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A POPULAR ACCOUNT OF THE MAMMALS OF BORNEO.

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(Plates XI-XIX).

To write a popular work on Natural History is to earn the toleration of the more scientifically minded whilst to write for them alone is to be labelled "highbrow" by those who would have appreciated it in a more simple form: to write for both will not satisfy either but there is one point here to which neither should object—namely the illustrations. They are taken of captive animals and though they have not the same appeal as wild life photographs will go some way to familiarize residents in Borneo with the Mammals they are likely to meet.

I should here say that the pictures were taken by Mr. C. Jee Koo, for many years Taxidermist to the Sarawak Museum, the trouble and extreme care he has taken being reflected in the excellence of his results.

The visitor to the East not unnaturally hopes to compare what mammals he may see with those of Europe but obtains little satisfaction in this respect. The Anteater and the Sea Cow are unfamiliar to him and he is not likely to encounter any of the Whales which occasionally turn up, though Porpoises and Dolphins are fairly common.

The Deer, a representative of the Indian Sambhur, is a heavy beast of the woodlands with horns seldom exceeding 20 ins in length; the Barking Deer is superficially like a Roebuck and the Mouse Deer have no European counterpart—they resemble a Rabbit or a Hare in their size, colour and white tail but have short ears and long thin, hooved legs. Wild Pigs abound but unlike the European form are particularly noted for their very bristly faces, from whch they get the name "Bearded Pig" the native domestic pig which is not the wild one tamed, is much shorter in the face and leg, often with white "stockings" Water Buffaloes occur in some places, in many cases certainly the descendants of domestic ones run wild; there occurs a small Wild Ox, the "Temadau," a relative of the Javanese "Banting" and Burmese "Tsaine," ever so much smaller of course than the "Seladang" or the Indian "Gaur." The Rhinoceros is perhaps the smallest of its kind, practically never encountered in Sarawak by a European, and the only living Elephants are found in N. Borneo, almost certainly the descendants of a herd let loose, it is said, by the Sultan of Sulu; fossil Elephant teeth have however been recorded in Sarawak. Tapirs in spite of statements to the contrary do not occur in Borneo,

Of Carnivores there are no Tigers or Panthers, the largest cat being a beautiful Clouded Leopard which in Borneo neither troubles Man nor his possessions; quite a number of prettily marked medium size cats occur but on the whole are rather rarely taken. Civet Cats abound, notable for the sharp-pointed face, long tail, unsheathed claws and comparatively small size, which does not make them formidable opponents. A Bear is quite common, rather small and black with a white or yellow marking on the throat. Otters are numerous, not unlike European ones whilst there is a Badger, a Marten and a Stoat each but little resembling their European counterpart and perhaps more rarely encountered. There are no Foxes, Jackals or Wild Dogs in Borneo.

Rabbits and Hares are missing but the usual Porcupine is well to the fore. Squirrels abound both in species and individuals, from some as large as a Rabbit, down to minute little forms no bigger than Mice, including a number which glide from tree to tree. Rats and Mice are common here as everywhere, many of them peculiar to the country.

Insectivores, if one excludes the Tree Shrews as probably lowly Primates, are not characteristic of Borneo, in fact except for a few small and rare Ground-Shrews the only notable Insectivore is the Gymnura or Moon Rat, a beast which has a good deal of affinity with Hedgehogs if one makes allowance for its white, spineless fur and long, scaly tail. The Flying Lemur has drifted into a Sub-Order of its own. Bats are incredibly numerous both in individuals and species, from minute forms up to the huge Flying Foxes spanning some four feet or more.

Of the Primates I have already mentioned the Tree Shrews, perhaps more numerous in species in this country than anywhere else; in fact Primates are so well represented in Borneo that the veteran naturalist A. H. Everett was formerly deputed to seek here for that mythical being, the "Missing Link," in which it was supposed Man and Apes had their common origin. The Slow Loris is the only Lemur found, a small, round, tailless animal with large eyes, the little buff-coloured Tarsier—that strange looking animal with rounded head, enormous eyes and curiously elongated fingers and toes—having been pronounced more of a Monkey than a Lemur. Borneo is rich in Monkeys: besides two Macaques there are five or six Lotongs or Langurs and a large, strange looking, buff-coloured Monkey, the male having a protruberant nose two to three inches long. Of the Apes, the Gibbon is of course common and the Orang Utan, that large red-haired monstrosity so often human in appearance and actions, is quite plentiful in restricted localities.

All Mammals are not distributed evenly throughout Sarawak, some are local, some live in swamps, some on plains, some in secondary growth, some in old jungle and a few on mountain tops so that a consideration of the flora and topography of the country is necessary before a clear understanding can be reached.

To all intents and purposes Sarawak is covered in forest of some sort from end to end, clearings are negligible from a faunistic point of view and we lack even those occasional "lalang" grass covered plains rather characteristic of parts of N. Borneo. Large clearings are made annually by felling and burning the timber but the rice crop is hardly gathered before a secondary growth springs up. There are a few large settlements and a number of small ones with permanent but comparatively inextensive clearings and in widely scattered parts of the country rice planting in open wet fields is carried on to a relatively small scale; it is evident that clearings are so often transitory and always comparatively small that few Mammals, except some Rats, specialize in or become characteristic of such areas.

The deltas of all large rivers and the banks of their lower reaches as far as the tide is effective are covered variously in Mangrove or in "Pedada" trees or in "Nipah" palms, their roots washed by silt and mud quite uninhabited by any Mammals save a few Wild Pigs. In the trees Monkeys swarm, Kras* and to a less extent Broks,* Long Nosed Monkeys, grey and black "Lotong" Monkeys and even Gibbons occur, together with occasional colonies of "Flying Foxes;" all these are also found of course in old jungle and elsewhere and though the "Kra" is typical of a Mangrove, Pedada or Nipah Swamp perhaps the Long Nose Monkey is the only one peculiar to this type of Forest. Part of the coast from Igan to Bintulu is low and the ground very swampy, clothed to some extent in Sago Palms interspersed with various other swamp trees; Mammals are not noticeable here though Deer, Pigs and Bears occur and there are always a few Monkeys and Squirrels strayed into this area: the Long Nosed Monkey is absent from this region which one would have thought eminently suitable to it.

The second growth that springs up in clearings, whether made naturally or artificially, is the next type of vegetation; in the former case it is found chiefly near the sea-shore or on the site of a very occasional forest-fire, in the latter case in old "padi" farms. Huge areas of old jungle have been and still are felled by natives for rice-planting so that in comparatively thickly populated areas such as the Saribas and Kapit one may see for days practically nothing but secondary jungle and this is so to a less extent in some other parts of the country. This secondary type of growth varies a good deal but is mostly rather dense, consisting of sappy, pithy, soft-stemmed shrubs, harder wood only appearing later: it is about seven years before the aborigine thinks fit to fell and burn it to provide enough ash to make the ground fruitful again. Secondary growth is perhaps the densest kind of forest and the field of view is usually limited to only a few yards; owing to the slender nature of the branches arboreal forms though often found

* Macacus Monkeys.

feeding there do not as a rule live in it: " Kras " are the commonest, with grey and black " Lotong " Monkeys, many small Squirrels but not the very large ones. Ruminants are particularly fond of this region, both for feeding and resting, the Wild Ox, the Sambhur Deer, Mouse Deer and to a less extent the Barking Deer all being attracted by the succulent stems and fresh green leaves.

Of the true forest, old jungle proper, there are many variations, for it may occur from sea-level to high up on the mountains. Swampy forest areas depend on the kind of tree, hardwoods being rather more open but as a rule on mountain and plain there is a comparatively small number of enormous tree trunks, a goodly number of lesser saplings and a great many thin " withhies " about the height of one's head and more or less profusely leaved, so that though offering no great obstruction to movement the field of view is comparatively limited. Movement on the ground is still easy but as every tree intermingles with the branches of its neighbour, Squirrels and even Monkeys may move leisurely about without more commotion than would attract the attention of a trained ear; in fact the best time to look for animals is the early morning when most of them feed—the dew or rain is then still heavy on the branches and the slightest movement sends down a shower of drops which could hardly escape the notice of the most unobservant.

The climate of Sarawak is as a whole one of damp heat, the annual rainfall varying from 150—200 inches, mostly falling in the wet season—the "landas "—between September and March, the rest of the year being comparatively fine and dry. A comparison of five years rainfall readings, taken at various lowland Government Stations throughout the country, shows that at all seasons the Baram District and region to the North is rather wetter than the coastal area from Sibu to Bintulu, Kuching and Western Sarawak have the usual dry season but for some reason have a very pronounced wet one and constitute the wettest part of the lowland country in Sarawak.

