November, 1937.
- Buteo rofufuscus augur* (Rüpp.) Augur Buzzard.
Common and widespread above 8,000 feet in (a) but rare south of Bishoftu.
- Accipiter nisus nisus* (Linn.) European Sparrow-Hawk.
A ♀ is recorded by Patritzi from Addis Abeba, 29th December 1937.
- Accipiter rufiventris per. picillaris* (Rüpp.) Abyssinian Sparrow-Hawk.
Two ♂♂ are recorded from Addis Abeba during November 1938 by Patritzi.
- Accipiter melanoleucus melanoleucus* (Smith.) Great Sparrow-Hawk.
Only once seen in (e¹).
- Accipiter badius sphenurus* (Rüpp.) East African Shikra.
Several were obtained near the Bishoftu lakes, including an immature in July. Usually seen about cliffs.

Accipiter tachiro unduliventer (Rüpp.) Abyssinian Goshawk.

This hawk has only been found in (*e*¹) and (*e*²) in thickly wooded areas. In March an adult male was pursuing an immature female in Djemdjem forest and both were obtained.

Micronisus gabar (Daud.) Gabar Goshawk.

Only seen near Moggio and Zuqua'a where it preys on Weaver Birds.

Melierax metabates metabates (Heugl.) Dark Chanting-Goshawk.

Uncommon in (*b*).

Circus pygargus (Linn.) Montagu's Harrier.

One ♂ near Moggio, 27th December, and a second near Doukam, 7th January. On each occasion the streaking of the underparts and the dark wing bar were visible.

Circus macrourus (Gmel.) Pale Harrier.

Arrives in the region during October and leaves during April. On 12th July 1947/1948, a female harrier was seen near Addis Abeba. A single female was observed near Adama on 27th August, and at Lake Metahara on 8th September.

Circus aeruginosus aeruginosus (Linn.) Marsh Harrier.

Common and widespread from 17th October to 23rd March.

Polyboroides typicus typicus (Smith.) Harrier-Hawk.

Occurs in the forests of Djemdjem and Wachacha, and once seen at Bishoftu in July.

Pandion haliaëtus (Linn.) Osprey.

Reported once, fishing in a Bishoftu lake. In Ethiopia I have seen Ospreys at the following places:—two near Abroberifaghe (Danakil), 4th February 1947; one on Lake Bario (Danakil), 7th February 1947; several times on the Baro River near Gambela, 25th February 1948; and one fishing on Lake Auasa, 5th April, 1948.

Francolinus sephaena grantii (Hartl.) Crested Francolin.

The Crested Francolin keeps to thick bush near gullies and watercourses below 7,000 feet in (*b*). It is found in parties of up to six near Moggio and Zuquala and is extremely difficult to flush although it can fly very fast. No breeding records.

Francolinus afra psilolæmus (Gray.) Red-wing Francolin.

Only found in (*a*) above 8,000 feet. Coveys of up to ten birds occur on open and often stony ground and always sit very tight. During the Italian occupation they greatly decreased and appear still to be doing so. Abichacra has found four nests, all slight depressions at the foot of grass tufts in open country, and the beige coloured eggs never exceeded three.

Francolinus clappertoni sharpii (O. Grant.) Clapperton's Francolin.

This francolin is not found to the north of a line drawn through Akaki reservoir near where it is getting very scarce, and in the environs of Doukam and Bishoftu its extermination is not far off as the natural thorn scrub cover gets cut down rapidly every year. At Zuquala it begins to get locally plentiful and keeps to patches of thick bush and overgrown gullies in some of the cultivated valleys. Nests containing four and five eggs have been found in November and December.

Francolinus erckelii erckelii (Rüpp.) Erckel's Francolin.

Abundant everywhere above 8,000 feet where it is found in scattered coveys of up to twenty birds, and hides during the day among the undergrowth of steep hillsides. In the early morning and evening they come out to feed on cultivated fields and are fond of barley grain. Breeding appears to take place throughout the year. In (*b*) this francolin is found round the lake craters at Bishoftu, and in the hills to the west of Akaki reservoir where it overlaps slightly into the range of *F. c. sharpii*. However, it was not seen during the brief visit to Mount Zuquala. The colour of the legs irrespective of age, varies from pale yellow to deep orange-red and individuals vary greatly in size.

Coturnix coturnix coturnix (Linn.)

European Quail.

Widespread and sometimes common in teff fields and old sorghum cultivations, and has been shot between 23rd October and 3rd March. A ♀ containing a complete egg shot near Addis Abeba on 18th October 1941 caused Grant and Mackworth-Præd (*Bull. B.O.C.* lxiv, p. 7) to place *Coturnix coturnix erlangeri* Zedl. as a synonym of *Coturnix coturnix coturnix*, and to suppose that the European Quail bred in Abyssinia. However, since specimens of breeding *Coturnix c. africana* have now been obtained near Addis Abeba it seems probable that the ♀ containing an egg in October represents some freak phenomenon similar to that displayed by the curlews that dropped eggs on the coast of Mauritius in the non-breeding season, and that no European Quail breed in Ethiopia, October being the time of their arrival in these latitudes after breeding has finished. It is possible that some individuals remain throughout the year but sight records are unreliable as quail seen between April and September would normally be *C. c. africana* or *C. delegorguei*.

Coturnix coturnix africana (Temm. and Schleg.)

Cape Quail.

Two ♂♂ and a ♀ were obtained by Woodman on 5th September 1942, north of Addis Abeba, and these had blackish-brown throats, the only character given for *Coturnix coturnix erlangeri* Zedl., and so Grant and Mackworth-Præd (*Bull. B.O.C.* lxvii, p. 46) treated this race as a synonym of *C. c. africana* instead of *C. c. coturnix*.

I shot a pair about to breed, the ♀ containing yolked eggs, together in a marsh near Tafki on 18th July 1948, which agree well with Woodman's specimens. This pair may prove that the Cape Quail breeds in Ethiopia and that Woodman's birds were not really migrants from the south in the non-breeding season, but resident breeders. During the rains I have seen pairs of dark looking quail in (a) and (d), but they are rare and it is unlikely that they were Harlequin Quail. The Cape Quail is undoubtedly scarce near Addis Abeba and it may even make local migrations after breeding.

While examining a series of Cape Quail in the British Museum it became apparent that fifteen skins from Nyasaland, Tanganyika, Kenya and Ethiopia were nearly all darker on the back and more richly coloured than the darkest of forty skins from South Africa, while the five Ethiopian skins averaged darkest about the throat and face. All ten northern males had no white on the rufous of the throat, while twenty-two out of twenty-eight southern males had a variable amount of white showing. Bearing in mind the extreme variability of the species one hesitates to enrich the nomenclature further.

Coturnix delegorguei delegorguei Deleg.

Harlequin Quail.

A ♀ that had apparently flown into some telegraph wires was caught in Addis Abeba 8th July 1948, and brought to Gajdacs. In September I found this quail very abundant on the grass plains between Lake Metahara and Hawash station. One was shot south of Adama and probably odd quail seen in (b) between April and September belong to this species.

Numida meleagris meleagris (Linn.)

Tufted Guinea-fowl.

Not found north of a line passing through Akaki and Tafki, except in a patch of high bush and forest east of Ambo. Once seen north of Doukani but not getting common until dense cover is reached towards Zuquala and south of Bishoftu. Pairing seems to take place chiefly in August and breeding towards the end of the rains. Two-thirds grown birds are common in January and at this time considerable damage is done to teff and "shumbura" peas. Large flocks contain fifty birds and more, and to the less blasé they offer good sport and are better eating than any of the francolin.

Rougetius rougetii (Guérin).

Rouget's Rail.

Frequents overgrown marshes and streams with plenty of cover in (a), near Gafersa, and in a few places near the road to Addis Alem. It does not seem to range above 8,000 feet, nor does it occur in (b) or (d).

Rallus caerulesens Gmel.

Kaffir Rail.

Patrizi records a ♀ from Tafki, 23rd July 1938.

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- Crex crex* (Linn.) Corn-Crake.
Abichacra shot a ♀ near Sululta, 27th September 1947, and a second one 10th October 1948.
- Crecoptis egregia* (Peters). African Crake.
A ♀ from Addis Abeba, 16th June 1938, Patrizi.
- Limnocorax flavirostra* (Swains.) Black Crake.
Common in the bulrushes round the edges of the Bishoftu lakes where it probably breeds.
- Porzana pusilla obscura* (Neum.) African Lesser Spotted Crake.
A ♀ containing a fully formed egg was caught by hand in a marsh in (d), 12th July 1947. Abichacra secured a *Porzana* on 18th September 1948 at Sululta (at 22 km. to the left of the road).
- Sarothura ayresii* (Gurney). White-winged Rail.
Arrives at Gafersa and Sululta plain during July. Breeds in the Sululta marshes during August, remains at least until mid-September (♂ and ♀ obtained by Abichacra 10th and 15th September 1948) prior to departure for an unknown destination. Abichacra caught a young bird unable to fly on 22nd September near Sululta and it has been given to the British Museum. (See Guichard (4))
- Sarothura rufa rufa* (Vieill.) Red-chested Flufftail.
A ♀ was shot near Gafersa, 30th July 1947.
- Gallinula chloropus meridionalis* (Brehm). African Moorhen.
Occurs in the bulrushes around the Bishoftu lakes. Several pairs were observed during April along the stream below Gafersa reservoir.
- Gallinula angulata* (Sundervall.) Lesser Moorhen.
During July 1947 Lesser Moorhens were common in pairs in an overgrown swamp in (d). Two ♀♀ had the ovaries greatly enlarged, 31st July. One was seen at Bishoftu, 20th July. On the wing this bird appears grey with trailing yellow legs and a yellow bill.
- Porphyrio madagascariensis* (Lath.) Purple Gallinule.
K. D. Smith, *Ibis* 1944, p. 247, records the Purple Gallinule as a common resident in suitable marshy localities. I have never seen it in Ethiopia.
- Fulica cristata* (Gmel.) Red-knobbed Coot.
Common on Bishoftu lakes where it breeds in May and June.
- Baelearica pavonina cecilæ* (Mitch.) Crowned Crane.
Occasionally seen in threes and fours in (b), (c) and (d).
- Bugeranus carunculatus* (Gmel.) Wattled Crane.
From July to October feeding in shallow flooded parts of (d), sometimes in large scattered flocks.
- Grus grus grus* (Linn.) Common Crane.
Widespread and often feeding in large flocks, 19th October to 10th February.
- Lissotis melanogaster melanogaster* (Rüpp.) Black-bellied Bustard.
Found most commonly in (b) south of Bishoftu and near Zuqala in long grass and acacia scrub. Several were seen during July in (d) walking about in a marsh and a ♂ was displaying to a ♀. A few have been shot near Akaki, but never in (a).
- Oedicnemus oedicnemus* (Linn.) Thicknee.
A flock of about thirty migrants observed on stony ground north of Sululta, 12th January 1946. Probably this species.
- Charadrius pecuarius pecuarius* (Temm.) Kittlitz's Sand-Plover
Several parties running about a flooded ploughed field in (d), 18th August.
- Charadrius tricollaris tricollaris* (Vieill.) Three-banded Plover.
Normally occurs near water below 6,000 feet, but a single was seen beside a stream on Sululta plain, 12th January.

- Stephamibyx melanopterus melanopterus* (Cretz.) Black-winged Plover.
Flocks of up to fifty seen on Sululta plain, August-October, January and March; four obtained from a flock in October were all immature. One flock at Bishoftu in April, and a pair with two chicks, 1st May. Near Harar, a bird was sitting on four eggs in a depression in a ploughed field on 18th April.
- Hoplopterus spinosus* (Linn.) Spur-winged Plover.
Uncommon in (b) and (d), and once at Gafersa.
- Tylibyx melanocephalus* (Rüpp.) Spot-breasted Plover.
One ♂ collected by the Italians, Entoto, 6th February 1940.
- Afribyx senegallus major* (Neum.) Wattled Plover.
Between July and October small flocks occur in (b) and (d).
- Recurvirostra avosetta* (Linn.) Avocet.
From 26th to 29th March 1946, an Avocet was flying about Gafersa reservoir. Outside the region one was seen at Lake Metahara, 23rd April, and a flock of fifty and many singles and small parties at Lake Hora Abgiata, 22nd April 1948.
- Rostratula benghalensis benghalensis* (Linn.) Painted Snipe.
Woodman records occasional ones on the high plateau between November and April, and Patrizi records a dead ♂ being found in Addis Abeba, 27th September 1940. In (d) Abichacra obtained one on 20th August 1948, and on 8th September he shot three ♂♂ and a ♀ containing eggs. In his seventeen years experience he has never shot this bird before, but it almost certainly breeds in these marshes near the River Hawash.
- Capella gallinago gallinago* (Linn.) Common Snipe.
Widespread in the region from 31st August to 30th March, sometimes in wisps.
- Capella media* (Lath.) Great Snipe.
Arrives in the region in large numbers during the second or third week of August and some remain until the beginning of November. Most plentiful in (a) and (d).
- Capella nigripennis nigripennis* (Bp.) Ethiopian Snipe.
Arrives in the region during May, June and July and breeds in the marshes of (a) and (d) during August. Breeding areas are deserted by the end of October.
- Lymnocyptes minmia* (Brunnich) Jack Snipe.
A scarce migrant recorded from (a) and (d) during November and January.
- The following migrant waders of which a few individuals remain throughout the year, are widespread in the region:—
- Himantopus himantopus* (Linn.)
Calidris minuta (Leisl.)
Calidris temmincki (Leisl.)
Philomachus pugnax (Linn.)
Actitis hypoleucos (Linn.)
Tringa ochropus (Linn.)
Tringa glareola (Linn.)
Tringa totanus eurhinus (Oberh.)
Tringa erythropus (Pallas)
Tringa nebularia (Gunnerus)
Tringa stagnatilis (Bechst.)
Limosa limosa limosa (Linn.)
Numenius phaeopus phaeopus (Linn.) Uncommon.
Numenius arquatus (Linn.) Race not determined.
- Cursorius temmincki temmincki* Swains. Temminck's Courser.
A single near Zuquala, and eight on a ploughed field near Bishoftu in June.
- Hemerodromus cinctus cinctus* (Heugl) Hengli's Courser.
A pair in low Acacia Scrub near Bishoftu, 23rd April.

- Glareola pratincola* (race?) Pratincole.
During November an immature bird was shot in (a) and three more seen.
- Gelchelidon nilotica* (Gmel.) Gull-billed Tern.
A single on Gafersa reservoir, 3rd May 1946.
- Chlidonias leucoptera* (Temm.) White-winged Black Tern.
In non-breeding plumage during September and November at Gafersa, and mostly in breeding plumage during May and June.
- Eremialector quadricinctus lowei* (Grant) Four-banded Sandgrouse.
Patrizi records a ♂ from Zuquala plain, April 1939.
- Eremialector gutturalis saturator* (Hart.) Yellow-throated Sandgrouse.
This sandgrouse was seen for the first time on 23rd April 1948 near Bishoftu on open fields where it was common. On 5th May flocks were still present in the locality. A loud harsh double note is uttered in flight.
- Columba albitorques* (Rüpp.) White-collared Pigeon.
Common in (a) and sometimes flocking in hundreds, this pigeon does considerable damage to newly sown wheat in June. Rare in (b).
- Columba guinea guinea* (Linn.) Speckled Pigeon.
Common and widespread.
- Columba arquatrix arquatrix* (Temm. and Knip.) Olive Pigeon.
Confined to (e¹) and (e²) where it seldom descends from the highest junipers in the forest.
- Streptopelia turtur* (Linn.) Turtle Dove.
Small flocks of Turtle Doves were flying about the Acacias near the Akaki river, February 1948. A specimen is in Gajdac's collection. A Turtle Dove shot in Aussa (Danakil) on 2nd February 1947 belonged to the nominotypical race.
- Streptopelia lugens* (Rüpp.) Pink-breasted Dove.
Common in (a) but found as low as 6,000 feet. A nest with one egg was found in a willow overhanging a stream near Addis Abeba, 23rd February.
- Streptopelia semitorquata semitorquata* (Rüpp.) Red-eyed Dove.
Common and widespread up to about 8,000 feet. Two nests, one with young, were found near Zuquala, 10th March 1946.
- Streptopelia decipiens perspicillata* (Fischer and Reichw.) Mourning Dove.
Common and widespread up to about 8,000 feet. Its peculiar laughing cackle, paler colour, and pale orange-brown eye distinguish it from *S. semitorquata*.
- Streptopelia capicola tropica* (Reichw.) Ring-necked Dove.
Very common in (b) and up to 7,500 feet. The colour of this, the smallest species, varies greatly in intensity as was noticed when flocks feeding on the road one evening near Adama rose constantly in front of the lorry.
- Stigmatopelia senegalensis senegalensis* (Linn.) Laughing Dove.
Widespread in pairs below 7,500 feet. Two nests, each with two eggs, were found on 31st August.
- Oena capensis capensis* (Linn.) Namaqua Dove.
An occasional visitor to (b).
- Turtur chalcopsilos chalcopsilos* (Wagler.) Emerald-spotted Wood Dove.
Occasionally seen in thick bush near Zuquala and Moggio.
- Aplopelia larvata bronzina* (Rüpp.) Lemon Dove.
This shy dove was only seen in the shady thickets of Djemdjem forest where it hides by day. In the early morning and evening it feeds along the forest paths.
- Treron waalia* (Meyer.) Bruce's Green Pigeon.
Found in fruiting fig trees in (b) and particularly at Bishoftu.

- Cuculus canorus gularis* (Stephens.) African Cuckoo.
Wanders into (b) during June and July.
- Cuculus solitarius* (Stephens.) Red-chested Cuckoo.
Not uncommon around Addis Abeba from May to the middle of July, when its loud triple note is frequently heard.
- Clamator glandarius* (Linn.) Great Spotted Cuckoo.
Widespread, but mostly immature birds.
- Clamator caffer* (Licht.) Levillant's Cuckoo.
One ♀ was obtained near Ambo, 27th June 1946.
- Clamator jacobinus serratus* (Sparman). Pied Cuckoo.
Seen near Addis Abeba in June and July.
- Chrysococcyx caprius* (Bodd.) Didric Cuckoo.
Not uncommon in the region from June to August.
- Chrysococcyx klaasi* (Steph.) Klass's Cuckoo.
Widespread from the end of June until August.
- Chrysococcyx cupreus cupreus* (Shaw). Emerald Cuckoo
Widespread in the region from April to June. Parasitizes the White-vented Bulbul.
- Centropus superciliosus superciliosus* (Hemp. and Ehr.) White-browed Coucal.
Seen in thick bush near Moggio and Zuquala.
- Tauraco leucotis leucotis* (Rüpp.) White-cheeked Turaco.
Common in (e¹) and (e²), and observed eating wild figs.
- Corythaixoides leucogaster* (Rüpp.) White-bellied Goaway Bird.
Wanders occasionally into the south of (b).
- Gymmoschizorhis personata personata* (Rüpp.) Bare-faced Goaway Bird.
Only seen in thick bush near Zuquala in parties.
- Poicephalus flavifrons flavifrons* (Rüpp.) Yellow-fronted Parrot.
Restricted to (e¹) and (e²) where it keeps to the tallest trees.
- Poicephalus rufiventris rufiventris* (Rüpp.) Orange-bellied Parrot.
An occasional visitor to the south of (b).
- Agapornis taranta* (Stanley). Black-winged Lovebird.
Widespread and not uncommon, usually in small travelling flocks.
- Coracias abyssinica* (Hermann.) Abyssinian Roller.
Common below 7,500 feet.
- Coracias caudata caudata* (Linn.) Lilac-breasted Roller.
A pair with the lilac extending over the entire breast was obtained at Bishoftu, 22nd September 1946. These are in Gajdacs' collection. A week earlier a good view was had of another in the same locality sitting on telegraph wires.
- Coracias caudata lorti* (Shelley.)
Common in (b), many seen on telegraph wires.
- Coracias neovia noevia* (Daud.) Rufous-crowned Roller.
Widespread in (b).
- Ceryle rudis rudis* (Linn.) Pied Kingfisher.
Widespread below 7,500 feet.
- Megaceryle maxima maxima* (Pallas.) Giant Kingfisher.
A rare wanderer into the region; one seen at a quarry pool near Addis Abeba, 8th October 1945. It is rare on the Hawash River south of Adama.
- Alcedo semitorquata* (Swains.) Half-collared Kingfisher.
Several recorded from Akaki in May, and one near Addis Abeba.

- Corythornis cristata cristata* (Pall.) Malachite Kingfisher.
Widespread at all altitudes.
- Halcyon senegalensis senegalensis* (Linn.) Woodland Kingfisher.
One specimen was obtained near Moggio, 1st June. It is common during June on the Hawash River south of Adama but none were noted during November and December. In February it is common in Aussa (Danakil), and a movement from higher levels into the Danakil may possibly occur at the end of the rains, and it is unlikely that any of these birds are of West African origin.
- Halcyon leucocephala leucocephala* (Mull.) Grey-headed Kingfisher.
Occurs in (b), and at Bishoftu one was seen entering a hole in a bank beside a stream on 13th June (similar record from River Hawash, 8th June.)
- Halcyon chelicuti chelicuti* (Stanley.) Striped Kingfisher.
Uncommon near Bishoftu, Moggio and Zuquala.
- Merops apiaster* (Linn.) European Bee-eater.
A common passage migrant in Addis Abeba between February and April, latest date 27th April. The autumn migration possibly takes place to the east of the high plateau where at that season heavy storms would make travel difficult. European Bee-eaters were seen on 9th September near Hawash station.
- Merops nubicus* (Gmel.) Carmine Bee-eater.
Occasionally seen below 7,500 feet but becomes common at much lower altitudes.
- Melittophagu. variegatus lafresnayii* (Guér.) Blue-breasted Bee-eater.
Widespread and not uncommon, they appear to breed in banks and cliffs during March.
- Bycanistes brevis* (Friedmann.) Silvery-cheeked Hornbill.
I once thought I heard this bird far away in the depths of Djemdjem forest but it must be very rare. In western Ethiopia it is the most conspicuous forest bird.
- Tockus nasutus nasutus* (Linn.) Grey Hornbill.
Rare in (b).
- Tockus erythrorhynchus erythrorhynchus* (Temm.) Red-beaked Hornbill.
Common below 7,500 feet. A young bird was obtained near Zuquala in January.
- Tockus hemprichii* (Ehr.) Hemprich's Hornbill.
Widespread but not common.
- Bucorvus abyssinicus* (Bodd.) Ground Hornbill.
A pair was reported nesting in a cliff at Bishoftu. Small parties are occasionally seen near Moggio and Zuquala.
- Upupa epops senegalensis* (Swains.) Senegal Hoopoe.
Very common and widespread. A pair nested in a hole in a wall in Addis Abeba during April.
- Phoeniculus somaliensis neglectus* (Neum.) Black-billed Wood Hoopoe.
Common in parties in (b) and (c).
- Scoptelus aterrimus notatus* (Salvin.) Black Wood Hoopoe.
One specimen was obtained near Zuquala in January.
- Rhinopomastus minor minor* (Rüpp.) Abyssinian Scimitar-bill.
Uncommon near Moggio and Zuquala.
- Tyto alba affinis* (Blyth.) African Barn Owl.
Found in Addis Abeba and above 8,000 feet. On 19th February a young bird was caught in Dessie.
- Asio abyssinicus abyssinicus* (Guér.) Abyssinian Long-eared Owl.
This local owl is confined to grassy rocky areas above 8,000 feet north of Addis Abeba. I have seen it about eight times and it was invariably flushed from the ground and from amongst grass and boulders on the top of small hills or from hillsides. A ♀ was obtained, 24th August 1947, and is in Gajdacs' collection.

- Ciccaba woodfordi umbrina* (Heugl.) African Wood-Owl.
 During July 1947, a young bird with traces of natal down on the shoulders was caught in the British Legation grounds at Addis Abeba. There is a ♀ from Addis Abeba in Gajdacs' collection.
- Otus leucotis* (Temm.) White-faced Scops Owl.
 Two specimens were obtained near Bishoftu.
- Glaucidium perlatum* (Vieill.) Pearl-spotted Owllet.
 One seen in a ravine near Zuquala. Another was observed in bright sunshine holding a frog in its talons.
- Bubo capensis dillonii* (Des Murs and Prévost.) Abyssinian Eagle-Owl.
 This owl is confined to the higher altitudes of the high plateau, and Zaphiro obtained specimens on Managasha. It occurs on Entoto and apparently in Addis Abeba but is seldom seen.
- Bubo africanus cinarescens* (Guér.) Spotted Eagle-Owl.
 Widely distributed (both grey and brown phase).
- Bubo lacteus* (Temm.) Verreaux's Eagle-Owl.
 A pair was seen in a deep wooded gorge near Bishoftu and they probably preyed on rock rabbits which were common in the cliffs nearby.
- Caprimulgus nubicus torridus* (Phil.) Nubian Nightjar.
 A ♀ was shot near Addis Abeba in low vegetation near a stream, 28th July. In February it is found amongst tamarisks in the Dobi valley of the Eastern Danakil.
- Caprimulgus poliocephalus* (Rüpp.) Abyssinian Nightjar.
 Colonies of up to twenty nightjars occur on scrubby hillsides above 7,500 feet and probably belong to this species although no specimen was obtained. One such colony was found in July on a sheltered slope near the Akaki stream to the east of the road leading to Akaki.
- Macrodipteryx longipennis* (Shaw.) Standard-wing Nightjar.
 A ♂ in breeding plumage was seen on 1st May near Bishoftu in dense scrub.
- Colius striatus* (Gmel.) Speckled Mousebird.
 Common and widespread.
- Apaloderma narina narina* (Steph.) Narina's Trogon.
 Seen a few times in shady places in Djemdjem forest.
- Lybius guifsobalito* (Hermann.) Black-billed Barbet.
 Mostly confined to fig trees in (b) and (c).
- Lybius undatus undatus* (Rüpp.) Banded Barbet.
 Uncommon in (b) and (c). An immature bird was obtained north of Akaki on 28th June. A cockchafer was caught and eaten by one.
- Tricholaema melanocephalum melanocephalum* (Cretz.) Black-throated Barbet.
 Friedmann gives the distribution . . . "south as far as Addis Abeba," but it appears to be a bird of the more arid regions and I have never seen it.
- Pogoniulus chrysoconus xanthostictus* (Blundell and Lovat.) Yellow-fronted Tinker-bird.
 Rare in Djemdjem forest.
- Indicator indicator* (Sparrman.) Black-throated Honey-Guide.
 Patrizi records a ♂ from Addis Abeba, 13th April 1940, but I have never seen it north of Adama.
- Campethera nubica nubica* (Bodd) Nubian Woodpecker.
 Not uncommon in (b) and (c).
- Dendropicos fuscescens hemprichii* (Ehr.) Cardinal Woodpecker.
 Rare in (b) where it hunts in pairs in the Acacias.

- Dendropicos abyssinicus* (Stanley.) Golden-backed Woodpecker.
Rare in the more wooded parts of (a). Patrizi records it from Holetta and Zaphiro collected specimens from Managasha.
- Mesopicos goertae spodocephalus* (Bp.) Grey Woodpecker.
Occurs in (b) and (c), often tapping in fig trees. It ranges far below 6,000 feet and is found in the Eastern Danakil in Aussa.
- Jynx ruficollis aequatorialis* (Rüpp.) Red-breasted Wryneck.
Uncommon in (a) and once seen at wild figs near Managasha, and taking nectar from Aloes.
- Apus niansae* (Reichw.) Nyanza Swift.
Parties of Swifts appear in the region throughout the year. A ♂ shot in (a) on 6th June had enlarged testes.
- Apus melba africanus* (Temm.) Alpine Swift.
Flocks of travelling Alpine Swifts appear in (a) during July and August. A ♂ from Sululta, 25th July had fine dark shaft streaks on the feathers of the gular patch and breast.
- Apus aequatorialis aequatorialis* (Muller.) Mottled Swift.
A ♂ was shot from a travelling band near Gafersa, 22nd June 1946.
- Apus horus* (Heugl.) Horus Swift.
Has been seen at Bishoftu and Sendefa during July and August.
- Apus affinis affinis* (Gray.) Little Swift.
Only one record, near a quarry in Addis Abeba, 8th October.
- Galerida thecklae praetermissa* (Blanf.) Theckla Lark.
Widespread and common particularly in (a).
- Eremopteryx leucotis leucotis* (Stanley.) Chestnut-backed Sparrow-Lark.
Widespread in (b), (c) and (d).
- Calandrella cinerea erlangeri* (Neum.) Red-capped Lark.
Occurs as far south as Akaki and Tafki but more typically a bird of (a).
- Motacilla clara clara* (Sharpe.) Mountain Wagtail.
Widespread and found on streams.
The following migrant wagtails are present in the region between September and March:
- Monacilla alba alba* (Linn.)
M. cinerea cinerea (Tunstall)
Budytes thumbergi feldegg (Mich.)
B. flavus flavus and races (?)
- Anthus campestris campestris* (Linn.) Tawny Pipit.
A rare passage migrant
- Anthus similis hararensis* (Neum.) Long-billed Pipit.
Common in (b) and frequently perches on bushes.
- Anthus richardi cinnamomeus* (Rüpp.) Richard's Pipit
Common and widely distributed.
- Anthus trivialis trivialis* (Linn.) Tree Pipit.
Several times at Bishoftu during March.
- Anthus cervinus* (Pallas) Red-throated Pipit.
A common passage migrant.
- Macronyx flavicollis* (Rüpp.) Abyssinian Long-claw
Common in (a). A nest, similar to that described by Cheesman, was found near Addis Abeba on 10th August and contained two young.

- Turdoides leucopygia* (Rüpp.) White-rumped Babbler.
Common and widespread in chattering parties.
- Aleonax adustus minimus* (Heugl.) Dusky Flycatcher.
Confined to (a) and common in Addis Abeba.
- Parisoma lugens lugens* (Rüpp.) Brown Tit-Flycatcher.
Confined to the sheltered parts of (a) where parties hunt for insects in the larger Acacias. It is rare and I have only seen it to the west of Addis Abeba.
- Parophasma galinieri* (Guér.) Abyssinian Catbird.
Typically found in parties of up to eight in fringing forest and high scrub at Djem-djem. Single birds have been seen at Managasha, and in Addis Abeba gardens where it used to be not uncommon.
- Bradornis pallidus neumanni* (Hilg.) Pale Flycatcher.
A specimen was obtained amongst Acacias near Bishoftu in June.
- Dioptornis chocolatinus chocolatinus* (Rüpp.) Slaty Flycatcher.
A common resident in (a), and in Addis Abeba gardens where it is sometimes seen in parties.
- Melaenornis edohioides schistacea* (Sharpe.) Black Flycatcher.
Occurs in (b) and sometimes in parties.
- Tchitrea viridis ferreti* (Guér.) Paradise Flycatcher.
Widespread and usually in pairs. Nested in a Eucalyptus in Addis Abeba in June, both birds taking turns on the nest.
- Batis minor erlangeri* (Neum.) Black-headed Flycatcher.
Occasionally seen in Acacias in sheltered areas in (a). At lower altitudes in (b) similar looking birds are probably *Batis orientalis orientalis* and the mournful six or seven notes on a descending scale something like the revolutions of a squeaky cart wheel, I attribute to this last species and have never heard the song of *B. minor*.
- Turdus olivaceus abyssinicus* (Gmel.) Olive Thrush.
Common above 7,500 feet and in Addis Abeba gardens. Nesting occurs in May and June.
- Psophocichla litsitsirupa simensis* (Rüpp.) Ground-scraper Thrush.
Common and widespread and breeds in May and June.
- Monticola saxatilis* (Linn.) Rock-Thrush.
During November it is a not uncommon passage migrant in Addis Abeba (seen at Hawash in October).
- Monticola solitaria longirostris* (Blyth.) Blue Rock-Thrush.
A rare passage migrant. Zaphiro obtained two in Managasha during October and November.
- Monticola rufocinerea rufocinerea* (Rüpp.) Little Rock-Thrush.
Seen a few times near Bishoftu in a rocky ravine. Young out of the nest were being fed by parents near Adama on 21st June.
- Oenanthe lugubris lugubris* (Rüpp.) Abyssinian Black Wheatear.
Always about cliffs and ravines in several localities near Bishoftu, and near the edge of the Cassam River gorge. Not uncommon where it occurs.
- Oenanthe bottae frenata* (Heugl.) Red-breasted Wheatear.
Common and widespread above 7,000 feet.

The following passage migrants are found in the region between September and March:

- Oenanthe oenanthe oenanthe* (Linn.)
O. isabellina (Temm.)

- O. deserti deserti* (Temm.)
O. hispanica melanoleuca (Guld.)
O. leucomela leucomela (Pal!).
- Pinarochroa sordida sordida* (Rüpp.) Hill Chat.
 Common in (a) but not seen below 7,500 feet.
- Pentholæa melaena* (Rüpp.) Rüppell's Chat.
 This chat is very local and I have only seen it in small parties a little way down the Cassam River gorge near the Dessie road. It shows a distinct preference for the vicinity of waterfalls, and outside the region such localities occur below Fiché and along the Blue Nile gorge where the chat is equally local.
- Cossypha semirufa semirufa* (Rüpp.) Rüppell's Robin-Chat.
 Common in gardens in Addis Abeba where it sings sweetly at dusk. It breeds during June and is also found at lower altitudes.
- Thammolæa cinnamomeiventris albiscapulata* (Rüpp.) Cliff-Chat.
 This is a more sprightly and elegant chat than *T. semirufa* and is always seen about cliffs near water. It is common in a ravine east of the road leading to Akaki and young birds were present there on 28th June. Also seen about the cliffs at Bishoftu and Zuquala.
- Thammolæa semirufa* (Rüpp.) White-winged Cliff-Chat.
 In (a), often in small parties near Gafersa but not seen below 7,500 feet.
- Saxicola torquata albifasciata* Rüpp. Abyssinian Stonechat.
 Common in (a) above 8,000 feet. Near Sululta on 13th August spotted young were attended by their parents on a scrubby hillside.
- Saxicola torquata* (Linn.) Stonechat.
 Migrant Stonechats are common in the region during the dry season and they are referable to *S. t. armenica* Steg., and *S. t. variegata* (Gmel.)
- Saxicola rubetra* (Linn.) Whinchat.
 A few Whinchats were noted during April between Moggio and Bishoftu.
- Cyanosylvia svecica* (Linn.) Bluethroat.
 A ♂ is recorded by Patritzi from Holetta, 7th February 1941.
- Pyconotus barbatus schoanus* (Neum.) White-vented Bulbul.
 Common and widespread.
- Sylvia atricapilla* (Linn.) Blackcap
 During December several Bl ckcaps were seen in the denser parts of Djemdjem forest.
- Phylloscopus trochilus* (Linn.) Willow Warbler.
Phylloscopus collybita (Vieill.) Chiffchaff.
 Not uncommon migrants and seen in Addis Abeba gardens.
- Sathrocercus cinnamoneus cinnamoneus* (Rüpp.) Cinnamon Warbler.
 This warbler is local in (a) and confined usually to thick bush near streams on the lower slopes of the hills to the west of Addis Abeba.
- Calamocetor leptorhyncha macrorhyncha* (Jackson) Lesser Swamp Warbler.
 Restricted in the region to the edges of the Bishoftu lakes amongst the bulrushes, where they hunt for insects practically at water level and are very tame.
- Sylvietta brachyura leucopsis* (Reichw.) Crombec.
 Small parties of Crombecs are occasionally seen hunting in Acacias in (b).
- Eremomela griseoflava griseoflava* (Heugl.) Yellow-bellied Eremomela.
 Not uncommon in (b) and (c) hunting for food in Acacias. A cup-shaped papery nest lined with white feathers containing two white brown-spotted eggs was found on a bare Acacia twig on 30th June near Zuquala.

- Camaroptera brevicaudata abessinica* (Zedl.) Grey-backed Camaroptera.
Widespread but not very common it shows a preference for Acacias.
- Cisticola brunnescens brunnescens* (Heugl.) Cloud-scraper.
Common on open grassland above 7,000 feet and breeds during the rains.
- Cisticola erythroptus pyrrhomita* (Reichw.) Red-faced Cisticola.
A pair was seen in thick undergrowth near Bishoftu lake, but it must be rare.
- Cisticola galactotes lugubris* (Rüpp.) Winding Cisticola.
Common and widespread in the neighbourhood of water.
- Cisticola robusta robusta* (Rüpp.) Stout Cisticola.
Common and widely distributed. Nests with white eggs and blue eggs found in August.
- Cisticola natalensis inexpecta* (Neum.) Croaking Cisticola.
Recorded from near Addis Abeba (Yeka), O. Grant (3).
- Prinia subflava subflava* (Gmel.) Tawny-flanked Prinia.
Common and widespread, also in Addis Abeba gardens. It breeds during the rains.
- Hirundo rustica rustica* (Linn.) Swallow.
A passage migrant, September-October and March - April.
- Hirundo rustica rothschildi* (Neum.)
A common and widespread resident, breeds near Akaki and Bishoftu in May and June.
- Hirundo smithii smithii* (Leach.) Wire-tailed Swallow.
Widespread but never common.
- Hirundo daurica melanocrissa* (Rüpp.) Red-rumped Swallow.
Occurs near Addis Abeba and at Bishoftu and breeding appears to take place during the rains. The song is a characteristic rattling twitter.
- Hirundo senegalensis senegalensis* (Linn.) Mosque Swallow.
Common at Bishoftu and near Addis Abeba.
- Hirundo abyssinica abyssinica* (Guér.) Smaller Striped Swallow.
Only seen at Bishoftu where several were building nests on a cliff face on 13th June. On 20th April a pair were frequenting a retort-shaped mud nest under a road culvert near Harar.
- Hirundo griseopyga griseopyga* (Sund.) Grey-rumped Swallow.
Common at Bishoftu, 20th July 1947, where they were flying about slowly in parties and some were prospecting some bare ground and settling.
- Riparia paludicola schoensis* (Reichw.) African Sand-Martin.
Common and widespread and breeds in holes in the banks of the Akaki River and at Bishoftu in July and August.
- Riparia cincta erlangeri* (Reichw.) Banded Martin.
Widespread and breeding in the banks of the Akaki River during August.
- Ptyonoprogne fuligula pusilla* (Zedl.) African Rock Martin.
Frequently seen in Addis Abeba and widespread elsewhere about cliffs. There are three records outside the region of this martin making cup-shaped nests, on 20th October below Fiché on a cliff face, on 20th May at Lekempti on wall of building with three young in nest, and on 20th July at Dessie under eaves of a building.
- Psalidoprocne pristopectera pristopectera* (Rüpp.) Blue Rough-wing Swallow.
Widespread in the region, small parties are usually found flying to and fro with a rather slow undulating flight over streams and in wooded ravines. Sometimes mixed parties of swallows contain a single Rough-wing. They rarely settle and when they do it is upon trees and bushes. Erlanger records a nest with nestlings at Addis Abeba on 26th July. Elsewhere they have been seen entering holes in banks during June. The dark blue sheen (bottle green in *P. p. blanfordi*) is sometimes visible in flight.

- Psalidoprocne antinorii* (Salvad.) Brown Rough-wing Swallow.
Apparently rare but on occasions may have been mistaken for the Blue Rough-wing. Degen collected two ♀♀ from Addis Abeba in March 1902.
- Campephaga flava* (Vieill.) Black Cuckoo-Shrike.
A ♀ was shot in open country near Djemdjem on 3rd March.
- Graucalus caesia pura* (Sharpe). Grey Cuckoo-Shrike.
Found in Djemdjem forest, sometimes in parties in the taller trees.
- Dicrurus adsimilis adsimilis* (Bechst.) Drongo.
Common in (b) but not seen above 7,500 feet.
- Lanius excubitor buryi* Lor. and (Hellm.) Great Grey Shrike.
One was obtained from a party of three near Akaki on 19th August, and had a faint greyish wash on the breast and wing 110.
- Lanius excubitorius bohmi* (Reichw.) Grey-backed Fiscal.
Abundant in Acacias usually in parties in (b) and (c) and local in (d).
- Lanius collaris humeralis* (Stan.) Fiscal.
Common and widespread and breeds from late May to August.
- Laniarius ferrugineus Aethiopicus* (Gmel.) Boubou.
Widespread and common in pairs in thick bush.
- Tchagra senegala habessinica* (Hemp. and Ehr.) Black-headed Bush-Shrike.
Widespread where suitable cover exists from 6,000 to 10,000 feet.
- Parus leuconotus* (Guér.) White-backed Black Tit.
Rare and local in (a) above 8,000 feet and usually in Acacias.
- Oriolus oriolus oriolus* (Linn.) Golden Oriole.
Gajdacs shot one near Holetta on 5th October 1928.
- Oriolus monacha monacha* (Gmel.) Black-headed Forest Oriole.
Common and pleasantly vocal in (e¹) and (e²).
- Corvus albus* (Muller.) Pied Crow.
Widespread.
- Corvus capensis kordofanensis* (Laub.) Cape Rook.
Common and widespread.
- Corvultur crassirostris* (Rüpp.) Thick-billed Raven.
Rare in Addis Abeba and not seen elsewhere.
- Rhinocorax rhipidurus* (Hart.) Fan-tailed Raven.
Common and widespread, and probably breeds at Bishoftu.
- Creatophora carunculata* (Gmel.) Wattled Starling.
Common in (b) from June to August. In 1946 many near Doukam were visiting large stick nests in old Acacias.
- Lamprocolius chalybaeus chalybaeus* (Hemp and Ehr.) Blue-eared Glossy Starling.
Common and widespread.
- Lamprotornis purpuropterus purpuropterus* (Rüpp.) Rüppel's Long-tailed Glossy Starling.
Occasionally seen in (b).
- Onychognathus morio ruppellii* (Verr.) Red-wing Starling.
Widespread but local, occurring in flocks about cliffs and ravines including Managasha and the rocky summit of Wachacha. It is difficult to distinguish in the field from *O. tenuirostris* but is larger and possibly more gregarious.
- Onychognathus tenuirostris* (Rüpp.) Slender-billed Chestnut-wing Starling.
Apparently uncommon in (a) and only identified from a pair obtained near Gafersa. In the hand easily distinguished from the Red-wing Starling by the bottle green gloss of the head in both sexes (flecked with grey in the ♀) strongly contrasting with the bluish-purple of the back. In *O. morio ruppellii* there is no contrast in the ♂, and the ♀ has the top of the head ashy grey, the grey colour extending onto the nape.