Much of Sarawak is an extensive plain, sometimes flat and sometimes undulating, remarkable in that scattered about are a number of hills, sometimes Granite, sometimes Limestone, sometimes quite isolated, sometimes more or less continuous for some way, but all within a few hundred ft of 3000 ft. high. The interior of Sarawak bordering on Netherlands India Territory is rather different, nothing but a succession of steep, broken hills some of which culminate in peaks 6 and 7000 ft. high; owing to the hilly nature of these parts one's view from any mountain top is so restricted by the neighbouring hills that (short of using an aeroplane) it is impossible to get a general idea of the lie of this part of the country as a whole and the average map presents a continuous chain of mountains stretching nearly the length of Sarawak, in a N. E. & S. W. direction. Actually there are two or three breaks in the continuity of these mountains, how many

more it is impossible to say, for the hills sometimes give the impression of being interlocking spurs from adjacent mountain masses between which flows a river in its deep gorge, which may or may not eventually break the continuity of the chain.

Starting in the West of Sarawak there are two apparently isolated mountains, Poi and Penrissen, from 4000 ft. to 6000 ft. respectively, probably representing spurs of the neighbouring Bajang Mts. from across the border; to the N. E. separated from Mt. Penrissen by about 50 miles of lowland, rise the Kalinkang Mts. running some 70 miles in this direction and maintaining an average altititude of about 3000 ft. Towards Lobok Antu on the Sarawak side these mountains dip down to sea level and in many places become discontinuous to rise again to the Northward, still very broken, as the Batang Lupar Mts. which still further to the North attain an altitude of about 3000 ft. and appear to run continuously parallel to the Rejang River until they may join up with Mts Bulan and Tibang, peaks some 7000 ft. high, forming the source of this and many other rivers. This and the country immediately further North is the only important part of Sarawak I have not yet visited but there is no doubt about its hilliness and on proceeding into the interior from Lio Matu on the Baram River the Pa Mambo Range some 6000 ft. high is encountered coming up from the S. W and running steadily for perhaps over 100 miles to the N. E. to end in Mt. Murud, nearly 8000 ft. high. This range of mountains is pierced once by a steep, vertical and quite impassable gorge in which runs the Baram River (here known as the Pa Klapang) as it emerges from an extensive plateau some 3--4000 ft. high to the Eastward of these mountains. Mt. Murud appears to mark the end of this range for there is a marked gap at its Northern end, but in the neighbourhood of Batu Lawi * in the Ulu Limbang the mountains again appear in a high unbroken chain steadily running North Eastward into the head waters of the Trusan; at the source of the Trusan River (here the Pa Kelalang) is a fertile valley at an altitude of some 3000 ft where the local Muruts have made irrigated rice fields, and these mountains I have mentioned clearly cut across this valley to form a watershed between the Pa Kelalang on the Sarawak side and the Pa Bawan on the Netherlands India side, in the valley of which the local Muruts have similar irrigated rice fields. By now one is close to the border of the British North Borneo Company's territory, into which the hills appear to run some way; I have no information about this area beyond its general hilliness and this high range of hills must extend well towards Mt. Kinabalu some 13.500 ft. high and not so very far away.

I have gone into the lie of the country in some little detail for it has had a surprising influence on the Fauna. From near Mt. Kinabalu in N. Borneo there appears to run almost continuously

* Mjoberg places Batu Lawi to the S W of Mt Murud.

through most of Sarawak a high range of hills over 3000 ft. passing through the headwaters of the Trusan and Limbang Rivers, crossing the Baram River as the Pa Mambo range, extending further South (recently appropriately named the Nieuwenhuis Mts.) into Mts. Tibang and Bulan. Here I believe there is a split in the mountains, those of the Batang Lupar and Kalinkang Mts. running discontinuously at a lower altitude along the Sarawak-Netherlands India boundary; I have unfortunately not visited this particular neighbourhood but from what maps there are and from general considerations the high mountain range appears to bear more to the South and East into Netherlands India Territory as the Schwaner Mts. along the true left bank of the Kapuas River and however continuous they may be it is impossible either by these mountains or by those on the Sarawak border to link up Mts. Poi and Penrissen with the high Northern chain, for either the broad Kapuas River or long stretches of lowlands effectually intervene.

The significance of this topography is apparent when there is found a meagre but most interesting Fauna (consisting of about six species of Squirrels, two of Rats and two of Tree Shrews) which is found only above 3000 ft. on mountains such as Kinabalu, Murud, Dulit, Penrissen, Poi and possibly others; these Mammals—together with many peculiar species of birds—are to be found only on the tops of the mountains mentioned and nowhere at all on the their lower slopes or on the surrounding or intervening lowlands but in spite of this it is still possible to obtain on Mts. Penrissen and Poi some high altitude Mammals and Birds characteristic of the tops of Mts. Dulit, Murud and Kinabalu, even though there are in many places no land bridges 3000 ft. high in between and the species in question are quite unknown below that level. Nor is this high altitude Fauna uniform, for two Mammals—and a few Birds—on Mts. Penrissen and Poi differ racially from those on Mts. Murud, Dulit and Kinabalu whilst two others at least occur unchanged in spite of their isolation; further, about half this fauna is what one might expect—high altitude representatives of more widely distributed lowland races but the rest of this Fauna, including many species of Birds, has no lowland representative whatsoever. This high altitude Fauna which does not go below 3000 ft. is therefore discontinuous in its distribution, partly representative of lowland races and partly peculiar, as it were but the relic of former more widespread perhaps once lowland species which have been pushed up onto often isolated mountain tops by various agencies and now exist unchanged in but a few favoured localities.

A few Mammals never go above sea-level and a few others, like the Pig and the Deer, occur indifferently on mountain tops and down below; but the main Bornean fauna is found commonly throughout the lowlands and on hills or the lower slopes of mountains up to about 3000 ft. and only more rarely above that altitude. An altitude of about 3000 ft. is therefore of much importance in an

understanding of the local faunas for unbroken series of such mountains, together with broad impassable rivers, have limited the distribution of not a few species.

This main Bornean fauna (excluding Bats) consists of from 90 to 100 species of Mammals but they are not uniformly distributed throughout the country; six species differ racially in the North East from their representatives in the South and West, bearing out what is perhaps more apparent in Birds, wherein some 20 out of 200 show such racial differences. The proportion is not large but there is a uniformity of distribution which points to two very definite faunas, one in the North and East, the other to the South and West, the Baram District in Sarawak and perhaps the Bulungan in Netherlands India Territory representing the transitional areas, wherein (or at any rate the Baram District) North Eastern or South Western races may occur unchanged or as intermediates.

It would be at any rate thin to divide the Bornean lowland Fauna into two on account of some half dozen racial differences in Mammals but fortunately the division is nobly supported not only by more numerous racial differences in Birds but also by the distribution of various other Mammals. In N. Borneo alone there are half a dozen good lowland species which never occur in Sarawak at all and there are some ten others which may be found in the Lawas, Limbang, and even as far South as the Baram Districts but never in Central or Western Sarawak; further there are six other Mammals which are common enough in N. Borneo but exceptionally rare in Sarawak or Western Borneo where they have been taken but once or twice. I cannot however recall a single Central or Western Sarawak species which does not occur in N. Borneo, nor is there one which is even common in the West but rare in the North.

More remarkable still the division of the Mammal Fauna into N. & E. and S. & W. sections is mildly paralleled by the original distribution of some Bornean Natives, for the Iban or Sea Dayak occupies much of the South and West, the Murut and Dusun the North and East, the Kayans and "Kenyahs" the intervening Baram District, a transitional area wherein the other races mentioned (notably the Iban) do not occur, except by recent immigration.

There are therefore several divisions of the Mammalian Fauna of Borneo: most Mammals are common throughout the country on plains, in the hills or on mountains up to about 3000 ft. above which they are not so common; besides this common Fauna there are a few Mammals in the North and East racially different from their representatives in the South and West, a few Mammals found commonly the North and East and either very rarely or often not all in the South and West. Lastly there is a very small Fauna only found on Mountain tops above 3000 ft.

Before passing to a detailed account of Bornean Mammals I must record my obligations to the various agencies which have made this possible; I have freely consulted the works of Blanford, Whitehead, Everett, the late Mr. Oldfield Thomas and the late Dr. Charles Hose, and am particularly indebted to the last for the loan of copious M.S. notes made by A. H. Everett, when he contemplated a work on the Mammals of Borneo. I am further indebted to the authorities of the British Museum, Leiden Museum and Raffles Museum for permission and assistance in examining the relevant specimens and am particularly beholden to Mr. F. N. Chasen of the last institution for frequent advice, assistance and encouragement. To the Government of Sarawak and its administrative officers in outstations I owe a debt for facilities offered and assistance freely rendered whilst last but not least I am personally beholden to Mr. C. Jee Koo for his illustrations.