- Cinnyricinclus leucogaster arabicus* (Grant and Praed.) Violet-backed Starling.
Two ♂♂ were obtained on Managasha by Zaphiro during November 1904.
- Spreo pulcher rufiventris* (Rüpp.) Chestnut-bellied Starling.
Cheesman records this starling frequently in Addis Abeba, but in Ethiopia I have only seen it near the Mareb River on the Eritrean border.
- Spreo superbus* (Rüpp.) Superb Starling.
Common and widespread. Breeding activity has been noted in March and August.
- Buphagus erythrorhynchus erythrorhynchus* (Stan.) Red-billed Oxpecker.
Common and widespread. On 25th April a pair was seen visiting a hole in an old Acacia.
- Zosterops virens kaffensis* (Neum.) Green White-eye.
Not uncommon in (a). On 8th July parents were feeding two young with termites in an Addis Abeba garden.
- Zosterops pallidus poliogastra* (Heugl.) Pale White-eye.
Recorded by Patritzi from Addis Abeba.
- Nectarinia tacazze* (Stan.) Tacazze Sunbird.
Common above 7,500 feet, and plentiful near the top of Wachacha visiting the flowers of the Giant Lobelia in July. Also occurs on Mount Zuquala. Breeding takes place during the rains.
- Cinnyris mariquensis osiris* (Finsch.) Mariqua Sunbird.
Found at Bishoftu and south to Moggio and Zuquala.
- Cinnyris venustus fazoqlensis* (Heugl.) Variable Yellow-bellied Sunbird.
Common above 7,500 feet and occurs on Mount Zuquala. Breeds during the rains.
- Salpornis spilonota* Franklin. Spotted Creeper.
Patritzi records three specimens from Holetta collected in 1941.
- Bubalornis albirostris intermedius* (Cab.) Buffalo Weaver.
Common towards Moggio and Zuquala.
- Dinemellia dinemelli dinemelli* (Rüpp.) White-headed Buffalo Weaver.
Occurs near Moggio and Zuquala.
- Plocepasser mahali melanorhynchus* (Bp.) Stripe-breasted Sparrow Weaver.
Nests in Acacias in the south of (b).
- Passer swainsonii* (Rüpp.) Swainson's Sparrow.
Common and widespread. Nests in Addis Abeba from June to September, in buildings under eaves and in rafters. Young are fed with green caterpillars.
- Sorella emimbey* (Hartl.) Chestnut Sparrow.
During November 1946 there was a colony containing about thirty weaver type nests in an Acacia beside a native store in Moggio village. This bird was not seen elsewhere in the region, but occurs near Lake Metahara.
- Ploceus cucullatus abyssinicus* (Gmel.) Black-headed Weaver.
Occurs everywhere in (b), and breeding colonies are found in August and September, usually over water. One colony was feeding young with grasshoppers.
- Ploceus spekei* (Heugl.) Speke's Weaver.
Only found in (d) and breeds in small colonies in bamboo grass of native gardens and in small solitary Acacias from July to September.
- Ploceus baglafecht baglafecht* (Daud.) Baglafecht Weaver.
Common in (a) and nesting singly in June and July.
- Ploceus galvula* (Rüpp.) Rüppell's Weaver.
A few pairs were nesting in dense vegetation near one of the Bishoftu lakes in August. Not seen above 7,000 feet and never in flocks.

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- Quelea quelea Aethiopica* (Sund.) Red-billed Quelea.
Small flocks at Bishoftu in June.
- Euplectes orix pusilla* (Hart.) Red Bishop.
Scattered over the region below 8,000 feet between July and September but not identified in non-breeding plumage.
- Euplectes capensis xanthomelas* (Rüpp.) Yellow Bishop.
Local and breeding in marshes above 7,500 feet between July and September.
- Euplectes afra stricta* (Hartl.) Yellow-crowned Bishop.
Breeding in the same areas and at the same time as the Yellow Bishop but more abundant.
- Coliupasser axillaris traversii* (Salvad.) Fan-tailed Widow.
Common between June and September and breeding in marshes above 7,000 feet.
- Coliupasser macrocercus* (Licht.) Yellow-shouldered Widow.
Only seen in (b), where a flock of thirty, some ♂♂ in partial breeding dress, were feeding in tall grass of a dry crater at Bishoftu on 20th July. On 19th August a ♂ in full breeding dress was observed in a marsh near Akaki.
- Coliupasser laticauda laticauda* (Licht.) Red-naped Widow.
A few males in breeding dress seen during August near Addis Alem. A number of males were displaying to females as late as 20th October.
- Amadina fasciata alexanderi* (Neum.) Cut-throat.
Only seen a few times near Bishoftu in open bush country.
- Ortygospiza atricollis fuscocrissa* (Heugl.) Quail Finch.
Common and widespread in small flocks on open grassland.
- Anomalospiza imberbis imberbis* (Cab.) Parasitic Weaver.
At Bishoftu on 20th July a scattered flock was feeding on thistles in a dry crater. The males resemble a bright coloured Citril Finch.
- Lagonosticta senegala brunneiceps* (Sharpe.) Red-billed Fire Finch.
Common everywhere near human habitations. Breeds in Addis Abeba during the rains.
- Coccyzygia melanotis quartina* (Bp.) Yellow-bellied Waxbill.
Not uncommon in (a) and in Addis Abeba gardens. On 17th August a pair were making a grass nest in a thistle, the male bringing grass bents to the female in the nest at two minute intervals.
- Estrilda astrild peasei* (Shelley.) Waxbill.
Occasional flocks were seen in a marsh at Gafersa in July and September.
- Estrilda subflava subflava* (Vieill.) Zebra Waxbill.
On 3rd August large flocks of this waxbill were in a marsh east of Ambo. Patrizzi records specimens from Holetta in February.
- Uraeginthus bengalus schoanus* (Neum.) Red-cheeked Cordon-Bleu.
Common and widespread.
- Hypochera ultramarina ultramarina* (Gmel.) Indigo Finch.
Widespread but rare.
- Vidua macroura* (Pallas.) Pin-tailed Whydah.
Common and widespread and assumes breeding dress in June.
- Serinus flavivertex flavivertex* (Blanf.) Yellow-crowned Canary.
Specimens were obtained from a large flock near Managasha on 23rd July and a flock was seen near Sululta in August. Liable to be confused with the Citril Finch which, however, does not flock in large numbers.
- Serinus tristriatus tristriatus* (Rüpp.) Brown-rumped Seed-eater.
Common in (a) and in Addis Abeba. A linnet-like nest with three bluish-white eggs streaked purple-brown was found in a thistle on 8th October.

- Serinus leucopygius leucopygius* (Sund.) White-rumped Seed-eater.
Rare in (b), a small flock was seen in light thorn scrub near Doukam in August.
- Serinus atrogularis reichenowi* (Rüpp.) Yellow-rumped Seed-eater.
Occasional parties in (b).
- Serinus striolatus striolatus* (Rüpp.) Streaky Seed-eater.
Common in (a) and in Addis Abeba gardens. A nest with four eggs was found in a wild rose on 16th September.
- Carduelis citrinelloides citrinelloides* (Rüpp.) African Citril.
Common and widespread above 7,500 feet.
- Carduelis nigriceps* (Rüpp.) Black-headed Siskin.
Abundant in open country between 8,000 and 10,000 feet. A linnet-like nest with two young was found at 9,000 feet in a low bush on 8th June.
- Emberiza hortulana* (Linn.) Ortolan Bunting.
This migrant only occurs in (a), noted between 13th December and 29th March.
- Fringillaria tahapisi tahapisi* (Smith.) Cinnamon-breasted Rock Bunting.
Widespread in rocky localities below 8,000 feet.

Species found south-east of Moggio (Adama, River Hawash at Bukuru Bridge and the Hot Springs) which probably occur in the south of Area (b).

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- Oedicnemus senegalensis inornatus* Salvad.
Stephamibyx coronatus coronatus (Bodd.)
Turnix sylvatica lepurana (Smith), rare.
Centropus senegalensis senegalensis (Linn.)
Cuculus clamosus Stephens. September only.
Aerops albicollis Vieill.
Melittophagus pusillus cyanostictus (Cab.)
Tockus deckeni (Cab.)
Otus scops senegalensis (Swains).
Pogoniulus pusillus uropygialis (Heugl.)
Prionops cristata cristata Rüpp.
Malaconotus blanchoti perspicillatus (Reichw.)
Chlorophoneus sulfureopectus similis (Smith)
Lanius senator niloticus (Bp.)
Parus leucomelas leucomelas Rüpp.
Nectarinia pulchella lucidipectus Hart.
Chalcomitra senegalensis cruentata (Rüpp.)
Campephaga phoenicea (Lath.)

NEW SPECIES OF AFRICAN STAPHYLINIDÆ (COLEOPTERA)

PART I

by MALCOLM CAMERON, M.B., R.N., F.R.E.S.

(The species described as new in the following paper are part of a collection which has been submitted to the author for identification through the kindness of the Imperial Institute of Entomology. The types have been deposited in the British Museum (Nat. Hist.) It is unfortunate that many species rest on unique specimens but where possible para-types will be found in the collection of the Coryndon Museum, Nairobi. I have undertaken to correct the proofs and I hope the published paper will meet with the author's approval. I have added a little further detail regarding localities, some altitudes, and the name of the collector where this has been omitted.

A previous paper on the *Staphylinidæ* in the Coryndon Museum was published in the Annals and Magazine of Natural History, 1942, Ses. ii, vol. ix, p. 321. This dealt exclusively with a collection made on the Chyulu Hills. From this paper and the present it will be noted that the discovery of new species in this family is not a matter of great difficulty. It is hoped this will be an encouragement to collectors and the Coryndon Museum will be grateful for collections of beetles from any part of East Africa if accompanied by accurate data.—A. F. J. GEDYE.

1. ELEUSIS PICTURATA, sp. n.

Shining, head and thorax black, elytra and abdomen yellowish red, the former with the posterior margin narrowly dark. Antennæ ferruginous red, the penultimate segment infuscate. Legs reddish yellow. Length 9 mm. Of the colour of *picta*, Epp. but larger, the antennæ much longer, the mandibles much more elongate. Head quadrate, flat, slightly broader than long (5.5:5) as broad as the thorax with narrow deep post-ocular sulcus, very feebly impressed behind in the middle, the puncturation extremely fine and sparing, the ground sculpture uniform, very fine striate. Mandibles much produced and strongly dentate. Antennæ long and slender, third segment longer than second, fourth to tenth all longer than broad, decreasing in length, the penultimate distinctly longer than broad, the eleventh as long as tenth. Thorax slightly transverse (5.5:5), the sides without tooth, along the middle with an extremely fine impunctate line, elsewhere with sculpture as on the head. Elytra longer than the thorax (6:5), slightly longer than broad, the sculpture similar and without larger discal puncture. Abdomen almost impunctate with very fine transversely striate ground sculpture.

HABITAT: Uganda—Kalinzu Forest, 4,000 ft., (T. H. E. Jackson). Unique. October 1937. Type in B.M.

2. ELEUSIS CRIBRICEPS, sp. n.

Shiny black, the base, shoulders and reflexed margin of the elytra narrowly yellowish red. Antennæ reddish. Legs reddish-yellow. Length 4.5 mm. Head a little narrower than thorax, parallel, longer than broad (3:2.6), with fine post-ocular sulcus, moderately finely, rather closely punctured and with fine strigose ground sculpture on front and sides only. Antennæ slender, the second segment shorter than third, fourth and fifth slightly longer than broad, the penultimate slightly transverse. Thorax transverse (3:2.5), the sides rounded and without trace of lateral tooth, much more finely and less closely punctured than the head, with fine striate ground sculpture at the sides only. Elytra longer than the thorax (3:2.5), as long as broad, very finely and sparingly punctured and with a large puncture on each before the middle and with fine striate ground sculpture at sides and behind only. Abdomen practically impunctate, finely coriaceous, less shining than the fore parts.

HABITAT: Kenya Colony—Tumutumu, 5,500 ft., April 1939. Unique. Type in B.M.

3. PHLOEONOMUS (*Phloeostiba*) BIFORMIS, sp. n.

Rather shining; head and thorax black, elytra reddish-yellow, the posterior margin and sides narrowly infuscate; abdomen in the ♂ black, the last tergite reddish, in the ♀ with the lateral margins and under surface red. Antennæ reddish-yellow, the last segment infuscate. Legs reddish-yellow. Length 2.75-3 mm.

Remarkable in the differently coloured abdomen in the sexes. The ♂ has the build and colour of *philanthus* F. but is larger, the head and thorax more closely and less finely punctured and with coarser ground sculpture, the ♀ has similar sculpture to the ♂ but is at once distinguished by the colour of the abdomen. Head much narrower than the thorax, feebly bi-impressed in front; rather closely, moderately finely punctured, the ground sculpture distinct and more or less striate. Antennæ with third segment as long as second, fourth small, as long as broad, fifth slightly, sixth to tenth more strongly transverse gradually increasing in width. Thorax transverse (2.75:2) feebly impressed at the posterior angles, the disc without impression, the sculpture as on the head.

Elytra longer than thorax (4:2), longer than broad (4:3.5) more closely and deeply punctured than the thorax and without ground sculpture. Abdomen extremely finely and rather sparingly punctured, finely coriaceous, less shining than the foreparts.

♂: sixth sternite with small arcuate emargination.

HABITAT: Kenya Colony—Mount Kenya, 9,645 ft., August 1942.

4. TROGOPHLOEUS (*Taenosoma*) GEDYEI, sp. n.

In build, colour and lustre like *subtilis* Er. but differing in the following respects: the antennæ are shorter and entirely black, the head broader, more transverse, the post-ocular region a little dilated, the eyes a little larger, the puncturation less fine; thoracic impressions more distinct, the puncturation not so fine; the sculpture and pubescence of the elytra and abdomen scarcely differing from *subtilis* Er. Length 1.3 mm.

HABITAT: Kenya Colony—Athi Falls, 4,000 ft., November 1934. (A. F. J. Gedye). Unique. Type in B.M.

5. OXYTELUS (s. str.) PRODUCTIFRONS, sp. n.

Black shining, elytra pitchy. Antennæ black, the bases of the second and third segments reddish yellow: maxillary palpi pitchy, the fourth segment and legs reddish-yellow. Length 4.5 mm.

♂: of more robust build than *rugosus* F. and with different antennal structure, sculpture and thorax. Head strongly transverse, narrower than thorax, post-ocular region rounded and very slightly dilated longer than the eye; anterior margin produced in the middle as a stout spine, the punctures coarser and closer at the sides, much finer and close along the base, more sparing on the front which is not depressed. Antennæ with the 1st segment cylindrical and constricted before the apex, second and third of equal length, fourth small about as long as broad, fifth transverse, sixth to tenth slightly transverse differing but little, eleventh small, conical. Thorax transverse (4.3:3), the sides rounded and crenulate, retracted and slightly emarginate before the obtuse posterior angles, sulcate along the middle, at the sides feebly impressed, with rather closer and coarser punctures than on the head, more or less confluent in the lateral impressions. Elytra broader but scarcely longer than the thorax, slightly widened behind, broader than long, closely and rather coarsely punctured, the punctures confluent towards the sides. Abdomen very sparingly and obsoletely punctured, finely coriaceous. Fore parts entirely without ground sculpture. Fifth sternite with small transverse impression at the middle of the posterior margin.

HABITAT: Uganda—West Ruwenzori, 6,000 ft. (Van Someren). Unique. Type in B.M.

6. OXYTELUS (Caccoporus) COLORATUS, sp. n.

Shining; head black, thorax yellowish-red, elytra yellow, abdomen yellowish brown. Antennae and legs reddish yellow. Length 2.75 mm. In colour rather like *tergoensis* Bernh. but smaller, the head deep black with larger punctures, the eyes much larger occupying the whole side and with coarse facets. The antennae scarcely differ in structure. Head nearly as broad as the thorax, subtriangular, with moderately fine and moderately close punctures without trace of striae. Antennae with the third segment a little longer and more slender than second, fourth small, transverse, fifth to tenth transverse, gradually increasing in width. Thorax formed as in *tergoensis* Bernh., transverse (2.5:2) along the middle with extremely fine impressed line, on each side with a fine slightly curved sulcus not extending to the anterior border, near the anterior angle with a small round fossa; puncturation on the disc fine and scanty, at the sides close and much coarser. Elytra a little longer and broader than the thorax, punctate-striate. Abdomen very sparingly punctured, finely coriaceous. The fore parts without ground sculpture.

HABITAT: Abyssinia—Dire-Daua, July 1942. Unique. Type in B.M.

7. OXYTELUS (Anotylus) MARMORATUS, sp. n.

Head and thorax dull, black; elytra obscurely mottled brownish-yellow; abdomen black, more shining, the lateral margins reddish-yellow. Antennae black, the first segment reddish-yellow, second to fourth reddish-yellow, largely infuscate. Legs reddish-yellow. Length 3.75 mm ♂ in size and build much like *rugosus* F. but differently coloured, much less shining, the sculpture different, antennae shorter and size of thorax not crenulate. Head transverse (2.75:2) narrower than the thorax, the eye small, much shorter than the rounded and feebly dilated post-ocular region, the anterior margin rounded, the front depressed densely coriaceous and impunctate, the base and post-ocular region closely punctate-striate with a small impression before the middle of the neck. Antennae with the first segment gradually thickened from base to apex, third a little longer and more slender than the second, fourth small, rounded, fifth to tenth gradually more transverse. Thorax transverse (3.3:2.3), the sides gently rounded, straighter and more retracted behind, deeply tri-sulcate and laterally impressed, coarsely and closely striate scarcely punctured. Elytra longer (3:2.3) than the thorax, a little widened behind, broader than long (4.5:3) closely punctate-striate. Abdomen very finely, rather closely punctured on the anterior segments, less closely behind, very finely coriaceous. Pubescence fine, rather close: seventh sternite broadly rounded in the middle, arcuately emarginate on each side; eighth strongly narrowed and truncate at apex.

HABITAT: Kenya Colony—Molo, 9,000 ft. (D. MacInnes). Unique. Type in B.M.

8. OXYTELUS (Anotylus) aliiceps, sp. n.

Black, the fore parts (except the middle of the head) dull, the abdomen shining. Antennae black the first four segments yellowish-brown. Mandibles prominent, yellow, maxillary palpi with the first two segments yellowish, the third and fourth pitchy. Legs reddish yellow. Length 3 mm.

♂: very near *miriceps* Fauv. in build, colour, lustre, and sculpture of thorax, elytra and abdomen, but differing in the build and sculpture of the head. Head transverse, subquadrate, as broad as the thorax, in front broadly arcuately emarginate, the anterior angles rounded, the eyes small, the post-ocular region rounded and widened much longer than the eye; sides closely and finely striate, the middle region shining and without sculpture in shape somewhat like an hour glass and separated by deep sulci from the lateral regions, in front with an oblique ridge on each side. Antennae with the third segment a little shorter than the second, fourth small, orbicular, fifth to tenth transverse, the penultimate segments three times broader than long, eleventh short and stout. Thorax transverse (2.75:1.75), the sides nearly straight, retracted behind, in the middle in front with a superficial rounded impression, at the sides more deeply impressed, the whole

surface finely and closely striate as in *miriceps*. Elytra slightly longer and broader than the thorax, transverse, closely strigose. Abdomen finely and sparingly punctured and pubescent and without ground sculpture. Apical sternites not modified.

HABITAT: Kenya Colony—Londiani, 7,000 ft., May 1936. (H. J. Allen Turner).
Unique. Type in B.M.

9. BLEDIUS (*Pucerus*) SOMALIANUS, sp. n.

Entirely black, the head moderately, the rest more shining. Antennæ and legs reddish-yellow. Length 5 mm.

♀: differs from *verres* Er. in the colour, broader head, larger and more prominent eyes, stouter antennæ, shorter and more transverse thorax and coarser puncturation of the thorax and elytra. Head as broad as the thorax, the eyes large and prominent, finely and densely coriaceous, rather dull, between the antennal tubercles with fine transverse impressed line, the clypeus with a pair of small tubercles. Antennæ with very long first segment, second to fifth elongate decreasing in length, sixth as long as broad, seventh to tenth slightly transverse differing but little. Thorax transverse (3:2.5) finely sulcate along the middle, the sides straight and parallel in front, behind obliquely retracted to the base, the punctures small, moderately close, less strongly coriaceous than the head. Elytra longer than the thorax (3.5:2.5) as long as broad, more closely and more deeply punctured, ground sculpture absent. Abdomen very sparingly punctured, finely coriaceous.

HABITAT: Somalia—Gai Mudugh Prov., 700 ft., May 1945. (T. H. E. Jackson).
Unique. Type in B.M.

10. OSORIUS SECRETUS, sp. n.

Shining black. Antennæ and legs reddish, the femora darker. Length 8 mm. Head (except the neck and a large area at base of antennæ) finely and rather closely longitudinally carinate, the median keel broadest, the keels here and there interrupted especially on the declivous front, the interspaces less shining and coriaceous, a large area over the base of the antennæ shining and without sculpture, the neck at the middle of base very finely and closely punctured, at the sides very finely and closely striate. Antennæ rather long extending backwards a little beyond the middle of the thorax, the penultimate segments scarcely transverse, the eleventh a little longer than the tenth. Thorax transverse (7:5½), trapezoidal, the sides very slightly rounded in front, retracted and scarcely sinuate behind, very narrowly explanate, along the middle with narrow slightly raised impunctate area, more externally with a narrow elongate extremely finely punctured area, elsewhere with moderate, rather close more or less elongate punctures with tendency to coalesce; ground sculpture absent. Elytra longer than the thorax (7:5½), slightly longer than broad, with superficial post humeral sulcus and sparing irregular superficial punctures between the suture and the sulcus, the reflexed sides with smaller scattered punctures; ground sculpture absent. Abdomen with smaller and deeper punctures than on the elytra, but sparing: ground sculpture absent except at the bases of the segments where it is very fine and coriaceous.

HABITAT: Uganda—Bwamba Valley. Unique. Type in B.M.

11. STENUS (*Nestus*) TURNERIANUS, sp. n.

Black, shining. First three visible tergites each with three basal keels. Antennæ black. Palpi reddish-yellow, the third segment infusate. Legs pitchy brown. Length 3.5 mm.

In size, build, colour and antennal structure much like *argus* Gr. but with deeper frontal sulci and much stronger rugose puncturation of the fore parts, that of the abdomen very like that of *argus*. Head as broad as the base of the elytra, the frontal sulci feeble, the whole surface coarsely, closely and rugosely punctured. Thorax slightly longer than

broad, the sides rounded, widest at the middle, equally retracted in front and behind, with slight indication of a median sulcus behind, the whole surface much more coarsely and rugosely punctured than the head. Elytra longer (3:2.3) and broader than the thorax as long as broad, the sculpture similar. Abdomen narrowed from base to apex, rather finely, closely punctured, finely pubescent. Posterior tarsus about as long as half the tibia, the first segment scarcely longer than the last. ♂ unknown.

HABITAT: Kenya Colony—Londiani, 7,000 ft., May 1936. (H. J. A Turner).
Unique. Type in B.M.

12. **STENUS (s. str.) RUFOTESTACEUS**, sp. n.

Entirely light red, scarcely shining, the head slightly infusate. Antennæ, palpi and legs pale yellow. Length 5 mm.

In size and build much like *guttula* Mull. but in all other respects different. Head as broad as the base of the elytra, rather broadly and deeply bisulcate and with fine median keel, the puncturation close and moderately strong as in *guttula* but the median keel more distinct. Antennæ very slender, extending almost to the base of the thorax, the penultimate segments longer than broad. Thorax longer than broad (3:2.5), the sides rounded in front, rather strongly sinuately retracted behind as in *guttula*, sulcate in the middle of the posterior half, closely, rugosely and more coarsely punctured than the head. Elytra very slightly longer than the thorax, broader than long, the sculpture rather coarser. Abdomen gradually narrowed from base to apex, the first four visible tergites each with short median keel, closely punctured, more coarsely in the impressions, more finely and obsoletely on the seventh and eight tergites.

HABITAT: Kenya Colony—Ngong, 6,000 ft., May 1939. Unique. Type in B.M.

13. **STENUS (Hypostenus) KABETENSIS**, sp. n.

Very like *silvaticus*, Bernh. in general facies, colour, and antennal structure, but the head a little broader and without trace of median keel, the whole closely punctured and the punctures a little larger; thorax more closely and more finely punctured; elytra a little less finely and more closely punctured and without trace of ground sculpture; abdomen much more closely and coarsely punctured the ground sculpture very fine. Length 5 mm. ♂: sixth sternite with moderately deep subtriangular excision at the middle of the posterior margin, its apex rounded: fifth rather broadly and feebly impressed along the middle, the posterior margin of the flattened area with a few long yellow hairs.

HABITAT: Kenya Colony—Kabete, 5,800 ft., December 1938. Unique. Type in B.M.

14. **STENUS (Hypostenus) RHODESIANUS**, sp. n.

Size, build, colour and antennal structure of *silvaticus*, Bernh. but with the last three segments of the antennæ infusate, the head obviously more finely and less closely punctured; thorax more closely punctured and with a fine median keel in the posterior half, ground sculpture absent; elytra much more closely and less finely punctured, more shining, the ground sculpture much weaker; abdomen with puncturation distinctly closer and less fine, the ground sculpture weaker. Length 5 mm.

HABITAT: Tanganyika Territory—Mwamgongo, November 1943. (Meneghetti).

15. **STENUS (Hypostenus) TURNERI**, sp. n.

Shining, black, antennæ with the first and seventh to eleventh segments dark, the rest reddish-yellow. Legs black, the tarsal segments more or less reddish at the bases. Length 3.5 mm.

Belongs to the *tricarinatus* group and would appear to be very near *grandispennis*, Ben. Head narrower than the base of the elytra (2.5:3), with the antennal and three basal tubercles shining, the median one the largest and elongate, elsewhere with small

close punctures. Antennæ short, scarcely extending beyond the middle of the thorax, the segments of the club scarcely longer than broad. Thorax but little longer than broad, widest at the middle, the sides gently rounded in front, retracted and very slightly sinuate behind, posteriorly in the middle with narrow slightly raised impunctate area, elsewhere closely and much more coarsely punctured than the head. Elytra longer than the thorax (3.5:2.75), even, lightly convex, more closely and more coarsely punctured, as long as broad. Abdomen narrowed towards apex, the tergites but little constricted at their bases, much less coarsely punctured than the elytra, much more finely behind. The whole insect without ground sculpture. A single female.

HABITAT: Kenya Colony—Naivasha, 6,000 ft., July 1937. (H. J. Allen Turner)
Unique. Type in B.M.

16. **PINOPHILUS** (s. str) **RUGICOLLIS** sp. n. (Bernhauer in litt.)

Very near *egyptius* Er. of similar colour, lustre, and antennal structure, but narrower, the puncturation of the thorax coarser and closer that of the elytra yet coarser and distinctly rugose; the eyes are larger but less prominent than in *egyptius*, the temples about a third of their length, the arrangement of the sculpture of the head is exactly similar but the punctures on the basal half are distinctly closer and slightly smaller, but scarcely different in size and distribution anteriorly. Thorax as long as broad, sides almost straight and retracted to the round posterior angles, before the scutellum with a very fine short impressed line. Elytra longer than the thorax (8:7), longer than broad coarsely, closely and rugosely punctured. Abdomen closely much less coarsely punctured than the elytra. The whole insect without ground sculpture and much less pubescent than *egyptius*. Length 12 - 14 mm.

HABITAT: Kenya Colony—Arabuko Forest, 500 ft., June 1940. (T. H. E. Jackson)
Type. Ema'i Range, 4,900 - 5,900 ft., March 1940.

17. **PINOPHILUS** (**Phinophilus**) **RUGOSIPENNIS**, sp. n.

Deep black, shining, the seventh and eighth tergites rufescent posteriorly. Antennæ and legs reddish-yellow. Length 8.5 mm.

Of the build of *brevicollis* Er. but larger and more robust, blacker and more shining, the antennæ similarly constructed. Head closely and rather coarsely punctured on posterior half, in front extremely finely and very sparingly. Thorax transverse (6.5:5.5) convex, sides in front slightly rounded, straighter and more retracted behind, the posterior angles broadly rounded, before the scutellum with two small impressions separated by a short keel, the puncturation uniform, coarser and closer than on the head. Elytra longer (7:5.5) than the thorax, longer than broad (7:6.5), closely and much more coarsely punctured, the intervals between the punctures less than their diameter. Abdomen with close reticulate sculpture at the bases of the first three visible tergites, posteriorly more finely and gradually more sparingly punctured. The whole insect without ground sculpture.

HABITAT: Abyssinia—Dire-Daua, July 1942.

18. **PINOPHILUS** (**Phinophilus**) **PERSIMILIS** sp. n.

Very similar to *brevicollis*, Er. of the same build, lustre and antennal structure and only differs in the deeper and coarser puncturation of the head and thorax, the uniform reddish-brown colour of the elytra and the black tergites without rufescent posterior margins. Length 8 mm.

HABITAT: Abyssinia—Omo Valley January 1942. (T. H. E. Jackson)
Uganda—Turkhana—November 1940 (T. H. E. J.) Type.

19. **PAEDERUS** **GEDYEI**, sp. n.

Shining, head and thorax black, elytra blue, a little shorter than the thorax and slightly widened behind, abdomen black the last two tergites red. Antennæ black, the

first two and the last two segments yellowish-red. Legs black, the bases of the femora broadly reddish-yellow; tarsi reddish-yellow. Length 11 - 12 mm.

Build of *basipes* Fauv. and very similar in colour except that the last two tergites are red and the femora more broadly reddish-yellow, the head less deeply and rather less closely punctured, thorax much more finely punctured, elytra of duller blue colour, more closely transversely rugulose, abdomen more finely and more closely punctured. The seventh tergite is without a membranous border as in that species. From *bayer* Bernh differs in the colour of the abdomen, head and thorax more obsoletely punctured, the latter a little longer.

HABITAT: Kenya Colony—Wandanyi, 5,000 ft., March 1939.

20. *PAEDERUS MONTIVAGANS*, sp. n.

Entirely black, the elytra less shining than the fore parts and abdomen. Antennæ and palpi reddish-yellow. Legs black, the tarsi reddish-yellow, the apices of the individual segments of the middle and posteriorly pairs narrowly infuscate. Length 11—12 mm. Size and build of *marshalli* Bernh. but differs in the black and more closely and rugosely punctured elytra. Head transverse, suborbicular as broad as the thorax, broader than the base of the elytra, the eyes small, much shorter than the post-ocular region, rather closely punctured except in front and on the vertex, the punctures of varying size but mostly rather large. Antennæ long and slender, all the segments much longer than broad. Thorax a little longer than broad (8:7), the sides gently rounded, impunctate along the middle, sparingly and irregularly punctured, the punctures of varying sizes. Elytra a little shorter than the thorax (7:8), narrower at the base, widened towards apex, coarsely, closely and rugosely punctured. Abdomen moderately coarsely and closely punctured, more finely and sparingly behind and with very fine transverse ground sculpture and long black setae.

HABITAT: Kenya Colony—Emali Range, Sultan Hamud, 4,900 - 5,900 ft., March 1940.

21. *PAEDERUS SEMICYANEUS*, sp. n.

Moderately shining; black, the head and thorax with strong, the elytra with feeble blue reflex. Antennæ and legs black, the second segment of the maxillary palpi reddish-yellow. Length 6 - 7 mm. In size, build and colour much like *schoutedeni* Bernh. but less shining, the eyes larger, the antennæ entirely black, the head and thorax more finely punctured and with a fine but distinct coriaceous ground sculpture. Head broader than long (3.5:3), broader than the thorax, hexagonal, the eyes large, longer than the rounded post-ocular region, finely, moderately closely punctured, the punctures larger on the front; ground sculpture fine, coriaceous, finely pubescent. Antennæ rather long, the penultimate segments slightly longer than broad. Thorax slightly longer than broad, the sides rounded in front, straightly retracted behind, rather closely and a little more finely punctured than the head but with similar ground sculpture and pubescence. Elytra longer than the thorax (4.5:3.5), as long as broad, with close rather fine asperate sculpture without distinct ground sculpture, finely pubescent. Abdomen narrowed before the apex, closely moderately finely punctured and with fine transverse ground sculpture and fine whitish pubescence, the sides and apex with a few long black setae. ♂: sixth sternite with a deep parallel-sided excision at the middle of the posterior margin, the sides levelled, the apex rounded.

HABITAT: Kenya Colony—Stony Athi, 4,500 ft., July 1940.

22. *PAEDERUS RUFOBRUNNEUS*, sp. n.

Shining; entirely light reddish-brown. Antennæ with the first two segments reddish-yellow, the following reddish. Palpi and legs reddish-yellow. Length 11 mm.

Head suborbicular, slightly broader than long, a little broader than the thorax, distinctly broader than the base of the elytra, the gently rounded post-ocular region much

longer than the eye, with a few small punctures near the eyes and before the base, otherwise practically impunctate. Antennæ long extending a little beyond the base of the elytra, all the segments much longer than broad. Thorax slightly longer than broad (5.75:5), the sides rounded in front, straighter and more retracted behind, on each side of the middle with an irregular row of ten or eleven small punctures, more externally with a few others. Elytra a little shorter than the thorax (5:5.75) narrowed at the base, gradually widened behind, with close, rather large but superficial punctures. Abdomen slightly widened before the apex and with small scanty punctures, finely coriaceous ground sculpture and sparing long black setae: seventh tergite without membranous border.

HABITAT: Tanganyika Territory—Mt. Kilimanjaro, 6,000 - 8,000 ft. (Mrs. P. Bally).

23. **PAEDERUS ALIIPPENNIS**, sp. n.

Shining; head black, thorax and abdomen dark red, elytra green. Antennæ with the first five segments elongate, reddish-yellow, the rest wanting; third segment of maxillary palpi, legs and tarsi black, the bases of the femora reddish-yellow. Length 10 mm. In colour much like *arrowianus*, Bernh. but at once distinguished by the longer elytra which are longer than the thorax and parallel. Head slightly wider than the thorax, hexagonal, the eyes large and prominent, fully as long as the post-ocular region, rather strongly, closely punctured except in front and along the middle. Thorax longer than broad (5.3:4.3), the sides behind nearly straight and retracted on each side of the middle with a somewhat irregular row of six or seven small punctures, at the sides with a few others. Elytra longer than the thorax (6:5.3), parallel, coarsely and rather closely punctured, longer than broad. Abdomen moderately coarsely and moderately closely punctured at the base of the tergites, more finely and sparingly elsewhere, finely coriaceous. Pubescence yellow and scanty, at the sides with longer black setae.

HABITAT: Kenya Colony—Ruiru Falls, 4,000 ft., July 1937. (A. F. J. Gedye).
Unique. Type in B.M.

24. **PAEDERUS ABDOMINALIS**, sp. n.

Shining; head black, thorax red, elytra blue, abdomen red, the posterior margins of the tergites (except the last) broadly black. Antennæ with the first three segments and palpi reddish-yellow, the rest reddish. Legs reddish-yellow, the apices of the femora black. Length 11 - 12 mm.

In size and build much like *annexus* Epp. but with differently coloured abdomen and shorter antennæ. Head suborbicular, as broad as the base of elytra, with moderately fine and moderately close punctures at the sides and base, the front and vertex practically impunctate. Antennæ with the penultimate segments a little longer than broad, much shorter than in *annexus*. Thorax longer than broad (7:6), slightly narrower than the head, with dorsal row six or seven small punctures, at the sides with a few others irregularly scattered. Elytra longer than the thorax (9:7), longer than broad, coarsely and closely punctured. Abdomen with small punctures closer at the bases of the tergites, scanty elsewhere and with long black setae and feeble ground sculpture.

HABITAT: Kenya Colony—S. Kavirondo, Homa, December 1934. (H. J. A. Turner). Type in B.M. Kisumu, November 1939. (E. Opiko).

25. **PAEDERUS ABYSSINICUS**, sp. n.

Shining; head black, thorax yellowish-red, elytra greenish-blue, abdomen with the first four visible tergites red, the last two black.

Antennæ with the first four segments reddish-yellow, the following infuscate, palpi and legs reddish-yellow, the apices of the posterior femora slightly infuscate. Length $5\frac{1}{2}$ mm.

Very like *fuscipes* Curt. but smaller, the elytra shorter and greenish-blue, more coarsely punctured, the thorax broader and shorter. In the shape and punctuation of the head scarcely differing from *fuscipes*, the antennæ similar, but the thorax is distinctly shorter and broader, slightly longer than broad (4:3.5). Elytra longer than thorax (5:4), longer than broad. In all other respects similar.

HABITAT: Abyssinia—Omo Valley, January 1942. (T. H. E. Jackson). Type. Uganda—Turkhana, November 1940 (T. H. E. J.)

26. **PAEDERUS TURNERIS**, sp. n.

Shining; head black, thorax yellowish-red, elytra blue, abdomen with the first four visible tergites yellowish-red, the following black. Antennæ with the first three segments reddish-yellow, fourth to seventh blackish, the following wanting. Maxillary palpi yellow, the apex of third segment infusate. Legs black, the bases of the femora broadly reddish-yellow. Length 5.5 mm.

Body colour of *fuscipes* Curt. but smaller, the head much broader, the eyes much larger and more prominent, longer than the post-ocular region, thorax narrower. Head transverse, broader than the thorax, almost as broad as the base of the elytra, impunctate along the middle elsewhere with rather close and moderately coarse punctures. Antennæ with the first seven segments elongate, the rest wanting. Thorax longer than broad ($3\frac{1}{2}$:3), sides straight behind and moderately retracted, with a row of four or five punctures on each side of middle, at the sides with a few others. Elytra longer ($5:3\frac{1}{2}$) and broader than the thorax, a little longer than broad, parallel, the sculpture scarcely differing from that of *fuscipes*, that of the abdomen also similar.

HABITAT: Kenya Colony—Naivasha, 5.37 (H. J. A. Turner). Unique. Type in B.M.

27. **ASTENUS ANGUSTICOLLIS**, sp. n.

Moderately shining; head, thorax and abdomen dark red, elytra reddish-yellow. Antennæ and legs, pale yellow. Length 5 mm.

In build and antennal structure much like *longicollis* Epp. but much more coarsely punctured. Head a little longer than broad, broader than the elytra, the post-ocular region a little longer than the eye, gently rounded and retracted, with coarser umbilicate punctuation than in *longicollis*. Antennæ long and slender, all the segments longer than broad as in that species. Thorax narrow, oval, longer than broad (2.75:2) widest at the middle, the sculpture coarser than that of the head, the sides with long black setae. Elytra slightly longer and distinctly broader than the thorax, a little longer than broad the punctuation rather finer and less close than in *longicollis*, the sides with long black setae. Abdomen more strongly and less closely punctured than in *longicollis*, more finely and obsoletely on the last two segments, finely coriaceous, and with numerous black setae. Pubescence throughout sparing, fine and yellow.

HABITAT: Kenya Colony—Rabai, 600 ft., August 1937. Unique. Type in B.M.

28. **ASTENUS TURNERI**, sp. n.

Robust and moderately shining, head and thorax dark brownish-red, elytra first four and last visible segments of abdomen reddish-yellow, the fifth, black. Antennæ and legs pale yellow. Length 5 mm. Ground colour and lustre of *nigromaculatus* Motsch., but larger, the antennæ much longer, the elytra without black mark. Head slightly longer than broad, broader than the base of the elytra, the post-ocular region gently rounded and retracted, much longer than the eye, the close umbilicate sculpture rather fine. Antennæ long and slender, all the segments much longer than broad. Thorax longer than broad, ($3\frac{1}{2}$: $2\frac{1}{2}$), widest at the middle and rounded, from thence, retracted more strongly in front than behind, the sculpture a little coarser than on the head. Elytra longer ($4:3\frac{1}{2}$) and broader than thorax, longer than broad ($3\frac{1}{2}$:3), closely and rather

coarsely punctured. Abdomen closely and less coarsely punctured than the elytra on the anterior tergites, finely and sparingly on the last two; ground sculpture very fine, coriaceous. Pubescence throughout fine, yellow, scanty; sides of thorax and abdomen with a few short inconspicuous black setae.

HABITAT: Kenya Colony—Nairobi, 5,500 ft. Unique. Type in B.M.

29. **ASTENUS OBSCUREGUTTATUS**, sp. n.

Head and thorax, dull, the former black, the latter dark reddish-brown, elytra and abdomen more shining, the former reddish-yellow with very obscure dark marking on each side of the base of the suture and another equally obscure near the postero-external angle; the latter black, with the sides and posterior margins of the tergites narrowly reddish-yellow. Antennæ, palpi and legs yellow. Length 4 mm. This species would appear to be very similar to *elevator* Fauv., but to differ in the markings of the elytra. Head scarcely longer than broad, subquadrate, the base truncate, as broad as the base of the elytra, the eye a little longer than the temple which is slightly retracted with the posterior angle rounded, the sculpture close, unilobate and rather fine. Antennæ long and slender, all the segments distinctly longer than broad. Thorax slightly longer than broad, widest just before the middle, the sculpture scarcely differing from that of the head. Elytra longer than the thorax (3:2), longer than broad (3:2½), closely and less finely punctured. Abdomen closely more finely punctured than the elytra on the anterior tergites, much more finely and sparingly on the last two; ground sculpture absent. Pubescence yellow and scanty and without long black setae.

♂ sixth sternite with acute triangular excision at the middle of the posterior margin.

HABITAT: Kenya Colony—Chyulu Hills, alt. 5,600 feet, June 1938. Unique. Type in B.M.

30. **ASTENUS NAIVASHANUS**, sp. n.

Head and thorax dark brown, rather dull, the elytra and abdomen more shining, the former reddish-yellow, the latter black. Antennæ and legs, yellow. Length 4.5 mm. Fore parts in colour and lustre much like *obscoreguttatus* Cam., but of more robust build, the head larger and thorax broader, the puncturation coarser, antennæ shorter and stouter, the penultimate segments less elongate. Head as long as broad, subquadrate, the base truncate, as broad as the base of elytra, the post-ocular region very slightly rounded and but little retracted, the posterior angle rounded, the eye shorter than the post-ocular region, the sculpture close, rather fine, umbilicate. Thorax slightly longer than broad (2.5:2.2), widest before the middle. Elytra longer than the thorax (3:2.5), very slightly longer than broad, closely, more coarsely punctured, transversely rugulose. Abdomen closely and rather finely punctured. The pubescence fine, yellow, scanty; long black setae absent. In immature specimens the head and thorax are of lighter reddish colour as are also the first four visible tergites.

HABITAT: Kenya Colony—Naivasha, July 1937. Type in B.M.

31. **STILICUS TURNERI**, sp.n.

Very shining, the fore parts black, the posterior margin of elytra very narrowly and obscurely yellow: abdomen with the first two visible tergites, red, the following, black. Antennæ reddish-yellow, the median segments infusate. Legs reddish-yellow, the apices of femora and whole of tibiae blackish. Length 4 mm.

Very near *clarissimus* Bernh., but differently coloured and with rounder head. Head orbicular, as broad as long, as broad as the elytra at base, broader than the thorax, eyes small: with close elongate umbilicate punctures as in *clarissimus* except on the almost impunctate post-ocular region; the vertex and moderately broad median area in front impunctate. Antennæ moderate, the penultimate segments very slightly transverse. Thorax as long as broad, widest before the middle from thence retracted in front and behind, on either side of the middle, with a row of small, closely placed punctures at the

sides with a few others irregularly scattered. Elytra longer than the thorax (3:2.2), as long as broad, almost impunctate. Abdomen finely and closely punctured at the bases of the anterior tergites, yet more finely elsewhere.

HABITAT: Kenya Colony, Naivasha, May 1937. (H. J. A. Turner). Unique.
Type in B.M.

32. **ACANTHOGLOSSA RUFONITIDA**, sp. n.

Head and thorax shining red, elytra shining yellowish-red, abdomen duller, reddish-brown. Antennæ and legs reddish-yellow. Length 3.5 mm. Distinct from the small reddish African species in the shining fore parts. Head as broad as long, as broad as the thorax, temples parallel, much longer than the eyes, the posterior angles briefly rounded, rather finely and closely punctured, the punctures umbilicate. Antennæ rather short, the penultimate segments about a half broader than long. Thorax trapezoidal slightly broader than long, before the base with a row of four small foveæ and a finer raised impunctate median line not reaching the middle, the sculpture as on head. Elytra longer than the thorax, (3:2), slightly longer than broad, as closely but more finely and obsolete punctured and with two irregular rows of larger punctures which however are not well marked. Abdomen very finely and closely punctured throughout. Pubescence yellow, close all over.

HABITAT: Abyssinia—Dire-Daua, 20th July 1942. (Meneghetti). Unique.
Type in B.M.

33. **LITHOCHARIS KABETENSIS**, sp. n.

Fore parts rather shining, head and elytra black, thorax dark reddish-brown, abdomen less shining pitchy. Antennæ reddish-yellow, the base slightly infusate, legs yellow. Length 4 mm.

Except for the colour of the elytra, much like *soror* Cam., but the head is suborbicular, as long as broad and a little narrower than the thorax, the antennæ also are longer. Head suborbicular, the post-ocular region gently rounded with the base, the eye much shorter; puncturation very fine and close. Antennæ moderate, the penultimate segments slightly longer than broad. Thorax scarcely longer than broad, the sides straight and almost parallel, along the middle narrowly impunctate, elsewhere closely but less finely punctured than the head. Elytra longer than the thorax (3:2.3), slightly longer than broad, (3:2.75) as finely and closely punctured. Abdomen extremely finely and closely punctured and pubescent.

♂: Unknown.

HABITAT: Kenya Colony—Kabete, alt. 5,800 feet. Unique. Type in B.M.

34. **CHARICHIRUS GEDYEI**, sp. n.

Black, greasy lustrous, the postero-external region of the elytra from the middle of the sides to the apex of suture, reddish-yellow, the lateral margins of the abdomen obscurely reddish-yellow. Antennæ red. Legs, reddish-yellow. Length 6 mm.

Of the build and lustre of *chinensis* Boh., but rather broader and with different elytra colour pattern, the puncturation of the head and thorax not so fine. Head quadrate slightly broader than long, as broad as the thorax, the posterior angles broadly rounded, the eyes large, puncturation close, moderately fine and umbilicate, finer towards the base. Antennæ as in *chinensis*, but a little stouter. Thorax as long as broad, a little narrower than the elytra along the middle, with a fine elevated shining line, the sculpture as on the head. Elytra longer than the thorax, (4.75:3.75), a little longer than broad, finely, closely and asperately punctured as in *chinensis*. Abdomen very finely and closely punctured and finely pubescent.

♂: Unknown.

HABITAT: Uganda—Kampala, February 1937. (A. F. J. Gedye). Unique.
Type in B.M.

35. **SCOPAEUS GRATELLUS**, sp. n.

Moderately shining, head and abdomen black, thorax red, elytra black with the posterior margin narrowly and sharply yellow. Antennæ reddish-yellow. Legs yellow. Length 2.5 mm.

In build and antennæ structure much like *debilis* Hochh., but in all other respects different. Head quadrate, very slightly longer than broad, the posterior angles broadly rounded, the eyes a good deal shorter than the temples, very closely and finely punctured, the punctures finer towards the base, a little narrower than the base of the elytra. Antennæ with the penultimate segments slightly transverse. Thorax a little longer than broad, oval, along the middle, with fine slightly raised impunctate line, elsewhere closely, finely, somewhat asperately punctured. Elytra a little longer than the thorax, longer than broad (2:1.75) similarly punctured. Abdomen extremely finely and closely punctured and pubescent.

HABITAT: Kenya Colony—Magadi, May 1942. Unique. Type in B.M.

36. **SCOPAEUS NITIDIPENNIS**, sp. n. (Bernh. in litt.)

Shining; head dark reddish-brown. Thorax and abdomen reddish-yellow, the sixth and seventh tergites slightly infuscate, elytra pitchy, the posterior margin narrowly and obscurely reddish-yellow. Antennæ and legs reddish-yellow. Length 3 mm.

Slightly larger than *gratellus* Cam., differently coloured and more shining, the head and thorax a little broader, the head quadrate, as long as broad, the fore parts very finely and very sparingly punctured. In other respects, similar.

HABITAT: South Africa—Natal, Frere. Unique. Type in B.M.

37. **PSEUDOBIUM CASTANEUM**, sp. n.

Rather shining, castaneous, the elytra lighter. Antennæ red. Legs reddish-yellow. Length 6 mm.

Colour and lustre much like *Dolicoon indicum* Kr., head longer than broad (3:2.5), a little broader than the base of the elytra, the sides feebly rounded, the posterior angles broadly rounded, eyes very small; punctures small, umbilicate, rather close, except on the front, the ground sculpture feeble, striate. Antennæ long, all the segments longer than broad, the eleventh longer than the tenth. Thorax longer than broad (3:2), cylindrical, along the middle, smooth, elsewhere with punctures much like those of the head; ground sculpture absent. Elytra longer (3.75:3) than the thorax longer than broad, the punctures simple and smaller, close and more or less in rows. Abdomen rather finely, moderately closely punctured on the anterior tergites, more sparingly towards the apex, the ground sculpture feebly coriaceous.

♂: unknown.

HABITAT: Uganda—Turkhana, November 1940. (T. H. E. Jackson). Type in B.M.

The *Pseudobium bredoi* Bernh., is a *Scimbalium*.

38. **ACHENIUM RUFOTESTACEUM**, sp. n.

Fore parts shining; head and thorax light red, elytra yellow; abdomen less shining light red. Antennæ red. Legs yellow. Length 6 mm. Depressed parallel. Build of *cribriceps* Fauv. but differently coloured, the eyes larger, the thorax and elytra much less punctured, the antennæ similarly constructed. Head quadrate, very slightly broader than long, as broad as the thorax. The posterior angles briefly rounded, temples parallel, longer than the eyes; with moderately large close puncturation as in *cribriceps*: gular sutures parallel. Antennæ long and slender, all the segments longer than broad. Thorax

longer than broad (3.5:3), the sides straight, slightly retracted to the base, the posterior angles rounded; on each side of the middle with dorsal row of small and very small punctures about twelve in all, near the sides, with about fifteen similar but scattered punctures, otherwise impunctate, so that a broad impunctate area lies between the dorsal row and the lateral puncturation. Elytra longer, (4.5:3.5) and slightly broader than the thorax slightly longer than broad, the puncturation superficial, larger than on the thorax, and moderately close. Abdomen finely, rather closely punctured on the anterior segments, more sparingly behind: ground sculpture very fine, transverse.

♂: sixth sternite with moderately deep triangular excision of the posterior margin, its apex rounded.

HABITAT: Somalia. Alt. 800 ft. (T. H. E. Jackson). Unique. Type in B.M.

39. **CRYPTOBIUM RUFUM**, sp. n.

Shining red. The posterior margin of the elytra and last two tergites lighter. Antennæ reddish-yellow. Legs pale yellow. Length 6 mm. In build much like *abdominale* Motsch., but with shorter broader thorax and the puncturation of the fore parts coarser. Head slightly longer than broad, parallel, as long and as broad as the thorax, the posterior angles rounded, the eyes prominent situated just before the middle; between the antennal tubercles with a pair of large fossæ, the front margin and interval between them impunctate, elsewhere closely covered, with moderate umbilicate punctures. Antennæ with the intermediate segments a little longer than broad, the penultimate scarcely. Thorax longer than broad, (3.75:3), the sides feebly rounded and equally retracted in front and behind, along the middle, with slightly raised impunctate area, elsewhere with similar but larger punctures than on the head. Elytra longer (5:3.75) and broader than the thorax longer than broad, (5:4), and with very similar coarse deep puncturation. Abdomen closely but much more finely punctured than the fore parts, less closely and more finely on the last two segments. The whole insect without ground sculpture, the pubescence yellow, scanty on the fore parts, closer on the abdomen.

HABITAT: Abyssinia—Omo Valley. January 1942 (T. H. E. Jackson). Unique. Type in B.M.

ORTHOPTERA FROM THE HILLS OF SOUTH-EAST KENYA

by D. KEITH McE. KEVAN, B.Sc., A.I.C.T.A., F.R.E.S.*

From the eastern edge of the Kenya Highlands, south-eastwards to the coast, extends a series of ranges of hills roughly parallel to the Meru-Kilimanjaro-Pare-Usambara chain of Northern Tanganyika. These are the Emali Hills which rise to almost 6,000 feet, situated approximately between latitude 02°- 05' and 02°- 10' South and between longitude 37°- 12' and 37°- 25' east; The Chyulu Hills rising to nearly 7,000 feet and lying roughly between 02°- 22' and 02°- 48' south and between 37°- 40' and 38°- 00' east; the Teita Hills which attain over 7,000 feet in height and extend approximately from 03°- 15' to 03°- 30' South and from 38°- 15' to 38°- 30' East; and finally the low coastal Shimba Hills which fall just short of 1,500 feet at their highest point and which are situated between about 04°- 10' to 04°- 15' south and between 39°- 20' and 39°- 25' east.

The insect fauna of the Chyulu Hills has already been studied in a series of papers in this *Journal*, the Orthopterous family Acrididæ or Short-Horned Grasshoppers having been dealt with by Uvarov and Van Someren (1941). It is interesting, therefore, to compare with the Chyulu species material obtained from the other ranges in south-east Kenya, and in addition it was considered that it would be of further interest to include in the present paper a list of the species obtained by members of the East Africa Natural History Society in their Biological Survey of the Stony Athi area. This region is situated in a south-eastern extension of the Kenya Highlands (approximately 01°- 30' south and 37°- 00' east), being about 4,500 feet above sea-level and comparable in altitude with the Emali, Chyulu and Teita localities.

In the collection studied, the groups other than the Acrididæ are too poorly represented to be of much value for determining the affinities of the fauna of the various localities with that of other regions, but it is worth noting the occurrence of *Paraspheria marmorata* Shelf., a Meru Cockroach and *Grylloderes kilimandjaricus* Sjöstedt, a Kilimanjaro Cricket, on the Emali Hills, and of the Kilimanjaro Stick-Insect, *Gratidia kibonotensis* Sjöstedt, on the Chyulus.

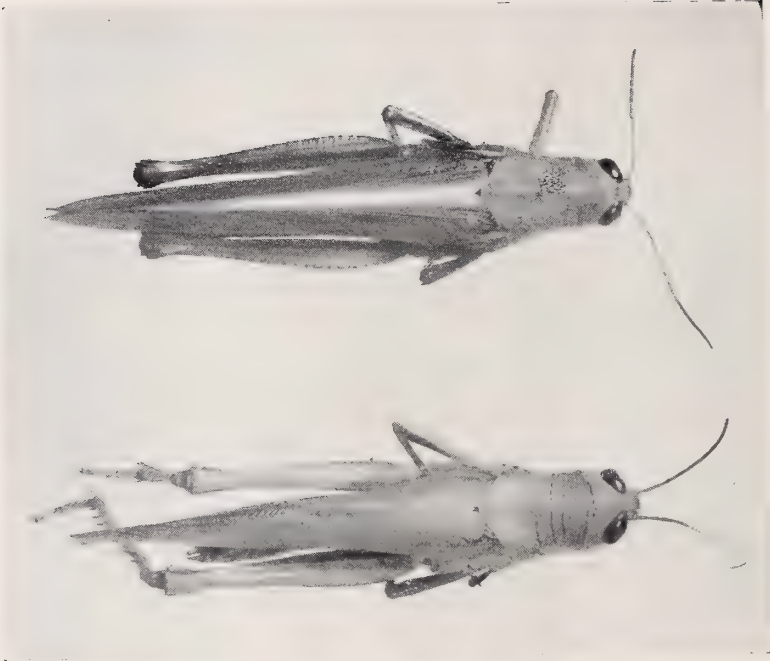
Among the Acrididæ a better indication of faunistic affinities can be seen since the material belonging to this family is considerably more extensive, although, even in this case, the species represented are, in the main, of wide distribution in East Africa. The following comparisons, however, may be of interest.

The Acridid fauna of the low coastal Shimba Hills, as might be expected, bears a closer relationship to the Usambaras (and the fauna of the East African coastal belt generally) than to the elevated masses more inland, as indicated by the occurrence of *Catantops neumanni* Rme., *Eupropacris obscura* Mill., *Oxaeida poultoni* Rme., *Kraussaria dius* Ksch., and *Parapetasia impotens* Ksch., while the apterous genera *Ixalidium* and *Rehnula* are represented by species very closely related to (if not identical with) those occurring in the Usambaras. Only about thirty per cent. of the thirty-two Shimba species are definitely known from the Teita Hills (and *vice versa*) while over sixty per cent. occur in the Usambaras. Less than fifty per cent. are known in the Kilimanjaro-Meru region, but of the species under discussion, more than forty per cent. are widely distributed in East Africa and occur also in the eastern Kenya Highlands.

Of the twenty-nine species (discounting species of migratory locusts) but including *Catantops sancius* Burm. which is probably found only at lower altitudes) represented from the Teita Hills over seventy per cent. are known from the Kilimanjaro-Meru region, in addition to which, closely allied species of the apterous genera *Parashhenaz*, *Usambilla* and *Ixalidium* also occur. Almost seventy per cent. of the species, however, also occur widely distributed in the East African uplands, but the apterous genera mentioned and

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PLATE XXXIV



Above: *Kraussaria decteni* (Gerst.) ♀

Below: *K. dius* (Karsch) ♀



Above: *Kraussaria deckeni* (Gerst.) ♀

Below: *K. dius* (Karsch) ♀

Zonocerus elegans Thunb. show a definite affinity with Northern Tanganyika. Quite a large proportion (about sixty per cent.) of Teita species are represented also in the Usambaras.

On the other hand, only eight species are known to be common to both the Teitas and the Chyulus which would lead one to suppose that the fauna of these two ranges was not closely allied. Their species of *Parasphena*, however, are related and further collection would probably increase the number of species common to both, since, from further west, the Emali material contains a larger number (thirty-six per cent.) of the Teita species with closely allied members of the genera *Usambilla* and *Ixalidium* in addition.

Species which occur in the Teita Hills and which are not yet known from other localities are *Parasphena teitensis* Kev., *Ixalidium hæmatoscelis** Geost., *Usambilla montana* n. sp. and *Gymnobothroides montanus* n. sp.

Gerstaecker (1873) records a fair number of Orthoptera from Endara (Ndara, 03°- 30' S., 38°- 40' E.) which is in the Teita Hills area but the hills near there are not high and the specimens were probably taken at lower altitudes than are considered in this paper. Only two species are actually recorded from the Teita Hills proper—*I. hæmatoscelis* (described) and "*Truxalis nasuta* Lin." (*Acridella* sp.).

Nearly seventy-five per cent. of the thirty-two species recorded from the Chyulus above 3,500 feet are known also from the Kilimanjaro-Meru region but over seventy per cent. are known from the eastern Kenya Highlands. *Parasphena chyuluensis* Kev., however, is more closely related to *P. meruensis* Sjöstedt from the former area than to species from the latter (Kevan, 1946), while *Catantops kilimandjaricus* Rme. forms another link. *Thispicetrus laticercus* Uv., however, is closely related to *Th. brevipennis* I. Bol. from the eastern Kenya Highlands.

The association between the Chyulus and the Emalis appears on the face of it, not to be very strong, less than sixty per cent. of the Chyulu species or sub-species being represented in the Emali collection. All the species common to both ranges are widely distributed† and there are no apterous genera in common for comparison. *Thispicetrus laticercus* Uv. and *Parasphena chyuluensis* Kev. are not known from any other locality.

Fifty-six species (excluding locusts) are recorded from the Emali Hills of which about fifty-five per cent.—as well as related species of the apterous genera, *Ixalidium* and *Usambilla*—occur also in the Kilimanjaro-Meru region. *Usambilla olivacea* Sjösd. was originally described from the Usambaras and thus forms a link with the south-east as probably do *Meruana nyuki* Sjösd. and *Brachycrotaphus sjostedti* Uv.

The great majority of the species, however, are widely distributed in East Africa and over sixty-five per cent. are known from the eastern Kenya Highlands. *Aulacobothrus emalicus* Uv., *Ixalidium bicloripes* Uv., *Mecostibus sellatus* Uv., and (presumably) *Dno-pherula* sp. are not yet known from any other locality. The occurrence of *Ischnasis curvicerca* Uv. is interesting since this species was previously considered endemic to the Turkhana Desert.

The Stony Athi area does not form part of the series of ranges extending inland from the coast but belongs instead to the region of elevated plains and would, therefore, be expected to have a closer faunistic relationship with the Eastern Kenya Highlands proper than to the hills to the south-east.

*All species of this genus are not completely apterous but Kenya species are.

*See page 23.

† *Catantops kilimandjaricus*, Rme., (known to the writer only from the Chyulus, Kilimanjaro and Ngorongoro) has been reported from the Emalis also, but its occurrence there is doubtful—see footnote p. 27,

In actual fact, over seventy-five per cent. of the thirty-nine* represented, are widespread East African species, occurring in the Highlands, but only just over forty per cent. are recorded from the Emalis. On the other hand, a somewhat high proportion—about the same, though not including all the same species, as for the eastern Kenya Highlands—is found also in the Kilimanjaro-Meru region, but all are widely distributed in East Africa.

The brachypterous species, *Rhaphotittha reducta* Uv. was described from the area but is now known to the writer from Nairobi (H. Copley, 2 ♂♂, May 1941) and the Ngong Hills (8,000 ft., 1 ♂, August 1939).

To recapitulate: the Acrididæ of the Stony Athi area, as would be expected, appear to be closely related to the fauna of the eastern Kenya Highlands, but an equally strong affinity with Meru-Kilimanjaro is also indicated. The relationship with the Emali Hills is apparently much less pronounced.

At the other extremity of the region considered, the Shimba Hills are more closely related to the Usambaras than to any other range.

The Emali, Chyulu and Teita Hills all have about seventy per cent. of their Acridid fauna made up of widely distributed species which occur also to the north-west. Of the three, the Teita Hills (which have much in common with the Usambaras) and the Chyulus show about an equally close relationship with Kilimanjaro-Meru, while the Emalis show considerably less. Among themselves there appears to be a closer affinity between the Chyulus and the Emalis than between the Chyulus and the Teitas. It would also seem that the Chyulus are more akin to Kilimanjaro than to the Emali Hills, but since a considerable proportion of the species from each locality are of wide distribution, the evidence is not so strong as would at first appear, and it would be unwise to base any conclusions on this alone.

The apterous genera *Ixalidium*, *Usambilla* and *Parasphena*, however, furnish better evidence of the inter-relationship of these ranges with Kilimanjaro-Meru. The former two genera are not known from the Kenya Highlands, but each has species known from the Emali Range, Kilimanjaro, the Teita Hills and the Usambaras (*Ixalidium* also occurring in the Shimbas). *Parasphena* is a widespread African genus but the species from Kilimanjaro-Meru, the Teitas and the Chyulus appear to be more closely related to each other than they are to other species (Kevan, *l.c.*).

The other apterous genera, *Mecostibus* and *Rehnula*, are represented only by *M. sellatus* Uv. (Emali)—which is not very closely related to other known species although the genus occurs in the Usambaras (*M. leprosus* Ksch. and *M. physalus* Ksch.)—and *R. usambarica* Rme. (Usambara-Shimba). Neither genus is yet known from the Kenya Highlands although *R. turgidicrus* Ksch. was described from Kitui (N. Ukamba).

Further material of these apterous genera—particularly of *Parasphena* from the Emali Hills or *Usambilla* and *Ixalidium* from the Chyulus would almost certainly throw further light on the problem.

* Including the solitary phase of *Locusta migratoria migratorioides*, R. and F., and regarding *Rhaphotittha nyuki* Sjöstedt and *R. meruensis* Sjöstedt.

In the following list of species obtained in these various localities, certain abbreviations are used in giving the data attached to specimens. Full data are only given where specimens are exceptional in this respect. The following are the abbreviations used:

SHIMBA: "Shimba Hills, 1,000 ft., 7-39."*

TEITA: (B)—"Bura, Teita, 5,000 ft., 2-39." (The Bura Mission area is in the South of the Teitas, approximately 03° 18' S., 38° 18' E.)

(W)—"Wandanyi, 5,000 ft." with the date which, unless otherwise given, is March, 1939.

(Wandanyi is the Agricultural Station in the central Teitas, approximately 03° 2' S.) 38° 22' E.; the mountain of the same name is further north, about 03° 19' S., 38° 23' E.,

(T)—"4,500 - 5,500 ft., Grass and Bushes, Teita Hills, Kenya, 25th to 27th December 1945, D. K. Kevan, Coll."

(These specimens were all taken in the vicinity of Wandanyi Agricultural Station and occurred among the low herbage in open places such as along tracks and in clearings.)

EMALI: "Emali Range, Sultan Hamud, 4,900 - 5,900 ft., 3-1940." The collection from the Emali Hills was made by members of the East Africa Natural History Society and includes a large number of Acrididae. A few specimens were collected in July and not in March. These are distinguished in the text by a small "vii."

STONY ATHI: "Stony Athi, E.A.U. Nat. Hist. Soc. Biol. Survey," with the dates of collection which were between March and December 1940. The month in which the specimens were collected are given in small roman numerals. Where more than one specimen of a series was taken in the same month, the number of specimens is indicated in brackets, except where none was collected in any other month.

CHYULU: "Coryndon Museum Expdt. Chyulu Hills," with the altitudes and dates of collection, which were between April and July 1938. In the case of species of other families than the Acrididae the same abbreviations are used as for Stony Athi (above) with the altitude given in addition. The Acrididae have already been listed (Uvarov and Van Someren, *l.c.*) and the data are not repeated.

(A few species of Acrididae from the Chyulus, but not recorded above 3,500 feet, have been omitted.)

All the specimens mentioned, with the exception of certain type material retained by the British Museum, are in the possession of the Coryndon Memorial Museum, Nairobi, Kenya.* Much of the Acridid material, particularly from Emali, was determined by Dr. B. P. Uvarov of the Imperial Institute of Entomology, London, to whom grateful acknowledgement is made.

* Several species which are known to occur on the Shimba Hills are not represented in the Coryndon Museum. These are included in the following list of species but the reference is given in parenthesis, thus: (SHIMBA). The specimens are in the private collection of Dr. V. G. L. van Someren, at Ngong, Kenya, through whose kindness the writer was able to study them.

BLATTODEA**BLATTOIDEA****BLATTIDAE****BLATTINAE*****Deropeltis melanophila*** (Walker 1869)

EMALI: ♂ 1 ; 1 ♀.

(The taxonomy of this genus is in an unsatisfactory state. The four following species are only very tentatively determined)

Deropeltis integerrima Brunner 1865?

CHYULU: 1 ♀-v; 6 nymphs-v(2), vi(2), vii(2), 5,600 ft.

Deropeltis autraniana de Saussure 1895?

EMALI: 1 ♂; 1 ♀.

Deropeltis pallipes Chopard 1938?

EMALI: 1 ♂.

***Deropeltis* sp.**

(This species has the head and legs castaneous as in *D. erythropeza* de Adelung 1905, and is densely pubescent.)

EMALI: 1♀.

Pseudoderopeltis petrophila Shelford 1907?

(SHIMBA: ♂♂, ♀♀.)

***Pseudoderopeltis* sp.?**

(A stout, handsome species with black body, piceous tegmina and a large, almost round, intense black maculation occupying the greater part of the otherwise pale yellow pronotal disc.)

SHIMBA: 1♂.

Periplaneta americana (Linné 1758)

SAGALA HILL: 1♂ —November 1938.

(This locality is a mountain very close to the Teita Hills but separated from them —approximately 03°- 30' S., 38°- 35' E.—and although this cosmopolitan species occurs in buildings in the Teitas, no authentic Teita material exists).

CORYDIIDAE**POLYPHAGINAE*****Discologamia capensis*** de Saussure 1893

EMALI: 1♂. (SHIMBA: ♀♀.)

EUTHYRRHAPHINAE***Euthyrrhapha pacifica*** (Cocquebert 1804)

EMALI: 1♂.

PHYLLODROMIIDAE**ECTOBIINAE****Ectobius**, spp. (2)

(a) STONY ATHI: 1♀—June.

(b) EMALI: 1♂.

PHYLLODROMIINAE**Blatella germanica** (Linné 1767)

KASIGAU: 2♂♂—November 1938.

This locality is an isolated mountain to the south of the Teita Hills—approximately 03°- 50' S., 38°- 39' E.—and although this cosmopolitan species occurs in buildings (at least) in the Teitas there is no authentic Teita material.)

SHIMBA: 1♂.

Phyllodromia sp.

EMALI: 2♂♂.

Supella supellectilium (Serville 1839)

EMALI: 2♂♂.

PERISPHAERIINAE**Parasphaeria** (?) **marmorata** Shelford 1907

EMALI: 3♀♀; 4 nymphs.

Derocalymma lampyrina Gerstaecker 1869

STONY ATHI: 8♂♂—iii(4), iv, v(2), viii; 10♀♀—iii(4), iv(3), v(3); 9 nymphs—iii(6), iv(3).

Cyrtotria capucina (Gerstaecker 1869)

STONY Athi: 1♂—vii; 1♀—ix.

Cyrtotria givvicollis (Stal 1871)?

SHIMBA: 2♂♂; 1♀.

Cyrtotria sp.

STONY ATHI: 2♂♂—vii, viii; 7 nymphs—iv, v, vi, viii(2).

EMALI: 2 nymphs.

Gynopeltis picta Gerstaecker 1869

CHYULU: 5♂♂—v(4), vii, 5,500 ft.

Gynopeltis sp.

(Length 31 mm.; unicolorous fuscous except for knees and anterior margin of pronotum which are testaceous)

SHIMBA: 1♂.

EPILAMPRINAE**Calolampra** sp. ?

SHIMBA: 1♀.

PANCHLORINAE**Nauphoeta** sp.

EMALI: 1♀.

Gyna aetola Shelford 1909 ?

(Agrees with the original description of this species from W. Africa, but may be a form of *G. maculipennis* Schaum 1853).

SHIMBA: 1♀. (damaged).

Gyna costalis (Walker 1868) ?

SHIMBA: 1♂.

OXYHALOINAE

Oxyhaloa deusta (Thunberg and Engstrom 1784)

EMALI: 1♂; 1♀.

(Two further females differ in their very short tegmina and may be referable to *O. variabilis* Shelford 1907.)

MANTOIDEA

MANTIDAE

EREMIAPHILINAE

Tarachodes kibwezi Giglio-Tos 1911 ?

EMALI: 1♂.

Galepsus modestus (Gerstaecker 1869) ?

EMALI: 1♂.

Galepsus minutus Giglio-Tos 1910 ?

STONY ATHI: 1♂—xii.

EMALI: 7♂♀.

Galepsus gracilis Giglio-Tos 1910 ?

EMALI: 10♂♂.

Pyrgomantis singularis Gerstaecker 1869

EMALI: 1♂.

AMELINAE

Metentella meruensis (Sjostedt 1908)

EMALI: 4♂♂.

DYSTACTINAE

Gonyptela flavicornis (Sjostedt 1908)

CHYULU: 3♂♂—vi, vii(2), 5,600 ft.

THESPINAE

Hoplocorypha Montanca Giglio-Tos 1916

EMALI: 1♂.

ANGELINÆ

Agrionopsis modesta Werner 1907 ?

EMALI: 1♂. (badly damaged).

ACROMANTINAE

Galinthias meruensis Sjostedt 1909

SHIMBA: 1♂; 1♀.

MANTINAE

Sphodromantis viridis (Forskäl 1775)TEITA: (B) 1♂. *Sphodromantis gastrica* (Stål 1858)

TEITA: (B) 1♀.

Polyspilota aeruginosa (Goeze 1778)(Form *P. pustulata* (Stoll 1813)).

TEITA: (B) 2♂♂; 4♀♀.

SHIMBA: 1♂.

Parasphendale agrionina (Gerstaecker 1869)

SHIMBA: 1♀.

Parasphendale costalis (Kirby 1904)

EMALI: 3♀♀.

TEITA: (Mbololo*, 5,000 ft., October 1938) 1♀.

Parasphendale minor Schulthess-Schindler 1898

STONY ATHI: 1♂—iv.

Miomantis aurantiaca (Giglio-Tos 1911)

CHYULU: 5♂♂—iv, 5,200 ft., v(2), 5,500 ft., vii(2), 5,600 ft. (? This species)

TEITA: (B) 1♀.

Aiomantis sp.

(Species of this genus are difficult to determine with certainty.)

STONY ATHI: 1♀—ix.

EMALI: 3♂♂.

VATINAE

Danuria bolauana de Saussure 1871

SHIMBA: 1♂.

Popa undata (Fabricius 1793)(Often referred to as *P. spurca* Stål 1856, which is probably a synonym—*vide* Rehn 1927.)

EMALI : 1♀.

PHASMATODEA

PHASMATIDEA

BACILLINAE

Xylica oedematosa Karsch 1898?

(Rather small for this species and (?) with shorter antennae.)

EMALI: 1♂; 1♀.

Xylica sp. near **kilimandjarica** Sjostedt 1908

(Differs from the original description in its longer antennae.)

TEITA: (W) 1♂.

Xylica sp.

(A slender species with the pair of tubercles on the vertex very strong.)

TEITA: (B) 2♂♂. (W) 1♂.

Bacycharax sp.

(The anal segment and operculum in this species form a very long beak-like process.)

TEITA: (B) 1♂. (W) 1♀; 1 nymph (♀).

* About 03° 18' S., 38° 28' E.

BACTERIIDAE

BACUNCULINAE (Clitumnini)

Gratidia kibonotensis Sjostedt 1908

CHYULU: 1♂—vi, 5,600 feet.

Gratidia planicercata Rehn 1914 (or very near it)

CHYULU: 11♂♂—iv, 5,200 ft., vi(6), vii(4), 5,600 ft.; 8♀♀—iv(2), v, 5,200 ft. vi(3), vii(2), 5,600 ft.; 5 nymphs—iv(2), 5,200 ft. vi(2), vii, 5,600 ft.

Gratidia postrostratus Karsch 1898

EMALI: 1♂.

Gratidia sp. near **tenuis** Sjostedt 1908(The supra-anal plate is rather more attenuate and slightly more deeply excised than in *G. tenuis*. The cerci are very similar).

CHYULU: 2♂♂—vi, vii, 5,600 ft.

Gratidia and **Phthoa** spp. (4)

(The taxonomy of these and other Phasmatidae is in a chaotic state.)

(a) (Male genitalia similar to the last species but cerci rather more spatulate.

A larger species, the male with much longer legs.)

SHIMBA: 2♂♂; 1♀; 1 nymph (♀).

(b) (Male genitalia similar to *G. furcifer* Sjostedt 1908 but with the cerci very strongly biramous, T-shaped.)

STONY ATHI: 1♀—v.

EMALI: 9♂♂; 5♀♀.

(c) (Vertex with a pair of tubercles.)

EMALI: 2♀♀.

(d) TEITA: (B) 1♀; 1 nymph.

ACRIDODEA

TETTIGONIOIDEA

TETTIGONIIDAE

PHANEROPTERINAE

Noia sp.

STONY ATHI: 1♂—iv; 1♀—iv.

Peronura sp. near **clavigera** Karsch 1888

TEITA: (W) 2♂♂; 2♀♀.

Peronura spp. (3)

(a) STONY ATHI: 6♀♀—iv(2), v(4).

(b) EMALI: 1♀.

(c) TEITA: (W) 1♂.

Plegmatoptera hoehneli Brunner von Wattenwyl 1891

TEITA: (T) 1♀.

Plegmatoptera meruensis Sjostedt 1908

STONY ATHI: 1♂—vi.

EMALI: 1♀ (? this species)

Pantolepta heteromorpha Karsch 1888?

TEITA: (T) 1♂.

SHIMBA: 1♂. (both badly broken).

Pantolepta sp.

(A shorter winged species than the last.)

STONY ATHI: 12♂♂—iv, v(11).

Tylopsis merucensis Sjostedt 1908

EMALI: 6♂♂; 5♀♀ (3,vii).

Tylopsis dispar Sjostedt 1908

EMALI: 1♂ (vii); 6♀♀ (1, vii).

Dioncomena superba Karsch 1888

TEITA: (T) 1♂; 1♀.

SHIMBA: 2♂; 3♀.

Phaneroptera nana Fieber 1853

TEITA: (B) 2♂♂; 2♀♀. (T) 1♂.

SHIMBA: 1♂; 1♀.

Phaneroptera sp. near **albida** Walker 1869(This may be *Ph. reticulata** Brunner von Wattenwyl 1878)

EMALI: 1♂.

Phaneroptera punctulata Burr 1900?

EMALI: 1♂ (vii); 1♀ (vii).

Phaneroptera nana Burr 1900?

EMALI: 1 (vii); 1 (vii).

Phaneroptera sp.(Rather like *Ph. nana* but with very short tegmina in comparison).

SHIMBA: 1♂.

Genus and species?

(Very like *Phaneroptera* in appearance but with very reduced coxal spines very distinct pronotal sulci and a long biramous subgenital plate in the male.)

EMALI: 1♀.

CHYULU: 1♂—vii 5 600 ft.

Parapyrrhicia sp. ?(Differs from the original description of the genotype *P. zanzibarica* Brunner von Wattenwyl 1891 in weakly spined anterior and middle femora and excised subgenital plate.)

SHIMBA: 1♀.

Eurycorypha prasinata Stål 1873 ?

SHIMBA: 1♂.

Eurycorypha sp.

(Individual females of this genus are impossible to determine. There are several undescribed species in E. Africa.)

SHIMBA: 1♀.

CONOCEPHALINAE

Conocephalus maculatus (Le Guillou 1841)

EMALI: 1♂.
SHIMBA: 2♂♂.

Conocephalus iris (Serville 1839)

SHIMBA: 1♂.

Conocephalus meruensis (Sjostedt 1908)?

TEITA: (T) 1♀.

COPIPHORINAE

Homorocoryphus longipennis (Redtenbacher 1891)?

STONY ATHI: 1♂—v.
EMALI: 1♂.

Homorocoryphus sp.

(The taxonomy of African species of this genus is in an unsatisfactory state. These may be *H. vicinus* (Walker 1869) which is the name usually given to the common swarm-E. African species.)

EMALI: 1♀.
TEITA: (B) 1♂; 1♀.

PSEUDOPHYLLINAE

Acauloplax sp.

SHIMBA: 1♂.

HETRODINAE

Eugaster loricatus Gerstaecker 1869

EMALI: 1♀.

Spalacomimus talpa (Gerstaecker 1869)

EMALI: 2♂♂; 2♀♀.

Enyaliopsis ehippiatus (Gerstaecker 1869)

STONY ATHI: 8♂♂—vii(3) viii(3) ix(2); 5♀♀—vii(3) ix(2).
EMALI: 1♀.

GRYLLACRIDAE

Gryllacris meruensis Sjostedt 1908?

EMALI: 1♀.

Gryllacris sp.

(A very small species with wings and tegmina scarcely so long as the body.)
SHIMBA: 1♂.

GRYLLOIDEA

GRYLLIDAE

GRYLLINAE

Brachyterypus membranaceus (Drury 1773)

SHIMBA: 2♀♀.

Gryllus bimaculatus (De Geer 1773)

STONY ATHI: 2♂♂—ix; 2♀♀—ix.

Gryllus morio Fabricius 1781

STONY ATHI: 2♀♀—iii.

Scapsipedus marginatus (Afzel and Brenn 1804)

STONY ATHI: 1♀—iii.

Gryllulus gracilipes (de Saussure 1877)

SHIMBA: 1♂; 1♀.

Gryllulus spp.(3)

(a) (Small brachypterous with white palpi)

SHIMBA: 1♀.

(b) (Small black with tegmina almost as long as abdomen.)

TEITA: (T) 1♂; 1♀(5 nymphs from Chyulu—vi(2) vii(3) 5,600 ft. may also be this species).

(c) (Rather small black hemipterous.)

STONY ATHI: 1♂—iii; 4♀♀—i.

Grylloderes Kilimandjaricus Sjostedt 1909.

EMALI: 1♀.

Gryllodes sp.

(Dark dull, brachypterous.)

STONY ATHI: 1♀.

EMALI: 2♀♀.

Cophogryllus sp. near **boromensis** (Brandik 1896)

STONY ATHI: ♀

OECANTHINAE

Oecanthus brevicauda de Saussure 1878

STONY ATHI: 2♂♂—ix, 2♀♀—ix, xii.

EMALI: 1♂ (? this species)

Oecanthus pellucens (Scopoli 1763)

CHYULU: 3♂♂—iv, 5,400 ft., vi(2), 5,600 ft.; 8♀♀—v, vi(2), vii(2), 5,600 ft.; vii(3), 6,000 ft.

Oecanthus sp.(In the absence of females it is impossible to determine these specimens. They may belong to *Oe. burmeisteri* de Saussure 1878, which is often regarded as synonymous with form *aqueus* Fabricius 1793 of the last species.)