ORDER I EDENTATA.

(Sloths, Armadillos & Anteaters).

The Edentates comprise a number of usually toothless animals which present such a diversfied appearance and distribution that they give the impression of a number of Families lumped together for convenience.

Extreme forms include the present small South American Sloths and their extinct relatives as big a Rhinoceros, together with the Hairy Anteater and the Armadilloes of the same region In S. Africa there is the large Cape Anteater or Aard Vak, bizarre in appearance, and side by side the Scaly Anteaters found as well in India and Malaya. The scales of the Anteater are not in the least comparable to those of the Armadillo of S. America, in fact most of the superficial resemblances are due to similar feeding habits so that considering the diversity of this Order generally it is not surprising that some enterprising Zoologist has sought to remove these Scaly Anteaters from its midst Similarly it has been suggested that the African and Oriental forms be separated generically, the former lacking any hairs when adult, having a flat, depressed, shovel shaped head and I believe " ventral ribs " supporting its stomach, analogous to those found in certain Reptiles.

Manis (Phatages) javanica Desm. (Plate XI).

THE SCALY ANTEATER; Malay: *Tengiling;* Murut: *Balukun;* Tagal: *Caloni.*

This is a very stoutly built animal up to three feet or more in length covered except on the throat, breast, abdomen and inside of the legs with coarse, yellowish brown scales, serially arranged. The thickset body, broad, powerful tail about half the total length of the animal and the small head with pointed, tapering snout, are prominent features; the tongue is long and thin, the external ear reduced, the eyes small and black, the feet provided with

The Scaly Anteater *(Manis javanica)*

The Smaller Mouse Deer *(Tragulus kanchil hosei).*

strong claws. The appearance of the animal is peculiar, back high arched, head carried low and close to the ground, claws of the fore feet pointing inwards and upwards, for the animal has to walk on the outer, post-axial border of its "hands" as these claws are too long and curved to permit walking on its palms; the down curved tail is carried with the tip just clear of the ground.

The scales are the most peculiar feature and are probably to be regarded as a number of hairs cemented together (somewhat as in a Rhinoceros horn) and are not the same as those of Fish and Reptiles, in fact I believe in the embryo the hairs appear before the scale and the ridges marking the component hairs may be seen on each adult scale, the interspaces between these hairs having in the embryonic stage been filled up with eqidermal tissue.

There are a number of coarse short hairs on the under-surface and some more protruding beyond the scales on the upper and undersides of the tail, more particularly in the posterior region. The scales on the flanks and hind legs are more pointed than those elsewhere and have a well marked median ridge. The scales on the hind legs have their free ends pointing straight down in the general direction of the long axis of the limb but those of the fore-limbs are arranged spirally, pre-axial scales with the free ends pointing backwards and slightly downwards, median ones pointing straight back and post-axial ones pointing backwards and slightly upwards, an arrangement presumably to prevent the free edge of the scale from catching in the soil and offering increased resistance as the animal digs.

It is a most accomplished excavator and elsewhere its burrows may extend as much as eight feet into the ground with a circular dwelling chamber at the end; in Borneo I have never noticed many signs or any marked tendency in captives to go digging, in fact they are most often taken in, and generally make for, trees. The country being forest covered from end to end it is possible that it dos'nt visit the ground much more than to feed and is able to pass from tree to tree. It is of course a most expert climber and will shin up the smoothest tree trunk or post by taking a widespread grip with its forelegs and in one motion bringing its hind legs close up to them, progressing rather in the manner of a "looper" Caterpillar; I have seen it when walking upside down suspending itself solely by its forelegs and, when climbing upright, grip the tree trunk with its hind feet and tail only, the forefeet and it body swaying freely as it investigates its surroundings; in this position it is said to be able to hold itself, to tuck in its head and mimic the broken off end of a dead branch, though I have not observed this. The soles of the hind feet are apposable, as in an aberrant Civet Cat (*Arctictis binturong*) and the tail is of the greatest use to it in climbing; in going up it is laid obliquely across the trunk and the sharp points of the scales on its edges no doubt help to prevent the animal from slipping back, whilst in descending

head foremost the tail is even more prominent, curling round any irregularities and acting as a brake. The tail is furthermore prehensile and specimens may be suspended from a branch by the tail only (a distinction also shared by the " Binturong ") though after between 5 and 10 minutes the weight of the animal is too much for the tail muscles; on the underside of the tip of the tail there is a small bare patch suspected to be sensory. Whilst therefore the Anteater is provided with the usual facilities for digging it has many specializations towards an arboreal mode if life, which may have been readily adopted by it in such a heavily forested country as this: our Anteater is possibly more arboreal and less fossorial than is thought, particularly as true digging animals like Badgers, Porcupines and some Rats are provided with long, tactile whiskers for feeling their way in the dark, such aids being quite absent in the Anteater.

It makes no noise beyond a snuffling in its nose* which organ is so much in use that its sense of smell is probably well developed; its sight is poor, at any rate in the day time, and it will bump into objects it should easily have avoided: according to general accounts it will sit up on its tail and hind legs to take a look round but I have never seen it do so. Its sense of hearing is fair and at the sound of footsteps it puts its head between its forelegs, its hind legs on top of that and the whole is wrapped round by the tail into a scaly ball not to be opened by any ordinary strength. Termites are quoted as its usual food but it also takes various kinds of ants; in captivity it was always too restless to take any notice of the different foods offered and I used to have to let mine go in the garden under supervision for an hour or so morning and evening when it would poke its pointed nose in crevices, under flower pots and round the bases of trees to take a number of ants of various kinds. Other observers found them to feed on chopped raw meat, cooked eggs and rice, unboiled milk and milk puddings.

Nothing but the stoutest box or cage will hold a captive " Tengiling," for if there is a plank started or a bulge anywhere he seems to find it and by dint of partially rolling himself into a ball and then expanding, his own strength together with the grip obtained by his scales is sufficient to enlarge the hole for his escape.

A single young one is born at various times (Museum specimens in February, March (twice) August and October) resembling its parents except that it is light yellowish in colour. Various observers have noted that the young is carried clinging obliquely to the upper surface of its mothers tail and suppose that in time of danger the offspring somehow becomes enclosed in the ball when the tail is wrapped round the curled up animal; there are said to be two pectoral mammae.

* The Burmans fancy it calls just like a man in the jungle but anyone who answers this call is sure to die.

The animal is a lowland species in Sarawak, not occurring above 3000 ft. if as high. Its dried skin is in some demand among Chinese for export to their country as medicine and may often be seen in outstations bazaars; at times it realizes $30 to $40 per pikul, rather less then $2000 worth being exported in some years. The flesh is said to be good eating, white and like veal, but it is not taken in any numbers for food; the Nagas say it must be killed before it curls up into a ball and touches its genital organs with its tongue, when its meat immediately becomes bitter: this superstition may have its origin in the musky smell of the animal, which is said to be so strong as to deter dogs from attacking it. The best Anteater story is common to Borneo and elsewhere: the "Tengiling" having thoroughly disturbed a Termites nest, lies down with all scales expanded and the wretched ants, having got between the scales to attack the supposed corpse, are trapped by the closing down of these scales and the Ant-eater moves off to the nearest pool; having entered the water the Ant-eater opens his scales and licks up the ants as they float about.

ORDER II SIRENIA.

(Sea Cows).

As the name implies, this Order has much to do with the Ungulata, of which the Cow is a typical example; the real position of these animals is however obscure, for they appear to have a number of things anatomical in common with Elephants notably the longitudinal rather than vertical succession of the teeth.

The Manatee of W. Africa and S. America and the Dugong of the East are the only living representatives but fossils have been found in California, some parts of Europe and even in Suffolk. Stellars Sea Cow, an animal inhabiting the Behring Sea and some 25 ft. in length, belonged to this Order but has become extinct in historical times owing to the rapacity of blubber hunters.

Halicore dugong Illig.

Sea Cow. Malay; *Doyong;*

The Sea Cow is entirely marine, a large usually greyish brown animal up to 9 ft. in length in males, with a blunt whiskered head, thick body, small flippers and no hind limbs, the tail bearing two horizontal "flukes." The skin is hairless except in the region of the mouth, which owing to the bend in its jaw bones, opens downwards enabling this heavy, shortnecked animal to browse for its food on the sea bottom; the upper lip is peculiar in that it is cleft and the slit provided with opposing, stiff, blunt bristles not unlike those of a Porcupine, the whole apparatus, together with some scrubbing brush-like stiff bristles in the lower jaw, enabling it to collect its food, marine plants like Zostera or in the Malayan region a Phanerogram known as "Daun Setu" (*Enhalus acaroides*). Its teeth are most remarkable for the molars or grinders are replaced from behind forward as in the Elephant, the youngest teeth being

the posterior ones and the partitions between the various molars slight and porous; as many as five molars may appear, though seldom all at once, and it is even more surprising that whilst these teeth show signs of great wear in coping with gritty matter taken up with food, stomach contents show that the actual leaves are hardly at all bruised by these teeth. Incisor teeth are present, two of which in the upper jaws of males may project a little forward and downward as tusks; they resemble Rodents incisors in being covered front and sides with hard enamel, leaving a chisel shaped edge; their use is uncertain, scarred animals that have been recorded are just as likly to have been wounded in fighting as to have rubbed against coral or rocks on the sea bottom.