EMALI: 2♂♂ (1, vii).

CHYULU: 4♂♂—v, 5,200 ft.

ENEOPTERINAE

Aphonus sp. ?

SHIMBA: 1♀.

PODOSCIRTINAE

Dolichogryllus sp.

EMALI: 1♂.

Dolichogryllus griseus Chopard 1932?*

TEITA: (B) 1♂.

MOGOPLISTINAE

Ectatoderus kilimandjaricus Sjostedt 1909

CHYULU: 4♂♂—iv, 5,200 ft., iv(3), 5,600 ft.; 3♀♀—iv(2), 5,200 ft., v, 5,600 ft.

GRYLLOTALPIDAE

Gryllotalpa africana Palissot de Beauvois 1805

STONY ATHI: 1 nymph—x.

ACRIDOIDEA

EUMASTACIDAE

Plagiotriptus hippiscus (Gerstaecker 1869)

STONY ATHI: 2♀♀—v, ix.

EMALI: 2 nymphs.

TEITA HILLS: 4,600 ft., January 1947 (J. G. Williams): 1♀.

Euschmidtia sp.

(SHIMBA: ♀).

Thericles sp.

EMALI: 1♀.

TETRIGIDAE

TETRIGINAE

Paratettix scaber (Thunberg 1815)?

STONY ATHI: 8♂♂—vii, viii(4), ix(2), xii; 1♀—v.

All the males but one (viii) are much below average size for the species, but only one species seems to be represented. An additional female (viii) with the posterior prolongation of the pronotum ending rather abruptly and leaving almost the whole of the apical half of the wings exposed is perhaps merely an aberration since no other significant difference can be detected. The genus requires revision, however).

ACRIDIDAE

ACRIDINAE

Acrida sulphuripennis (Gerstaecker 1873)

STONY ATHI: 10♂♂—v(3), vi(2), viii(2), xii(3); 1♀—viii.

EMALI: 19♂♂.

SHIMBA: 2♂♂.

* This species was described from "Bura" but at what altitude is not known. Presumably the same Bura as the locality of the present specimen.

Acridella spp. (3)

There is a great deal of confusion in the taxonomy of this genus and it is advisable to leave specific determinations until the genus is revised. Certain of the forms have been referred to *A. nasuta* (Linné 1758) in the past (*e.g.* sp. *b*). This, however is a Mediterranean species and distinct from the tropical forms—*vide* Uvarov and Van Someren (1941). The following three forms are distinct.

(a) (Markings of tegmina well defined; hind wings of female bright red; pronotum much constricted—common Coast species.*)

SHIMBA: 1♀.

(b) (Markings of tegmina weakly defined; Hind wings of female dull purplish-red; pronotum strongly constricted—widespread.)

STONY ATHI: 3♂♂—xii; 1♀—v.

CHYULU:

TEITA: (B) 1♀.

(c) (Markings of tegmina strongly defined; hind wings of female bright purplish-red; pronotum not strongly constricted. A fairly large species resembling a small *A. procera* (Klug 1829), differing from *A. rendall*; (Kirby 1902) in the dark spots on the hind wings and the weak constriction of the pronotum.)

STONY ATHI: 2♂♂—v; 1♀—v.

EMALI: 3♀♀; 5 nymphs.

Cannula linearis (de Saussure 1861)?

(Specific determinations in this genus are unsatisfactory and, without males, impossible.)

EMALI: 4♀♀.

CHYULU:

Mesopsis laticornis (Krauss 1877)

(SHIMBA: ♂♂.)

Brachycrotaphus sjsotediti Uvarov 1932

EMALI: 5♂♂ (2, vii); 1♀.

Parga xanthoptera (Stål 1855)

EMALI: 1♀.

Platypternodes sp.

(SHIMBA: ♂.)

Amphicremna sp.

EMALI: 1♂ (vii).

Duronia tricolor Karny 1907

STONY ATHI: 4♂♂—v, vi, vii, xii; 6♀♀—iv, vi, vii, xii(3).

SHIMBA: 1♀.

Lobopoma ambages Karsch 1896

EMALI: 12♂♂; 3♀♀.

CHYULU:

* Gerstaecker (1873) incorrectly describes this species as the female of *Trudalis miniata* Klug. He also records "*T. nasuta* Linneus," from the Bura Mts. (=Teita Hills. *T. miniata* Klug 1829 = *Acridella grandis* (Klug 1829) *partim*).

Orthochtha desyncnemis (Gerstaecker 1869)

STONY ATHI: 1♀—iv.
 EMALI: 32♂♂; 35♀♀; 7 nymphs.
 TEITA :* (B) 1♀; (W) 1♀.

Paracomacris stenopterus (Schaum 1853)

CHYULU:

Anablepia rufescens (Kirby 1902) ?

CHYULU:

Paracinema tricolor tricolor (Thunberg 1815)

STONY ATHI: 3♂♂—viii, xii(2).
 TEITA: (W) 3♂♂; 1♀ (4 additional ♀♀, x, 38).

Prostethophyma cephalica I. Bolivar 1914

EMALI: 4♂♂.

Gymnbothrus temporalis temporalis (Stål 1876)

EMALI: 7♀♀.

Gymnbothrus temporalis flexuosus (Schulthess-Schindler 1898)†

STONY ATHI: 2♂♂—vi, vii; 1♀—x.
 EMALI: 2♀♀.

Gymnbothrus inflexus Uvarov 1934

EMALI: 2♀♀.

Gymnbothrus graeilis (Ramme 1931)‡

STONY ATHI: 1♂—xii; 2♀♀—v, xii.

GYMNOBOTHROIDES MONTANUS n. sp. (*fig. 1*)

TEITA: (T) 2♂♂; 3♀♀.
 HOLOTYPE: ♂, 4,500–5,500 ft., Grass and Bushes, Teita Hills 25th December 1945, D. K. Kevan, Coll.

Antennæ: Very slightly expanded basally, somewhat longer than the head and pronotum together.

Head: Face very oblique, almost straight in profile; frontal ridge reaching the clypeal suture, parallel-sided, deeply sulcate throughout; lateral facial carinae strong, very slightly arcuate; fastigium of vertex inclined downwards to meet frontal ridge at a rounded acute angle, concave above with raised margins; occiput somewhat rounded in profile; median carinula obsolete.

Pronotum: But little constricted; anterior margin of pronotal disc rounded, posterior margin slightly excised medially; median and lateral carinae strong, latter slightly convergent for about one third of the pronotal length, thereafter sharply divergent; first and second sulci of the pronotal disc irregularly impressed, the former very indistinct, the two placed close together at about one third of the pronotal length; typical sulcus distinct, situated beyond the middle of the disc, somewhat arcuate.

* Known also from Mt. Kasigau, 03°-50' S., 38°-39' E..

† *G. brevipennis* Miller 1929 seems to be a synonym of this species.

‡ This appears to be a synonym of *G. rammei* (Sjostedt 1931) but whether this is itself a synonym of *G. maruensis* (Sjostedt 1929) as Sjostedt states, is not certain.

Tegmina: Abbreviate, long-oval, reaching slightly beyond the posterior margin of the first abdominal tergum.

Cerci: Straight, obtusely pointed, slightly longer than the supra-anal plate which is bluntly rounded apically.

ALLOTYPE: ♀, same data as holotype.

Agrees with the above description though a larger insect with shorter cerci.

COLORATION: The males (holotype and one paratype) have the general coloration reddish-brown. The antennæ, frons, occiput and a patch behind the eye, the median carina of the pronotum, the upper half of the lateral pronotal lobes, the tegmina and the sides of the abdomen are darker. Posterior femora orange; apex of femur and the extreme base of the tibia black. Posterior tibia infuscated but with a whitish ring near the base. An indistinct dark maculation is also present on the upper keel of the hind femur just basal of the middle. The allotype shows the same coloration except that only the lower side of the femur is orange. The two female paratypes are almost unicolorous red-brown.

MEASUREMENTS (in millimeters):

	Length	Antenna	Pronotum	Tegmen	Hind Femur	Hind Tibia
♂ Type . . .	12.0	6.0	2.5	2.7	8.5	7.5
♀ Allotype . . .	19.5	7.0	3.8	3.4	12.2	9.8

This species differs from the species from Mt. Kenya—*G. keniensis* Johnston 1937—and the very closely allied E. African *G. levipes* (Karsch 1896)— in its slightly less constricted pronotum, its larger size and more slender appearance and its more shallowly sulcate and more parallel sided frontal ridge. From the South African *G. hemipterus* Miller 1932 to which it is most closely allied, it differs chiefly in the excised posterior margin of the pronotal disc and in the form of the frontal ridge which is less deeply sulcate. *G. pullus* Karny 1915, from Tanganyika is stouter, has a less strongly produced fastigium to the vertex and apically rounded tegmina. The posterior femora (in the female at least) are stouter in *G. pullus* and the pronotal carinae are more divergent.

***Pnorisa squalus* Stål 1860**

EMALI: 3♂♂; 1♀.

SHIMBA: 1♂.

***Afrohippus* sp. nov.**

(This species is very near *A. brevipennis* Miller 1929 which is only known from a single female. The present specimen agrees quite closely with Miller's type, but differs in its smaller size and less slender appearance and in the lateral pronotal carinae continuing on to the metazona—almost reaching the hind margin. Since only a single female is known, it is best left undescribed for the present.)

STONY ATHI: 1♀ —iv.

***Aulacobothrus emalicus* Uvarov 1941**

EMALI: 33♂♂; 13♀♀; 2 nymphs (and further material retained by the British Museum).

***Aulacobothrus* sp.**

SHIMBA: ♂♂, ♀♀.)

***Rhaphotittha meruensis* Sjöstedt 1909**

STONY ATHI: 14♂♂—iv, v(3), vi, viii(3), ix(5), xii; 12♀♀—v(4), vi, viii(2), ix(4), xii.

Rhaphotittha nyuki Sjostedt 1909

(This species occurs together with the last in many places. It differs only in the shape of the pronotal carinae and is almost certainly synonymous with it, the present species having page priority.)

STONY ATHI: 1♂—v; 7♀♀—iv, v, vi(2), viii(2), ix.

Rhaphotittha subtilis Karsch 1896

EMALI: 1♀; 1 nymph.

Rhaphotittha reducta Uvarov 1941

STONY ATHI: 2♂♂—iii (paratype, v (type, retained by the British Museum).

Dnopherula sp. (probably new)

(It would be unwise to describe this without direct comparison with other species).

EMALI: 1♂; 4♀♀(vii).

Stenophippus xanthus (Karny 1907)

EMALI: 1♀.

OEDIPODINAE

Aiolopus meruensis Sjostedt 1909

EMALI: 1♀.

Aiolopus sp.

(The group to which this species belongs includes the European *A. thalassinus* (Fabricius 1793) from which the African forms are distinct (Uvarov, 1938.)

STONY ATHI: 4♂♂—viii(2), ix(2).

Aiolopus longicornis Sjostedt 1909

STONY ATHI: 2♂♂—iv, ix; 2♀♀—viii.

TEITA HILLS:* 1♂; 2♀♀—September 1921 (H. E. Box).

Morphacris fasciata (Thunberg 1815)

(All typical form with red hind wings.)

STONY ATHI: 13♂♂—viii(7), ix(3), x(2), xii; 5♀♀—vi, viii(2), ix, x.

TEITA: (W) 2♀♀—October 1938, (T) 2♂♂; 5♀♀.

SHIMBA: 1♀.

Acrotylus patruelis (Herrich-Schaeffer 1838)

STONY ATHI: 22♂♂—iv, v(3), vi(2), viii(7), ix(5), x, xii(3); 20♀♀—iii, v, vi, vii, viii(7), ix(6), x, xii(2).

TEITA: (T) 1♂; 1♀.

Acrotylus elgonensis Sjostedt 1933

STONY ATHI: 2♀♀—ix, x.

Trilophidia conturbata (Walker 1870) ?

(This genus requires revision before certain determinations can be made)

STONY ATHI: 2♂♂—xii; 2♀♀—xii.

* In collection of Scott Agricultural Laboratories, Kabete, Kenya.

Heteropternis saussurie Kirbe 1902

EMALI: 7♂♂ (2, vii) 8♀♀ (1, vii).

Heteropternis coulouiana (de Saussure 1884)

CHYULU:

TEITA: (T) 2♂♂; 1♀.

Heteropternis thoracica Walker 1870

SHIMBA: 1♀.

Pycnodictya galinieri (Reiche and Fairmaire 1847)

STONY ATHI: 6♂♂—v, viii(2), ix, x, xii; 2♀♀—v, xii.

EMALI: 10♂♂; 8♀♀; 1 nymph.

TEITA: (B) 1♀.

Humbe tenuicornis (Schaum 1853)

STONY ATHI: 8♂♂—v(2), vi, vii, viii(4); 6♀♀—iv(3), v, vii, viii.

EMALI: 2♂♂; 2♀♀.

TEITA: (W) 1♀.

SHIMBA: 1♂.

Gastrimargus volkensi Sjostedt 1909

EMALI: 4♂♂; 26♀♀.

TEITA: (B) 1♂.

SHIMBA: 1♀.

Gastrimargus africanus (de Saussure 1888)

STONY ATHI: 1♀—vii.

EMALI: 1♂; 4♀♀.

CHYULU:

Gastrimargus brevipes Sjostedt 1928

EMALI: 1♂; 2♀♀.

CHYULU:

Locusta migratoria migratorioides (Reiche and Fairmaire 1847)

(It is most improbable that this species is a permanent resident in either of the localities given below although the solitary phase of the Tropical Migratory Locust has been found in isolated places in East Africa since the last outbreak which came to an end in 1940).

STONY ATHI: 1♂—vi; 1 nymph.

(Solitary phase—presence possibly due to breeding of isolated individuals broken off from a swarm.)

EMALI: 8♂♂; 2♀♀ (Gregarious phase).

Oedaleus citrinus de Saussure 1888

STONY ATHI: 10♂♂—vii, viii(8), ix; 7♀♀—iv(2), vi, vii, viii(3).

(There is an additional female in the Coryndon Museum—viii, 1939, 4,500 ft.)

Oedaleus nigeriensis Uvarov 1925

EMALI: 1♀.

PYRGOMORPHINAE

Chrotagonus sp.

(A brachypterous species. This difficult genus needs revision before certain determinations can be made.)

TEITA: (T) 1 ♂.

Tapesia grisea grisea (Reiche and Fairmaire 1847)

CHYULU:

Tapesia grisea intermedia Sjostedt 1923

EMALI: 1 ♂.

Parapetasia impotens Karsch 1888

(SHIMBA: ♀♀).

Zonocerus elegans (Thunberg 1815)

TEITA:* (B) 3 ♀♀ (brachypterous form), (T) 1 nymph.

Taphronota calliparea (Schaum 1853)

EMALI: 1 ♂.

CHYULU:

TEITA: (B) 4 ♂♂; 2 ♀♀, (W) 1 ♂.

SHIMBA: 4 ♂♂.

Phymateus viridipes (Stål 1873)

EMALI: 1 ♂.

CHYULU:

TEITA: (Mbololo, 5,000 ft., ix— 1938), 1 ♀. (This locality is approximately 03° 18' S., 38° 28' E.)

Phymateus purpurascens Karsch 1896

TEITA: (B) 1 ♂, (W) 1 ♀, (T) 1 nymph (? this species).

Phymateus aegrotus (Gerstaecker 1869)

STONY ATHI: 1 ♂—xii; 1 ♀—iv.

Atractomorpha gerstaeckeri I. Bolivar 1884

(SHIMBA: ♀♀.)

Parasphena nairobiensis Sjostedt 1933

STONY ATHI: 3 ♂♂, 5 ♀♀. (Retained by British Museum.)

Parasphena chyuluensis Kevan 1946

CHYULU: (Previously recorded as *P. nairobiensis* Sjostedt 1933.)

Parasphena teitensis Kevan 1946

TEITA: (W) 3 ♀♀, (T) 6 ♂♂; 11 ♀♀; 3 nymphs (All type material).

* Known also from Mt. Kasigau, 03° 50' S., 38° 39' E.

PAMPHAGINAE

Lamarckiana sp.

(The taxonomy of this genus is chaotic. This species is often referred to as *L. loboscelis* (Schaum 1853).

EMALI: 1 ♀.

SHIMBA: 1 ♀.

CATANTOPINAE

Ixalidium obscuripes Miller 1929

(Not yet compared with authentic material, but agrees with Miller's description and figures.)

(SHIMBA: ♂♂; ♀♀).

Ixalidium haematoscelis Gerstaecker 1869. (*fig. 2A*)

Described from the Bura Mountains (—Teita Hills). From the original description it is obvious that the specimens below belong to this species although the description is not sufficiently full to distinguish it from certain species now known. It is closely related to *I. bicoloripes* Uvarov 1941, but differs from paratypic material of that species in being slightly smaller, in the hind tibiae being less extensively and less intensely dark basally, in the very slightly narrower fastigium of the vertex, in the rather less gibbose abdominal terga, in the finer puncturation, in the trapezoidal excision of the last abdominal tergum and in the shape of the supra-anal plate of the male, of which the basal portion is slightly narrower and the apical portion slightly shorter with straight (not slightly concave) sides and a more distinct median sulcus. The impression on the base of the supra-anal plate, also, is narrower and better defined, being a sulcus rather than an impression between two widely spaced ridges (*vide* also Uvarov, 1941). From the Kilimanjaro species* it differs in being very slightly larger, in the rather wider fastigium of the vertex in the gibbose abdominal terga and the wider supra-anal plate. It differs from both *I. usambaricum* Ramme 1929 and *I. obscuripes* Miller 1929 from N.E. Tanganyika by the shorter supra-anal plate and the inflated, apically attenuated subgenital plate in these two species. *I. transiens* Ramme 1929 and *I. asymmetricum* (Ramme 1929) also from Tanganyika, differ in the aberrant genitalia of the male.)

TEITA: (T) 4 ♂♂; 5 ♀♀.

Ixalidium bicoloripes Uvarov 1941

EMALI: 4 ♂♂; 4 ♀♀; 2 nymphs (All type material, 2 ♂♂ (including the holotype) and 2 ♀♀ retained by the British Museum.)

USAMBILLA MONTANA n. sp. (*fig. 3B*)

TEITA: (T) 3 ♀♀.

HOLOTYPE: ♀, Teita Hills, Kenya, (03° 23' S. 38° 23' E.), 4,500 - 5,500 feet, in Forest Clearings, 24th December 1945, (D. K. Kevan).

* Sjostedt (1909) records this as *I. haematoscelis* but it is certainly distinct from that species, differing as described, particularly in the narrower though less acutely pointed supra-anal plate of the male. The specimen of "*I. haematoscelis*" in the British Museum collection presumably the same as those studied by Uvarov (1941) when he described *I. bicoloripes* and compared that species with them—belong to Sjostedt's original Kilimanjaro series for which the name *Ixalidium Sjostedti*, n. sp. (*fig. 2B*) is proposed. The following specimen should be regarded as the type:—♂, Kilimanjaro, 1905—06, Kibonoto, Kulturz., 12 okt., *Sjostedti*, B.M. 1927—4. The following are Paratyped: 2 ♀♀, data as Type, but Kibonoto—niedr (not kulturz) 2 and 7 Jan; 1♂, data as Type, but Kibonoto, Stapf, 1000—1200 m. (not kulturz) Aug.

Antennæ: Longer than head and pronotum together, filiform.

Head: Short, strongly punctured. Face straight when seen in profile, slightly inclined backwards, strongly punctured. Frontal ridge broad, strongly punctured, somewhat excavate; from fastigium of vertex to median ocellus, as wide as interocular space; from ocellus to clypeus narrower. Lateral carinæ of face almost vertical from eye to clypeus. Fastigium of vertex very short and wide, scarcely protruding beyond the eyes, slightly excavate anteriorly almost twice as wide as interocular space, margins distinct, convergent backward on to vertex, the enclosed space longer than wide. Eyes somewhat protruding, the distance between their outer faces almost equal to the greatest width of the pronotum.

Pronotum: Cylindrical with anterior margin placed just behind the eyes; anterior and posterior margins almost straight; greatest width, length and depth all about equal. Median pronotal carina present but indistinct. Lateral pronotal carinæ obsolete. Only the typical sulcus present on the pronotal disc but all three sulci fairly distinct on the lateral lobes. Metazona of pronotum less than one-quarter of pronotal length. A small hump is situated medially in the region of the typical sulcus of the pronotal disc. Puncturation of pronotal disc fine, strongly impressed and evenly distributed, dense; of pronotal lobes, fine and scattered. Meso—and metanota with almost straight margins except for the posterior margin of the metanotum which is slightly excised medially. Mesonotum equal in length to the metazona of the pronotum; metanotum almost twice this length. Puncturation of meso—and metanota and of pleurae as on pronotal disc. Prosternal tubercle large, obtuse, the anterior face flat. Mesosternal lobes rather wider than long, their inner margins slightly divergent posteriorly and their posterior margins inclined postero-laterally. The interspace between the mesosternal lobes is slightly greater than the width of a lobe.

Tegmina and wings: Absent.

Abdomen: Terga, except last three, similar to meso—and metanota in form and puncturation. Last three terga broadly concave posteriorly and less punctured. Supra-anal plate broadly triangular, as wide basally as long, with a median basal, longitudinal impression. Cerci conical, about half as long as supra-anal plate. Subgenital plate considerably longer than wide with the posterior margin very broadly triangular. Ovipositor valves short, with poorly-developed apical hooks; upper pair rather slender, superior and inferior margins sub-parallel.

Only the female is completely known.*

COLORATION: The general colour is reddish-brown. The antennæ are variegated blackish and yellowish, being more predominantly black apically. The head and pronotum have a lateral black band reaching from behind the eye to the posterior margin of the pronotum and widening posteriorly. Below this runs a wide, yellowish stripe. The meso—and metanota and the abdomen are black laterally except for a large, lateral, reddish-brown patch extending from the meso—and metanota to the first abdominal tergum. The hind tibiae are dull greenish, suffused blackish apically, their spines dull yellowish with black tips. The tarsi are suffused blackish.

MEASUREMENTS (in millimeters):

	Length	Length of Pronotum	Length of Hind Femur
♀ Type	16	3.5	8.5

* A single, damaged male (without hind legs) was taken with the Type but, with a few other less important specimens, was regrettably lost at a later date. A rough notebook entry, however, shows that this differed from the female in its smaller size, more slender appearance, narrower fastigium, less quadrate pronotum devoid of a definite hump and narrower mesosternal interspace. The only measurements noted were "length c. 10 mm., pronotum c. 2 mm."

The two female paratypes (same data as type) have similar measurements.

HABITAT: The specimens were taken in open places in forest and plantations among low herbage generally.

This species is intermediate between *U. olivacea* Sjostedt 1909 (fig. 3A) and *U. modicircus* (Karsch 1896) (fig. 3C). It differs from specimens of the latter from Kili-manjaro, in that the fastigium of the vertex is wider, less produced and less excavate, the median pronotal carina is less distinct, the hump on the posterior part of the pronotal disc is less pronounced, the puncturation is more even and the supra-anal plate of the female is somewhat shorter.

From the genotype *U. olivacea*, the new species differs in its smaller size, its finer and more regular puncturation, its slightly more excised fastigium (seen from above), its narrower interocular space and the coloration, there being more black laterally on the pronotum and abdomen and no trace of olive coloration except on the hind tibiae. The superior ovipositor valves are more like those of *U. modicircus* than of *U. olivacea*.

U. (?) cylindricollis Ramme 1929 from Southern Rhodesia of which only the male is known, has a more tumid, smoother pronotum and narrower fastigium than other species.

Usambilla olivacea Sjostedt 1909

EMALI: 1♀.

Rehnula usambarica (Ramme 1929)

(Without type or authentic material for comparison one cannot be absolutely certain that the specimens below are the same as those described from the Usambaras, but they agree closely with Ramme's figures and description.)

(SHIMBA: ♂♂; ♀♀.)

Mecostibus sellatus Uvarov 1941

EMALI: 1♀ (Type: retained by British Museum).

Phialosphaera severini Ramme 1929

(SHIMBA: ♂, ♀.)

Catantops vanus Karsch 1896

(Sometimes referred to the genus *Parapropacris* vide Ramme 1929.)

TEITA: (B) 2♂♂; 3♀♀.

(SHIMBA: ♂♂.)

Catantops saucius (Burmeister 1838)

TEITA: (Mbololo—November 1938). 1♂.

(Strictly speaking this species should not be included in the fauna of the Teita Hills for although the locality gives rises to over 4,500 ft.—about 03° 18' S., 38° 28' E.—the specimen was most probably caught in the grass and thorn-bush country at a much lower altitude. It is a dry grassland species.)

Catantops decoratus decoratus Gerstaecker 1869

EMALI: 6♂♂ (4, vii); 6♀♀ (2, vii); 1 nymph.

CHYULU:

Catantops neumanni Ramme 1929

SHIMBA: 1♀.

Catantops sp. (*tukuyuensis* group*)

EMALI: 1♂, 1♀ (Retained by British Museum).

CHYULU:

Catantops curvicercus Miller 1929

STONY ATHI: 2♀♀—vi, xii.

EMALI: 2♂♂; 3♀♀.

TEITA: (T) 1♂; 2♀♀.

Catantops melanostictus Schaum 1853

STONY ATHI 2♂♂—viii, xii; 3♀♀—xii.

CHYULU:† 1♀—iv, 3,800 ft.

SHIMBA: 1♀.

Catantops loveni Sjöstedt 1931

EMALI: 1♂, 2♀♀.

Catantops kilimandjaricus Ramme 1929

CHYULU: ‡

Catantops momboensis Sjöstedt 1931?

STONY ATHI: 1♀—viii.

(The coloration, particularly of the hind legs, agrees with the above species from its description. Without the male certain determination is impossible.)

CHYULU:

CATANTOPS (MICROCATANTOPS) EMALICUS n. sp. (*fig. 4*)

EMALI: 2 ♂♂; 1 ♀. *

HOLOTYPE: ♂, Emali Range, Sultan Hamud, 4,900 - 5,900 ft., March 1940.

Antennæ: Very slightly shorter than head and pronotum together.

Head: Fastigium of the vertex broadly rounded in front, about as wide as long and about two and a half times as wide as the interocular space; frontal ridge strong, reaching the clypeal suture, parallel-sided, tapering only very slightly towards the fastigium, sulcate and strongly punctured throughout, lateral margins sharply defined dorsal carinula obsolescent.

Pronotum: Strongly and rugosely punctured; median carina weak but distinct, cut by three transverse sulci, the typical sulcus situated behind the middle of the pronotal disc, extending on to the lateral lobes, the anterior sulcus not extending on to the lateral lobes; anterior margin of pronotal disc almost straight, but rounded laterally, posterior margin forming a rounded obtuse angle; prosternal tubercle obtuse, directed slightly backward; meso-sternal interspace rather wider than long, slightly widened posteriorly.

Tegmina: Not quite reaching half way to the posterior margin of the second abdominal tergum, widely separated on the dorsum, long-oval, the apex broadly triangular, the costal margin almost straight, widest point at about two-thirds of the length.

* The author understands that hairy species such as this *C. villosus* Karsch and *thirtus* Miller will go to form a new genus in a paper by Uvarov (not yet published).

† Omitted from the list published by Uvarov and Van Someren (1941).

‡ Van Someren in the same paper also reports this species from EMALI, but all specimens included thereunder in the Coryndon Museum collection from that locality are, in fact, *C. loveni* Sjöstedt, the male cerci of which are quite distinctly different (as is also the colour of the hind tibiae).

x Now also known from Kibwezi (Kenya) and Arabuko (Kenya Coastal area).

Cerci: Straight, conical, sub-equal to the supra-anal plate in length, the latter being narrowed in the apical third to a triangular point.

ALLOTYPE: ♀, same data as holotype.

Agrees with the holotype except in its larger size, broader tegmina and shorter cerci.

COLORATION: The general coloration of the holotype and a male paratype is brown with a broad black shiny stripe running across the upper part of the lateral pronotal lobe but much less distinct behind the typical sulcus where it is dark brown and not black. The lower margin of the lateral pronotal lobes and the mesopleura are pale yellowish. The antennæ are mottled greyish. The hind femora are orange within and below; the lower external area is dark brown; the lower carina of the median external area has several black maculations along it; and the dorsal carina has a sub-median and a sub-apical dark brown fascia obliquely and rather faintly across the median external area, the sub-apical fascia being present also on the inner side of the femur. The hind tibiae are orange, somewhat infuscated externally for one-fifth of the tibia-length a short distance beyond the base, and also at the apex. The hind tarsi are infuscated. The allotype is generally paler in colour with a large, dark, medially-constricted area on the pronotal disc.

MEASUREMENTS (in millimeters):

	Length	Antenna	Pronotum	Tegmen	Hind Femur	Hind Tibia
♂ Type	14	5.0	3.5	3.2 x 1.8	8.7	7.3
♀ Allotype	20	...	4.6	3.8 x 2.6	10.6	9.0
♂ Paratype	13	4.5	3.2	3.9 x 1.7	8.5	7.1

This species differs from *M. brachypterus* Ramme 1929, in the rather shorter fastigium of the vertex, in the mesosternal interspace being rather wider and in the wider, shorter and less lanceolate tegmina. In colour it differs also in there being no pale maculation on the lateral pronotal lobes between the penultimate and posterior sulci, and in the orange instead of red colour to the inside and lower part of the posterior femur and tibia, the colour not extending on to the tarsus.

With a series, comparison with Ramme's type might prove the two synonymous since they are very similar.

Europacris obscura Miller 1929

SHIMBA: 5 ♂♂; 12 ♀♀.

Thisoicetrus laticercus Uvarov 1941

CHYULU:

Thisoicetrus brevipennis I. Bolivar 1914

EMALI: 12 ♂♂; 4 ♀♀.

Bibulus coerulescens (Stål 1876)

STONY ATHI: 3 ♂♂—v, xii(2); 6 ♀♀—v(3), vi, x, xii.

EMALI: 3 ♀♀.

CHYULU:

Eyprepocnemis ibandana Giglio-Tos 1907

STONY ATHI: 3 ♂♂—iv, viii(2); 6 ♀♀—vi(3), vii, viii(2).

EMALI: 5 ♂♂; 5 ♀♀.

CHYULU;

Taramassus cuncator (Karsch 1900)

STONY ATHI: 1 ♀—ix.

TEITA: (T) 1 ♀.

(SHIMBA: ♂♂, ♀♀.)

(The Teita specimen differs from typical examples by its small size and doubtless belongs either to *T. c. sjostedti* (Ramme 1929) or *T. c. flabellatus* (Ramme 1931), which were described from Meru and Kilimanjaro respectively. Without males, however, sub-specific determination is impossible.)

Oxaeida poultoni Ramme 1929.

(SHIMBA: ♀.)

Caloptenopsis ferrifer (Walker 1870)

EMALI: 1 ♂; 2 ♀♀.

CHYULU:

Caloptenopsis speciosus Sjostedt 1909

STONY ATHI: 2 ♂♂—viii, xii; 2 ♀♀—viii.

EMALI: 5 ♂♂; 24 ♀♀; 4 nymphs.

SHIMBA: 1 ♂.

Caloptenopsis meruensis (Sjostedt 1909)

STONY ATHI: 11 ♂♂—viii(4), ix(4), x, xii(2); 13 ♀♀—v, vii(2), viii(4), ix(4), xii(2).

Platyphymus granulatus Uvarov 1922

STONY ATHI: 1 ♂—vi.

CHYULU:

Tylotropidius speciosus (Walker 1870)

(SHIMBA: ♂♂, ♀♀.)

Tylotropidius gracitipes Brancsik 1896?

(This genus, and the following require revision before reliable determinations can be made.)

STONY ATHI: 1 ♂—v; 1 ♀—viii.

CHYULU:

Tropidiopsis pendulus (Karsch 1894)?

STONY ATHI: 1 ♂—viii; 1 ♀—viii; 1 nymph—vi.

EMALI: 13 ♂♂; 35 ♀♀; 2 nymphs.

SHIMBA: 1 ♂; 1 ♀.

Cataloipus oberthuri I. Bolivar 1891

TEITA: (B) 1 ♀.

Cataloipus tanaensis Sjostedt 1929?

(After examining long series of this species—or at least specimens which agree with Sjostedt's distinction from the oberthuri—the writer feels fairly certain that it is but a sub-species of the last, there being apparently intermediate forms, particularly among males. Without type material for comparison, however, it is not proposed to synonymise the two species for the present.)

STONY ATHI: 6 ♂♂—v(2), viii(3), ix; 8 ♀♀—v(2), vi(4), vii, viii.

EMALI: 8 ♂♂; 27 ♀♀.

Ischnansis curvicerca Uvarov 1938

(There is some evidence that this species is synonymous with *I. gracilis* Schulthess-Schindler 1898. It is apparently more widely distributed than was thought when originally described, but since the present specimen (determined by Uvarov himself) and material from Turkana and the Northern Province of Kenya examined by the writer are, like Schulthess' type, all females, the question must remain open regarding synonymy.)

EMALI: 1♀.

Abisares viridipennis azurea Sjostedt 1909

STONY ATHI: 2♂♂—vii, viii; 1♀—viii.

EMALI: 1♂.

CHYULU:

TEITA: (B) 16♂♂; 14♀♀; 2 nymphs.

SHIMBA: 1♂.

Anacridium moestum (Serville 1839)

(Typical form, not *A. melanorhodon* Wlk, which may or may not be distinct.)

EMALI: 8♂♂; 14♀♀ (1, vii); 4 nymphs.

CHYULU:

Bryophyma debilis picta Uvarov 1922

CHYULU:

Bryophyma debilis debilis (Karsch 1896)

(The specimen below is somewhat discoloured but resembles this sub-species more closely than the last.)

EMALI: 1♀.

Schistocerca gregaria (Forskäl 1775)

(The Desert Locust is not a permanent resident in any part of the area under discussion, only the gregarious phase being known from the various localities. Swarms have been recorded from all five places at various times during 1943-46* and breeding took place in the Stony Athi area in May 1944, and a fair hopper infestation resulted. The low country around the Teita Hills has also been subject to heavy infestations of hoppers—records going back to the beginning of the present century—but there is only one record of breeding at higher altitudes—a very small hatching at Wesu, about 5,400 feet, December 1945.)

TEITA: (T) 1♂.

(The only specimen from any of the localities which has been preserved. A yellow straggler from swarms moving in the low surrounding country at the time.)

Ornithacris cyanea magnifica (I. Bolivar 1886)

(All the material below belongs to the same form of *O. cyanea* (Stoll 1813), the Chyulu material being determined as the above sub-species by Uvarov who mentions 1942 that the specimens like all Kenya material available to the writer are intermediate between it an *O. c. orientalis* Sjostedt 1909 since the wings are purplish-red in colour. Rehn 1943 disagrees with Uvarov's classification, this form being his *O. pictula cruenta* Rehn 1943.)

EMALI: 1♂(vii); 5♀♀ (4, vii).

CHYULU:

TEITA: (B) 1♀, (W) 1♀.

* Similarly during 1934-36 swarms of the Red Locust, *Nomadacris septemfasciata* serv. occurred in most of the localities but breeding did not occur there.

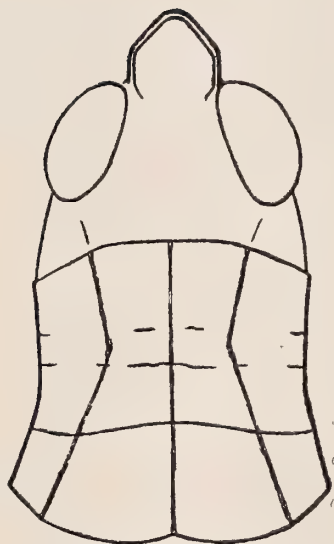


FIG. 1
Gymbothroides montanus, n. sp.
 ♀ Head and Pronotum

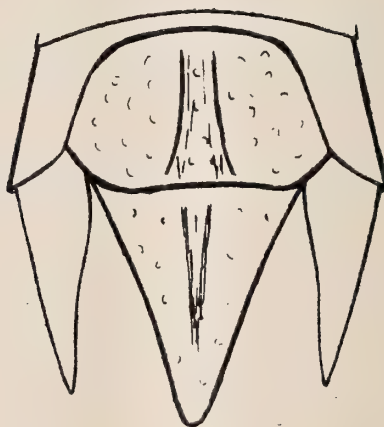


FIG. 2B
Ixalidium sjostedti, n. sp.
 Apex of abdomen of ♂

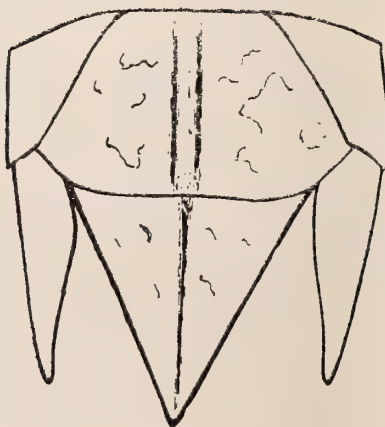


FIG. 2A
Ixalidium hematoscelis Gerst.
 Apex of Abdomen of ♂

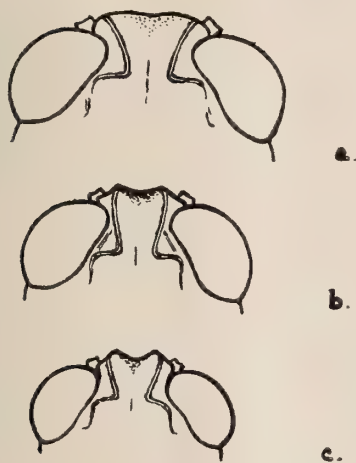


FIG. 3
Usambilla ♀♀; Head
 (a) *U. olivacea* Sjöstedt.
 (b) *U. montana* n. sp.
 (c) *U. modicrus* (Karsch)

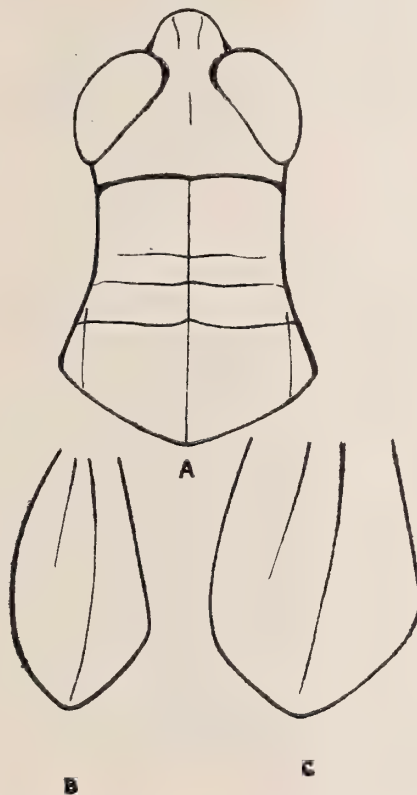


FIG. 4
Catantops (Microcatantops) emalicus, n. sp.
 (a) ♂ Head and Pronotum
 (b) ♂ Right Tegmen
 (c) ♀ Right Tegmen

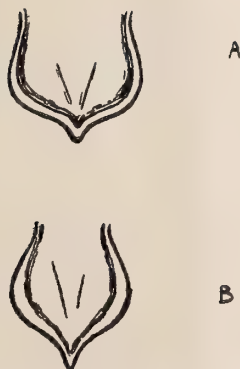


FIG. 5. Subgenital Plate of male seen from above
 (a) *Kraussaria dius* (Karsch.)
 (b) *K. deckeni* (Kerst.)

Cyrtacanthacris tatarica tatarica (Linné 1758)

STONY ATHI: 15♂♂—iii, v, vi(2), vi, viii(6), ix(2), xii(2); 4♀♀—iii(2), v, ix.
EMALI: 2♂♂; 2♀♀. CHYULU: TEITA: (W) 1♀.

Acanthacris ruficornis fulva (Sjostedt 1909)

STONY ATHI: 2♂♂—iii, ix, EMALI: 1♂. CHYULU:
TEITA: (B) 2♂♂; 1♀; 1 nymph, (T) 1♂.

Chondracris sanguineus (Sjostedt 1912)

EMALI: 4♂♂; 1♀. CHYULU:

Kraussaria dius (Karsch 1896) (*figs. 5 and 6*)

(SHIMBA: ♀.)

Kraussaria deckeni (Gerstaecker 1869)* (*figs 5 and 6*)

(The specimens differ from the original description and Gerstaecker's (1873) figure of *Acridium Deckeni* only in the lack of testaceous markings on the pronotum (and the green—not brown—head and abdomen which is probably merely due to better preservation). The tarsi also are rather brighter red than indicated in the figure while the hind wings are greener and not so yellow. They undoubtedly belong to this species, however, and not to *K. dius* (Karsch 1896) which also lacks the testaceous markings on the pronotum and occurs in similar localities, differing from that species in coloration (*cf.* Gerstaecker, 1873 and Miller, 1929), particularly in the red tarsi, pale whitish anal area of the tegmina, blue-green spines of the hind tibiae and the green venation, instead of the green tarsi, reddish or greenish-brown anal area of the tegmina, yellow (tipped with red and black) tibial spines and the red venation. The two species differ also morphologically (*figs 5 and 6*) in the relative size of the head, the profile and width (particularly anteriorly) of the pronotum, the length of the tegmina and the distinctness of the pronotal sulci. In the male, the acuminate apex of the sub-genital plate (seen best from above) is longer, more pronounced and less abrupt in *K. deckeni*. The base of the sub-genital plate is more constricted in *K. deckeni*, the lateral margins being divergent instead of sub-parallel as in *K. dius*.