Not long ago Dugongs were sufficiently numerous near Tanjong Datu to be worth hunting and were harpooned at night from a boat, in the light of a reflector lamp; they were exceptionally wary and it was recorded that the spear required little or no barb, once the point entered the animal the skin and flesh exerting a grip sufficiently strong to hold the beast. It was said that the length of rope attached to the harpoon should be 40 ft., the length of the animals intestine.

Save for an occasional one in a fish-trap the animals are now no longer molested and Dugongs are I believe plentiful; apparently they rest out in deep water during the day and the broad swathes cut in the sea-grass in shallow water indicate their nightly visits.

The meat is considered second to none for eating, some Malays requiring the animal's throat to be cut, latecomers apparently stoutly asserting that it is a kind of fish.

Wherever the Dugong appears in numbers elsewhere it has been much hunted for profit, a beast of 5 cwt. providing about 10 gallons of an odourless, tasteless oil used as a substitute for cod liver oil; the hide may be used as leather and the meat is said to resemble beef when cooked. The eye is small and may, on capture of the animal, exude a clear mucous resembling tears, which in young animals is much valued as a love potion by Malays.

Sea Cows and Mermaids are synonymous with many people but it is not clear how the idea originated; considering the myth is found in many places far from the haunts of these animals, that the mythical being often lacked a " fish " tail and that the teats of a Dugong are situated under the armpits and not on any raised pectoral swelling resembling the human form, it is hard to see how this story has come about; the appearance in the sea of an ugly, upright, whiskery head about every three to five minutes does not come up to my expectations of a Siren and it seems more likely that Mermaids having already originated, the existing Sirenians were conveniently cited to convince the credulous of the truth of the stories.

As it depends for its food on a rocky, weedy bottom it is not common in all the coast parts of Sarawak, some of which are muddy, where the silt brought down by the rivers prevents marine plant

life; they may occasionally be seen off Tanjong Datu, or Kedurong Pt. and are said to be sometimes taken in the fish traps in the Limbang and Lawas District to the North. Both sight and hearing are said to be very keen and all one usually sees is a whiskery head surmounting an upright pair of shoulders rising out of the water at intervals.

They are usually seen singly but the female is said to be very solicitious both of its young and its mate.

ORDER III CETACEA.

(Whales, Dolphins & Porpoises).

Whales are no less Mammals because they happen to swim in the sea like most Fishes than are Bats who happen to fly in the air with most Birds; numerous anatomical features—of which the suckling of their young is a criterion—prove the Whales to be Mammals but their nearest relatives in this Class are still uncertain. By some it is held that they are anatomically nearest to a hypothetical Pro-Mammalia, something neither Reptilian nor yet quite Mammalian; others going by internal anatomy pick the Edentates—the extinct Sloths and the like—in the free-for-all hunt for cousins to the Cetacea, whilst a more reasonable (superficially) view is to connect them with the Carnivores, the Otter, Seal and Sea Elephant indicating the plasticity of the flesh-eaters towards an aquatic life; a certain amount of fossil material supports this school of thought. Disregarding the Sirenia or Sea Cows—equally cousinless—Whales are most often allied anatomically with the Ungulates, the Deer, Sheep, Oxen tribe and this is supported in an amazing way by blood precipitation tests; Anti-Cetacean serum gives 80% reaction with the Pig, 70% with the Deer but no reaction with Rhinos, Tapirs and Horses nor with the Carnivora.

The Cetacea may be divided into two groups, with and without teeth in an adult state. The latter constitute the " Whale-Bone " Whales, as a matter of fact in an embryo state sporting teeth and even hair; they obtain their food in a characteristic way, for by opening their enormous mouth a large quantity of sea water is enclosed together with a number of minute organisms, the largest being the " Sea Butterflies," flattened, free swimming shell-less Snails: the mouthful of water is then expelled but rows of flexible " balleen " plates, hanging vertically along the edge of the mouth, strain this water causing all extraneous matter to remain behind entangled in the feathery edges and free ends of these plates. These minute particles form the food of the world's largest animals, Whales some 90 ft. long, whose gullet is yet too small for them to accomodate a decent sized Herring.

Of the toothed Whales, the Sperm Whale is the best known on account of its oil, ambergris and general sporting propensities, relying largely for its food on Cuttle Fish, Squids and the like. The Killer Whale is fairly well known, feeding on Fish, Seals and even other Whales, a number of Killers combining to force open the

victims mouth, for even a Whale must drown like any other Mammal if unable to breathe. In this respect all Cetacea must come to the surface at intervals to "blow," that is to expel the used air from their lungs and take in a fresh supply, the "spout" of a Whale being moisture condensed from its breath, together with the sea water in the neighbourhood of its nostrils, being blown up as spray; Porpoises and Dolphins blow so quickly that no spout is noticeable as in the slower Whales.

Lastly come the Porpoises and Dolphins, the latter with a long, projecting, toothed beak, the former with blunt rounded muzzles. Some Dolphins of the genus *Sotalia* are peculiar in that in China and the Amazon they live hundreds of miles up river and possibly never see the sea at all; a similar but estuarine species is found in Borneo.

Dolphins and Porpoises are but little prized by the natives for food or oil.

SUB-ORDER ODONTOCETAE.

(Dolphins, Porpoises, Killer & Sperm Whales).

Delphinus malayanus Less.

THE MALAYAN DOLPHIN.

Not actually recorded from Borneo but doubtless occurring.

Sotalia borneensis Lydekker.

THE WHITE DOLPHIN.

Several of this peculiar Dolphin have been taken at the mouth of the Sarawak River, fine animals some seven feet long with pure white glossy skins marbled with grey spots on the back, a pattern which may have given rise to the illusion of the Spotted Dolphin (*Steno, Delphinus* or even *Sotalia lentiginosus*) in Bornean waters.

This is the only Dolphin apparently recorded from these parts but the Malayan Common Dolphin (*Delphinus malayanus*) no doubt occurs; I believe it is a uniform ashy grey, rather lighter below.

The first specimen was taken by Mr. E. Hose near Tanjong Sipang and they have since been taken a mile or so up the Santubong branch of the Kuching River; they are said by the natives to only come inshore for breeding purposes.

I once (September) observed a shoal of about a dozen near Santubong, the pointed dorsal fin being rather conspicuous, their steel grey warship-like colour and leisurely movements being in striking constrast to the other two species which appear dark and are more lively as a rule.

Orcaella brevirostris Owen.

THE LARGE INDIAN PORPOISE.

This is a large animal up to about 7 ft. of a dark slaty blue, almost black, colour with a very blunt rounded snout; it is often seen in rivers which it ascends with the tide.

We have the skin and skeleton of one from Buntal, distinguished by the small dorsal fin only an inch or more high but sufficient to differentiate it from other local Porpoises.

Phocaena (Neomeris) phocenoides Cuv.

THE SMALL INDIAN PORPOISE; Malay: *Lomba lomba.*

This ranges up to 4 or 5 ft. in length and is black in colour; it may occur in flocks, or often quite solitary and is more or less estuarine or littoral.

Though there is no dorsal fin there is a slight ridge towards the upper side of the tail. This is the commonest species and we have five from the mouths of the Sarawak River.

Orca gladiator Bonnat.

KILLER WHALE.

A specimen of this Whale was cast ashore at Miri and the skeleton preserved in the Sarawak Museum. The animal occurs at wide intervals in the Indian and Pacific Oceans

It is said to have a very long upstanding pointed dorsal fin showing when swimming, whilst the formidable teeth and black and white colour serve to distinguish it.

Physeter macrocephalus L.

THE SPERM WHALE

The hollow tooth of a Sperm Whale was used as a receptacle and as part of a bunch of charms formerly belonging to a Kayan and now in the Sarawak Museum. The origin of this tooth is of course unknown but no doubt obtained in the course of trade and it is not impossible that Sperm Whales occurred in Bornean waters for they have been known in the Straits of Malacca and of course in Japan.

SUB-ORDER MYSTACOCOETI.

(Right, Finner, Hump Back or Rhorqual Whales).

Balaenoptera schlegelii Flower.

FINNER OR RHORQUAL WHALE. Malay: *Ikan Paus.*

This is the Whale most often washed up, though even that is of rare occurrence. A monster 66 ft. long was washed up at Simatan and its skeleton, collected by Mr. Shelford, mounted near the Museum; it is said that six Malays were able to sit within the cavity of its mouth whilst at a later period all the Pigs, Crocodiles and Monitor Lizards for miles around gathered to feed off its stinking flesh. Shelford mentions that it should probably be called *B. musculus* Flower, the appearance of which is not surprising for it is probably conspecific with *B. australia,* such a source of profit in New Zealand waters during former times. Borneo has not been in any way connected with Whaling for though Whalers often passed it on their way to other grounds it was given a wide berth on account of pirates and for other reasons.

This is of course one of the Whale-Bone Whales; the colour is dark grey-blue above, white below, the dorsal fin large and high, the flippers relatively slender and small. From the chin to the middle of the belly are the usual longitudinal furrows, about 50 in number.

ORDER IV UNGULATA.

Many diverse looking Mammals are included in this Order but all are characterized by modification of teeth and stomach to their herbivorous habits. Giraffes, Pigs, Antelopes, Sheep, Goats, Elephants, Rhinoceros, Tapirs, Hippopotamus, Cows, Mouse Deer, Camels and Horses all go in this Order, which lends itself to unlimited sub-division though by no means all of the groups are found in the Oriental Region.

SUB-ORDER PROBOSCIDEA.

Nowadays everyone knows a certain amount about Elephants but as they have only a very local interest in Borneo it is hardly necessary to go into general details here.

Elephas indicus Cuv.

ASIATIC ELEPHANT. Malay: *Gajah*.

Bornean elephants are rather a problem, for whilst those of N. Borneo have most probably been introduced, there is in the Museum here part of a fossil molar tooth of an Indian Elephant taken from a crevice in the limestone near Bau in Upper Sarawak; the specimen consists of four and part of a fifth distal sections of the first of the two premolars in the upper jaw and indicates that Elephants existed sometime ago in parts of Borneo where there are at present no other traces of them. *

No recent information is available about the Elephants of N. Borneo but St. John records them in his well known book as being numerous in the neighbourhood of Cape Usang on the N. E. corner of Borneo, herds of 50 and 100 being mentioned and the tusks running up to 6 ft. in length. Their present distribution is not well defined but they do not come anywhere near Sarawak and have a suspiciously restricted range even in N. Borneo; sections of their tusks are often worn in the Lawas district as bangles and the Dayaks have a poor opinion of the Elephants fighting powers, for it is too clumsy to protect itself from a party of them armed with spears.

The origin of these Elephants is obscure and their first appearance is recorded by Pigafetti, chronicler to Magellan, who on the occasion of a visit to Brunei in 1521 mentions that they were conveyed to the palace on "caparisoned elephants." Hunt visited the Sulu Islands in 1814 and found the elephants there to be neither useful nor ornamental, for whereas they had been formerly used as in Siam for religious purposes, a change in religion had left them

* Another fossil Elephant's tooth seems to have been sent home in 1864, but details are lacking; Gertrude Jacob "Rajah of Sarawak" Vol. II, p. 361.

unemployed, whence they developed into a nuisance. St. John's story is the most usually accepted one, that the E. India Co. (about 1750) presented the Sultan of Sulu with a herd of Elephants (though I don't know where his information came from); it was a tactless thing to present more elephants when they or their memory were already a burden to the Sulu Islands and it is not unreasonable to suppose that the Sultan diverted them to the nearest mainland with a sigh of relief. Their distribution bears this out, for they are confined to a comparatively small strip of N. Borneo in the neighbourhood of these islands; it has been objected that presuming only a few to have been given and let loose at first there is probably not sufficient time for these slow breeding animals to reach their alleged numbers but short of the ill effects of inbreeding one might imagine Borneo to be overrun with several million Elephants, if Darwin's classic estimate of their birth rate be correct. *

Borneo has of course been visited by many outside races, such as Javanese and Hindus, the last of whom may have used Elephants and certainly left behind a number of Elephant Gods—Ganesa—mostly in Dutch Borneo but on one occasion at Limbang in Sarawak. Parvathi is said to have accused Siva of infidelity and assaulted her; Ganesa their son, intervening on behalf of his mother, had his head cut off, whereupon Siva upbraided Parvathi, who called upon soldiers to cut off the head of the first animal they met to replace that of Ganesa: an Elephant was the first encountered and Ganesa was miraculously restored to life with its head.

The races of the Elephant are not very clear but the Malayan form has been separated as *E. m. hirsutus* on account of its general hairiness* and on other characters; similarly the Sumatran one has long been separated as being more slender generally, differing in skeleton and teeth and shape of ear, in longer and thinner trunk, more expanded tip of tail with longer and stronger bristles. How far these races can be upheld remains to be seen but it might be worth while for someone to make a detailed study of the Bornean Elephant to see which of the proposed races it more nearly resembles and in which it presumably has its origin.

Mastodon latidens Clift.

There was brought to Everett from the jungle near Brunei and forwarded to the Secretary of the Zoological Society a tooth assigned to this extinct species of Elephant; the specimen was the crown of the 3rd and last left upper molar, consisting of 5 transverse ridges and a " talon," the whole measuring 6·3 ins. long and 2·95 ins. wide at first ridge. Similar specimens are known from the Siwalik hills, from Burma and from Perim, but they are all a little larger suggesting that the Bornean tooth may belong to a dwarf race; it merges into other species recorded from Mindanao, Sumatra and Malacca.

* A conservative estimate of the offspring of a pair of Elephants attained nineteen million in about 700 years.

* I am informed that this is only a pathological character.

SUB-ORDER PERISSODACTYLA.

In spite of the rather fearsome looking name this sub-order is remarkable for containing Ungulate mammals with an uneven number of Toes and includes the Horses, Rhinos and Tapirs.

Family Equidae.

There are of course no feral horses in Borneo but Ponies of varying degrees of wildness are a prominent feature in some places, though beyond that they occur in many parts of the Archipelago their real origin appears to be uncertain. There are however two main stocks from which domestic horses have sprung, a Northern Mongolian and a Southern Arabian race, the skull of the former showing no trace of the depression corresponding to the pre-orbital tear pits (as found in Deer), the skull of the latter showing some such trace in a varying degree according to its interbreeding: more remarkable still, a slight depression in the skull of the Bornean pony indicates an infusion of Arab blood at some time in its ancestry, a conclusion also supported by the shape of its molar teeth.

Family Tapiridae.

The appearance of the Tapir is familiar to most people from pictures but whilst found in Malaya and Sumatra it is altogether absent from Borneo; another species is found in S. America and fossils have been found in France and Germany, and even in Suffolk.

In spite of repeated statements to the contrary, there has so far been no authentic record of a Bornean Tapir and though natives sometimes assert their presence their stories have so far never held water; a Sadong Malay described in correct detail to Everett the appearance of a Tapir he had killed in Dutch Borneo but the teeth he produced in evidence were those of a Rhinoceros.

Borneo is too well known for such an animal as a Tapir to have so far escaped notice though popular prejudice, both here and at home, is rather in favour of it; older natural histories usually included Borneo in its range and, stimulated by certain N. Bornean stamps, one fully expects to find them on first arriving in the country.

Family Rhinocerotidae.

Judging by the number of fossil forms throughout the world this must have been at one time a large and most successful Family; at present there are but two African and three Asiatic surviving species, one of the last occurring in Borneo.

The Indian form is an immense beast, the Javan one smaller, rather hairy and with one or sometimes no horn, the Sumatran and Bornean one being the smallest and most hairy of all, as well as possessing two horns. All three are distinguished from their African cousins by the presence of incisor teeth in the lower jaw and particularly in the "armour plating" effect caused by folds in the skin, one fold in the neck region, a very marked shoulder crease and a smaller one before the hind leg.

Our Rhinoceros resembles more than anything an enormous pig about 4 ft. high and 8 ft. long, usually quite black but sometimes greyish as in the Javan species and with a lot of stiffish hairs standing out, sometimes all over it but forming tufts on the ears and tail; the skin is very thick, as much as half an inch in some parts and with three well marked folds in neck, shoulder and hind quarters. This Rhinoceros always has two horns and occurs in Sumatra, Malaya, Burma, Assam and Siam and is not to be confused with the single horned Javan Rhinoceros of Java, Sumatra and Malaya; in some females of the latter the horn is I believe occasionally absent but the Sumatran Rhinoceros may be at once distinguished from the Javan one by having only one pair of lower incisor teeth instead of two pairs, a point worth bearing in mind as it is still a little uncertain if both do not occur in Borneo.