MEASUREMENTS (in millimeters) of typical examples† of the two species are as follows:

		Width of Head	Length and Width of anterior pronotum	Length of Tegmen	Length of Hind Femur
<i>K. dius</i>	♀	8.7	12.2 x 11.0	47	30
<i>K. dius</i>	♂	5.8	9.8 x 7.5	36	23
<i>K. deckeni</i>	♀	7.2	12.2 x 10.5	51	29
<i>K. deckeni</i>	♂	5.5	9.3 x 7.2	37	22

TEITA: (B) 2♀♀.

Oxya hyla Serville 1831

TEITA: (B) 1♀, (T) 1♂; 1♀ (*var. minor* Sjostedt 1909).
(SHIMBA: ♀.)

Tristria sp.

(SHIMBA: ♂.)

* *Acanthacris deckeni* (Gerst.) Uvarov, 1924, *Ann. Mag. Nat. Hist. Ser.* 9, 13:19.—An examination of the male shows this species to belong to *Kraussaria* Uvarov and not to *Acanthacris* Uvarov.

† The *K. deckeni* ♀ is one of the above Teita specimens. The others are all from Rabai, near Mombasa—*K. dius* ♀, i-ii, 1929 (A. F. J. Gedye); *K. deckeni* ♂, iv, 1930; *K. dius* ♂, ix, 1933; the two last (with other specimens from the same locality) being in the possession of Dr. V. G. L. Van Someren of Ngong, Kenya, whose collection the writer was kindly allowed to examine.

Leptacris elegans (Chopard 1921)?

(African species of this genus require revision, but the specimens below agree with the description and figures of *L. elegans* and differ from Uganda material—*L. monteiroi* (I. Bolivar 1890)?—in the more acute fastigium of the vertex and the more oblique and concave face as seen in profile as well as in the colour. All Kenya material known to the writer differs from typical Uganda material in this way although one Uganda male agrees with the Kenya form.)

(SHIMBA: ♂, ♀♀.) EMALI: 2 nymphs (? the same species).

Meruana nyuki Sjostedt 1909

EMALI: 1♀.

Oraistes luridus Karsch 1896

(SHIMBA: ♂♂, ♀♀.)

Afroxyrrhepes procera (Burmeister 1839)

EMALI: 8♂♂; 12♀♀. CHYULU:

Afroxyrrhepes brevifurca Uvarov 1943

(The female of *A. brevifurca* has not been described, but a series of females associated with undoubted *brevifurca* males taken by the writer near Kibwezi, Kenya (10th to 12th April 1947), show the following differences from *A. procera*: size larger with the lateral pronotal carinae slightly less convergent anteriorly; pronotum more strongly marked; median carina with a dark fuscous stripe over 2 mm. wide (*A. procera* in all material available to the writer has only the carina itself dark); lateral carinae each with a well-defined dark fuscous stripe over 1.5 mm. wide; lateral pronotal lobes pale with a pair of narrow, dark stripes about the middle, running from the anterior margin across the lobes and on to the pleura (in *A. procera* these stripes are very indistinct or absent, the upper half of the pronotal lobe being generally infuscated and not pale). The basal part of the tegmen, particularly in the post-median and anal areas, has a more streaky and mottled appearance. None of the females mentioned under *A. procera* (above) agrees with this conception of the female of *A. brevifurca*.)

EMALI: 1♂.

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FURTHER RECORDS OF ORTHOPTERA FROM THE TURKANA DESERT

By D. Keith McE. Kevan, B.Sc., A.I.C.T.A., F.R.E.S.

Until the years 1937-1938, the Orthopterous fauna of Turkana was virtually unknown except for a very few scattered references, only two of which have come to the writers's notice. These were to the Blattoid, *Derocalymma lampyrina* Gerst. (Perisphaeriinae), recorded by Rehn (1933), and to the Acridid, *Allaga striolata* Rme. (Catanopinae), described from the River Turkwell by Ramme (1929). Neither of these was included in any of the lists of Turkana Orthoptera since published (Beier, 1937; Buxton, 1937a; Chopard, 1938; Uvarov, 1938.)

Buxton (1937) also included references to certain Orthoptera which are not recorded in the lists mentioned above. The writer has not seen Turkana material of any of them, however, but they are as follows: The Blattoid, *Polyphaga* sp. (Polyphaginae), the Tettigoniid, *Homorocoryphus nitidulus* (Scop.) (Copiphorinae), and the Acridid, *Conipoda gracilis* Miller (*i.e.* *Ptenoscirtus gracilis*) (Oedipodinae).

The following Orthoptera, most of which are at present in the Coryndon Museum, Nairobi, have not previously been recorded from Turkana:

BLATTIDAE**BLATTINAE*****Periplaneta* sp.**

Lokitaung, March 1934, (D. MacInnes), 2 ♂♂.

PHYLLODROMIIDAE**PERISPHAERIINAE*****Cyrtotria capucina* (Gerstaecker 1869)?**

Lokitaung, May 1945, (M. Wright), 1 ♂.

MANTIDAE**EREMIAPHILINAE*****Galepsus capitatus* (Saussure 1869)**

Fergusson's Gulf, May-June 1934, (D. R. Buxton), 1 ♂, det. Uvarov.

GRYLLIDAE**GRYLLINAE*****Scapsipedus marginatus* (Afzel and Brann 1804)**

Fergusson's Gulf, May-June 1934, (D. R. Buxton), 1 ♂, 1 ♀, det. Uvarov; Lopetobong, 27th June 1945, (D. K. Kevan), 3 ♀♀.

***Scapsipedus* sp. (brachypterous)**

Lorugumu, 6th June 1945 (D. K. Kevan), 1 ♂.

***Gryllulus conspersus* (Saussure 1869)**

Fergusson's Gulf, May- June 1934 (D. R. Buxton), 1 ♀.

TRIDACTYLIDAE

Tridactylus madecassus Saussure 1896

Fergusson's Gulf, Mud Flats, 13th July 1945 (D. K. Kevan), 12 ex.
(Chopard (*loc. cit.*) reports this species from Namuruputh.*)

TETTIGONIIDAE

Conocephalus (Palotta) iris (Serville 1839)

Lokitaung, March 1934 (D. MacInnes), 1 ♀.

GRYLLACRIDAE

Gryllacris sp. (The tegmina are missing)

Lokitaung, May 1945 (M. Wright), 1 ♂.

TETRIGIDAE (ACRYDIIDAE)

Paratettix scaber (Thunberg 1815)

Kalin, September 1941 (T. H. E. Jackson), 2 ♀♀.

ACRIDIDAE

ACRIDINAE

Macrocymochtha sp. (possibly new)

Lokitaung, June 1941 (T. H. E. Jackson), 1 ♀.
(This genus is at present only known from W. Africa.)

Gymnbothrus fallax (Karny 1907)

Fergusson's Gulf, May- June, 1934 (D. R. Buxton), 1 ♀; 1 det. Uvarov.
Kevan), 1 ♀.

Aiolopus sp. (*thalassinus* group)†

Kalin, Sept., 1941, (T. H. E. Jackson), 1 ♂.

OEDIPODINÆ

Trilophidia sp.†

Kalin, Sept., 1941, (T. H. E. Jackson), 1 ♂.

CATANTOPINÆ

Tylotropidius sp. (*gracilipes* group)†

Fergusson's Gulf, May-June, 1934
(D. R. Buxton), 2 ♀♀; 13th July, 1945,
(K. K. Kevan), 1 ♂.

* "Éthiopie: Namoropus, plage du Lac Rudolphe." Namuruputh is actually now within the Kenya administrative boundary although it was not regarded so at the time the material was collected.

† These genera need revision before more exact identification is possible.

Abisares depressus Uvarov 1938

Lodwar Hill, 17th June 1945 (D. K. Kevan), 1 ♀.

(This species was originally described from Turkana by Uvarov *loc. cit.*, but, as only a single female was known, it is recorded here again.)

Schistocerca gregaria (Forsk. 1775)

Turkana, 1928-1930, 1943-1946 (Swarms.)*

(The Desert Locust, although presumably not permanently present in Turkana, should not, for the sake of completeness, be omitted from this list, since, during outbreaks of this locust, the gregarious phase finds ideal seasonal breeding conditions over most of the area, particularly in Central and Southern Turkana.)

The approximate geographical positions of the localities mentioned are as follows:

Fergusson's Gulf	. . . . .	02° 30' N.	35° 57' E.
Kalin	. . . . .	04° 10' N.	35° 35' E.
Lodwar	03° 08' N.	35° 35' E.
Lokitaung	04° 18' N.	35° 45' E.
Lopetobong	02° 10' N.	35° 30' E.
Lorugumu	02° 55' N.	35° 17' E.

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* During 1931 and 1947 *transiens* and *solitaria* phases occurred in fair numbers, at the end of the 1928-31 and present outbreaks.

BIRD NOTES CHIEFLY FROM THE NORTHERN FRONTIER DISTRICT
OF KENYA

PART II

by W. Tomlinson.

ALAUDIDAE

Mirafra albicauda Reichenow. White-tailed Lark.
Thika, April.

Mirafra hypermetra hypermetra (Reichenow) Red-winged Bush-lark.
Angata Kasut; Merille; Thika.

In the Kasut to the south-west of Marsabit Mountain this large lark was fairly common, haunting a patch of desert where there was some bush and even grass following rain. Runs well in quick spurts; but, pursued, usually takes wing. The flight is strong, although it seldom goes far before ducking down again, usually perching on tops of bushes. In the heat of the day seen sheltering under bush. Has a clear and loud, two-noted call and a very pretty song of four or five notes. The cinnamon-rufous of its plumage shows in flight but is invisible in the bird when at rest. At Merille, the Kasut and at Thika, where this bird occurred, the ground was the same russet colour as the bird's plumage.

Mirafra africana dohertyi Hartert Kikuyu Red-naped Lark.
Thika; Nanyuki.

Mirafra fischeri fischeri (Reichenow) Flappet Lark.
Thika.

Mirafra africanoides intercedens Reichenow. Masa' Fawn-coloured Lark.
Merille; North Horr.

A "flappet-lark," fairly common at Merille in January, was I think this. At the time a small cricket was in thousands in patches of open country, followed up by Larks and Wattled Starlings.

Mirafra poecilosterna poecilosterna (Reichenow). Pink-breasted Singing Lark.
Merille.

A bird frequently flushed from the ground, which flew to bushes and low trees, was I think this.

Galerida cristata somaliensis Reichenow. Somali Crested Lark.

At North Horr this bird was very common. Song sweet, often uttered from the ground. Seldom perched on bushes. When approached, often crouched motionless until almost trodden on, then flew up and dashed down behind cover. Found singly, sometimes in small lots of three to four birds.

Galerida theklae elliotti Hartert. Somali Thekla Lark.

I saw no Crested Larks at Kalacha or Gamra; but they occurred on the lava plains about twenty miles north of Marsabit and I feel certain that some seen on the plains north-east of Marsabit on the Moyale track belonged to this species. A comparison between *Galerida cristata magna* and *Galerida theklae cyrenaicae*, the Egyptian equivalent, so common at Sollum is interesting. *G. cristata magna* is there a purely desert bird, whilst *theklae* is restricted to coastal cliffs and rocky wadis.

Eremopteryx leucotis madaraszi (Reichenow). East African Sparrow-Lark.
Near Merille, January

Large flocks were seen on a rocky hillslope. Many were on the ground, but some rested in stunted acacias. The flight was graceful, somewhat hovering when heading upward; several times birds were seen to sweep in wide circles before alighting.

Eremopyeryx signata (Oustalet) Chestnut-headed Sparrow-Lark.
Merille, North Horr.

Merille, particularly round the Matthews Range, abounded in Sparrow-Larks. A flock of about twenty of this species was seen on a lava dust plain, fraternising with a few Isabelline Wheatears. They perched on the tops of rocks and on the topmost twigs of the few bits of scrub. Call note was a rather sharp "chip-op" At North Horr seen in pairs in February.

Eremopteryx leucopareia (Fischer and Reichenow)
Merille; Angata Kasut

From December to February seen many times, always in sandy or dusty country dotted with rock and low scrub; In pairs at Merille in December, and in flocks at Merille and in Kasut in January and February. At one oasis in the Kasut—an old camping ground—I came across a flock while I was following up some Somali Bee-eaters. They were crouched behind rocks and under bushes, apparently for shade as it was a blistering hot day, and as I approached they rose one after the other at my feet, flying low for a short distance before dropping into cover once again. The call was a chirrup.

MOTACILLIDAE

Motacilla alba alba Linn. White Wagtail.
North Horr.

Common at oasis pools 18th to 25th February.

Motacilla aguimp vidua Sundervall. African Pied Wagtail
Thika; Meru.

Motacilla clara Sharpe Mountain Wagtail.
Meru.

Common on upper reaches of mountain streams.

Budytes flavus flavus (Linn.) Blue-headed Wagtail.
Benane (November); North Horr (15th February 1941); Siolo River (23rd March 1941).

Common at pools in river at Benane, and on a lava plain near the Siolo River in March. A single bird only seen at North Horr at an oasis pool.

Budytes flavus thunbergi (Billberg.) Grey-headed Wagtail.
Siolo River (23rd March 1941).

A few by a manyatta not far from the Siolo River.

Budytes flavus luteus (S. G. Gmelin.) Eastern Yellow Wagtail.
Siolo River (23rd March 1941).

Amongst many Wagtails seen on this date, several of this race were seen associating with the type form.

Anthus trivialis trivialis (Linn.) Tree-Pipit.
Merille; Marsabit.

A few seen at Merille in late January. Fairly common on Marsabit mountain in late March.

Tmetothylacus tenellus (Cabanis.) Golden Pipit.
Benane; Merille.

On a day of violent rain and heavy low clouds many suddenly appeared in the wilderness around Benane. Seen on the ground, this bird appears dull, but as soon as it takes wing the brilliant yellow of its plumage flashes out with rare beauty. A male and female were watched for some time. The female fed quietly on the ground whilst the male courted her with great vigour. The cock would swoop down right on to the hen as though trying to force her to rise, hovering over her with wildly fluttering wings and widespread

tail until at last she flew fast and tortuously, to alight some way away. The male has a very high, thin, sibilant warble, uttered with wings a-flutter and tail expanded. When disturbed, these Pipits often alighted on bushes or trees. Another habit is that of a bird launching itself from a treetop with wings upturned over the back in a V, and volplaning rapidly towards the ground, only to rise abruptly to the top of another tree. Invariably just before alighting the wings were again extended into a V, and tail feathers widely spread.

On another occasion a male was seen hovering quite high, beating its wings rapidly and with wide-spread tail, when suddenly it closed its wings and dived like a stone to a tree-top below.

These antics were performed by the male alone. The date was 26th November. Subsequently a single male was seen at Merille, 11th and 12th February, very unobtrusive and very wild.

Macronyx croceus croceus (Vieillot).

Yellow-throated Long claw.

Nanyuki.

Breeding in April, and common.

Macronyx ameliae wintoni Sharpe.

Kenya Rosy-breasted Long-claw.

Kikuyu.

TIMALIIDAE

Turdoides hypoleuca (Cabanis.)

Kenya Pied Babbler.

Mana (Jombeni Mountains); Thika.

Call insistent and harsh, a loud "quorr-quorr"; flight wavering and weak. Birds at Mana skulked in dense cover, but at Thika I met a group in open sparsely-treed country, and was able to examine them more closely.

Argya rubiginosa rubiginosa (Rüppell).

Rufous Chatterer.

Merille; Marsabit; North Horr, Siolo River.

Common at Merille. Call a long plaintive quavering whistle. Only once seen away from the dense bush they favour; that was at Merille when a flock was seen passing up-river through the tree-tops. Inhabits dense vegetation along rivers and watercourses. In flocks November-March.

Argya rubiginosa heuglini Sharpe.

Coastal Rufous Chatterer.

Mombasa

PYCNONOTIDAE

Pycnonotus tricolor fayi Mearns.

Kenya Highland Black-capped Bulbul.

Meru; Nanyuki; Thika.

Pycnonotus tricolor littoralis van Someren.

Coast Black-capped Bulbul.

Mombasa.

Pycnonotus tricolor dodsoni Sharpe.

White-eared Bulbul.

Isiolo; Benane; Habbaswein; Merille; Marsabit; Laisamis; North Horr; Mana (Jombeni Mountains).

Common and breeding at Merille in November and December. The sleek and colourful plumage of the Marsabit birds in March contrasted strongly with the appearance of birds in the low country. At Meru and Nanyuki the race was *P. tricolor fayi*, whilst at Mana in the Jombeni Mountains east of Mount Kenya and at a greater altitude, the white-eared form (*P. t. dodsoni*) was found.

Arizelocichla tephrolaema kikuyuensis (Sharpe).

Kikuyu Grey-throated Greenbul.

Meru, 3rd April at about 6,000 feet.

Phyllastrephus strepitans (Reichenow). East African Scrub Bulbul.
Merille; North Horr; Benane.

At Merille common in parties of three or four birds in dense scrub along the river-bed. It forages methodically, passing slowly from bush to bush and tree to tree, often dropping to the ground to pick up insects like a Drongo. It has a habit of "twinkling" its wings and tail; I found it surprisingly tame. The note is a pleasant chatter.

Phyllastrephus fischeri placidus (Shelley). Kenya Highlands Olive Bulbul.
Marsabit; Nanyuki.

A party of four seen in a deep forested ravine on Marsabit Mountain in March. Very sociable and restless, flitting about rapidly from branch to branch, often hanging in all sorts of positions like a Tit. Has the habit of spreading out its tail in quick flicks. Call, a churring note, taken up by all birds when alarmed. They fed in dense undergrowth close to the ground.

Andropadus insularis subalaris Reichenow. Malindi Sombre Bulbul.
Mombasa.

I thought I heard one in bush near Merille, but could not confirm.

Stelgidocichla latirostris eugenia (Reichenow). Uganda Moustached Bulbul.
Nanyuki.

A single bird seen flitting about in forest undergrowth, uttering "chuck—chuck—chuck" calls.

MUSCICAPIDAE

Muscicapa striata striata (Pallas). Spotted Flycatcher.

Isiolo, October; Benane; Merille; Laisamis; Siolo River, 23rd March; Marsabit; Meru, 10th April; Habbaswein. Widely distributed.

Muscicapa gambagae somaliensis Bannerman. Somali Dusky Flycatcher.
Benane; Merille.

At Benane on two occasions numbers of what was possibly this small Flycatcher associated with Spotted Flycatcher during November and December. Largest number seen together was twelve birds.

Alseonax minimus minimus (Heuglin). Pigmy Flycatcher.
Nanyuki; Meru; Marsabit.
Common, particularly at Meru and Marsabit.

Dioptrornis fischeri Reichenow. White-eyed Slaty Flycatcher.
Meru; Nanyuki; Th'ka; Mana (Jombeni Mountains).

Widely distributed. At Mana very noisy in April. The call is a hoarse, throaty squeal. At Meru in April common singly, in pairs, and family parties of three to four birds. Immature birds being fed by parents in Nanyuki, 20th April. Rather Drongo-like in its habit of hawking for insects.

Parisoma bohmi marsabit Van Someren. Marsabit Tit-Babbler.
Isiolo; Merille.

An attractive thorn-bush bird, extremely common at Isiolo. There the air used to be filled with their song, a very pleasant trill, often preceded by two sharp notes. It is a leaf-searcher: small lots of two to three individuals were seen hunting through bushes and flat-topped acacias for insects. Restless but sociable, and often found in foraging parties after Crombecs, Sunbirds, etc.

Batis molitor puella Reichenow. Kenya Chin-spot Flycatcher.
Isiolo; Nanyuki; Mana (Jombeni Mountains).

Batis orientalis perkeo Neumann. Pigmy Grey-headed Flycatcher.
Benane; Habbaswein; Merille.

A bird of the dry, dense thorn-bush and flat-topped acacias. Calls a harsh "chur" and a series of four weak "peeps." Wings noisy in flight. I think breeding at Benane in November, after heavy rain, when a male bird was seen soaring round and round, high in the air, calling loudly over the bush.

Platysteira peltata peltata Sundevall. Black-throated Wattle-eye.
Thika, April.

Tchitreia viridis viridis (P. L. S. Müller). Paradise Flycatcher.
Meru; Nanyuki.

A male in full chestnut plumage seen at about 5,300 feet at Meru, 3rd April. On the 7th, also at Meru, but at 7,000 feet, a male in full white breeding-plumage was seen. At Nanyuki at about 6,500 feet in forest, a chestnut-plumaged male was seen on the 15th.

Tchitreia viridis suahelica (Reichenow). Swahili Paradise Flycatcher.
Benane; Isiolo; Marsabit; Siolo River.

On 9th November a fully-plumaged white male, with elongated tail feathers, was seen in arid bush at Benane.

At Merille, on 8th January, a male was seen with partial development of breeding-plumage; the wings were mainly white, with some dusky markings; the tail white with black shafts but no elongation present. Subsequently this bird was watched for development. By 19th January the tail was elongated to about half-length. On 25th January it was seen with a female bird in a tree. The tail of the male was now more elongated still. The two birds perched opposite each other on parallel branches, high up in the tree, the male every now and then rising and fluttering over his mate with beating wings and spread tail. Sometimes he made wide circular flights; but always returned to his perch opposite the hen, and then both went through a lot of dipping and bowing to each other. A Van der Decken's Hornbill alighted in the tree and both Flycatchers furiously attacked it, the male particularly making vicious stoops, uttering loud cries, and finally, after making a few beak snaps at its tormentors, the Hornbill beat a rapid retreat.

10th February: Male in full breeding-plumage.

12th February: At Marsabit a male seen in full breeding-plumage, but with some chestnut on wings and also in the shorter tail-feathers, the long rectrices white, with black shafts.

23rd March: Siolo River. Male seen in full breeding-plumage. A patch on the back was chestnut, the wing-quills dusky grey with conspicuous white edgings to feathers. Tail white with black shafts.

It would seem that the pure white form of *T. v. suahelica* occurs in the low country only in the N.F.D.

TURDIDAE

Turdus olivaceus elgonensis (Sharpe). Kenya Olive Thrush.
Marsabit; Meru; Nanyuki.

Common and tame on Marsabit mountain. When alarmed, individuals quiver and twitch the tail rapidly up and down. Mt. Kenya birds seem much darker than the Marsabit ones.

Turdus tephronotus Cabanis. Bare-eyed Thrush.
Benane; Merille; Laisamis.

Essentially a bird of arid thorn-scrub and rocky country. Wild and shy at Benane in November, and mainly in pairs. Alarm note a series of four or five musical whistles. When alarmed they flew to dense cover, rested for a moment, and then disappeared, to emerge quickly at the opposite side, and dash away further into the "bana." At Merille very shy until February, when individuals suddenly developed the habit of approaching our camp and singing, thrush-like, from the tops of tall trees.

Monticola saxatilis (Linn). European Rock Thrush.
Isiolo, 10th December; Merille, January; Laisamis; Isiolo, 21st March 1941.

Oenanthe oenanthe oenanthe (Linn). European Wheatear.
Isiolo, December.

Fairly common in rocky country around Isiolo; but I did not record it elsewhere in the N.F.D.

Oenanthe leucomela leucomela (Pallas). Pied Wheatear.
Merille; Laisamis; Marsabit; Kalacha; North Horr.

End January, at Merille, a male heard to utter a sharp guttural alarm note. They were shy. Common from Marsabit to North Horr until early March.

Oenanthe isabellina (Temminck and Laugier). Isabelline Chat.
Isiolo; Garba Tula; Benane; Siolo River; Merille; Laisamis; North Horr.

Common throughout N.F.D. November to end March.

Cercomela scotocerca turkana van Someren. Turkana Brown-tailed Rock-chat.
Isiolo; Benane; Merille; Laisamis.

A charming bird of the bush veld, met with first at Isiolo in November, and common there until I left at the end of March. Found in low thorn bush, in rocky country by the river (at Benane) and on the lava plains (north of Merille). Very tame, permitting close approach. Never seen in tall, flat-topped acacias; hunts about on the ground, scrabbling amongst rocks and round the bases of bushes; I often mistook it for a small mammal. It would alight on the tops of low bushes and work its way down to the base. The ordinary note is a sweet, powerful "chuke—chuke," but there is also, less often heard, a short sweet trilled song. The "chuke" note was uttered for hours on end by birds searching bushes for insects. Characteristic is the continuous "twinkling" of wings and spasmodic jerking of tail into a wide fan. I found this bird to be solitary. Often seen with its feathers all puffed out, when it resembled a grey-brown ball. Flight fast and brisk, but it seldom goes far at a time.

Myrmecocichla aethiops cryptoleuca Sharpe. Kenya Anteatteer Chat.
Nanyuki; on edge of escarpment twenty-five miles north of Nanyuki on Isiolo road; Kenyanga (Jombeni Mountains).

Local. Common on northern slopes of the Jombeni in rocky country, but not seen on the forested Tana River near Mana. None at Meru.

Saxicola torquata axillaris (Shelley). Kilimanjaro Stonechat.
Meru; Nanyuki.

Common at Nanyuki in April; many young birds seen.

Cossypha heuglini heuglini Hartlaub. White-browed Robin-Chat.
Meru; Marsabit; Siolo River; Nanyuki.

Common at Marsabit in forest. A pair began a nest in a deep crevice in the trunk of a forest tree, about fifteen feet from the ground, early in March. Both birds worked hard, taking up first bits of twig and then leaves. Afterwards, when the female was sitting, the male adopted an "on-sentry-go" position below the nest, and vigorously chased intruders away, particularly shrikes.

Cossypha heuglini intermedia (Cabanis). Mombasa White-browed Robin-chat.
Mombasa.

Cossypha semirufa intercedens (Cabanis). Kenya Black-tailed Robin-Chat.
Meru.

Found alongside *C. heuglini*. I could detect no difference in habits.

Cossypha caffra iolema Reichenow. Kenya Robin-Chat.
Meru, April.

One in banana forest was seen hopping along the ground searching for insects. Loud churring alarm note. Much shyer than *C. heuglini*.

Cichladusa guttata guttata (Heuglin). Spotted Morning Warbler.
Merille; Siolo River; Benane; Mombasa.

Common in dense riverside bush at Merille, and singing well from December to February. Found in pairs. As I procured no skins or specimens it is possible that all those that I saw were *Cichladusa guttata rufipennis* or intermediates.

Erythropygia leucoptera leucoptera (Rüppell). White-winged Scrub-Robin.
Garba Tula; Merille; North Horr; Benane; Laisamis.

This was widely distributed throughout the N.F.D., but nowhere so common as at Benane and Garba Tula. It was tame, haunting the topmost twigs of low thorn bushes, and sang its sweet warbled song the whole day through. It used even to enter our Mess-tent, and, after a hasty scurry over the floor, perch just outside on a bush. It constantly "twinkles" its wings and tail, the latter often being cocked over the back. It usually feeds on the ground under bushes, though I often caught it out in the open. The song is varied, but is usually of five or six notes. Another call uttered was a loud "chee—chee—chee—chee." At Merille it seemed wilder than at Benane; possibly it was nesting there, for a nestling was picked up at Benane on 25th January.

Numerous unidentified Scrub-Robins were seen: unfortunately I was unable to collect them. One seen in the bracken forests at Mana on the summit of the Jombeni Mountains was singing a loud sweet song of five or six notes. At Isiolo and Merille Scrub-Robins occurred that certainly were not *Erythropygia leucoptera leucoptera*, there being no white in the wing feathers.

Irania gutturalis (Guérin). White-throated Robin.
Benane, December.

A single male was seen in a shallow "donga" choked with thorn scrub, through which it scabbled like a mouse.

SYLVIIDAE

Sylvia atricapilla atricapilla (Linn.) Blackcap.
Marsabit, 10th to 15th March 1941.

Fairly common in bush below forest at Marsabit. Both males and females seen. Rather shy. One bird heard singing beautifully on the 15th.

Acrocephalus scoenobaenus (Linn).

Sedge-Warbler.

Benane; Merille; Laisamis; North Horr; Silio River, 23rd March 1941; Meru, 3rd April 1941.

First seen and heard at Benane in early November. Very common at Merille in January and February. A few at North Horr in late February.

Phylloscopus trochilus trochilus (Linn).

Willow Warbler.

Isiolo, March; Siolo River, 23rd March 1941.

Calamonastes simplex simplex (Cabanis).

Grey Wren-Warbler

Garba Tula; Benane; Merille.

Most common at Benane in the "bana." Song short and "chip-chipping" in character always uttered from the top of a bush or tree. When disturbed it either flew far away to another tree-top, there to resume its call, or hastily ducked down into dense cover where it was very difficult to follow up.

Genus *Apalis*

Many of these birds were seen in the N.F.D., but the difficulty was to classify them without procuring specimens. At Marsabit I saw *Apalis cinerea cinerea*. At Isiolo I saw several times a Forest Warbler with a broad black chest band and salmon-coloured lower parts, which I classified as *Apalis pulchra pulchra*. This was in acacia country. In a dry stream in forest at Nanyuki, at 7,000 feet, several bush warblers, presumably *Apalis melanocephala nigrodorsalis*, were seen.

Apalis flavida malensis Neumann.

Abyssinian Black-breasted Bush-Warbler.

Benane; Isiolo; Merille

Benane, 10th November. A pair seen in arid bush near our camp. Very restless, and constantly on the move with rapid, darting flight from one bush to another, always keeping near the ground. A lot of "twinkling" of wings and tail.

Isiolo, 22nd March. A pair seen by a wooded watercourse, flitting rapidly through the acacias as they searched for food. Very noisy, uttering a persistent soft "querr—querr."

Apalis flavida flavocincta (Sharpe).

Kenya Black-breasted Bush-Warbler.

Nanyuki, at 6,500 feet in riverside timber. Always in pairs or small parties.

Eminia lepida Hartlaub.

Grey-Capped Swamp-Warbler.

Meru; Mana (Jombeni Mountains)

At Meru mainly in gardens and dense waterside timber and cultivations along mountain streams. Call beautiful and powerful. One theme heard was of two sharp notes followed by a rapid flute-like trill of four or five whistles. Also common at Mana, on the summit of the Jombeni Mountains, in early April.

Sylvietta brachyura leucopsis Reichenow.

Kenya Crombec.

Isiolo; Benane; Habbaswein; Merille; Laisamis; North Horr; Kalacha.

Common throughout the N.F.D., even in the most desolate regions. Favours bush and low trees in rocky country. Found in pairs and small lots; the greatest number seen in one party was seven at Merille. Very sociable, attaching itself to foraging parties of other birds. A "churring" note and a very vigorous little warbling song were often heard, the latter being—like the English wren's—exceptionally loud considering the tiny size of the bird.

Sylvietta whytii jacksoni Sharpe.

Kenya Red-faced Crombec.

Isiolo; Merille; Laisamis.

Seen singly and in pairs in flat-topped acacia country. Has a low twittering song and a soft churring alarm note.

Sylvietta isabellina Elliot.

Long-billed Crombec.

Benane; Isiolo.

Most common at Benane, where it was seen many times in the bush, often associating with the Kenya Crombec.

Sylvietta l. leucophrys Sharpe.

White-browed Crombec.

Nanyuki, at 7,000 feet.

Seen a few times in tall forest trees by a river on Mt. Kenya in April, in lots of two to three individuals.

Eremomela griseoflava abdominalis Reichenow. Tanganyika Yellow-bellied Eremomela

I have several records of birds of this genus being seen in the flat-topped acacias at Isiolo, both with parties of foraging Crombecs and also with their own kind in twos and threes. Exceedingly restless, but not very shy, and easily approached. The only call heard was a sweet, low twittering song, uttered as they searched the leaves for insects. A bird of this species seen at Benane in November may have been either this race or *E. g. flavicrissalis* Sharpe. It was solitary and silent in low bush.

Camaroptera brevicaudata abessinica Zedlitz. Abyssinian Grey-backed Glass-eye.

Siolo River; Merille; Meru; Marsabit, Mana (Jombeni Mts.); Nanyuki; Nairobi; Thika.

Very common at Marsabit in March. Nesting at Nanyuki in April. Notes a "clucking" call, a loud "too-white" uttered with a "lip-smacking" effect, and a bleat. Curious in the comparative gloom of a forest, is the effect of a white abdomen flashing out as the bird hops through the bush with cocked tail. It is curiously like the flash of white showing from a rabbit's tail. Perhaps, as in that case, it is also a signal to its mate.

Cisticola chiniana humilis Madarasz.

Settima Rattler.

Siolo River; Isiolo.

Cisticola chiniana bodessa Mearns.

Hawash Rattler.

Benane; Merille; Marsabit.

Common and tame at Marsabit in March. Sociable, often found in small family parties. Common at Benane in November. Song loud and clear, "chip—chip—chip—tiperee." At Marsabit in the misty, early morning as many as four birds were seen huddled on a sprig of low bush, with feathers all puffed out, awaiting the morning sun.

Cisticola erythrops sylvia Reichenow.

Uganda Red-faced Grass-Warbler.

Meru.

Prinia mistacea immutabilis van Someren.

Kenya Tawny-flanked Long-tail.

Nairobi; Thika; Nanyuki; Kabete.

Prinia somalica erlangeri Reichenow.

Stephanie Pale Long-tail.

Benane; Merille; Laisamis; North Horr.

In November common at Benane, in pairs and small lots of up to four. Movements erratic and rapid, the long tail jerked up and wagged in all directions; up and down, sideways, and rotating. They flew so low that they seemed to scuttle along, and when the hot wind was blowing they were more like a rattle-taggle of bits of brown paper than birds. As distinct from the bush-loving *mistacea*, the Stephanie Long-tail spends a lot of time on the ground amongst lava rock and about the base of bushes. At Merille it was

fairly common. A "twink—twink" note was heard uttered by one of a pair scrambling about amongst rocks. They have also a low "churring" call, but I did not hear the real song until I reached North Horr in February. Here in dense bush they were extremely common, in pairs and small lots, from dawn to dusk uttering a vigorous and loud "chip—chipping" song of five or six notes. There was considerable variation in the tawny wash of the lower parts. North Horr birds seemed brighter below than those of Benane.

HIRUNDINIDAE

- Hirundo r. rustica* Linn. European Swallow.
Marsabit 16th March 1941.
The only time I identified the swallow was whilst walking on the open downs near Marsabit village on 16th March 1941, when numerous flocks, some low down and some at immense heights, passed in a northerly direction.
- Hirundo g. griseopyga* Sundevall. Grey-rumped Swallow.
Siolo River; N. Uaso Nyero near Archer's Post; Meru; Marsabit.
Locally common, preferring hill-slopes near streams or rivers. At Meru one bird resting on a fence uttered a pleasant little twittering song.
- Hirundo s. smithi* Leach. Wire-tailed Swallow.
Siolo River, N. Uaso Nyero (near Archer's Post); Meru; Isiolo; Mombasa.
- Hirundo rufula emini* Reichenow. Great Lakes Red-rumped Swallow.
Meru, at about 5,500 feet, in a river valley, numbers could be seen daily, resting during the hot hours on the branches of a low, leafless tree.
- Hirundo senegalensis aschami* Granvik. Kenya Mosque Swallow.
Nanyuki.
- Hirundo senegalensis montei* Hartlaub. Monteiro's Mosque Swallow.
Mombasa.
- Hirundo abyssinica unitatis* Sclater and M. Praed. South African Smaller Striped Swallow.
Siolo River; N. Uaso Nyero (Archer's Post); Meru; Thika; Nairobi
- Psalidoprocne holomelaena massaica* Neumann. Masai Rough-Wing.
Meru; Nanyuki.

CAMPEPHAGIDAE

- Campephaga flava* Vieillot. Black Cuckoo-shrike.
Isiolo; Merille; Nanyuki.
- Coracina pectoralis* (Jardine and Selby). White-breasted Cuckoo-Shrike.
A pair seen in January, in open country dissected by frequent wadis and dotted with trees. One bird uttered a curious trilled note as it perched on the topmost branches of a tall tree. I tried to get a skin, but they were very wild.
- Coracina caesia pura* (Sharpe). Elgon Grey Cuckoo-Shrike.
Marsabit; Nanyuki (6,500 feet).

DICRURIDAE

Dicrurus adsimilis divaricatus (Lichtenstein). Senegal Glossy-backed Drongo.

Widely distributed though rarer at Marsabit and absent from Kalacha and North Horr. A fledgling picked up at Merille at the end of December had fallen out of the nest. Young birds being fed by parents were very numerous in January. The young bird, whilst waiting to be fed, utters a continuous, low, twittering warble, only audible within twenty yards. The youngster hardly opens its beak at all as it sings; it seems to be entirely a "stomach" warble. When a parent approached with some tit-bit in its beak, the low babble would rise to a screaming crescendo, then the young bird would ravenously gulp the food and resume the quiet babble. The parent birds urged the young one to follow them, first on short trial flights, then on longer and longer ones, until by the end of the month the youngster was bigger and stronger than the parents, had ceased to babble, and was feeding itself.

PRIONOPIDAE

Prionops cristata melanoptera Sharpe. Somali Helmet-Shrike.
Benane; Garba Tula; Merille.

Very common in the bush around Benane and Garba Tula. I mentioned in my notes on vultures how a flock haunted the carcass of a Spotted Hyæna. At Merille it was equally common, in parties of four to five, and always very sociable. Foraging flocks attract other birds to them, and many times I saw Black-throated Barbets, White-crowned Shrikes and the peculiar Red-winged Anaplectes keeping close company with them as they flew from tree to tree. It also frequently forages on the ground, like a Drongo. The call is a soft-toned yet loudly uttered "chow—chow" often repeated as many as seven or eight times in quick succession, both whilst perched and on the wing.

During the third week of February, in acacias at Merille, I suddenly heard from above the unmistakable "chow—chow." Looking round I could see nothing. A few seconds later four Helmet-Shrikes flew up and alighted in the tree above my head. Then I saw the nest, beautifully concealed in a double fork about thirty feet from the ground. Through my glasses I could clearly distinguish the head of the sitting bird. The four birds that had flown up disappeared like ghosts. I watched the solitary bird for some time, and beyond shifting round once or twice, and once actually getting off the nest to hawk at a passing fly, it was silent. The next day I watched the nest carefully. Small birds, such as Crombecs, Grey Tits and Flycatchers were allowed to visit and forage in the tree, but when a White-crowned Shrike suddenly joined these, the sitting bird jumped out of the nest and attacked it, uttering loud and long "chow—chows" of distress, but failed to drive the Shrike away; it merely circled round once and came to rest again on the nesting tree. Then within a few seconds the other four Helmet-Shrikes arrived and attacked it, driving it away. Then, in a second it seemed, the sitting bird was back on the nest and the four guardians had disappeared; so discreetly was it all done that the separate movements passed unnoticed.

On a later day I watched a Hornbill treated in the same way. The call of distress of the sitting bird was louder and more frequently repeated than the normal call. I watched the four guardians, and found that the whole day through they foraged within a radius of about 200-300 yards of the nest; that is, within easy calling distance by the sitting bird. They never came unless called up.

A couple of days later I left for Marsabit, but left instructions for the nest to be watched. Unfortunately the boy climbed the tree after one or two failures, scared the sitting bird off the nest, and found two eggs with a pale olive-green ground covered with drab pink spots. He told me that the nest was beautifully woven externally, with grasses that shimmered with spiders' webs, whilst internally were a few bits of bark. The birds deserted, and he said that he thought he knew where they were building another nest, but I never heard from him again.

Sigmodus retzii graculinus (Cabanis). Kenya Red-billed Shrike.
Thika.

Eurocephalus r. rueppelli Bonaparte. White-crowned Shrike.
Isiolo; Benane; Habbaswein; Merille.

Occurs in pairs and lots of four. Very sociable, particularly with the Black-billed Sparrow-Weavers, which superficially it resembles in habits, and a little in appearance. It looks like a Grandpa Sparrow-Weaver. Also very friendly towards Superb and Wattled Starlings, Parrot-billed Sparrows and White-headed Buffalo Weavers. Immature birds were common at Merille in January, and were very tame. The slow bat-like flight and "chee—chee" call are distinctive.

Nilusa afer minor Sharpe. Somali Brubru.
Isiolo; Garba Tula; Benane; Habbaswein; Merille; Laisamis; North Horr.

Common throughout the acacia country of the N.F.D. Has a "churring" alarm note, and a "popping" call that reminds one of that of a Tinker-bird, but is less persistent.

LANIIDAE

Lanius collaris humeralis Stanley. East African Fiscal.
Marsabit Village; Isiolo; Meru; Mana and Kunjanga (Jombeni Mountains).

Lanius antinorii Salvadori. Somali Fiscal.
Marsabit; Angata Kasut; North Horr.

More of a bush and semi-desert bird than the E. A. Fiscal, and never at Marsabit. Occurring in forest, preferring low trees on the downs, where it was very tame and in pairs in December. A low "churring" alarm note was frequently heard. At North Horr it was equally tame in patches of dense, low bush west of the oasis pools; but there, in February, it was solitary.

Lanius dorsalis Cabanis. Teita Fiscal.
Isiolo; Siolo River; Benana; Merille.

A bird of open bush country, common round Isiolo where it haunted lava beds dotted with low bush. Mainly solitary. A flute-like whistle heard, and a harsh "churring" alarm note.

Lanius cabanisi Hartert. Long-tailed Fiscal.
Nanyuki; Thika.

Has two calls at least; a low in-drawn "chaak," and another, a loud mellow whistle. Common at Thika.

Lanius collurio Linn. Red-backed Shrike.
Thika 15th April 1941.

Seen on one day only, and not common, the majority being males.

Corvinella corvina chapini Friedmann and Bowen. Uganda Yellow-Billed Shrike.
Merille.

I was very interested to meet with this bird on 16th January in a patch of dense bush and low acacia trees on a lava dust plain. The flock of almost twenty was associated with great numbers of Wattled Starlings, also foraging for food. Some fed on the ground, others perched on bushes and trees. The Wattled Starlings were shy, but the Shrike quite tame, mostly resting quietly in the trees. On the wing, however, they were

noisy, the call being a loud hoarse "schiss—schiss." The flight is direct and strong, the rising of one bird being a signal to the rest. The attraction was immense numbers of grasshoppers and locusts. A week later a flock, perhaps the same, was seen by the river-bed at Merille, this time with many kinds of other birds, including Wattled Starlings, Kenya Buffalo Weavers, Northern Carmine Bee-eaters and Abyssinian Masked Weavers. Again the birds were after young grasshoppers and locusts.

Laniarius f. funebris (Hartlaub). Slate-coloured Boubou.
Isiolo; Benane; Merille; Marsabit; Siolo River; Mombasa.

Laniarius ferrugineus ambiguus Madarasz Kilimanjaro Boubou.
Nanyuki; Meru; Marsabit.

Common on Marsabit Mountain in forested ravines and well-treed slopes, where its calls were heard all day long. Apart from the usual bell-like notes, I heard an alarm note like the rasping tear of canvas often answered by the other bird with a single bell-like note.

Dryoscopus cubla affinis (G. R. Gray). East African Puffback.
Meru; Nanyuki.

Dryoscopus gambensis nyansae Neumann. Uganda Puffback.
Siolo River; Marsabit.

A young bird being fed by a parent was seen at Marsabit on 1st March 1941.

Dryoscopus pringlii Jackson. Pringle's Puffback.
Benane; North Horr; Merille.

Tchagra s. senegala (Linn). Black-headed Tchagra.
Isiolo; Siolo River; Nanyuki; Meru; Kunjanga (Jombeni Mts.)
Common.

Tchagra australis littoralis (van Someren). East Coast Brown-headed Bush-Shrike.
Mombasa.

Tchagra j. jamesi (Shelley). Three-streaked Tchagra.
Merille; Benane.
Uncommon.

Chlorophoneus sulfureopectus similis (A. Smith). Southern Sulphur-breasted Bush-Shrike.
Marsabit.
Scarce.

Malaconotus poliocephalus approximans (Cabanis). East African Grey-headed Bush-Shrike.
Marsabit; Mombasa.

Rhodophoneus cruentus hilgerti (Neumann). Somali Rosy-patched Shrike.
Isiolo.

A few seen in December on a lava plain dotted with bush and a few trees. Difficult to approach. Most of the time the pair hopped about the rocks, and once ran ahead of me instead of taking to flight. The notes I heard were clear and loud, running down the scale.

PARIDAE

Parus afer barakae Jackson. Kenya Grey Tit.
Isiolo; Garba Tula; Habbaswein; Benane; Merille; Laisamis.

Common through the flat-topped acacia country of the N.F.D. Has the usual rasping Tit-like call, but also, to my surprise, a very pleasant little warbled song, very seldom heard.

Anthoscopus musculus (Hartlaub). Mouse-coloured Cappoc-vogel.
Isiolo; Laisamis.

Common at Isiolo, and because of its minute size, caused much comment amongst the men. It was tame, paying no heed to human beings, and was easily approached. Usually in pairs, but in March several family parties were seen, individuals uttering a constant "dee—ee—dee—ee—dee" in thin high notes. A bird of low thorn-scrub interspersed with flat-topped acacias in rocky country.

ORIOOLIDAE

Oriolus o. oriolus (Linn). European Golden Oriole.
Isiolo.

A small flock seen early in November.

Oriolus auratus notatus Peters. South African Golden Oriole.
Mombasa.

Oriolus monacha rolleti Salvadori Sudan Black-headed Oriole.
Isiolo; Siolo River; Merille; Marsabit.

At Merille in late January common in pairs, and at Marsabit also in February and March. Calls various; the mewling note, a "whee—ku—ku—wow," and again "cheep—weeno." On the Siolo River at the end of March a few were seen, in very poor plumage.

CORVIDAE

Corvus corax edithae Phillips. Dwarf Raven.
Kalacha; North Horr; Karoli Desert.

Immense numbers seen at North Horr, where it was the principal scavenger. The palms were black with them at night when they roosted. Long before dawn they became active, and the air was soon full of the swishing of their wings. Easily visible in the field are the flat nasal bristles and the white base to the black feathers of neck, upper breast and mantle, the latter particularly in the strong wind that usually blew at North Horr. There was much variety of plumage. Some apparently old birds were very ruffled looking, others sleek. Like most ravens, they were a curious mixture of wildness and cheekiness. I whiled away many an hour trying to catch one with a home-made trap made of a petrol-box balanced on a stick, to which a piece of string was attached, with a bit of meat as bait. One or two ravens would alight nearby and edge gently closer, watching carefully, and after many tentative approaches and precipitate retreats, one would suddenly pounce like lightning, insert a telescopic neck and beak inside and yank the meat away, only to be robbed of it by the other hungry ravens, less daring, that hung about in the vicinity. It was amusing too, to dump some carcase in the desert nearby, and watch. Scores, even hundreds, would assemble, but keeping well away and walking round suspiciously. Gradually the circle would narrow. Then fights were numerous as the birds in the front rank became nervous at being hustled along by those

in the rear, and obviously wanted to get outside the circle. They fought fiercely with wing-buffets and strong beak-jabs. A sheep's head was propped up against a stick: one of the leading birds, bolder than the rest, jabbed at it with its beak. It rolled over on to the dust, and the birds all rose in a panic, their worst fears of a booby trap apparently confirmed! They alighted some way away to calm down, and then the whole business of careful approach was gone through once more. At last the bravest were busy on the meat, but even then many of the craven-hearted waited some way away and robbed other birds of their pickings. Fierce fights occurred. One bird stood on the stomach of another which lay, back and wings a-flap in the dust, striking at it fiercely with its beak.

The Dwarf Ravens sometimes fly high up, and then their soarings are beautiful to watch. I have seen a high short-circling tower of them whirling round and round to a great height, like a living dust-devil. During the day they prefer to rest on the sand rather than in the few trees around the oasis pools. The call is a harsh croak, but there is also a curious "stomach-warble" like that of the Fan-tailed Raven.

It may be that it was the military camps which introduced the concentrations of this bird at North Horr.

Corvus albus P. L. S. Müller.

Pied Crow.

Kikuyu; Nanyuki; Nairobi; Mombasa; Nyeri.
Not seen on the Jombeni Mountains or at Meru.

Corvus capensis kordofanensis Laubmann.

Lesser Cape Rook.

Isiolo; Garba Tula; Benane; Habbaswein; Merille; Laisamis; Mana (Jombeni Mountains); North Horr; Marsabit.

Widely distributed but local. Common at Laisamis, where immense numbers used to cluster round the wells with Vultures and Fan-tailed Ravens. Sociable, and found in flocks. Utters throaty squawks. Very rare at North Horr.

Corvultur albicollis (Latham).

White-necked Raven.

Voi.

None seen in the N.F.D.

Rhinocorax rhipidurus (Hartert).

Fan-tailed Raven.

Isiolo; Merille; Laisamis; Dida Gulgulla; Marsabit.

Common locally. One or two will always be found trailing along with a ragged flock of Lesser Cape Rooks, but otherwise it is solitary. Besides normal croaking note, there is another peculiar note that I can only call a "stomach-warble." The first time I heard it uttered was when one was being harried by a Fork-tailed Drongo as it perched on a branch. The Drongo repeatedly stooped at it, forcing the Raven to duck its head every time. Then the Raven uttered many times the deep warble, barely audible at twenty-five to thirty feet., something like "churr—de—de—churr—churr." The bird's belly seemed to vibrate meanwhile. In the arid Dida Gulgulla, north-east of Marsabit, many of these Ravens were seen; there they were shy and wild.

STURNIDAE

Creatophora carunculata (Gmelin).

Wattled Starlings.

Isiolo; Benane; Merille.

Two things about these birds were noticeable. One was the great diversity of plumage, the other, the attraction flocks on local movement searching for food had for birds of other kinds. Before I left Merille I found that the best way to find bird-life was to learn where Wattled Starlings were feeding, for where they were there would always be plenty of ground insects. They have a strong liking for fruit and berries as well as for insects. The following notes were made,

Benane, November. Flock of about twenty in bush, mostly females and immature birds. The males present had no wattles.

Isiolo, November. As at Benane, but more birds. No wattled birds.

Merille, 16th January. Numbers seen with Yellow-billed Shrikes. A few males had fairly developed lower wattles and one or two the upper wattles. Large numbers of immature birds present.

Merille, 21st January. Large flocks settled on trees in our camp and ate fruit. A few individuals kept up a persistent call like "pretty boy." Only lower wattles were evident in the males, and those only partially developed.

Merille, 25th January. Another flock, again with Yellow-billed Shrikes and also Nubian Carmine Bee-eaters, attracted by myriads of crawling crickets, locusts, etc.

Merille, 30th January. On a rocky kopje this evening a large flock was observed hunting for insects. They were scattered over the lower slopes, about three birds to a square yard, running in all directions with wings slightly a-flap, neck outstretched and head down, in quick little dashes. So intent were they that often birds collided when chasing the same insect. Lower wattles were very evident in many cases, and a few showed slight growth of upper wattles.

Merille, 3rd February. In same locality a large flock seen with Buffalo Weavers, Drongos and Sparrow Weavers; once again the attraction was myriads of crawling and jumping insects on the ground. I noticed again many well-developed lower wattles and definite growth of upper wattles in many of the males. When next I was at Merille in March, heavy rains had broken and there was not a sign of any Wattled Starlings, nor were there any at Isiolo, further south.

It would seem that the growth of the wattles is definitely yearly or seasonal. Starlings of this species must cover enormous areas in pursuit of crawling and jumping insects (not necessarily locusts) at the time when these insects breed.

Cinnyricinclus leucogaster verreauxi (Bocage). Southern Violet-backed Starling.
Nanyuki; Nairobi. None seen in N.F.D.

Speculipastor bicolor Reichenow. Magpie Starling.
North Horr.

On a hot stifling day in February, a pair of these brilliant starlings suddenly alighted by one of the oasis pools, drank, and then had a bath, splashing water over themselves with little wing-flicks and with their beaks. They stayed only a few minutes then flew off in an easterly direction, and I never saw the bird again.

Lamprocolius c. chalybaeus (Hemprich and Ehrenberg). Blue-eared Glossy Starling.
Nairobi; Nanyuki; Isiolo; Habbaswein; Merille.

Common at Habbaswein in October and November, noisy and restless on moonlight nights, frequently flying about from tree to tree. In immense flocks in January at Merille, where during the hot hours thick-leaved trees by the river bed were a mass of these birds every day. Normally it is more often seen in small parties, often associating with *Spreo superbus*.

Lamprocolius corruscus mandanus van Someren. Lamu Black-breasted Glossy Starling.
Mombasa; Changamwe; Mana (Jombeni Mts.).

Seen in small lots of four to six birds at Mana in borassus palms. Very noisy, with cheeping whistles; moving restlessly in short circular flights.

Lamprotornis p. purpuropterus Rüppell. Rüppel's Long-tailed Glossy Starling.
Habbaswein.

In acacia country, moderately common. None seen elsewhere in N.F.D.

Cosmopsarus regius Reichenow. Golden-breasted Starling.
Benane; Garba Tula; Merille.

First met with at Benane, where in late October and November it was extremely common in pairs and small lots of from four to six individuals. Like the Superb Starling, it was very tame. It used to perch on trucks, tents and the cookhouse, and even entered the mess via the branches of the acacia tree that formed the roof. So attractive was its plumage that many fell victims to catapults for the sake of their feathers used as helmet decorations.

Onychognathus morio shelleyi (Hartert.) East African Redwing.
Meru.

Onychognathus tenuirostris (Rüppell). Slender-billed Chestnut-wing.
Meru; Mana (Jombeni Mountains).

Galeopsar salvadori Sharpe. Bristle-crowned Chestnut-wing.
N. Uaso Nyiro (near Archer's Post); Habbaswein.

Spreo fischeri (Reichenow). Fischer's Starling.
Benane.

In early December, following several days of heavy rain, I found several pairs of this Starling nesting in dense thorn scrub. The nests were roughly built of twigs, circular, about a foot in diameter and averaging ten feet from the ground. The nestlings were being fed by the parents, who were not at all disturbed when I approached directly below their nesting sites. Call, a loud, shrill whistle.

Spreo albicapillus. White-capped Starling.
North Horr.

Individuals visited waterholes regularly in the morning between 8 a.m. and 10 a.m. Typical starling habits, running about like *Spreo superbus*. Very assertive, chased other birds away from holes. A harsh cry heard once, but birds were mainly silent.

Spreo superbus (Rüppell). Superb Starling.
Isiolo; Garba Tula; Benane; Habbaswein; Merille; Laisamis; North Horr.

Most common at Isiolo, where very tame. Used to enter our kitchens and messed and had to be "shooed" away like a chicken. Nesting at Isiolo in March in trees in our camp, even above our orderly room, always a noisy place with trucks constantly coming and going. Nests were rough, prickly-looking structures of twigs and grasses, usually fifteen to twenty feet from the ground, and the red gapes of the youngsters inside were clearly visible from below as they peered out watching for the parent birds. Very noisy, particularly on moonlight nights, and at times they whistle very well. Rare at North Horr, only a few pairs seen, and then very wild and unapproachable.

Spreo hildebrandti shelleyi Sharpe. Shelley's Starling.
Isiolo.

Only seen at Isiolo, but less common than the Superb Starling, with which it is often noticed associating. Wilder and less amenable than that bird. Was certainly not nesting at Isiolo in March; indeed I saw no representative of this bird there after December, so perhaps it withdraws into the bana to breed.

Buphagus e. erythrorhynchus (Stanley). Red-billed Oxpecker.;
Isiolo; Garba Tula; Benane; Habbaswein; Merille; Marsabit; Siolo River
Meru; Mana (Jombeni Mountains); Thika.

Usually found in parties of about eight, and very common in N.F.D. The following are some notes:

Isiolo, December. Very Common. One, seen to enter the nest of a Black-billed Sparrow Weaver, was immediately chased away and mobbed by a hurried concentration of those birds.

Merille, January. Comparatively rare, despite the enormous amount of game in the vicinity.

Marsabit, March. Oxpeckers common on downs below forest, frequenting grazing areas where numbers of donkeys and cattle used to feed.

Meru, 6th April. A pair of Red-billed Oxpeckers were seen with one very young bird perched in a tree in Meru village. Nearby was a hole in the trunk about forty feet from the ground, into which one bird kept flying with insects which it collected from the ground near the tree, in its beak.

This bird was most common at Garba Tula and Benane, where flocks were seen daily.

Zosterops virens kikuyuensis Sharpe. Kikuyu Green White-eye.
Meru; Nanyuki.

Zosterops virens kaffensis Neumann. Kaffa Green White-eye.
Marsabit.

Seen mainly in lots of two to three in forest trees. Not shy. Besides its short note it has a faint warbled song, so subdued as to be barely audible at a distance of ten feet.

NECTARINIIDAE

Nectarinia famosa aeneigularis Sharpe. Kenya Malachite Sunbird.
Nanyuki; Mana (Jombeni Mountains); Meru; Kabete.

Nectarinia k. kilimensis Shelley. Bronze Sunbird.
Meru. Nanyuki; Kabete.

Seen at Meru at 6,500 feet in a river valley. At Kabete seen several times. It has a lovely call, a rapid string of twinkling notes.

Nectarinia nectariniodes Fischer and Reichenow. Eastern Black-bellied Sunbird.
Isiolo; Siolo River.

A dead male was handed to me at Isiolo for identification. A few were seen in a tremendous concentration of sunbirds on the Siolo River in March.

Drepanorhynchus reichenowi Fischer. Golden-winged Sunbird.
Near Timau; Nanyuki.

Cinnyris h. habessinicus (Hemprich and Ehrenberg). Shining Sunbird.
Isiolo, Garba Tula, Siolo River.

Common at Isiolo. In early December a pair were discovered busy nest-building in a low bush in open lava country. The nest was very exposed, waist high, and constructed of bits of grass and herbs woven externally with spiders' webs and lined with woolly seed heads. The pair built with great vigour, although they had to fly a long way for building materials. Strangely enough, they seemed to fly in opposite directions. The note is rasping. This little bird also figured largely in the March concentration of Sunbirds on the Siolo River. There was a stretch of this river where tall trees grew; these were full of sunbirds, all in a state of great excitement and feeding hard. It was difficult to pick out individuals, so restless were they, and so numerous. I put the number present in that small area at over a thousand.

Cinnyris mariquensis osiris (Finsch). Abyssinian Mariqua Sunbird.
Isiolo; Siolo River.

Cinnyris venustus blicki. Somali White-bellied Sunbird.
North Horr.

Found to be common in a patch of dense bush east of oasis at North Horr. It was in fine plumage and singing vigorously in February, a sharp twinkling little wren-like song.

Cinnyris venustus falkensteini Fischer and Reichenow. Kenya Buff-breasted Sunbird.
Siolo River; Meru; Nanyuki; North Horr.

At North Horr either this race or *fazoqlensis* was often seen alongside the last-mentioned race. In that arid region they must have lived entirely on insects.

Cinnyris r. reichenowii Sharpe. Nandi Double-collared Sunbird.
Meru; Mana (Jombeni Mountains).

Chalcomitra amethystina doggetti (Sharpe). Kenya Highlands Amethyst Sunbird.
Marsabit.

Common in forest, cultivated areas and low bush at Marsabit, haunting low bush and the tops of forest trees. Often flies high and far in an erratic and tortuous course. Hawks after insects from the tops of forest trees like a Flycatcher. On 13th March a pair were seen frantically nest-building in a tall tree in a deep gorge. Externally the nest seemed to be made of grass and lichen woven on to an outer branch, and as I watched the pair were busy lining it with moss.

Chalcomitra senegalensis lamperti (Reichenow). Kenya Highlands Scarlet-breasted Sunbird.
Nanyuki.

Chalcomitra hunteri (Shelley). Somali Scarlet-chested Sunbird.
Isiolo; Siolo River; Garba Tula; Benane; Merille.

Stolid, for a Sunbird. Immature males numerous at the Siolo River in late March. I heard only a loud single note, frequently repeated.

Anthreptes collaris elachior Mearns. Mombasa Collared Sunbird.
Mombasa.

Anthreptes orientalis orientalis Hartlaub. Kenya Violet-backed Sunbird.
Isiolo; Siolo River; Garba Tula; Benane; Habbaswein; Merille; Laisamis; Kalacha; North Horr.

Widely distributed throughout the N.F.D.—in desert, lava, acacia forest and arid bush. It is one of the most beautiful and interesting birds I met with in Kenya. The female in a quiet way is just as good to look at as the male. Flight erratic and fast—almost butterfly-like. Nesting at Merille in November and December, and many young birds seen with the parents in January. The female seemed to do most of the feeding, searching diligently for insects, uttering a constant “chip—chip” in reply to the somewhat plaintive “cheeps” of the young birds. This bird is crepuscular in habits, and many times has alighted near me long after dark. I have also heard the “flip—flap” of its wings and its sharp chip note as it flew from bush to bush. The male has a pleasant little warbled song, usually uttered when perched on a bush. This bird is conspicuous by constantly “twinkling” its wings and spreading its tail into a wide fan.

On one occasion I saw two hens fighting hard, apparently for possession of a male that was perched nearby: so vigorous was the fight that even when they fell to the ground with an audible bump they still kept on mauling each other.

PLOCEIDAE

I noticed a characteristic in certain weavers as to the position in which their nests are built, namely that they build their nests on the west side of the trees; particularly noticeable in *Plocepasser mahali melanorhynchus*, *P. donaldsoni*, *Pseudonigrita cabanisi*, *Othypantes r. reichenowii*, *Sitagra n. nigriceps*, and *S. r. rubiginosa*. The last two usually commenced building on the west side, although eventually the colony became so large that it overflowed on all sides.

In the flat-topped acacia country of the N.F.D. it is impossible to get lost because one can always find the west point from the position of the nests of *P. mahali*.

The reason can hardly be the question of prevailing wind, for in the N.F.D. this varies considerably, and the branches of a flat-topped acacia would hardly act as a barrier. In many cases the nests of the Black-capped Social Weaver have the entrance holes at the bottom of a solid pear shaped structure, so, in this instance at least, the wind factor must be ruled out. Possibly it is the sun which causes the birds to nest-build on the west side, for building commences in the early morning; and yet a flat-topped acacia casts a very slight shadow.

Bubalornis albirostris intermedius (Vieillot) Kenya Buffalo-Weaver.
Isiolo; Merille.

A pair seen with two young birds at Merille in mid-January. The youngsters called insistently, uttering harsh grating cries. The parents foraged on the ground whilst the young birds perched nearby on the branch of a fallen tree. The family party was foraging with a mixed flock of Wattled Starlings and Uganda Yellow-billed Shrikes. Seen in February, again with a foraging party of White-crowned Shrikes, White-headed Buffalo Weavers and Wattled Starlings. On other occasions solitary. The flight is fast and direct and it seems to travel far from one place to another. Call a loud "churr."

Dinemellia d. dinemelli (Rüppell). White-headed Buffalo-Weaver.
Isiolo; Garba Tula; Benane; Habbaswein; Merille; Laisamis; North Horr; Gamra.

Common and widely distributed. Has a bubbling, twittering, prolonged note and a loud parrot-like call. A very sociable bird, foraging with Superb Starlings, Black-billed Sparrow-Weavers, etc. There was an exceptionally large colony breeding by the river-bed at Laisamis in November and December, and in January immature birds were common at Merille. This bird occurred in the Karoli Desert west of the lava escarpment wherever there was a patch of scrub or bush.

Plocepasser mahali melanorhynchus Bonaparte. Black-billed Sparrow-Weaver.
Isiolo; Benane; Habbaswein; Merille; Laisamis.

None seen north of the Kasut. At Merille breeding in November, and in December at Habbaswein. A noisy night-songster.

Plocepasser donaldsoni Sharpe. Donaldson's Sparrow-weaver.
Laisamis; twenty miles north-east of Marsabit Mountain; near Isiolo.

Very local, but haunts deadly country and may often be overlooked. It likes lava, intense heat, scattered low acacias, and solitude. At Laisamis it inhabited a stretch of lava some way from the river-bed with its green trees and great colonies of other Sparrow-Weavers. Characteristic is the manner in which it segregates itself from the Black-billed Sparrow-weaver, and indeed from most other birds. The only one with which it seems to fraternise is the White-headed Buffalo-weaver. Occurs in ragged parties; frequently flies from one rock to another or from one bush to another, invariably alighting on the top of whatever it rests on. Not shy, and a robust bird of direct flight. Has a variety of call notes, somewhat like a number of the calls of the Black-billed Sparrow-

weaver and White-headed Buffalo-weaver. There is a loud parrot-like cry, a "chink—chink" like a Stonechat, and a low twittering little song. It has some resemblance at first glimpse to the Common Wheatear, for with the wings closed the white rump and upper tail coverts are in part visible. On 5th March after rain I came across a colony of these Weavers nest-building on the lava twenty miles north-east of Marsabit Mountain. The nests seemed to be similar to, but larger than, those of the Black-billed Sparrow-weaver; pear-shaped and built in low thorn trees, at five to 10 feet from the ground. Nests, but no birds, were also seen on the lava at Gamra. At Isiolo, on a lava plain east of the town, there was a great concentration of nests in a small area of stunted bushes. In some cases as many as twenty nests were found in one bush. Apparently this species relies on nesting in the desolate "bana" for security.

Pseudonigrita cabanisi (Fischer and Reichenow). Black-capped Social Weaver.
Matthews Range; Merille; Laisamis.

Another solitude-loving species which, however, prefers tall acacia trees for nesting purposes. It likes lava-rock-country in the "bana," and usually a colony selects a single giant Euphorbia or Acacia to build in, although on the Matthews Range I found a colony occupying two such trees. The number of nests in a colony usually is from forty to sixty. They are beautiful structures, closely woven with dry grass, and cone-shaped, the tapering top suspended by a stout grass cable to a branch of the tree. The entrance holes are two in number, one being stopped up in the breeding season. At Merille in January a colony of these birds were very active patching up their nests. Their behaviour generally was unusual, for on my approach they left the tree and dropped down to the lava and bush below, where they flitted about restlessly, uttering sharp little cries. On the ground and in bush they were sociable, perching close together and following each other when on the move.

Passer iagoensis rufocinctus Finsch and Reichenow. Kenya Rufous Sparrow.
Near Timau; Nanyuki.

Passer castanopterus fulgens Friedmann. South Somali Sparrow.
North Horr.

Very common in bush east of the oasis of North Horr in large flocks of over a hundred individuals. It probably made use of the oasis simply for water, for later, after rain, it disappeared. Very restless, and sociable. Flocks fly bunched up and not strung out. Call a "chirrup."

Passer griseus gcngonensis (Oustalet). Parrot-billed Sparrow.
Isiolo; Garba Tula; Benane; Habbaswein; Merille; Laisamis; North Horr.

Common in ones and twos until January, when it was in vast flocks at Merille associating with Drongo and Silver-bills, and then very wild. Frequently seen pecking at gummy exudation from trees by the river-bed, to the branches of which they used to cling like woodpeckers. Rare at North Horr.

Phormoplectes i. insignis (Sharpe). Nairobi Brown-capped Weaver.
Marsabit.

A few pairs seen in forest at Marsabit. I heard a low chirruping note, and also a high squeaky call in three short cadences that reminded me of the note of the Black-capped Weaver of South Africa.

Othyphantes r. reichenowi (Fischer). Reichenow's Weaver.
Nanyuki; Marsabit; Kabete; Meru; Nairobi.

Common. Nest-building at Marsabit in March and at Meru in April. Has a shrill call and a loud "pinking" note.

- Sitagra i. intermedia* (Rüppell). Abyssinian Masked Weaver.
 Isiolo; Habbaswein; Merille; Marsabit.
 At Merille between December and February common in flocks, but in very poor plumage.
- Sitabra vitellina uluensis* (Neumann). Kenya Vitelline Weaver.
 Benane; Marsabit.
 At Marsabit in March numbers were found in sheltered ravines, in company with Reichenow's Weaver.
- Sitagra n. nigriceps* (Layard). Spot-backed Weaver.
 Meru; Kinyanga (Jombeni Mts.)
 A very large colony was actively repairing and building up nests at Kinyanga in early April.
- Sitagra r. rubiginosa* (Rüppell). Chestnut Weaver.
 An immense colony was found in a great Baobab at Benane in November; they were active and noisy, with rippling call notes.
- Hyphanturgus ocularius suahelicus* (Neumann). East African Spectacled Weaver.
 Siolo River; Meru; Mana (Jombeni Mountains).
 This Weaver has the habit of "twinkling" wings and tail.
- Hyphanturgus nigricollis melanoxanthus* Cabanis. Kenya Black-necked Weaver.
 Merille.
 Common at Merille in pairs or several pairs together. Difficult to approach as they creep about in dense bush, twisting and turning like Tits. Only call heard a Chaffinch-like "pink." Also seen on the leaf-tops of doum palms.
- Xanthophilus aureo flavus bojeri* (Cabanis). Mombasa Golden Weaver.
 Siolo River; Mombasa.
 Local; fairly common on the Siolo River. They were busy building in late March, uttering loud chattering cries.
- Xanthophilus xanthops camburni* (Sharpe). Camburn's Golden Weaver.
 Meru; Mana (Jombeni Mountains).
 Busy completing nests in April.
- Amblyospiza albifrons montana* van Someren. Kenya Grosbeak Weaver.
 Meru; Mana.
 Building in April. Largest colony was one of fifteen nests at about 5,500 feet near Meru.
- Anaplectes melanotis* (Lafresneye). Red-winged Anaplectes.
 Merille; Siolo River.
 Common at Merille, favouring flat-topped acacia country intersected by wooded watercourses. I saw individuals only, never the sexes together. A male at Merille in December was on several consecutive days foraging with a party of Somali Helmet Shrikes. It was the Weaver that attached itself to the Shrikes, not the converse; it followed them closely everywhere. In January, a male, and later a female, was seen with a party of Abyssinian Masked Weavers. At the Siolo River a male was seen feeding with a great congregation of Sunbirds. I never heard this bird utter any note at all, and in feeding it is quiet and usually concealed in the foliage.

Quelea quelea aethiopica (Sundevall). Sudan Dioch.
Merille; Mana (Jombeni Mountains).
In vast flocks at Merille in January and February, associating with Parrot-billed Sparrows and Silverbills.

Euplectes n. nigroventris Cassin. Zanzibar Red Bishop.
Mombasa; Changamwe.

Euplectes hordacea changamwensis (Mearns). East Coast Fire-crowned Bishop.
Mombasa.

Euplectes hordacea craspedoptera (Bonaparte). Abyssinian Fire-crowned Bishop,
Marsabit.
A ragged flock in off-season plumage seen at Marsabit in February. Very wild. Accompanying Waxbills and Silverbills.

Euplectes capensis xanthomelas Rüppell. Abyssinian Yellow Bishop.
Nanyuki; Meru; Kinyanga and Mana (Jombeni Mts.); Thika, Nairobi.

Urobrachya axilliaris zanzibarica Shelley. Zanzibar Fan-tailed Widow-bird.
Changamwe.

Coliuspasser albonotatus eques (Hartlaub.) East African White-winged Whydah.
Marsabit; Meru.

In early February in Marsabit great flocks of this bird roosted in the rough hedges bordering cultivation. They were shy and restless, and when disturbed always flew strongly far away, uttering loud tinkling cries. At Meru in April several males seen displaying in fallow cultivations at about 5,000 feet.

Coliuspasser ardens suahelica (van Someren). Kenya Red-naped Whydah.
Nanyuki; Meru; Kinyanga (Jombeni Mts.); Kabete.

Coliuspasser progne delamerei (Shelley). Kenya Sakabula.
Near Nyeri.
In April males were in full breeding plumage.

Spermestes cucullatus scutatus Heuglin. Abyssinian Bronze Mannikin.
Meru; Kinyanga; Mana (Jombeni Mts.)

Spermestes n. nigriceps Cassin. Rufous-backed Mannikin.
Meru.

Euodice cantans meridionalis (Mearns). Kenya Silver-bill.
Merille; Laisamis.

Inhabits arid semi-desert country such as the Kasut. A flock of about thirty were seen one day in January at a water hole at Laisamis, perched close together in a small bush almost touching one another. A few feet away in the waterhole an old Samburu man was bathing; the birds were intently waiting for the water. They uttered loud tinkling little cries when forced up by the approach of a Goshawk, and flew in a cloud into dense cover. Later this species was seen on the eastern slopes of the Matthews Range, flocked with Diochs and Parrot-billed Sparrows.

Odontospiza caniceps (Reichenow). Grey-headed Silver-bill.
Marsabit.
A small flock, wild and shy, was seen in fallow at Marsabit in February.

Nigrata canicapilla diabolica (Reichenow and Neumann). Kilimanjaro Grey-headed
Negro-Finch.

Meru.

A pair seen at Meru at 6,000 feet, were haunting the sandy margin of a pool over-hung with rocks and herbage. They flew about with rapid little jerks like Sunbirds, and picked up seeds that lay at the water's edge. They were silent.

Amadina fasciata alexanderi Neumann. Abyssinian Cut-throat.
Merille.

Large numbers were seen one evening in January at Merille in flat-topped acacias. They were in company with Parrot-billed Sparrows, Abyssinian Masked Weavers and Black-billed Sparrow Weavers, and uttered frequent tinkling little cries.

Mandingoa nitidula chubbi (Ogilvie-Grant). Marsabit Green-backed Twin-spot.
Meru.

A female seen in a banana forest at a range of a yard or so in April. Subsequently, at 6,500 feet, in a dark rocky gorge a pair seen slipping quietly through dense foliage. Also seen in lower forest in similar damp country at about 4,500 feet.

Pytilia melba soudanensis (Sharpe). Kenya Melba.
Merille; North Horr.

Common at North Horr in February after rain, in dense bush east of the oasis. Always in pairs either on the ground or flitting about the bases of low bushes.

Lagonosticta rubricata hildebrandti Neumann. Kenya Fire-finch.
Meru.

Lagonosticta senegala kikuyuensis van Someren. Kikuyu Red-billed Fire-finch.
Isiolo; Siolo River; Kinyanga and Mana (Jombeni Mts.); Meru.

Common. Haunted our camp at Isiolo and was very tame, frequently entering messes and kitchens.

Lagonosticta senegala somaliensis Salvadori. Somali Red-billed Fire-finch.
Mombasa.

Coccygia melanotis kilimensis Sharpe. Kenya Yellow-bellied Waxbill.
Mana; (Jombeni Mts.)

Estrilda astrild massaica Neumann. Masai Waxbill.
Meru.

Common in parties of thirty or so on eastern slopes of Mt. Kenya.

Estrilda astrild minor (Cabanis). Mombasa Waxbill.
Mombasa.

Estrilda rhodopyga centralis Kothe. Uganda Crimson-rumped Waxbill.
Nanyuki; Marsabit.

A great flock of at least 200 strong, very restless and noisy, seen in Marsabit forest in February. They also frequented native cultivations, uttering little twittering cries. At Nanyuki, in April, seen only in pairs.

Estrilda c. charmosyna (Reichenow). Abyssinian Red-rumped Waxbill.
Isiolo; Siolo River; Benane; Merille; Laisamis; Thika.

This beautiful bird was widely distributed and was in pairs during October and November at Isiolo and Benane. It was then a silent bird, much given to clinging to the bases of trunks of trees and hanging about in all sorts of positions like a Tit. It was in company with the Purple Grenadier. Likes rocks and rocky places, especially when overgrown with scrub or bush. At Merille in January in parties of five to eight individuals, and always sociable not only with its own kind but with others. Very noisy. One call was a loud sweet whistle in two cadences, first low and then rising smoothly to a higher key. Another, seldom heard, is a pretty warbled song.

Uraeginthus bengalus brunneigularis Mearns. Kenya Red-cheeked Cordon-bleu.
Isiolo; Siolo River; Meru; Mana; Thika.

Uraeginthus bengalus ugoensis Reichenow. East Coast Red-cheeked Cordon-bleu.
Mombasa.

Uraeginthus cyanocephalus (Richmond). Blue-capped Cordon-bleu.
Isiolo.

Rare, seen only October to December at Isiolo, in pairs in acacia country.

Granatina ianthinogaster ugandae van Someren. Hawash Purple Grenadier.
Isiolo.

Common and resident. In December a male was seen acting in a curious way towards a hen. Both were perched on a twig; the cock with a blade of grass in its beak, went through rhythmic motions, straining upwards on its legs with head and neck out-thrust, beak upturned and head towards hen. After doing this several times, he suddenly flew off, dropped the blade of grass, and uttered shrill excited cries. It is a very restless bird. A great "twinkler" of wings and tail. In March I heard its song, a pleasantly modulated sing-song theme of four notes: "whee—whee—whee—whee," the third note rising and the last falling in key.

Hypochera ultramarina purpurascens Reichenow. Kenya Purple Indigo-bird.
Meru; Kinyanga and Mana (Jombeni Mts.); Thika.

Vidua macroura (Pallas). Pin-tailed Whydah.
Meru; Mana; Mombasa.

Stegamura p. paradisaea (Linn.) Paradise Whydah.
Eastern slopes of Mt. Kenya at about 5,000 feet.
A single male in full plumage seen in early April.

FRINGILLIDAE

Serinus dorsostriatus maculicollis Sharpe. Somali White-bellied Canary.
Isiolo; Benane; Merille.

Always in pairs; Singing well at Isiolo in March.

Serinus sulphuratus sharpii Neumann. Kenya Brimstone Canary.
Meru; Nanyuki.

A male seen displaying round a female at Nanyuki in April, shuffled round with feathers puffed out, wings a-flutter and tail widespread in a sort of dance, singing sweetly the whole time.

Polioptila angolensis reichenowi (Salvadori). Kenya Yellow-rumped Seed-eater.
Isiolo; Meru; Marsabit; Mana (Jombeni Mts.)

Nesting at Meru in April in cultivations by streams. In flocks on lava at Isiolo in December.

Poliospiza s. striolata (Rüppell). Streaky seed-eater.
Mana; Meru; Nanyuki.

Nesting in April at Meru. One pair building in a bush in a sheltered valley, collected mosses and grasses as I watched them. Has a very pleasant canary-like song.

Poliospiza burtoni albifrons (Sharpe). Kenya Grosbeak Seed-eater.
Meru.

This large Seed-eater was seen several times one miserable cold day on Mt. Kenya, at about 7,000 feet.

Spinus citrinelloides kikuyuensis Neumann. Kenya Citril.
Kinyanga and Mana (Jombeni Mts.); Meru.

A pleasant songster. The notes are rather low and indistinct but very sweet and canary-like; uttering a short, sharp note when in flight. Essentially a leaf-searcher, and seen mainly in pairs.

EMBERIZIDAE

Emberiza f. flaviventris Stephens. Golden-breasted Bunting.
Nanyuki, in a clearing in forest at 7,000 feet—a single bird seen.

Emberiza poliopleura (Salvadori). Somali Golden-breasted Bunting.
Garba Tula; Benane; Merille; North Horr.

Common at Benane in dense bush, mainly in pairs. A ground feeder; very tame, seldom flying more than a few yards when pursued. Occasionally it perched on the top of a bush or rock and sang its short pleasant song, but on the whole was a silent bird, Common on the eastern slopes of the Matthews Range, but never seen in flat-topped acacia country. At Laisamis it avoided the wooded watercourse, haunting the lava in company with Donaldson's Weavers and the White-headed Buffalo Weaver.

THE GREEN AND BLACK MAMBAS OF EAST AFRICA

By A. Loveridge,

(*Museum of Comparative Zoology, Cambridge, Mass.*)

Recently Dr. V. FitzSimons (1946, *Ann. Transvaal Mus.*, **20**, pp. 392-393) has invited attention to the specific distinction of the so-called "black" mamba. A species that has been regarded as identical with the green mamba ever since Boulenger's (1896, *Cat. Snakes Brit. Mus.*, **3**, p. 537) revision of the genus—formerly known as *Dendroaspis* (not of Fitzinger, 1843) but now referred to *Dendroaspis* Schlegel (? 1848). The importance of FitzSimons' discovery lies in the "black" mamba being the largest and most dangerous of all African elapids.

The numerous differences, set forth in tabular form of admirable clarity by FitzSimons, need not be repeated here. FitzSimons, however, was dealing with South African material from a relatively small area and some of the distinctions he cites are not nearly so clear cut when tropical Africa is involved. In the hope of stimulating others with extensive material to check scale-counts and so elucidate the range of the two species, I cite below the data of specimens in the Museum of Comparative Zoology, and of one in the Chicago Natural History Museum. All extreme counts have been double checked and FitzSimons' figures given in parenthesis.

<p><i>Dendroaspis angusticeps</i> (A. Smith)</p> <p>Common or Green Mamba</p> <p>Midbody scale-rows 17-21 (19)</p> <p>Ventrals 209-232 (201-210)</p> <p>Subcaudals 109-126 (99-110)</p> <p>Inside of mouth white to bluish white.</p>	<p><i>Dendroaspis polylepis</i> (Günther)</p> <p>"Black" (green or brown) Mamba</p> <p>Midbody scale-rows 23-25 (21-23)</p> <p>Ventrals 242-282 (247-282)</p> <p>Subcaudals 105-127 (112-126)</p> <p>Inside of mouth bluish grey to black.</p>
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It will be observed that while the midbody scale-rows of most common mambas number 19, occasionally 17 (M.C.Z. 29182. ♂. Chirinda Mountain, Southern Rhodesia) or 21 (M.C.Z. 48474. ♀. Kitaya, Ruvuma River, Tanganyika Territory) do occur. Similarly "black" mambas usually have 23 scale-rows, with 21 or 25 (M.C.Z. 40752. ♀. Kitau, Manda Island, Kenya Colony) as unusual variations. Snakes having 21 rows, a count common to both species, may be identified by reference to their number of ventrals in which apparently no overlap occurs. As, however, there is a variational range of 41 shields (242-282) in *polylepis*, it is reasonable to assume that the ventrals of *angusticeps* will have a similar range instead of only 32 (201-232). In both species the lower ventral counts are from males, the higher from females.