Rhinoceros (Ceratorhinus) sumatranus Raffl.

THE SUMATRAN RHINOCEROS. Malay: *Badak*; Iban: *Schimaru*; Murut: *Tembaiungan*; Tagal: *Camansur*; Dusun: *Tampak*.

The Rhinoceros in Borneo is the smallest of all in size and is by no means a prepossessing animal, though as I shall have occasion to mention later it is one of the most popular among the natives. It is usually a solitary, wary and inoffensive beast, though several have at times been recorded together; owing to persecution it has become most retiring and if it suspects men on its trail may leave the neighbourhood for another as much as two or three days distant. It much prefers to run rather than fight though from all accounts can put up a good show when wounded and cornered, curiously enough rushing upon its enemies open mouthed and attempting to bite with its sharp chisel-like incisor teeth rather than using its horn.

It is a browser, feeding on twigs and leaves, knocking down small saplings, making a great noise about its feeding and leaving a broad path of broken trees and trampled undergrowth; it is not particular about what sort of country it inhabits, being found from the tops of mountains down on to the plains though as these are more likely inhabited and cultivated it is much less often found there. They are said be fond of a muddy bath by the river side and I have seen the tracks where they and many pigs wallowed in the hollows of a mountain ridge.

It is hard to give any exact localities but they occur in the mountainous region in the Lawas interior, various places in the far interior of the Baram and Rejang Rivers, occasionally straying as far down as the Ulus of Mukah and Oya but is not found on the left bank of the Rejang or down into Saribas and Sarawak proper. In fact it is a most unsatisfactory animal to look for, there is no very certain locality but it is sure to be a long way from houses so that it requires some trouble to get in its neighbourhood and it may be several days on short rations if one is to follow the animal up to a finish.

Rhinoceros horn is greatly valued by the Chinese for making medicine and commands an immense price; the longest horn in the Museum measures I think 19 ins. but though they are not usually as long as this a dead Rhinoceros may be converted into as much as $2—300. In fact since Dayaks and others no longer take heads and there is a certain amount of safety in penetrating the interior, parties of them in the off-season when their padi farms don't require attention move away for a few months and combine pleasure with profit in Rhinoceros hunting. In many parts frequented by the Rhinoceros there are no settled houses or villages but small bands of natives such as Punans and Ukits roam about living on what they shoot, cultivating no crops, making no permanent houses and of course fully aware of the value of a Rhinoceros. Now there can at the moment be no fear of Rhinoceros becoming scarce for as many as 36 trophies were brought into Belaga in two years not so long ago and I have met men who have claimed to have shot over 30 in the course of their life time, but it must be evident that such a slow breeding animal cannot stand destruction for long at this rate so that the matter will one day have to be attended to. The wandering Punan or Ukit, armed with a blow-pipe and inhabiting the same country as the Rhino has surely every right to shoot if he wants to as his forefathers used to do and anyway it would be impossible to control him in this as it is in many other matters; the Dayak out for a holiday and to make some money as well is probably the chief destroyer, for he owns a breech loading twelve bore with buckshot and is thus much better equipped, though a recent Order which I shall refer to later has deprived him of much of this advantage.

Reserves so successfully made in other countries are impossible to enforce here owing to the remoteness of the animal's haunts, the presence of these wandering tribes and it must be admitted to the inconstant nature of the Rhino itself. In India I believe female Rhinoceros are preserved but it would be just as difficult for a native to follow the rule here as it now is for him to keep within the present Order that no Rhino with a horn of less than 4 ins. may be shot: they are preserved altogether in N. Borneo but it would be a more popular move here, no less effective, to suppress the demand for its horn among the Chinese. Fortunately the Rhinoceros has been helped indirectly in another way for it seems to have been evident that breech loading 12 bores were becoming more numerous in the country than was consistent with safety and in future only muzzle loading guns are to be sold,* the inferiority of the weapon and difficulty of obtaining powder will be in the Rhino's favour, whilst the present cheap American 12 bores cannot be expected to last very long.

There are a few odd points of interest about the animal; it is said to always deposit its excrement in the same spot and natives by patiently watching its "jamban" sometimes shoot a specimen;

* This has most unfortunately not come into force.

other natives deny this and aver that having deposited its excrement in a stream it turns round and eats the stupefied fish that come to the surface. The male organ is most peculiar as it has an indication of the cross-bar or "palang," as artifically inserted by such tribes as the Kayans, Kenyahs and some Dayaks. Rhinoceros are said to snore loudly when asleep and thus sometimes betray themselves to hunters.

Fossil teeth have been recorded from Sarawak from a depth of as much as 60 ft. at Paku in Upper Sarawak, where the animal is of course now unknown alive; it is amusing to recall that the teeth were assigned to *R. sondaicus* and the bones associated with them to the present species, *R. sumatrensis*.

SUB-ORDER ARTIODACTYLA.

(The Even Toed Ungulates).

This is at present the most successful Ungulate group and is distributed all over the world, including all the Cattle, Antelopes, Deer, Pigs and remaining Ruminants.

Group I

Family Suidae.

The Pigs (with the Hippopotamus who hardly concerns us here) are distinguished from the rest of the Artiodactyla by the cusps of their molar teeth, which retain a more or less primitive, conical or pyramidical shape (known as "Bunodont") whilst the cusps of the molars of Sheep, Deer and Oxen are modified into crescentic ridges (known as "Selenodont").

Pigs reach their maximum development in Africa and the East though of course extending into Europe, most of them remarkable for one or more warty protruberances on the face. The origin of domestic Pigs has never been settled though it is more than probable that some "wild" Pigs are strays, which may perhaps account for some of the unexpected "species" that turn up in Borneo and elsewhere.

Sus barbatus barbatus Mull.

The Bearded Pig. Malay: *Babi Utan*; Dayak: *Jani*; Tagal: *Ulak;* Murut: *Basing* (?); Dusun: *Bakass; Ugok* (Domestic); Barawan: *Bikuoi tanah;* Bintulu & Kalabit: *Bakah;* Miri: *San;* Kayan: *Babui*.

The Bearded Pig is found in Sumatra, rarely in the Malay Peninsula and some islands but is very common in Borneo where so far it is the only species really known, though some others have been doubtfully recorded. The British Museum has an undoubted skull of the Javan Wart Hog (*S. verrucosus*), taken by Wallace in the Upper Sadong, but it is possible that Wallace mixed this and others of his specimens as regards localities and the animal has never been taken again; I believe the same skull, which is of course ever so much shorter in the snout than any *barbatus* skull, was later attributed to the Bornean form of *S. celebensis*, a varied

career for a skull which may well have not come from Borneo at all. Another mythical Bornean Pig is *S. longirostris* Nehring, resting on a single specimen killed by Grabowsky near the Kuala Kapuas, very large, dark haired and with *two* wart like skin-folds on the face, supposed to at once differentiate it from other pigs taken at the same time; it has however been since relegated to an ordinary Bearded Pig. *Sus gargantua* is another supposed Pig; the skull some three inches longer than any known *barbatus* skull but there is a good deal of mystery about the animal itself, especially as the only other known specimen is but doubtfully recorded from Java.

Anyone shooting a number of Pigs in different stages of growth might easily think there were several kinds. Very old boars are quite chalky white, even to the tuft of hairs on the movable pair of warts situated on the upper surface of the snout over the tushes; slightly younger specimens are more yellowish and have a darker patch of bristles on the snout by which they may be recognized at a distance. Half grown specimens in which the testes have not descended (they are not very prominent in adults, just a slight swelling with a groove) are like the sows and are quite unlike the adult boars; young boars are usually a dark grey with a whorl of hairs on the snout where the warts are going to appear, this whorl being whitish strongly contrasting with the rather dark black of the muzzle. Sows are a rather lighter grey with a pink nose, black muzzle and a whitish whorl over the short tushes, where the wart does not of course grow to any size; there are a number of whitish hairs on the cheeks and usually a well marked patch on the crown, the long bristles* down the ridged back varying from dark to light yellowish compared with the grey flanks, the whole suggesting to a varying extent a white crown spot and dorsal stripe. The stockings and tail are a darker brown; the iris is white but much duller in young animals.

Sucking pigs appear to be dark brown with three narrow longitudinal yellow ochre stripes along the flanks and traces of fourth and fifth stripes near the elbow joint; striped house piglets are rare in Borneo—in fact I've only seen but one and that had much broader, lighter, whitish yellow stripes not particularly like the wild ones. Both striped and plain ones occur together in domestic litters and it is said in wild ones also. The young are usually born about January and may be seen up to July.

Pigs are subjected to irregular migrations, seeming to follow the fruit when in season so that one year a particular spot may swarm with them but not be troubled again for many years after. The actual individuals are not met in more than twos and threes until it comes to swimming across rivers when there may be anything from 30-300; the aborigines wait all day in favoured spots on the river for "babi sebrang," as they can be caught in the water

* These constitute the Pig's "bristles" of commerce.

and held until a blow on the nose with a stick finishes them off. They swim well but low in the water, just the snout and crown showing and though they don't sink when hit, ones bullets seem to richoet off the water and one might as well wait for them to come to land. In the evenings upriver it is a common sight to see them loafing about on shingle banks before crossing and as a rule they choose a shallowish place where the noise of the running water as a matter of fact enables one to get fairly close to them in a boat; downriver they are said to cross more frequently just after it has rained, though I don't know how much truth there is in this.

Droves of Pigs are a nuisance, in fact are vermin, destroving crops, rooting up roads, in remote parts taking little notice of shots and are said to have been killed with a " parang." Now that heads are no longer taken, Pigs are the main object of a hunt, by no means a tame one for wounded boars may charge home, grunting and chocking their tusks and I knew one man who was upset and killed in such an encounter, accidents to arms and legs being not unusual. They are of course much hunted with dogs which are most clever in circling rounnd the beast at bay and engaging its attention until someone comes up but it is a strenuous and not always successful pastime; except on river banks pigs are most often seen in coastal areas of an early morning as they move up from the sea shore to rest on the mountain sides during the heat of the day: in the jungle itself the aborigine is an adept at hearing pigs some way off, when a cautious approach and a short wait generally gives an apportunity for a shot. Most often one hears two or three farm-yard like grunts which put one on the " qui vive " but are really I believe notes of alarm, for one seldom sees the beast on these occasions. The clicking of their tusks may sometimes be heard as they are feeding. Sows with young may be found feeding at all times for they must have a hard job to keep their family of seven or eight going; they range through any kind of jungle from the beach to mountain tops at 7000 ft. on Mt. Murud, rooting in the ground, tearing open rotten logs, picking up fruit, gnawing roots and consuming any carrion handy, the last a trait taken advantage of by the Dayak: a bit of offal is hung in the jungle until it is " ripe " and the hunter keeps an eye on it of an evening until a pig succumbs to the attraction. They are also very fond of a mud bath in hot weather and seen to use the same place daily which lays them open to a visit from a Dayak. Their greatest enemies are crocodiles and perhaps even more so the Punans, nomad hunters who keep the Pigs on the move by hanging about the rear of a migration, at such times killing immense numbers and eating themselves into a stupor, from which they emerge for a further orgy or hastily to kill another one if the last is finished. The most successful trap was the " blatik," a sharp bambo spike released by the pig into his own flank as he walks

along the path but that is now barred owing to so many human accidents; the "jaring," or row of nooses, is sometimes used and a not unknown r ıse is to leave a gap in the fence round the padi fields—a pit with sharp spikes is sunk just beyond this gap and Pigs often impale themselves in their eagerness.

Except in the open on river banks Pigs are most often encountered in thick jungle and detect the hunter before he is aware of them; the Pig however is a good citizen and warns his neighbours either by a grunt, by "chocking" his tushes or striking them against a tree, producing a definite but often un-pig-like noise: every Pig is then on the alert and the hunter needs to remain quite still even up to two or three minutes for a clear shot, his slightest movement sending the whole lot scurrying away.

The wild pig is not infrequently tamed by the Punans but the domestic house pig is a different species, probably obtained by trade from non-Islamic coastal peoples; wild and house Pigs fight on meeting and wild boars sometimes make a good thing by snapping up a tame litter of young ones. A pig's nest in old jungle or "jerami" consists of a bundle of leaves on which it is said to sleep but it is on the whole a spot to avoid on account of the numerous ticks left behind.

Boars on the whole are heavier than sows though they may both attain maximum weight; some sows in fact may get thin and mangy, even assuming the much longer lower tushes characteristic of the boar; the tushes are longer in the boar, our longest (lower jaw) measuring 8½ ins. along the outside curve whereas those of *Sus cristatus* of India may go up to 10½ ins. or more.

For the benefit of sportsmen I may mention that the Javan Wart Hog (*Sus verrucosus*) has two pairs of warts on its face, one projecting below the eyes and the other above the tushes; it is I believe uniformly coloured in all stages of its growth. *Sus vittatus* also of Java has a collar formed by a white streak running from the face to the sides of the neck, its young having the usual longitudinal body stripes and it would be of immense interest to know if both striped and unstriped piglets do really occur wild in Borneo.

Group II Ruminantia.

Tragulina.

This comprises the Mouse Deer of West Africa and the Oriental Region, hornless and most aberrant little animals in appearance and anatomy. The stomach has only three compartments instead of four as in Deer and they have four toes as in Pigs (only two of which of course reach the ground) but the metacarpals—the shank bones—are fused as in Deer, so that in many characters they are intermediate between these and Pigs.

For the rest they chew the cud like other Ruminants and the males are remarkable for their curved, protruding canine teeth pointing downwards from the upper jaw. Their present distribution is peculiar but further complicated by the existence of fossil forms found in France.

Tragulus kanchil hosei Bonh. (Plate XI).

THE SMALL MOUSE-DEER. Malay: *Pelandok*; Iban: *P. tampin*; Sennah: *P. Pipin*; Dusun: *Belabagan.*

This is the smaller of the two mouse Deer found in Borneo and is about the size of a Rabbit, a warm buffish brown with a darker sometimes almost black back, black nape stripe, the underside white with some buffish markings; on the white throat is a dark brown V shaped marking, the point forward and the two arms sometimes separated there. The face is rather pointed, the ears short, the feet very elongated and furnished each with two small hooves; the tail short and white underneath.

In appearance this and the next species are rather similar, head held rather low, back arched, stern rounded and the little tail not just held down but actually tucked away under the belly when the animal runs along, in fact in ordinary circumstances the white of the underside of the tail is only seen when the animal is relieving itself. They usually sit down stern first, may even assume a truly rabbit-like form and remain sitting on their haunches; they usually squat just like a rabbit, head drawn well in but fore feet tucked under the body as well, it being always a matter of surprise how both Sambhur and Mouse Deer regain their feet and dash off at less than a moments notice from a lying down position, with their long, and one would think breakable legs helplessly tucked away under the body. When walking a Plandok's legs almost seem to twinkle so quickly does step succed step, the whole an example of most exquisite daintiness; the forefeet are bent forward rather markedly at the knee and one foreleg may stiffen and paw the ground when in doubt just as do the Sambhur Deer. They have no particular turn of speed out in the open but in jungle they show a most uncanny faculty of clearing fallen logs in their stride, dodging right or left round small trees, squeezing between fallen branches all without hesitating or checking speed for a moment, a faculty which takes them out of sight in no time and right away from ordinary dogs which would catch them in a few minutes out in the open.

Pelandok are usually found solitary, occasionally in pairs and in inhabited districts are so quite, unobtrusive and wholly nocturnal that they live quite unsuspected, visiting with impunity gardens of houses in the middle of Kuching; they are not very often seen at any time and surprisingly little is known of them. Two things contribute to the undoing of the Pelandok these days, firstly the use of Reflector lamps, for one has only to steal along the river bank in a boat during the earlier hours of the night to see quite a number of Mouse Deer and other animals down for a drink. The other factor is the Dayak snares or " Panjok: " a line of brushwood a couple of feet high extends through the jungle for a hundred yards or so with a gap complete with snare set about every 10 yards: now the Pelandok can jump as high as two or three feet or even climb

a sloping branch but on meeting this line of brushwood it promptly seeks an opening and is caught by the foot. Such Mouse Deer are seldom much use to keep alive as the foot is usually a braded, twisted or even broken; care is needed in taking them out of the snare alive for the males, with a downward and sideways movement of the head, can inflict a bad wound with their sharp canine teeth. Though such a dainty looking animal they are not particularly good to eat, the meat being coarse; they are not difficult to keep in captivity if uninjured and soon become tame, making the most dainty pets. They seem to eat most fruits and readily take bananas though their favourite food is the fruits and particularly the flowers of "Bua simpo;" they also root around in the grass on the lawns and find something they are fond of in the ground. They swim well and drink frequently, seem to feel the heat a good deal and sit panting with the mouth open or even lie on their side instead of squatting; they "chew the cud" just like other Ruminants and appear to have temporary pouches in the cheeks which bulge out when they are feeding on anything large like bananas. They make very little noise, in fact it is only if one bends down close that one can sometimes hear a very faint whistling, bubbling noise going on, almost like a Canary but ever so faint. They are said to communicate with each other by tapping on the ground, I believe with their hind legs, and are sometimes decoyed by someone making a similar sound with a leaf on a stick.