As for subcaudals, it appears that they no longer serve to separate the two species. In general the lining of the mouth remains a good criterion, but now and then it may be difficult to decide whether an individual should be classified as bluish white or bluish grey. The buccal membrane of a young female *angusticeps* from Kitaya (M.C.Z. 48476) certainly appears as dark as in some *polylepis*. It may be added that I have taken both species at Kitaya as well as at Morogoro.

The complete list of localities on which the preceding figures and remarks are based, is as follows:

D. angusticeps—**Kenya Colony**: Kibwezi; Malindi; Tsavo; Witu. **Tanganyika Territory**: Kitaya; Magrotto Mtn.; Morogoro; Nchingidi on Rondo Plateau. **Southern Rhodesia**: Chirinda Mtn. *D. polylepis*—**Ethiopia**: NW. of Lake Tana. **Kenya Colony**: Kitau on Manda Id.; Mbololo Mtn. **Tanganyika Territory**: Bahi near Dodoma; Chanzuru; Kitaya; Morogoro. **Belgian Congo**: Mahagi Port. **Transvaal**: Barberton district. **South West Africa**: Kaoko Otavi.

For *D. polylepis* "black" mamba is an unfortunate misnomer as the reptile is green when young, olive to brown when adult. Probably the name is too well established in our language to be displaced, but in western Kenya the glossy black cobra (*Naja melanoleuca*) is commonly called "black mamba." Indeed, any hapless, harmless, black snake is liable to be labelled "black mamba" as a prelude to being scotched.

After writing the foregoing, I suggested to my colleague Mr. H. W. Parker of the British Museum (N.H.) that it would be most useful to have amended identifications of the mambas in his care, many of which have appeared as "*angusticeps*" in reports by his predecessor, the late G. A. Boulenger. Mr. Parker, though exceptionally busy at this time, very kindly supplied me not only with the list of localities given below, but also with the scale counts of each individual. As these counts, with the exception of ninety-seven subcaudals for a Mount Edgecombe *angusticeps*, fall within the combined limits given above, they need not be repeated, but the definite localities of the British Museum material is as follows:

D. angusticeps—**Kenya Colony:** Kilifi; Taveta. **Tanganyika Territory:** Nakin near Tendaguru. **Zanzibar:** Pete. **Mozambique:** Zambesi River (type of *D. intermedius*). **Nyasaland:** Mzimba. **Northern Rhodesia:** Lake Tanganyika (Sir J. Kirk). **Zululand:** Ngoye Hills. **Natal:** Durban; Mount Edgecombe. **Cape Province:** Pondoland. *D. polylepis*. **Ethiopia:** "Amibarra (Degen)" ? Amhara. **British Somaliland:** Wagga near Berbera. **Uganda:** Mount Moroto. **Kenya Colony:** south of Kiboko (J. W. Gregory); Mombasa. **Mozambique:** Zambesi River (type of *D. polylepis*). **Nyasaland:** Mzimba (? as "Mzumba Brit. E. Africa, coll. Sharpe"). **Northern Rhodesia:** near Luangwa River, Mpika district (? as "nr. Luangera R., Mpita district.") **Bechuanaland:** "Kwebe" (? Kubi) hills near Lake Ngami (F. D. Lugard). **Natal:** Durban.

HISTORY AND HABITS OF THE EAST AFRICAN BULLFROG

By Arthur Loveridge

(Museum of Comparative Zoology, Cambridge, Massachusetts).

The receipt by the Coryndon Memorial Museum of a Machakos bullfrog (*Rana adspersa edulis*) with a length from snout to anus of $6\frac{1}{4}$ inches (160 mm.), reveals that the East African bullfrog attains dimensions comparable with those of the typical South African form (*Rana adspersa adspersa*) of which it should be regarded as a race.

The precise delimitation of ranges for the forms must remain unsettled till adequate series of the two races from Mozambique and neighbouring territories have been studied. For present convenience the Zambesi may be regarded as marking the southern limits of the East African bullfrog. If the river is really the limiting factor, the type locality must be restricted to "mainland opposite Mozambique Island," for the type material of *Pyxicephalus edulis* Peters (1854, Ber. Akad. Wiss. Berlin, p. 626) came from three localities, one of which—Tete—is on the south bank of the Zambesi.

So slight are the differences between the two races that Boulenger (1882, Cat. Batr. Sal. Brit. Mus., p. 33) referred *edulis* to the synonym of *Rana adspersa* (Tschudi, 1838) with which it has long been confused. It is an open question whether *Pyxicephalus*, characterised by robust habit, short limbs, and a digging tubercle on the heel, should be regarded as a full genus or, as I prefer, accorded subgeneric status.

Young bullfrogs are so utterly unlike the adults that it is not surprising that four juveniles from Quilimane, Mozambique, should have been designated *Phrynopsis boulengeri* by Pfeffer (1893, Jahrb. Hamburg. Wiss. Anst., 10, p. 101, pl. ii, figs. 5-6). Pfeffer based his new genus on the cartilaginous condition of the unforked omosternum and sternum a condition due to immaturity. In 1936, after examining Pfeffer's cotypes, I referred *boulengeri* to the synonym of *edulis*.

Another synonym, *Phrynopsis usambarae* Ahl (1924, Zool. Anz., 60, p. 271), was based on a young 25 mm. bullfrog from "Usambara" (District rather than Mountains, I imagine), Tanganyika Territory. This frog allegedly differed from *boulengeri* in having an inter-orbital space only two-thirds, instead of as broad as, an upper eyelid. The character is a notoriously variable one, permitting *usambarae* to be also synonymised without hesitation in 1936.

When a largish bullfrog from Orofillo, Somalia, was submitted to Miss Calabresi, she correctly observed it differed from *adspersa* in the length of its hind limbs, but overlooking the fact that the name *edulis* was already available and, indeed, had been recorded from nearby Gallaland by Peters in 1882, she named her frog *Pyxicephalus flavigula* Calabresi (1916, Monit. Zool. Ital., 27, p. 34, pl. ii, fig. 1). Under one or other of these five names, *Rana adspersa edulis* has been mentioned fifty times in herpetological literature since it was first described in 1854. The following notes summarize all that has been recorded of the life history of this interesting amphibian, chiefly observations by the present writer.

In East Africa these bullfrogs are most plentiful along the coastal plain, though occurring also in semi-arid upland savanna. However, owing to their burrowing habits they are rarely encountered except at the onset of the rains at which time the ground sometimes swarms with young ones ranging from half to one-and-a-half inches from snout to anus. What strikes the observer most is the disproportion of their short limbs to the obese, smooth-skinned bodies. The fingers, of course, are free of web, but the toes, with the exception of the longest, are half-webbed. At the base of the shortest toe is a compressed ridge that becomes quite horny in old rugose-skinned frogs. It is with this metatarsal tubercle that the bullfrog digs itself into sandy soil.

The general colour above ranges from olive in the young to plumbeus in adults; while extending from the tip of the snout to the anus of most young frogs is a pale green, vertebral stripe that disappears with age. From each eye three light stripes descend to the upper lip, occasionally these rather characteristic markings coalesce to eliminate the intervening dark bars and the entire lip region may be suffused with pale green or yellowish in half-grown frogs. The sides and sometimes, though to a lesser extent, the back, carry green and white vermiculations, while sometimes semi-circular patches of orange more or less surround the bases of all four limbs. The throat, chest and belly, which are pure white in the young except for brown or olive gular marmorations that may, or may not, be present, turn lemon yellow in later life. It may be supposed that this bright colouring is seasonal or sexual but it was displayed or absent in non-breeding bullfrogs of $3\frac{3}{8}$ to $3\frac{5}{8}$ inches taken at Bagamoyo on 11th November 1929. Like the dark gular markings that are sometimes absent in adult males, the whole question requires clarification.

With the breaking of the rains the adults assemble to breed in flooded areas. The tadpoles, as stated by Mitchell (1946, Nyasaland Agric. Quart. Journ., 6, p. 30) are gregarious, but in saying that they "are guarded by their parents for at least part of their lives" he is incorrect. On the contrary I have found both tadpoles and young *edulis* in the stomachs of adults on several occasions. The eviction from a pond of five hungry ducks in consequence of attacks by a bullfrog, is subject to a different interpretation, and may be attributed to the indiscriminate voraciousness of the species. Mitchell's frog kept popping up to see where the ducks were, then submerging for a fresh attack. When the birds finally left the water, the amphibian followed them out.

The South African race has been known to take ducklings, but a lizard (*Latastia johnstonii*) is the largest vertebrate I have recovered from the stomach of an East African bullfrog. Two young *edulis*, when picked up and dropped into an ordinary entomological killing bottle, and despite the fairly rapid action of the cyanide, seized and partly swallowed two of their companions. In one *edulis* was a young Mascarene frog (*Rana m. mascareniensis*), in another a partly-digested sedge frog (*Hyperolius* sp.) together with a small crab (*Potamon bottegoi*), a yellow millipede, carabid and various beetles, and the remains of other insects. A caterpillar, grasshopper and allied orthoptera, cockchafers, termites, ants including the formidable stink ants (*Megaponera foetans*), millipedes and a polydesmid, were recovered from sundry bullfrogs.

But the most astonishing meal I ever found in one of these amphibia had been taken by a Mikindani bullfrog, and appeared to indicate an imperviousness to stings that was truly astonishing. This creature's stomach held three scorpions each measuring $1\frac{1}{4}$ inches from head to end of sting; a centipede 4 inches long and $\frac{1}{3}$ inch broad; a millipede $2\frac{3}{4}$ inches long; a scutigera; a carabid beetle $1\frac{1}{2}$ inches long of a species that ejects formic acid; three black stink ants $\frac{11}{16}$ inch long; and the remains of a snail whose shell measured $\frac{7}{16}$ inch in diameter.

The only internal parasite I came across was an immature ♀ ascarid in a Bagamoyo bullfrog, but the pits and sores on the limbs of the Machakos frog in the Coryndon Museum are suggestive of myiasis. If correct, the fly responsible for the infestation may well represent an undescribed species as was the case with flies specializing in the parasitization of European and Australian amphibia.

Bullfrogs have other enemies. Near Dar es Salaam I found one with more than a score of dead driver ants, or *siafu* (*Dorylus nigricans brumeisteri*) attached to its belly and limbs. In some instances only the jaws and heads remained, like amphibian war medals, as mute testimony to what must have been an unpleasant encounter. At Mkonumbi I removed a young *edulis* from the stomach of a stripe-bellied sand-snake (*Psammophis sudanensis subtaeniatus*) and at Mangasini a larger bullfrog from a spitting cobra (*Naja n. nigricolis*). At Port Herald, says Mitchell, many bullfrogs are swallowed by pelicans (*Pelecanus rufescens*) and later regurgitated, their bodies being found beneath the nests.

Man must also be reckoned among their foes, for the name *edulis* was given these bullfrogs by Peters on account of their being eaten by the natives of Mozambique. This is also true of the Sena tribesmen at Port Herald, according to Mitchell, and in Northern Rhodesia as reported by S.A. Neave.

I cannot confirm or deny Tornier's (1909) statement that this bullfrog, when alarmed, renders itself less conspicuous by squatting with feet drawn in so they are concealed by the body skin. According to Werner (1913) a frightened bullfrog inflates and cries loudly. That people, unfamiliar with the deep resonant call of this frog, are sometimes alarmed by it I do know. At Kilosa, on 17th March, when the first heavy downpours of the rainy season flooded a maize plantation to the depth of a foot my collector, Salimu bin Asmani, reported hearing a "grunting" sound that caused him to run for he thought it emanated from a leopard. Later he saw the snout of the "biggest frog I have ever seen" break the surface and emit the same call. They were calling also during the lesser rains at Bagamoyo on 11th November, so spawning may take place twice a year.

For the present it must remain uncertain whether the record of one of these bullfrogs attacking a man (*cf.* Loveridge, 1945, Copeia, p. 232) refers to *edulis* or the possibly recognisable western form *Rana a. maltzani* Boulenger (*inc. bufonia* Boettger), the type of which came from Rufisque, Senegal. Whether *Phrynopsis ventrimaculata* Neideng (1908) of Longji, Cameroons, is a synonym also requires investigation. The bullfrog that bit the leg of an African policeman as he was passing a pool one night near Tapili, Niangara, Belgian Congo, was not preserved. The 2 $\frac{3}{4}$ -inch female "*adpersa*" recorded by Werner (1908) from Khor Attar, Anglo-Egyptian Sudan, is doubtless referable to the same subspecies. No bullfrog of *this group* is known from Uganda, and until a series of the western frog is available for study we cannot say with certainty whether it is distinguishable from the eastern *edulis*.

Undoubtedly the three bony teeth at the front of the lower jaw are capable of inflicting a severe bite, for the outermost resemble canines and rise $\frac{5}{16}$ inch from the parapet of the jaw in the largest specimens of this bullfrog. No one has studied the life history of the East African race and much remains to be learned of its habits. A search of over 2,000 contributions to African herpetology reveals that *Rana adpersa edulis* is known only from the following localities:

Somalia: Caitoi, Webi Shebeli; Goscia; Orofillo. **Kenya Colony:** Frere Town; Gallaland; Golbanti; Gongoni; Karawa; Kenya region; Lake Jipe near Witu; Likoni; Machakos; Mkonumbi; Mombasa; Peccatoni; Pokomoni; Unyika; Witu. **Tanganyika Territory:** Amboni near Tanga; Bagamoyo; Dar es Salaam; Kilimatinde; Kilosa; Kitaya; Lake Balangida; Liwale; Mangasini; Mikindani; Mogogoni Swamp; Mohorro; Nyambita; Siga Caves; Tanga; Ugogo; Usambara (Neumann coll.); Wembere Blats. **Northern Rhodesia:** Broken Hill; Chama River to Luwumbu River; Lialui (Lealui); Luangwa (Loangwa) River; Lukashashi River. **Nyasaland:** Port Herald; Rift Valley; Shire Highlands (Günther, 1895). **Mozambique:** north of Zambesi; Boror; Cabaceira Peninsula; mainland opp. Mozambique Island; Quilimane; Sena.

C. W. HOBLEY, C.M.G.—AN APPRECIATION

The late Mr Charles William Hobley, Companion of the Most Distinguished Order of St. Michael and St. George, A.M.Inst.C.E., F.G.S., F.R.G.S., died early in this year at the age of eighty after a life of varied and valuable service. Himself the son of an Indian Civil Servant, Hobley went out to Africa in 1890 as Geologist to the Imperial British East Africa Company; but on that Company handing over its rights to the Foreign Office four years later he officially joined the Administrative Branch of the Government, in which, as a matter of fact, he had already been mainly employed. For the rest of his time in East Africa, viz. until 1921, when he retired from the Colonial Service, African administration claimed most of his attention, though he remained the Government's adviser in geological affairs, carrying the title of Commissioner of Mines as well as that of Provincial Commissioner. During part of the 1914-1918 war he served as Chief Political Officer to the British forces in what is now Tanganyika Territory.

Hobley's scientific interests were manifold, anthropology, ethnology, geography and zoology competing with the geological for his attention. Before he left the Colonial Service being already a Fellow of the Royal Anthropological Institute and of the Royal Geographical and the Geological Societies, he was awarded the Back Grant of the Royal Geographical Society and, on his retirement, he became busily engaged in all their activities, as the following list of his appointments clearly shows.

During his last twenty-five years of life Hobley served for varying periods as Corresponding Fellow of the Geological Society and as a member of the Geological Survey Advisory Board. He was also a member of the Councils of the Royal Geographical and the Geological Societies and of the Royal Anthropological Institute and a Vice-President of the Geologists Association. In addition to these he was for fourteen years Secretary to the Society for the Preservation of the Fauna of the Empire. His principal writings consisted of the following: *Ethnology of the A-Kamba*, 1910, *Bantu Beliefs and Magic* 1922; *Kenya from Chartered Company to Crown Colony* 1929.

This imposing list of his activities reveals not only Hobley's industry and zeal for knowledge but also a kindly nature, which brought him into and kept him in close association with his fellow-men. For many years he was the main-spring of the effort which brought together the large numbers attending the annual Kenya dinner in London. His death marks the passing of another of the very few surviving links with the I.B.E.A. Company: he will be missed, however, not only by that small remainder but also by all who had at one time or another the privilege of working under or with him.

SIR GEOFFRY NORTHCOTE.

VOLCANOLOGICAL OBSERVATIONS IN EAST AFRICA

III THE ERUPTION OF KITURO NYEFUNZI NEAR LAKE KIVU IN 1948

by J. J. Richard

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1. Introduction.
2. The 1948 Eruption:
 - (a) The beginning of the eruption.
 - (b) The conditions in early April 1948.
 - (c) The conditions in early May.
 - (d) The conditions on and around Nyamlagira, 6th to 11th May 1948.
 - (e) The end of the eruption.
3. Petrography of the lavas of the 1948 eruption.
4. Conclusions.
5. Literature.

VOLCANOLOGICAL OBSERVATIONS IN EAST AFRICA

III THE ERUPTION OF KITURO NYEFUNZI NEAR LAKE KIVU IN 1948

1. Introduction

The Birunga volcanic area of Uganda and the Belgian Congo, although situated in Central rather than in East Africa, is geologically sufficiently related to the Great Rift system to allow us to include its renewed activity in this series of articles. The volcanoes are located north-east and north of Lake Kivu, about midway of the Western Rift Valley. The latter branches off from the Great Rift Valley, north of Lake Nyasa, and extends in a wide arc for over 1,000 miles, first in a north-westerly, thence in a north and north-easterly direction towards the Sudan. (Map 1.)

Lake Kivu is a drowned valley, which, before it was dammed up by the Birunga volcanoes, used to discharge its waters to the north in the direction of Lake Edward and the Nile. Today Lake Kivu has its outflow to the South by way of the Ruzizi river into Lake Tanganyika and forms one of the sources of the River Congo.

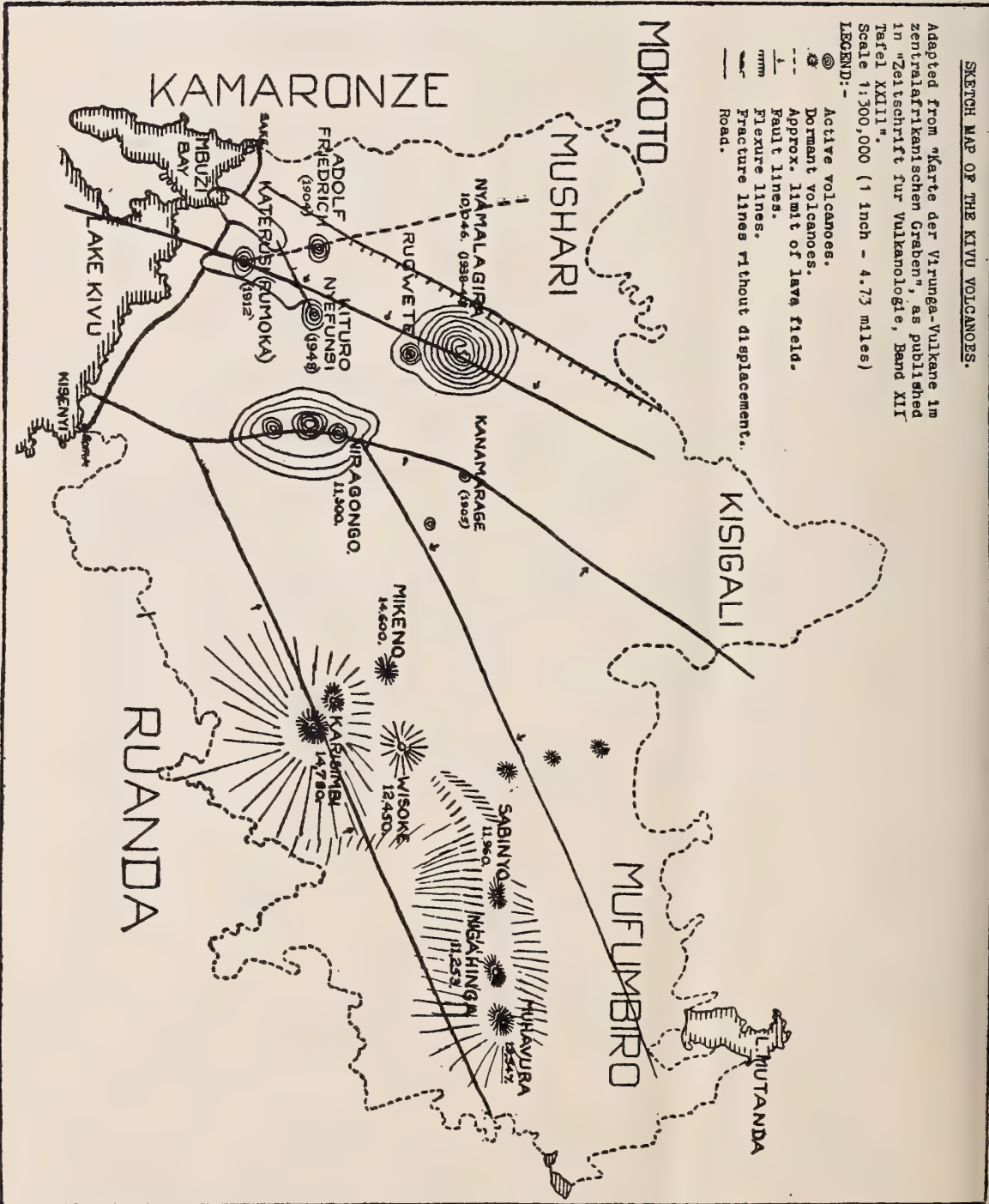
The eastern Birunga volcanoes: Muhavura, well-known as a sanctuary for gorillas; Mgahinga, Sabinjo, Visoke, Mikeno and Karisimbi, between 11,400 and 14,780 feet high, are now dormant or extinct. (1933.) Two of the Birunga volcanoes, north of Lake Kivu are active (Map 2). Niragongo, an impressive cone 11,386 feet high, holds an active lava lake in a sink of its nearly 4,000 feet wide crater, the like of which is only to be found in Hawaii. This lava lake discharges clouds of gaseous matter almost continuously and shows a red glow at night. The crater was entered for the first time by H. Tazieff and Mr. Tondeur in June 1948. Nyamlagira, a flat topped mountain, 10,048 feet high, situated about eight miles north-west of Niragongo, contains a 6,000 feet wide "caldeira" or cauldron, whose behaviour since the beginning of this century and the flank eruption of 1938-1940 are well-known through the earlier publications mentioned at the end of this article (Literature.)

Apart from these main features of the landscape, numerous lesser cones made their appearance in the past, which gave to this area its typical topography. In the last forty-eight years, four of these cones emerged around Niragongo and Nyamlagira. Adolf Friedrich appeared in 1904, Kanamaharage in 1905, Katerusi or Rumoka in 1912. Finally, during the night of 1st and 2nd March 1948, a new eruption began in the plain

SKETCH MAP OF THE KIVU VOLCANOES.

Adapted from "Karte der Virunga-Vulkane im zentralafrikanischen Graben", as published in "Zeitschrift für Vulkanologie, Band XII Tafel XIII".
 Scale 1:300,000 (1 inch = 4.73 miles)

- LEGEND:-
- ⊙ Active volcanoes.
 - ☼ Dormant volcanoes.
 - - - - - Approx. limit of lava field.
 - - - - - Fault lines.
 - Flexure lines.
 - Fracture lines without displacement.
 - Road.





south of Nyamlagira and the new cone in the north eastern (S. lat. $1^{\circ} 32'$ E. long. $29^{\circ} 10'$) sector of the eruption area was named Kituro Nyefunzi.* The activity of all these little cones was short-lived and Kituro was no exception, the eruptive phenomena lasting only for about six months. All these eruptions produced abundant lava streams, however, several of which reached Lake Kivu.

I flew† to the new eruptive area and stayed there between 6th and 9th April, returning for a longer visit between 1st and 11th May 1948. New information was gained during these visits, together with numerous photographs and a coloured film bearing witness of this very interesting eruption.

I express here warm thanks to M. and Madame de Munck of Buheno for their charming hospitality, to Dr. H. Tazieff, the geologist who studied the eruption and whom I was privileged to accompany during some of his investigations, and last but not least to Major van Coole the Conservator of the Parc National Albert, who gave me the necessary permits and the use of comfortable camps "en route."

2. The 1948 eruption

(a) *The beginning of the eruption*

On 29th February 1948 and the next day, the inhabitants of the agglomerations of Goma and Kisenji near Lake Kivu were given warning that something was amiss. Earth tremors were felt; subterranean noises were heard from a westerly direction, heralding the new eruption. During the night of 1st to 2nd March, thunderous explosions followed. Mr. and Mrs. de Munck, who live on the shore of Lake Kivu, a few miles south of the scene of eruption, told me that they were woken up during the small hours of the night by what sounded like an artillery barrage. Frightened natives were making for the hills. The sky was lit up by bright red clouds, while tremendous detonations, almost continuous, could be heard for the rest of the night. Curtains of smoke were passing by (*fig. 1*). The following day report came that a four-mile long fissure, direction N. 120° W., had opened up from three to ten feet wide, in the wooded plain between Niragongo and Nyamlagira, MAP 2, (*fig. 2*). At its eastern end, at an altitude of 1,000 feet above the level of Lake Kivu, a volcanic cone, elliptical E. W. at first, was growing up steadily. It threw up flames and gases, bright orange coloured lava fountains and red hot bombs, some of which were hurled up a thousand feet high. Light scoriæ fell on the surrounding country for about two to three miles. Ashes carried by an easterly wind blew to a distance of about thirty miles west of the new volcano, while very fine dust (I was told by Mr. Tazieff $\frac{1}{2}$ (for microw) in size) was thrown up to a height of several miles, producing a marked halo around the sun.

After a month the elongated main vent near the eastern end of the fissure was replaced by a series of smaller vents in alignment with the fissure. A single cone in this part became the major point of issue of the projections.

In the early days of the eruption, incandescent, ropy dermolithic (pahoehoe) lavas flowed from the cone southwards (*fig. 3, 4*). After nine days the lava crossed the Costermansville-Sake-Goma road at Km. 192, west of the "Lac Vert" (a crater lake), over a front of about 300 feet and forming a chaotic wall ten feet high of clastolithic lava blocks. Mr. Tazieff, who was investigating in the area was nearly trapped with his car in the meandering lava streams. Mr. Tazieff had a narrow escape himself when, with his porters, he had to cut his way out of the heavy bush to avoid being caught up by an advancing lava wall fifty feet high. The car was rescued in time, driven towards the lake and taken away by lighter. These lava streams did not reach Lake Kivu.

* Kituro=cone; Nyefunzi=pygmea name for a waterhole.

† With P Arnal in a chartered Leopard Moth piloted by Capt Fielden of Caspar Air Charters, Nairobi.

PLATE XIX



Fig. 1 (*Photo Vermeesch*)



Fig. 2 (*Photo Tazieff*)

PLATE XX

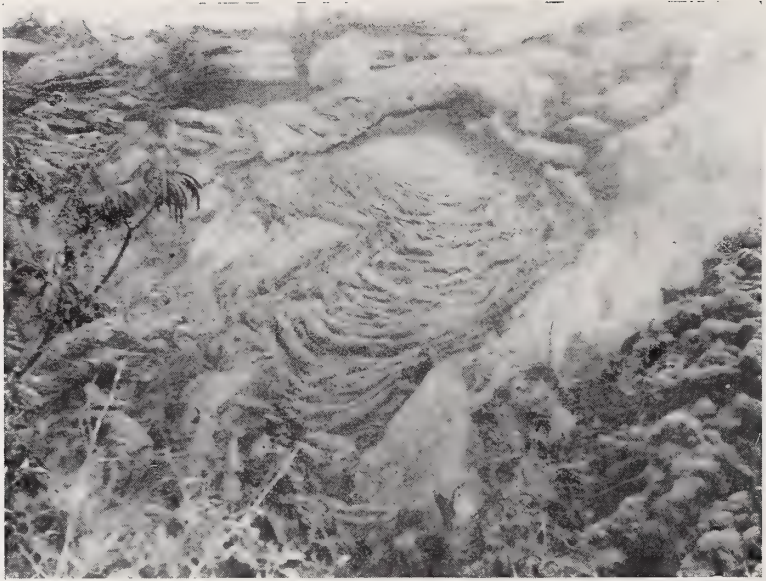


Fig. 3

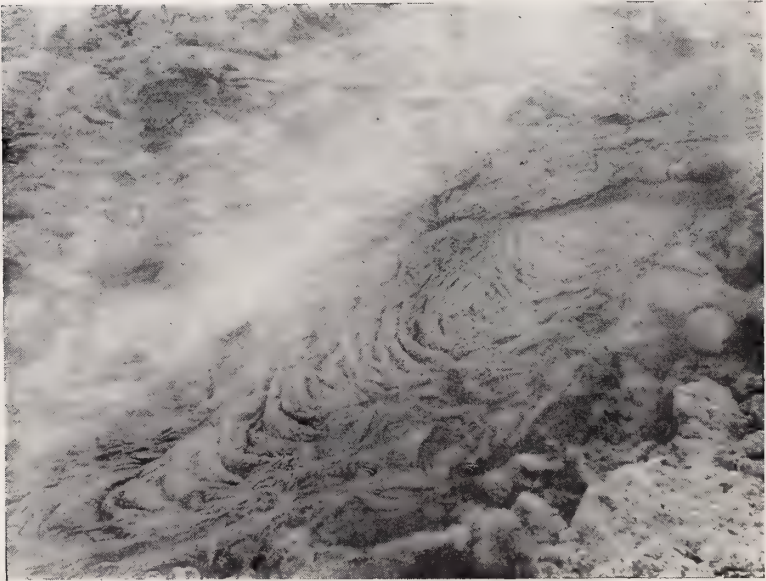


Fig. 4

PLATE XXI



Fig. 5



Fig. 6

PLATE XXII

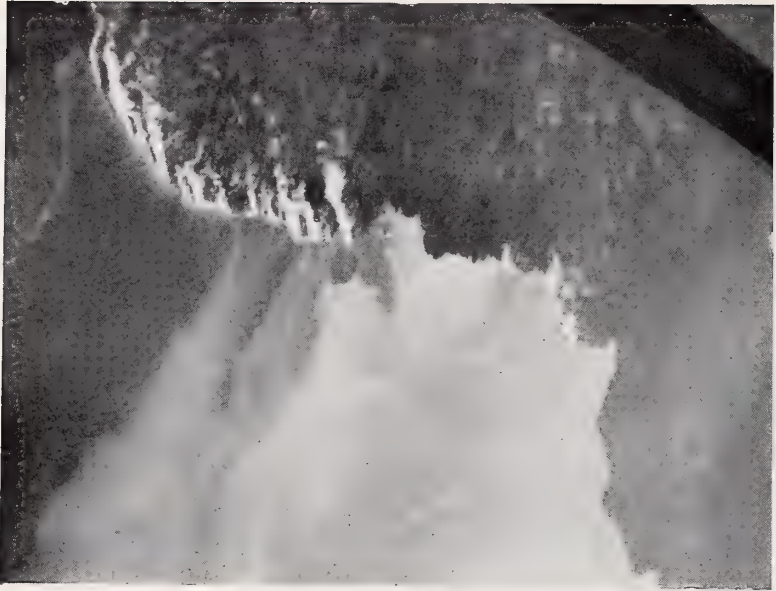


Fig 7



Fig. 8

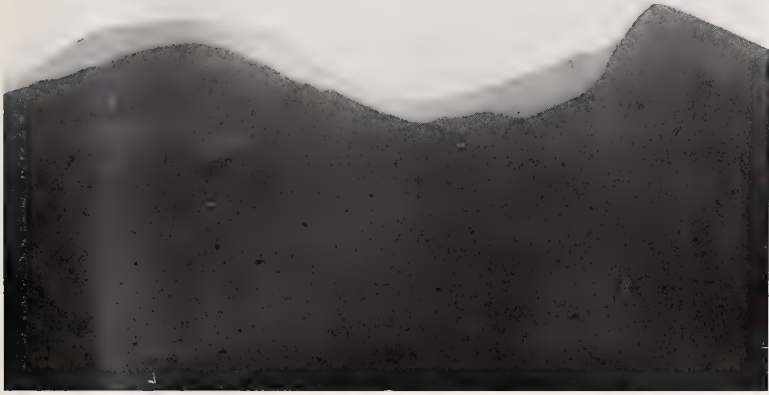


Fig. 9



Fig. 10

PLATE XXIV



Fig. 11 (*Photo Tazieff*)



Fig. 12 (*Photo Tazieff*)



Fig. 13



Fig. 14

PLATE XXVI



Fig. 15



Fig 16

Meanwhile, a second series of lava streams (MAP 3) issuing at the beginning of March from the west end of the great fissure between Shove and the little volcano Rumoka of 1912, flowed in a south-westerly direction, crossed the Costermansville-Sake-Goma road at Km. 185 and reached the bay of Sake in a few hours, travelling at times at the rate of over twelve yards a minute. Swift lava torrents with a temperature of 1,100- C. rushed through the thick jungle, burning everything in their way.

(b) *The conditions in early April 1948*

When I flew over the area on 7th April lava was still pouring into the bay of Sake over a broad front (ab. 3,000 feet). Huge geyser-like columns of steam marked the edge of the lake (*fig. 5, 6*). The waters showed streaks of yellow as well as greenish colourations, due to the sublimation of the gases issuing from the lava while it cooled off. The fissure was marked by several little spattercones in the region of Shove. From six to ten feet high, they were spitting up red coloured lava cakes. The enormous lava fields with their dark red tongues where forest had been before, was indeed a fantastic sight from the air.

When arriving near the volcano (*fig. 7*), the incandescent lava, churning and boiling heavily in its cauldron was clearly seen. Every few seconds, preceded by strong upwellings, gases escaped, throwing up bombs and scoriæ.

The next day, after one hour's walk from the main road along a newly made bush-path, Parc Albert was entered. Soon scoriæ up to two inches in size, thrown up during the first weeks of the eruption, were crunching under the feet. These scoriæ were cold when they had fallen: dark grey in colour, bluish in fresh breaks and were more numerous nearer the volcano. From the observation camp established south-east of Kituro near the edge of the lava field surrounding it, a full view of the new volcano 500 yards distant, about 250 feet high with a base from 800 to 1,000 feet wide, was obtained. (*fig. 8, 9*).

An explosion took place every few seconds with a noise comparable to heavy breakers on a shingle beach. Viscous lava cakes amidst showers of scoriæ and lapilli, after having been hurled through the air, were sometimes seen to alter in shape or break up in mid-air. They fell back together with smaller fragments, partly in the crater or on the outer slopes of the cone mainly to east and north. Volcanic bombs were seen falling and rolling for several dozen yards down the cinder slope, throwing up small dust clouds and leaving a trail behind (*fig. 10*).

Within a few minutes walking distance to the east, the major fissure was reached. It was a few feet wide and extended for about 500 yards in an easterly direction from the volcano. Here and there small streams of ropy lava had flowed out of it. Lava clots lay scattered on both its sides. The most striking feature however, was that where trees had been left standing along the fissure, black cakes of lava were found hanging in the forks and amongst the branches. They give some indication of the force with which the gases had been escaping from the fissure during the initial stages of its formation or shortly after. They must have been flung up in a molten state, but had only partly burnt the outer bark of the trees. Often both ends of these lava cakes, bending towards each other, had been fused together before solidifying. In this area, many trees had been uprooted presumably by the violent escape of gaseous matter from the fissure.

The gaping fissure (*fig. 11*), leading west to the volcano, was followed for about 200 yards. Hot gases were still escaping from it. Coloured sublimates were discernible on its edges, yellow sulphur, red crusts of iron oxide together with white salts were prominent. When the brink of the arena of lava encircling Kituro was reached, an attempt to cross the fantastically shaped lava battleground, to approach nearer to the cone, 200 yards away, was frustrated. The lava, though hardened, was still too hot to be crossed, with fumes and steam emanating from cracks everywhere.

The cone was breached on its eastern and western sides and had been extruding mainly to the north which showed a rounded slope in contrary to the southern flank which was steeper and possessed a ringwall of older debris to its south-east (*fig. 12*).

The rhythm of the explosions that day was not abating. Cherry-coloured lava fountains, hawaiian-strombolian in type, as they passed over the edge of the crater, reached a height of over thirty or forty yards, sometimes solo, often in pairs. The eruption tempo seemed to increase in intensity as the evening was proceeding. The billowing smoke screens, the fireworks, followed closely by the hissing noise, as from crashing trees, were breath-taking to watch.

And so it had been going on, day and night; the eruption was in its fifth week and did not seem to have decreased much, although it had somewhat changed in character.

The huge amount of gas produced during the first three weeks or so, mainly at the eastern end of the fissure, had given way to great masses of lava which from Shove, at the lower western end of the fissure were still pouring out over the plains towards Lake Kivu. The volume of lava had now reached approximately over half a million tons.

On my second visit, a little over three weeks later, the lava was still flowing out near Shove from the western end of the fissure. It was diminishing, however. The spectacular steam columns of April, when the lava was entering the waters of the bay, had much decreased.

The little volcano as seen from the observation camp on 3rd May had not increased much in height, its crater was narrowing as the explosions diminished in strength. Two weeks before, Mr. Tazieff, with some precautions had been able to climb the cone and to take photographs from the crater-edge.

The afternoon of 3rd May, a small party of us, including my eleven-year-old daughter Jocelyne, spent the afternoon on a tour of Kituro to examine it more closely (*fig. 13, 14*). It was rough going at first, where ropy lava had been broken up into chunks and blocks over large areas (*fig. 15*). Bulging or swollen lava crusts, tumuli (schollendome) due to pressure (*fig. 16*) demanded careful walking. Well preserved ropy surfaces were seen before reaching the foot of the cone (*fig. 17, 18*). Fumes and gas emanations were few, occasional cracks showing a red glow two feet below were passed. Nearer the cone the lava bombs, some with extraordinary shapes, were more numerous (*fig. 19-23*).

The scoracious slopes of the cone displayed beautifully coloured sulphur crusts, clustering along fissures and coating wide surfaces.

Proceeding from a westerly direction along the W. E. fissure line, the several minor vents, now dying, were passed. Warm gases still escaped from them slowly. Their inner walls were coated with lava projections which, when still in a semi liquid state, had stuck to their walls. (*fig. 24, 25*). The western breach in the main crater nearby, allowed a quick glance between two explosions of the boiling interior; one photograph and a hasty retreat, as molten scoriæ were flying around. Proceeding to the northern side of the cone, a twenty yards high hornito belonging to a former eruption was examined, Baked quartzites were collected. Lava caves hung with lava stalactites (*fig. 26, 27 and 28*) a dead antelope choked by the gases, its feet burnt, were passed, and camp was reached by nightfall.

For hours we sat outside the tents, watching the display of fireworks from the explosions into the red glowing eruption cloud lit up by the lava. Then Mr. Tazieff and I decided to try and climb the cone at night, to reach the very summit on the South side and secure photographs. After crossing the lavafield at the foot of the cone with much stumbling and nearly losing our way twice, we climbed the cone along its southern flank. The steep slope consisting of loose boulders, lava lumps, then fist-like lava clots, took some time to overcome. Cracks with a red glow were carefully crossed and at the top of the Southern ringwall a halt was called to observe the direction the projectiles above us were taking. The chances seemed good and a final rush along the edge brought us to the top of the cone. We looked directly into the fiery seething mass only a hundred feet distant. The noisy lava fountains seen from this point offered a fantastic sight above description. *Fig. 29, 30*.

Photographs give only a vague idea of what was really happening. A coloured film is more truthful, but even this could not really convey the deafening sounds and the

immensity of the explosions, without some comparative objects in the foreground. We found the ridge too small, the ground too hot, and time too short to achieve this. When at the opposite edge the chilled crust broke off and a small avalanche took place, we realised better that under a thin crust, the material forming the cone under our feet was still red hot.

Explosions followed each other with a few seconds interval. Sometimes the upswellings in the lava pool formed waves battering the sides of the cauldron. Masses of molten lava lumps were thrown up. Some plastered the inside walls, stuck to it or dropped back into the molten mass. Above us, the extraordinary fireworks against the blue smokescreens, the clattering sound from the material falling on to the outside slopes. Totally indescribable, the primeval-shaping-of-things; the labouring-Earth . . . Those who have seen an eruption at close quarters will understand.

(d) *The conditions on and around Nyamlagira between 6th to 9th May 1948*

In the early days of May it was reported that in the region North of Kituro, towards Nyamlagira, a new kind of activity had started in the form of a series of little active vents appearing in the middle of the forested region. I was able to visit Nyamlagira and this region accompanying Mr. Tazieff and Assistant Conservator de Wilde.

Leaving Mushangabo on the 7th of May, we reached that afternoon the camp on the northern flank of Nyamlagira, where Dr. Verhoogen had undertaken his laboratory studies of the 1938-1940 eruption. The following morning at 9 a.m. the caldeira of Nyamlagira was entered via the Western breach. An examination of the caldeira showed no signs of fresh activity. Fumaroles emitting mainly steam were blazing in the central part but no recent alterations could be detected in the elliptical southern depression due to engulfment, which before 1938 contained some lavapools, nor in the 450 feet deep crater in the eastern sector or near the little cone or stack which Dr. Combe regards as a remnant from the top of the old floor, before the collapse. A smell of sulphuretted hydrogen was noticed in the NW. part. The southern fracture, formed in 1938, through which the lava pools were drained, showed no change, apart from fumarolic action in its lower part. A descent was made to Tshambene, the scene of the flank-eruption of 1938-1940. Solfatara were still active in the fissure, but here also and around the spattercones of the 1938 eruption, no signs of recent activity were present. Of the fumarolic activity it is, of course, difficult to ascertain that no alterations have taken place lately as the region was not revisited by geologists since 1940. There is no permanent volcanological survey in existence: this is to be deplored, as with such great objects as Nyamlagira and Niragongo, volcanological data and surprising events of great interest may go by unnoticed.

On 10th May, the plain south of the adventive cone of Rugwete, just south of Nyamlagira was visited. This is the area where a week or so before, the new activity was observed. Mr. de Wilde told us that this region had been recently deserted by elephants. They had crossed the road towards Mikeno in great numbers as was proved when sixty to seventy droppings over a 500 yards stretch of road were found. We passed first a blow-hole about six yards in diameter in old lava covered by forest. It was due to a gas explosion. Blocks of old lava had been projected sideways for a distance of about twenty feet. There was a curious smell suggesting a combination of sulphur and chlorine, but its true origin could not be ascertained.

Several new vents were encountered, where in an old lava field already covered with some vegetation (1938 and pre-1938), volcanic gases were burning. At some places the red hot lava blocks looked like coke fires. At one spot where, during an earlier eruption, a tree stump had left a deep hole after having been burnt out, a flame was blowing with fair pressure to a height of about two or three feet. These mysterious fires appeared also in many places in the middle of the forest. The latter being wet as a result of the rains, the burning gases had not set fire to it yet. Evidence of shifting of these fiery foci was met with at places where the vegetation had been withered recently around the now extinct vents. Curious subterranean noises as dull thuds were occurring in the region

every few minutes. Was it due to the movement of rising magma under the area? Or was it a result of the search for equilibrium from a thrusting gas-head underneath?

From our camp on the Rugwete that night, one had a good view over the surrounding country. Rugwete is about six or seven miles distant from Kituro Nyefunzi, and between the two cones, numerous little gas fires and some steam columns could be seen. They were in a roughly north-south disposition. Light thumps were still noticed throughout the evening. The next morning, it seemed as if the activity had eased somewhat. About half a mile north of Kituro smoke or steam columns were seen. Two days later, Mr. Tazieff on his return to the cone of Kituro saw a new lava stream which had burst forth near the so-called "Hornito," north of the volcano, where only just a week before we had walked over chilled lava streams and solid ground.

(e) *The end of the eruption*

The situation in the middle of May, according to Mr. Tazieff, was as follows:

After the renewed issue of a small lava stream north of the cone of Kituro, about 400 feet long by 100 feet wide, the explosive activity at the crater was a little stronger than on 3rd May. Explosions followed each other at intervals of one to four seconds, the projectiles reaching a height of about 120 feet.

A small lava pool was formed at the foot of the cone at the end of May. Its surface was shivering and boiling. One did not know at first what to expect from it; was it going to burst into lava fountains? It was impressive to watch, until it merely started to overflow. Near this flow five or six spattercones were working in May.

In June the crater of Kituro was narrowing slowly, its interior terrace of efflata was taking on a conical shape. On the southern end of the major fissure, the little spattercones did not show any further activity.

In August, renewed action of burning gases set fire to the forest on the southern flank of Mt. Rugwete. This happened shortly before the ending of the 1948 eruption. At the end of August, the volcanic activity had ceased altogether and fumaroles only remained, belching fumes into the air.

3. PETOGRAPHY OF THE LAVAS OF THE 1948 ERUPTION

A small collection of the 1948 Kivu rocks has been deposited in the Museum of the Geological and Mining Department Nairobi. Thin sections of the following samples have been retained for examination:

- Kivu*
1. Sample from blocklava, first stream which cut the Goma-Sake road early in March 1948.
 - „ 2. Sample from the second (pahoehoe) flow which cut the same road on 13th March 1948.
 - „ 3. Scoriæ from the beginning of the eruption (March), fallen about 1,000 yards east of the cone of Kituro.
 - „ 4. Fragment of lava, beginning of eruption, taken from a tree, near fissure, north of Kituro.
 - „ 5. Lava which had flowed out of the major fissure about 300 yards north of Kituro.
 - „ 6. Bomb fragment Kituro cone, April 1948.
 - „ 7. Id.
 - „ 8. Id.
 - „ 9. Inclusion in bomb Kituro cone, May 1948.
 - „ 10. Id.

Dr. W. Pullfrey, Senior Geologist of the Geological and Mining Department, Nairobi, very kindly offered to undertake the petrographical examination of these rocks.

Their description follows in full, as it will no doubt prove useful for comparison with earlier and future lavas of Kivu as well as other lavas found in East Africa.

Kivu 1. Olivine hyalobasalt. *Texture* porphyritic with dense base (? weathering) with light patches. *Phenocrysts:Plagioclase* platy crystals and clusters, the latter up to 1 mm across. Some crystals zoned. Approximately An_{63} . A small amount of pericline twinning. *Titanaugite* scattered crystals and groups. Occasional crystals up to $\frac{1}{4}$ mm. and occasional clusters up to $1\frac{1}{4}$ mm. across. Some partly enwrap feldspars. Slightly brownish or purplish and feebly pleochroic. $Z\Delta C42^0$. Hour-glass twinning common, and there is occasional poor zoning. *Olivine* much rarer than pyroxene. Colourless. Cf+, 2V large—a magnesian chrysolite. *Matrix:Plagioclase* scattered prisms with indefinite albite twinning Cf. about An_{40} . *Augite* small editions of the phenocrysts. *Olivine* sporadic small grains. *Magnetite* scattered octahedra and grains. *Iron-staining* a considerable amount, and occasional translucent reddish-brown patches. *Glass base* brownish-yellow.

Kivu 2. Olivine hyalobasalt. *Texture* porphyritic, vesicular, glassy base. *Phenocrysts:Plagioclase* platy crystals and groups to 0.7 mm. Occasional pericline twinning and feeble zoning. An_{65} . *Titanaugite* slightly purplish, in well-shaped crystals and groups up to 0.45 mm. Hour-glass twins. Dispersion marked. $Z\Delta C38\frac{1}{2}^0$. *Olivine*. Rare much-embayed crystals up to 0.4 mm. Colourless, +. *Magnetite*. Rare grains. One 0.4 mm. across, encloses a small feldspar. *Matrix:Plagioclase* scattered prisms, Cf. An_{50} . Seriate up to phenocryst size. Also thin platy diamond-shaped crystals up to 0.25 mm. across, often entirely enclosed in the thickness of the slide. *Pyroxene* abundant small crystals resembling the phenocrysts, and seriate in size up to them. *Olivine* colourless ill-defined grains up to 0.15 mm. Occasionally much embayed—one for example is an "atoll" grain with a centre of glass. Occasionally euhedral +. *Magnetite* small octahedra, grains and groups. *Glass base* yellow-brown with numerous crystallites and groups of crystallites. Irregularly cracked. Where weathered much-stained by iron oxides.

Kivu 3. Olivine hyalobasalt. *Texture* highly vesicular. *Phenocrysts:* groups of *Plagioclase* and occasional crystals up to 0.6 mm. About An_{62} . *Titanaugite* slightly purplish, small e.g. 0.2 mm. $Z\Delta C47^0$. *Magnetite* crystals up to 0.2 mm. *Base* light brown glass with crystallites.

A second slide is not so vesicular, but has a stronger development of crystallites. The slide is thick, however, and identification of the crystallites is difficult. This slide also contains one grain of *olivine*.

Kivu 4. Olivine hyalobasalt. *Texture* highly vesicular, porphyritic. *Phenocrysts: Plagioclase*. Mainly synneuses of crystals up to 0.9 mm., but also occasional crystals up to 0.6 mm. An_{65} . *Titanaugite*. Slightly brownish and purplish. Rare groups up to 0.9 mm. across. *Olivine* Rare, up to 0.3 mm. Colourless. Cf. chrysolite. *Magnetite*. Occasional grains up to 0.25 mm. *Matrix:Plagioclase*. Appears to be An_{65} . Some thin diamond-shaped crystals. *Augite* purplish; occasionally stellate groups. *Olivine* small colourless crystals, occasionally sharply idiomorphic. *Magnetite* numerous grains and aggregates. Microlites not identifiable, but ? = feldspar. *Base* pale brown glass.

Kivu. 5. Leucite basanite. *Texture:* porphyritic with microlitic matrix. Rare synneuses of olivine, augite and feldspar. *Phenocrysts-Olivine*. Few. Occasionally large—2 mm. across, large optic angle, negative—suggests somewhat more iron-rich than in the basalts. *Plagioclase*. Groups up to 1 mm. across. An_{72} , i.e., more basic than in basalts. Occasionally has many inclusions. *Titanaugite* slightly purplish light brown. Occasional single crystals up to 0.3 mm., but most is in groups up to 0.6 mm. across. Hour glass twins. $Z\Delta C49^0$. *Leucite* scattered trapezohedra up to 0.15 mm. across. Contains prisms of pyroxene, plagioclase and iron ore—the pyroxenes being sometimes orientated more or less parallel with the faces. Isotropic. *Matrix:Plagioclase* abundant prisms sparsely seriate up to phenocryst size, but most are about 0.1 mm. in length. An_{58} . *Augite* small crystals, some idiomorphic. Colour as phenocrysts. *Olivine* scattered grains, much less common than pyroxenes. Occasionally much resorbed. *Magnetite*. Very abundant grains and octahedra. *Base* doubtful. Probably originally glassy; now ironstained,

Kivu 6. Olivine hyalobasalt. *Texture:* mainly highly vesicular, usually with small round or ovoid vesicles, the largest about 0.6 mm. Porphyritic, with glassy base. *Phenocrysts:* Plagioclase groups and crystals up to 1 mm. An_{59} . Some ophitic towards augite. Some zoned. *Titanaugite.* Rare, up to 0.9 mm. Pale brownish and slightly purplish weakly pleochroic. Also in microphenocrysts up to about 0.3 mm. $ZAc50^{\circ}$. Some hour-glass twinning. *Olivine* rare. Colourless. One is 0.25 mm. across, +, 2V large. One crystal is slender prismatic, 0.3 mm. in length. *Magnetite.* Occasional aggregates of octahedra 0.25 mm. across. *Matrix-Plagioclase.* Small prisms, thin diamond-shaped plates, and microlites. *Augite* prisms and microlites. *Olivine* occasional crystals. *Magnetite* octahedra and grains. *Base* brown glass.

Kivu 7. Olivine hyalobasalt. *Texture:* Highly vesicular, with two size-grades of vesicles—large, e.g., 1.7 mm, and small, 0.15 - 0.45 mm., the latter lying between the larger ones. Porphyritic. *Phenocrysts:* Felspar. Plagioclase groups up to 0.6 mm. across. An_{60} . *Titanaugite* slightly purplish and feebly pleochroic. Largest 1 mm. $ZAc53^{\circ}$. *Olivine* rare, up to 0.3 mm. Prisms and groups. *Magnetite.* Octahedra groups up to 0.15 mm. *Matrix-Felspar* a few prisms and thin diamond-shaped plates of plagioclase. *Augite* abundant prisms and microlites. *Olivine* rare. *Magnetite* abundant grains. *Base* light brown glass.

Kivu 8. Olivine hyalobasalt. *Texture:* highly vesicular with considerable variation of vesicle size. Porphyritic. *Phenocrysts:* Plagioclase. Prisms and occasional groups up to 0.4 mm. An_{65} . Some zoned. Occasional crystals contain many glass inclusions. *Titanaugite* slightly purplish-brown and feebly pleochroic. Prisms e.g. 0.3 mm. length; and groups. $ZAc50^{\circ}$. Some hour glass twinning. *Olivine.* Rare—Cf. some xenocrystic, 0.15 mm. across. Also 0.3 mm. prism. Some corroded. *Magnetite.* Occasional irregular grains up to 0.4 mm. *Matrix:Plagioclase* scattered prisms and thin diamond-shaped plates. *Augite* common prisms and microlites. *Olivine* rare small crystals. *Magnetite* numerous small grains. *Base.* Light brown glass.

Kivu 9. Transfused quartzite xenolith (References (1) A. Holmes. Transfusion of quartz xenoliths in alkali basic and ultrabasic lavas, south-west Uganda. Mineral. Mag. XXIV, 1936, 408-421 (2) A. Holmes. The petrology of the volcanic area of Bufumbria. Mem. III, Pt II, G.S. of Uganda. 1937 pp. 145, 148, 253, etc., (3) H. Kazmitcheff. Contribution à l'étude des Roches éruptives et métamorphiques du Kivu. Mem. Inst. Geol. Univ. Louvain. IX, VII. 1936, pp. 38-39). *Texture* highly vesicular with remnants of quartz. *Glass* colourless, highly vesicular; no crystalline phase; refractive index between 1.48 and 1.49. *Quartz relics.* Single or composite grains showing weak strain shadows. The glass is eating its way into the grains marginally and along junctions and cracks. *Orthoclase* has developed in the interior of glass veins penetrating the quartz, and in patches when reaction has gone on still further and no quartz remains.

Kivu 10. Transfused quartzite xenolith. Generally similar to nine, but (1) contains numerous prismatic grains of colourless tourmaline, which are presumably derived from the quartzite, and are unaffected by the transfusion (2) contains rare zircon crystals (0.05 mm.) also presumably derived from the quartzite. (3) exhibits small portions of the host rock, there being no development of pyroxene at the contact. The refractive index of the glass of the host is considerably greater than that of the inclusion.

This, writes Dr. Pulfrey is a provisional identification in default of a chemical analysis. The slides with quartzite xenoliths indicate that the glass is potash-rich and it is possible that the lavas are in fact of basanitic composition.

What connection do these rocks bear to those of Nyamlagira and Niragongo? Both, these volcanoes started building up in the early part of the Pleistocene. Combe & Simmons 333 p. 120, and consist of rocks which although related, show a striking difference chemically and petrographically.

The lavas of Nyamlagira consist of the more widespread type of medium grained leucite basanites in which porphyritic crystals of Plagioclase, Augite and brownish Olivine

are set in a holocrystalline groundmass. Nyamlagira also produced leucite theralite and blocks from the underlying rocks such as baked shales and quartzites which may represent the rocks of the Karagwe-Ankolean system that occur below the floor of the Rift Valley, Combe & Simmons, 327, p. 117. The K_2O content of the basanites is superior to that of Na_2O .

The lavas of Niragongo differ in that they are mainly: nepheline leucitites, leucite nephelinites, melilite nephelinites, melilite basalts, with a content of Na_2O over K_2O . It is not impossible that a degree of assimilation with englobing calcium-rich rocks has taken place (see C. & S., 317 p. 113, 114).

The eruptions of the last fifty years produced again different types of lavas. Those of the Adolf Friedrich eruption of 1904 were limburgites. Na_2O over K_2O . The eruption threw up also xenolithic quartzites and granites from the underlying formations. Kanamaharage in 1905, yielded black glassy leucite basanites akin to those of Nyamlagira, with volcanic bombs from a fluid magma similar to those of Kituro in 1948. According to Simmons, this rock is a poorly crystallised trachytic leucite with little feldspars, C. & S., 314 p. 112. Rumoka, 1912-13 yielded leucitites. The Nyamlagira flank eruption of 1938 produced leucite basanites. In view of the foregoing, we are inclined to agree with Verhoogen who wrote: "One should hesitate in considering the 1904 and 1912 eruptions as adventive eruptions of Nyamlagira. They came from distinct though temporary volcanoes."

Notwithstanding that the 1948 area of activity was nearer to Niragongo than to Nyamlagira, as the crow flies, and the fissure was directed roughly towards Niragongo, which fact at the time was interpreted by some as if the phenomena were related to this volcano, the character of the lavas issued in 1948, according to the petrographical examination above, are different from those of Niragongo. They differ also from those of the nearby cones of 1904 and 1912. They correspond more to those of Nyamlagira.

The area in which flames from burning gases occurred in May and again in August 1948, North of Kituro, was on roughly South-North lines, directed towards the eastern flank of Nyamlagira. A closer examination of the fault system of the region might give a clearer understanding of the 1948 happenings.

4. CONCLUSION.

The regional tectonics of the eastern Rift Valley north of Lake Kivu are outlined on map 2, after Boutakoff's *fig. 3* p. 26. The Kivu Rift, continuing towards lake Edward in the north, lies between the western Kivu and the eastern Ruanda tilted peneplains of Miocene age.*

The margins of the Rift consist of scarps due to fault fractures along which, in places, parallel to them, run older flexure lines which were precursory to the breach. The occidental fault fracture or "Faille du Mur" NW. of Lake Kivu which Boutakoff, p.30 regards as a rejuvenated fault, although partly hidden under the young volcanics, merges further North into the Lake Edward fault system. Asselberghs considers, p. 305, that the formation of this fault coincided with the rhyolitic phase south of Kivu of the volcano Kahusi, Biega, which followed upon the basaltic sereis from pliocene to middle pleistocene and belongs to the end of the pleistocene.

The lateral Graben or Rift of the Bufumbira, branches off NE. of Lake Kivu in a NNE. direction. Niragongo lies at the intersection of both rifts.

The other Birunga volcanoes are obviously situated on the fracture lines of the northern Rift, Nyamlagira lying exactly west of the "Faille du Mur," Kanamaharage

* I cannot refrain here from mentioning the suggestive figures, 434-435, p. 342, based on experiments undertaken at the Ryksmuseum for Geology and Mineralogy, Leiden, illustrating Leconte, Taber and Cloos's theories on the origin of Rift Valleys, as well as the entire inspiring interpretation on Rift tectonics, chapter XV, part I, p. 339-349 in Prof. B. Escher's *Grondslagen der Algemene Geologie*, 1948.

on the fault opposite, with three of the five eruptions of the last fifty years occurring between a NNW. fracture and the "Faille du Mur." Rumoka lies on their junction.

This short-lived volcanic activity of the lesser volcanoes and frequent tremors in the region point to movements of blocks, which still persists today. The adjacent down-thrown blocks and horsts may offer varying resistance to stresses. The underlying vitreous semi-rigid magma will raise or be squeezed up into zones of weakness. It may form small, individual, short-lived magmabodies in varying localities.

When the upper layers cannot offer further resistance and start yielding a release of pressure in the magma ensues. Gases which were in solution, are allowed to escape (Jagger's hypomagma evolves into pyromagma). This bursts through and an eruption takes place.

The four miles long fissure of 1948, main feature of the eruption, which, incidentally, cuts east-west partly through the southern triangle of the block formed by the Faille du Mur and the NNW fracture, did not show any vertical displacement or slip on its margins. It was a true fissure bulging out slightly and due apparently to thrusting from below. Little or no lavas issued from the central part. This part may have been blocked or sealed up. As already stated, at Shove, on the lower end of the fissure, altitude approximately 5,200, the lavas (2nd stream), were very fluid and gasarm (dermolithic), in contrast to those originating at the higher level, altitude approximately 6,800 (1st stream) which were aphyrothitic, while Kituro still further, provided both lavas, lava-fountaining and gas, the latter being dominant. This may have been due to unequal repartition of gas in the magmabody, due to convection.

It seems according to local reports, that the glow seen in the cloud above Niragongo has not been brighter than usual during the eruption months. The lava-fountaining discovered by Tazieff and Tondeur in June 1948, in its inner crater, may be an unusual feature.

The burning gases and numerous fires situated on north-south fractures between Kituro and the eastern flank of Nyamagira (Rugwete) may be regarded as a corollary of the 1948 eruption. This may have led to a reviving of the Faille du Mur, on which fault-system Nyamagira is situated.

The matter at this stage must remain somewhat conjectural. Precise levelling of this lively part of Kivu, the establishment of benchmarks allowing surveys made at regular intervals, would, as they have done in Hawaii or Japan, reveal trends and amplitudes of eventual block movements in future. In conjunction with these observations, seismographs would supply data on local shocks. A regular study of the fumarolic areas, gas analyses, temperature readings at Nyamagira and Niragongo etc., may lead to a better discerning of the premonitory symptoms of a pending eruption. It may also allow for their prediction, and permit safety measures to be taken in time, in the eventuality of eruptions taking a course different to that we have been accustomed to, in the very short period of our knowledge of the Kivu volcanoes.

5. LITERATURE

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PLATE XXVII

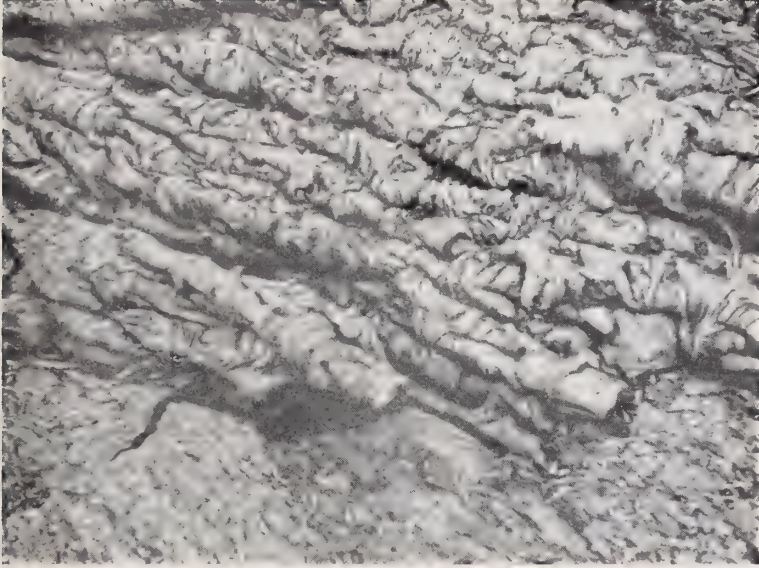


Fig. 17



Fig. 18

PLATE XXVIII



Fig. 19



Fig. 20

PLATE XXIX

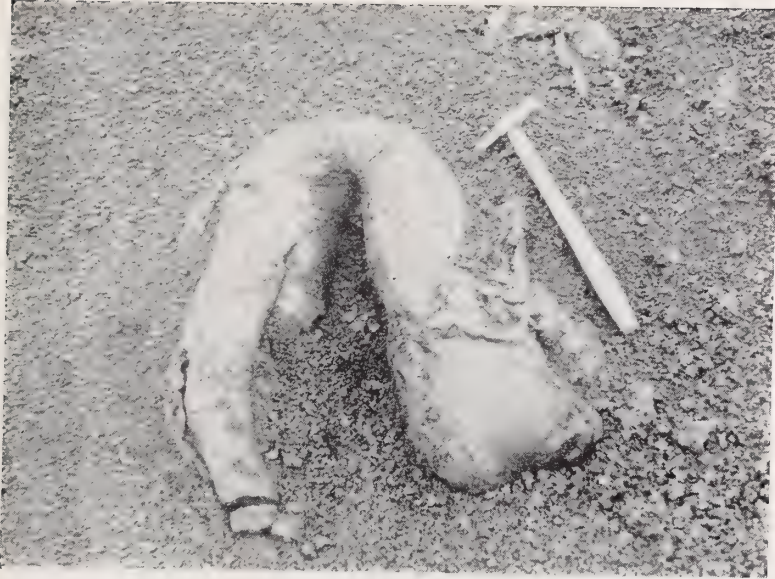


Fig. 21



Fig. 22

PLATE XXX



Fig. 23



Fig 24

PLATE XXXI



Fig 25

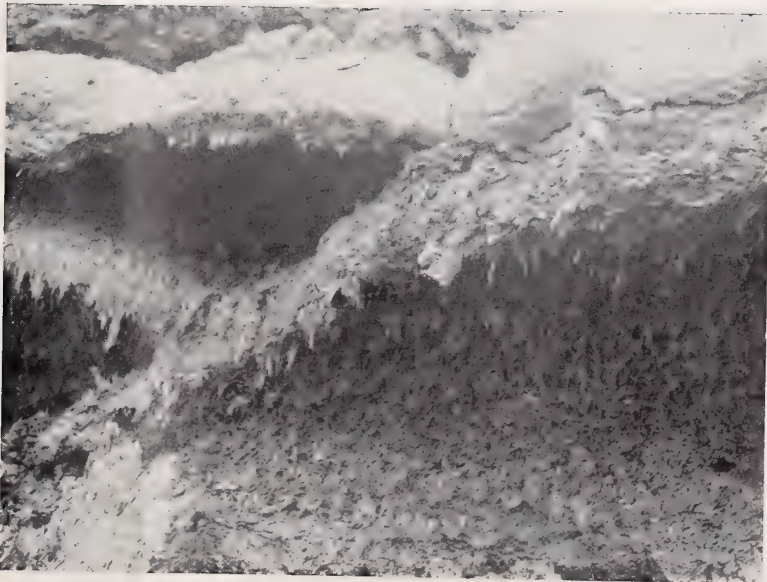


Fig. 26

PLATE XXXII



Fig 27



Fig. 28

PLATE XXXIII



Fig. 29

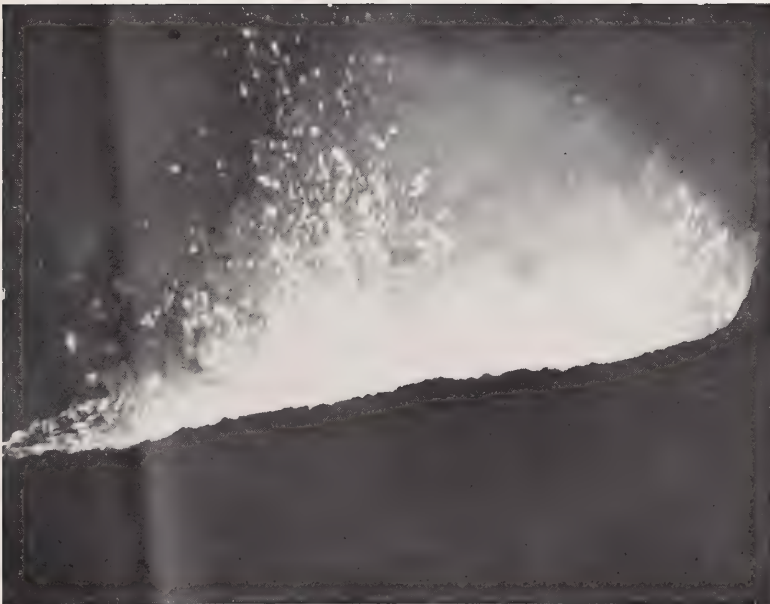


Fig. 30

THE EAST AFRICA NATURAL HISTORY SOCIETY

JAN. 1950

COMPARATIVE STATEMENT 1945 AND 1946

Thirty-sixth Annual Report

269

	1945	1946	To Expenditure	1945	1946
By Balances:					
Anthropological Fund (in P.O. Savings Bank)	1,000.00	1,000.00	Museums Trustees under Agreement	1,000.00	1,000.00
P.O. Savings Bank A/c (accumulated interest)	329.13	362.13	Subscriptions to Institutes	142.70	237.00
Cash at Bank	11,988.14	14,649.56	Publishing Journal and Reprints	10,761.08	5,314.50
Cash and stamps in hand	89.70	62.72	Postages	425.45	820.50
Museum Trustees (under Agreement)	2,000.00	2,000.00	Stationery	72.90	87.50
Subscriptions paid into Bank	10,438.90	10,103.55	Printing—By-laws and Notices	...	474.00
Donations	80.00	...	Miscellaneous items	427.30	184.05
Sales of Reprints and Journals	1,696.05	1,921.35	Bank Charges	39.75	33.10
Books bound for members	275.00	15.00	Refunds on subscriptions	93.50	22.50
Conversazione door takings	418.60	331.60	Purchase of Books and Periodicals	458.30	475.20
Ditto in arrears (1944)	296.20	...	Bookbinders' wages (Italian, later African)	1,212.05	1,541.45
Interest on P.O. Savings Account	33.00	34.00	Salary of Secretary (part time)	...	600.00
Museums Trustees—Donation to publishing <i>Journal</i>	2,000.00	...	Balances:		
			Anthropological Fund	1,000.00	1,000.00
			Interest on Savings Bank A/c	362.13	396.13
			Invested in P.O. Savings Bank	...	10,000.00
			Cash at Bank	14,649.56	8,293.98
			Cash in hand	...	...
			TOTAL	30,644.72	30,479.91
TOTAL	30,644.72	30,479.91			
			BALANCE at Bank on 31st December 1946		Sh. 8,293.98
			Less—Cheques not presented and accounts outstanding		694.00
			NET BALANCE		Sh. 7,599.98

JOHN G. WILLIAMS (Signed)
Hon. Treasurer.

28th February, 1947

EAST AFRICA NATURAL HISTORY SOCIETY

THE THIRTY-SIXTH ANNUAL REPORT OF THE SOCIETY FOR THE YEAR 1946

1. OFFICERS

The following members of the Society served as Office-Bearers during 1946:

R. DAUBNEY, Esq., *President*.
 H. J. ALLEN TURNER, Esq., *Vice-President*.
 Miss V. M. BLOOD
 Mr. J. G. WILLIAMS } *Hon. Treasurers*.
 J. R. HUDSON, Esq., *Hon. Editor*.
 Dr. V. D. VAN SOMEREN, *Hon. Secretary*.
 Mrs. V. PURCHASE, *Hon. Librarian*.
 Dr. L. S. B. LEAKEY.
 Dr. A. JEX-BLAKE.
 Dr. D. G. McINNES.
 F. B. HANNAM, Esq.
 R. W. RAYNER, Esq.
 HUGH COPLEY, Esq.
 A. F. J. GEDYE, Esq.

There were several changes in Committee Membership during the year. In the latter part of the year Mr. Daubney resigned from the Presidency, and under the terms of the Constitution Mr. H. J. Allen Turner acted as President for the remainder of the year. We would like to record our appreciation of Mr. Daubney's services while President of the Society for the last five years, and to wish him success in his new post in Egypt.

The Hon. Secretary was on overseas leave from February to August, and during this period Miss A. Ellis, Dr. L. S. B. Leakey and Mr. A. Gedye successively acted as Hon. Secretary, and the Hon. Secretary is sincerely grateful to all these three for having kept the ever-increasing amount of Society business satisfactorily up-to-date. During this period also by mutual agreement with the Board of Museum Trustees and the Curator of the Museum it was arranged to pay £40 per annum from the Society funds to their Secretary Mrs. Wood, to undertake a large amount of the secretarial work of the Society. Though Mrs. Wood did not serve on the Committee this worked most satisfactorily. The Society is now getting so large a membership and secretarial business so heavy that the appointment of a paid secretarial assistant is almost a necessity to keep up-to-date, and the Committee have felt that the expense is fully justified. Since Mrs. Wood resigned in January 1947, it is hoped that this arrangement may be carried on by Mrs. Wood's successor.

In November Miss Blood resigned from the Treasurership owing to pressure of other duties, and Mr. J. G. Williams was appointed by the Committee in her place. We would like here to pay a warm tribute to the hard work put in for the Society by Miss Blood during the last two years. The Treasurer's duty is not a light one, and it was carried on most capably by Miss Blood, whose advice at Committee meetings was always sound and welcome.

Other members of the Committee—Dr. Leakey, Dr. McInnes, Mr. Copley and Mr. Gedye were also absent for varying periods during the year on overseas leave, but because of the increased membership of the Committee authorised by the new Constitution and approved at the last Annual General Meeting, there was never any difficulty in obtaining a quorum at meetings. Dr. Jex-Blake expressed a wish to resign from the Committee in 1947, and his wise counsels will be greatly missed by other members.

The Executive Committee held thirteen meetings during the year.

2. MEMBERSHIP

At the end of the year, the Society membership stood at the excellent total of 469, this including only those members whose subscriptions were up-to-date.

In spite of the departure of most of the military forces from Nairobi, the number of new members elected during the year was a record, and was made up as follows:

Institute Members, 3; Life Members, 4; Ordinary Members, 121; Junior Members, 5; making a total of 133 new members for the year. Three previous members were elected as Honorary Members, and twelve members resigned on leaving the country. It is pleasing to note that

during the year, another two African Members of the Society were elected and we hope that their increasing interest in scientific and educational matters will encourage more to join later.

To save unnecessary queries and correspondence, we would again point out that members whose subscriptions are in arrears will not receive the *Journal*, nor be allowed free use of the Coryndon Museum and its Library.

3. OBITUARY

The Society records with regret the passing of a well-known nature lover in this Colony—Miss H. B. G. Sutherland, who wrote such charming bird articles to the press under the pseudonym of "Babbler." A letter of sympathy was sent to her family by the Committee on behalf of the Society.

4. FINANCE

A Financial Statement for 1946 has been prepared by the Hon. Treasurer and will be laid before this meeting.

5. CONVERSAZIONE

The 1946 Conversazione held in November was again a most successful function, though attendances and the number of exhibits were smaller than usual. The modern type of Museum exhibit is one which should catch the eye at once and have a certain dramatic appeal which unconsciously educates the observer. We feel that once a year at this function, when sufficient room is created in the Museum for putting up these spacious types of exhibits such as are afforded by the Conversazione, the potential attractions of a Museum can be made really manifest. This Annual Conversazione shows clearly what could be done with a much larger Coryndon Museum in creating a real interest in the natural history assets of this Colony, since the ability to create such arresting displays is lacking neither in Society members nor in Museum staff. A full report appeared in the press and will appear elsewhere in the *Journal*.

6. JOURNAL, PUBLICATIONS AND LIBRARY

The number of the *Journal* which was sent to the press in May 1945 appeared in February 1946, and has been distributed to members. This delay over the local printing has been most exasperating, though every effort was made by the Editor and Committee to expedite matters. As promised at the last Annual General Meeting, arrangements have now been made to have the *Journal* printed in England by Messrs Witherby's and the next number will appear in a few weeks. We think you will agree when you have seen this number that the change has been worth while. It is probable now that the publication of the *Journal* will be much more regular, and that the backlog of articles which has accumulated will soon be brought up-to-date.

Our Hon. Editor of the *Journal*, Mr. Hudson, is retiring in 1947 and we would like to take this opportunity on behalf of the Society to give him our most grateful thanks for all the conscientious hard work he has put in as Editor for the past six years. Due largely to his efforts, the *Journal* now ranks as a leading scientific publication which is accepted by many institutions all over the world—a fact which may not be generally realised by many members of the Society. We wish him a pleasant and happy retirement and all good wishes for the future.

The sale of brochures and articles reprints from the *Journal* has been well-maintained and forms a constant small addition to the Society revenue.

There have been few book additions to the Library in 1946, but a much greater number of exchange publications have been received than during the war, owing to the improvement of communications. During the year tentative arrangements were made with the Museum's Board of Trustees to bring the Library under unified control, but this has not been settled pending further financial arrangements.

The Italian bookbinder employed by the Society was repatriated in August, and an African has been employed for Sh. 67/- a month on bookbinding for the Society with the kind co-operation of the Veterinary Dept., where he works, and his work has been most satisfactory. Our Hon. Librarian, Mrs. Purchase, will also be resigning in 1947 on going on overseas leave, and users of the Library will have noted how very greatly her work has contributed towards the arrangement, labelling of the volumes, and up-to-dateness of the Library in general, which has also been of benefit to the Museum itself since the two libraries are combined. The Society is sincerely grateful to her for all the hard work which has made this possible.

7. OTHER ACTIVITIES.

At the last Annual General Meeting, the Society approved of a syllabus drawn up by the Committee for monthly and series lectures, which were then started on the lines recommended by this

meeting. The series lectures on Archaeology and Insects were well attended, but the four monthly public lectures which were given were extremely poorly supported by Society members and it was felt in fairness to the lecturers, some of whom had gone to considerable trouble and expense to attend, that these meetings should be discontinued. The Committee felt that it could not commit itself to the necessary arrangements for the loan of halls and attendance of lecturers if Society members themselves were not going to support these arrangements made for their benefit.

The Society continued to be active in pressing for an extension of Museum services as being the only form of Kenya War Memorial which would be both permanent, visible, utilitarian and free from all possible racial controversy. The result you all know, that the war Memorial Committee decided that such Museum services would be considered if any funds were still available after a bursary scheme had been fulfilled. We were unsuccessful however in asking that donations could be specially earmarked for this purpose, His Excellency the Governor having advised against this as an unbalanced fund might result.

The Museum continues to be a great attraction and incentive to membership of the Society and we record again our appreciation of the cordial relations between the Museum Trustees and ourselves. During the year well over a thousand visits by members of the Society were made to the Museum, out of a total Museum attendance of 98,102.

In place of the indoor lectures which proved unpopular, the Committee is now organising a series of outdoor Sunday rambles designed to stimulate interest in popular natural history, and announcements will be made about these shortly in the press and over the wireless.

In all, the first complete year of peace saw a welcome and continual progress in the activities of the Society. We have now however a very large membership and we would urge all our members to be more active in letting the Secretary or Committee members know in which direction they wish interest to be stimulated. The Committee are your executive members and all suggestions and criticisms, however trivial they may seem, are always welcome; in particular we would urge all members to make much more use of the *Journal* in publishing their natural history observations, however brief, on birds, plants or any other subject. All such notes are very carefully considered by the Editor and his advisers, then correlated and published if suitable.

Some of your observations may be quite new to science and we especially welcome notes on bird migrants, nests and nesting behaviour, plant flowering, insects and other animals—not curiosity notes, but everyday happenings. The *Journal* should act as a real link between our scattered members and other scientific bodies overseas who rely on us to provide full information about our own part of the world for them.

V. D. VAN SOMEREN,

Hon. Secretary.

East Africa Natural History Society

NOTICE TO CONTRIBUTORS

The Society is prepared to consider articles dealing with Natural History for publication in the Journal. The articles should be concise and should be typed on one side of the paper only.

In accordance with the accepted practice scientific names are printed in italics. These should be underlined in the typescript. Names of new species described in an article when mentioned are printed in bold face. Such names should be underlined with an interrupted line.

It will be appreciated if references to literature are typewritten in the form customary in English scientific periodicals. Each reference to a periodical should begin with the writer's name and the references should be arranged in alphabetical order. The name is followed by the initials and then the year of publication. The name of the journal should be given next in italics, followed by the volume number in bold face and the page in roman. Standard abbreviations for the names of most journals are available and should be adopted when possible.

References to text-books should be similar in form to those for journals; but after the title of the book, volume number and page, the place of publication and publisher's name should be given.

The following examples illustrate these points:

Evans, R. T., 1947. *J. East Africa Nat. Hist. Soc.*, 19, 18.

Jackson, F. J., 1938. *The Birds of Kenya Colony and Uganda Protectorate*, 3, 1261. London. Gurney & Jackson.

In the text, references should be made to the bibliography by giving the author's name and the date in brackets, not by numbers or footnotes.

Illustrations should be in a form suitable for reproduction. The Editor cannot be expected to re-draw. Black and white illustrations should be in Indian ink on Bristol board or thick white paper. If drawn larger than it is intended that they should appear, reproduction is usually better. An indication of the degree of reduction is advisable. Photographs should be printed on glossy paper and should be the size of intended reproduction.

Articles should be submitted to the Secretary, P.O. Box 658, Nairobi, for consideration by the Committee. The Committee reserve the right to reject papers that it considers unsuitable. Authors may be asked to pay part of the cost of making blocks if the number of illustrations is large. The writer of an article is entitled to twenty-five offprints free of charge. Larger numbers can be supplied at cost if ordered when the article is submitted.

BACK NUMBERS OF THE JOURNAL

The Committee is very anxious to obtain various back numbers of the Journal which are either in short supply or out of print. These are required for exchange purposes with scientific institutions or societies overseas, and if any members have back numbers which they would be willing to dispose of in this way, would they please notify the Hon. Secretary, P.O. Box 658, Nairobi. The numbers wanted in particular are:—Nos. 1-7, 9-13, 15, 16, 38/39, 45, 47, Vol. 12 Nos. 3/4, 75/76, 81/82, 83/84.

THE BIRDS OF KENYA AND UGANDA. By V. G. L. van Someren.

THE BUTTERFLIES OF KENYA AND UGANDA. by V. G. L. van Someren
and collaborators

A very limited number of complete sets of these two works are now available, bound in leather and parchment. Prices are as follows:

Birds. Vols. 1. and 2 bound together, Sh. 100/- for the two.

Butterflies. Vols. 1 and 2 bound separately, Sh. 100/- for each volume.

The following popular brochures published by the Society are also available at the uniform price of Sh. 3/- per copy from:

The Coryndon Memorial Museum, Nairobi.

S. J. Moore's Bookshop, Government Road, Nairobi.

The C.M.S. Bookshop, Nairobi.

The East African Standard, Ltd., Delamere Avenue, Nairobi.

A POPULAR GUIDE TO SOME OF THE FISHES OF THE CORAL REEF
By Hugh Copley.

AN INTRODUCTION TO THE EPIPHYTIC ORCHIDS OF EAST AFRICA
By W. M. and R. E. Moreau

SOME COMMON BUTTERFLIES OF THE NAIROBI DISTRICT
By A. J. Wiley and J. R. Hudson

A GUIDE TO THE SNAKES OF THE NAIROBI DISTRICT
By Arthur Loveridge





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