To the Malays the Pelandok takes the place of our Brer Rabbit and at times Reynard the Fox; the stories of his cunning, mostly successful if not always creditable, belong more properly to Peninsular Malays and as they have merely been copied over here, this is perhaps hardly the place to repeat them.

As far as I know the Pelandok only has one young at a time usually about December or January,* the fawn being unspotted at birth and rather brightly marked.

Two forms are said to occur, *hosei* in Baram and to the North, *longipes* in the Kuching area and to the S. W., where they are supposed to have longer hind legs but measurements of our specimens do not so far confirm this.

Tragulus javanicus borneanus Miller.

THE LARGE MOUSE-DEER. Malay: *Pelandok napu*; Iban: *Kamaya Panas*.

This is the larger of the two Bornean Mouse-Deer and is about the size of a small Hare and not unlike it in colour; the back is a light buff colour, sometimes more rufous, sometimes more blackish with a darker patch on the top of the head and nape of the neck. The flanks are usually greyish and the underside more or less white; on the underside of the white throat is a dark brown "V" shaped patch with the point forward, the whole rather irregular in shape, the white inside the V sometimes separating the

* One foetus about 2" long in July.

two arms at their normal point of junction. An almost but not quite constant feature differentiating it from the other species is the suggestion of a second V in front of the first, there being no trace of such a V in its smaller relative; the white of the throat encroaches on the buff of the neck on both sides to give the appearance of an incipient V shaped marking.

As far as I know there is little difference in their habits though the two may be shot together on the same night, as I have seen in the Pelagus Rapids; for some reason this larger form has never been taken round Kuching, though as it occurs in the Sadong district it has no doubt occurred in the neighbouring Sarawak River and not been recorded. *

Something like the Barking Deer, the Large Pelandok prefers hills, high or low, to swamps which perhaps accounts for its absence in many parts such as around Kuching. Seen wild it is the usual dilatory Mouse Deer, walking along "muttering" to itself without being particularly wary; in captivity even after a long time it never became as tame as the other species. A female pursued by dogs took to the sea and was captured; this was on the first of September and having lived amicably with the smaller species a young one was born just before Xmas, like its mother only darker, which gives about 4 months at least as the period of gestation. Both old and young throve without any difficulty.

It is this form I believe which is numbered among the Dayak Omen animals and they set considerable store on its behaviour as an augury, a Pelandok running across the path or calling from right or left may be sufficient to hold up an expedition; Kayans will not eat either species, which are therefore the more common in that part of the country.

C. Pecora.

A marked feature of the Pecora is the possession of paired horns and their nature is much the same in spite of diverse external appearances. There is in the Bovidae (Oxen, Antelopes etc.) a hollow, bony, core sheathed in a hard cornified layer; the last represents a modified epidermis or skin, the former a special bone, the "Os Cornu," which in the young can still be distinguished as separate from the frontal bone. In the Giraffe this "Os Cornu" is covered with the ordinary hairy skin, in the male Okapi the tip just breaks through, whilst in the Deer this bone is covered by a thick and very vascular skin—the "velvet"—which is periodically shed and leaves the spectacle of bony mesoblastic tissue exposed to the air and happily for its owner no longer sensitive. With the exception of Rhinoceros horn (which is but a number of stiff hairs cemented together) all horns consist of a special bony core, the covering of which when present varies from ordinary hairy skin to a temporary blood vascular integument or to a permanent hard cornified layer.

* Since taken on T. Datu.

The Pecora are mostly of a fair size and offer the chief prey of carnivorous animals; for these reasons they have been required to obtain a comparatively large amount of green food in as short a time as consistent with safety and have developed a complicated, four chambered stomach, by means of which they are able to regurgitate the raw food they have swallowed and further masticate it at their leisure—the familiar operation of "chewing the cud."

Family Cervidae.

Represented in Borneo by the Sambhur and the Barking Deer the most salient feature of the Family is the possession of bony uncovered horns on the lines just described. Horns are of course absent in the females and are very variable among the males, no two being quite alike, startling disfigurements occurring as accidents. It is I believe customary to estimate to some extent the age of Red Deer by the number of tines, a point being added for each years growth at any rate up to the animals prime: the Bornean Sambhur normally has but a brow tine and a fork to the beam though I am neither clear as to the intermediate stages nor certain of the time taken to mature, captives being deceptive in this respect.

Barking Deer for some reason often get their horns mixed up either by accident or not infrequently correlated with an internal injury or growth.

Muntiacus muntjac rubidus * Lyon.

Barking Deer; Malay & Iban: *Kijang;* Kayan & Punan: *Telauoh;*

The Bornean Barking Deer is the reddest one there is and has been supposed to occur in two shades, one a bright chestnut with the hind legs even more so and the other (*pleiharicus*) a more uniform light russet colour, often with a trace of a darker stripe down the back; besides skull differences the latter is said to have shorter pedicels and horns and no burr or curl to their tips but these characters are as variable here as elsewhere; chestnut and russet forms have in many places been taken together so that colour and horn differences must be regarded as variations due to age or season.

Barking Deer are very common on mountains and even on quite small hills, seldom if ever having much to do with plains; in some districts their harsh bark—more like the roar of the Bear than the bark of a dog—may be heard at any time of the day, uttered alike by male and female, sometimes even two and three consecutive barks. Many Dayaks and all Kayans and Kenyahs will not eat Kijang, though they will kill it for someone else, whilst many Malay and some Dayak dogs even will not hunt or bark at them, having been thus trained for many years; they are sometimes decoyed by the noise made by blowing into a thin bamboo split lengthways for about 6—8 ins.

* *pleiharicus* as a name has priority, *rubidus* suitability.

Perhaps on account of their immunity Kijang are one of the few notable diurnal animals, being also of course on the move at nights; though visiting cultivation for feeding purposes they are essentially animals of the old jungle and it is not uncommon to find where they have brushed aside the leaves with their forefeet in search of food, leaving a small bare patch on the floor of the jungle. Similarly they clear a larger space under some overhanging leaves on a hillside where they lie up and whilst by no means gregarious it is usual to find them in pairs. To see in the jungle they resemble a very large foxy red "Plandok" or Mouse Deer, the head carried low, back arched, stern very rounded, usual white scut and comparatively rather short hooved legs. The males have small horns mounted on curious bony pedicels which reach as ridges right down the face to the eyes and give the animal a peculiar appearance; the horns are sometimes used in defence but the long canine teeth hanging from the upper jaw of the male are useful, for they are sharp-pointed, curved and bladed, in one case at least having been capable of severely injuring a man's forearm. These teeth are further peculiar in that as they have nothing to rub against they do not have persistently growing roots to replace what is worn away, as do the teeth and tushes of many other animals.

Kijang on the whole take life very easily and move about most leisurely though when pressed they can be very swift and are expert jumpers; they also swim well and are not at all afraid to take to the sea. They have but one young at a time, usually about December or January; the pretty little fawn has two rows of sometimes almost continuous white spots down the back and two or more irregular rows on each flank. Adults are said to pair in January or February, bucks shedding their horns about May and renewing them in August though it is doubtful if the shedding is annual.

The Barking Deer is an omen animal among the Kayans, who prefer to hear it call on the right as they proceed.

Until the necessity arose of finding out about Kijang I knew very little of their habits and then endeavoured to catch one alive in a "jaring," the long row of overlapping snares which Malays suspended in the jungle and against which they endeavoured to drive the Barking Deer. Whilst the nature of the "aris" or thick rotan from which the snares were suspended was of little importance the snares themselves were about 18 ins. in diameter and set with their bottom about 6—8 ins. off the ground, each snare being made of two twisted strands of thin "rotan jangut." The ends were firmly fastened, the rest of the "jaring" only lightly suspended and easily carried away as soon as a noose closed round the Kijang's neck, for the animal struggled violently and broke out if the rotans did not otherwise give way; for this reason it was most necessary that the "jaring" should pass behind any trees or saplings which would otherwise prevent its easy removal. The total length of

the " jaring " was about 100 yards and 10 men driving for an hour or two proved quite sufficient, dogs that would hunt Kijang being by no means essential. A few men stationed themselves some 10 yards or more in front of the " jaring " and by shouting at the Kijang after it had passed them tried to startle the animal straight into the nooses; Kijang when startled put their head down and stern up so that the animal often passed underneath the snares; cut brushwood appropriately laid prevented this and the snares had to be set lower when driving up hill and higher when driving down hill to stop the animal.

Rusa unicolor equinus Cuv.

THE SAMBHUR. Malay: *Rusa;* Various people: *Paiau;* Murut, Tagal & Dusun: *Tembang.*

The Bornean Deer is a big umber brown beast, sometimes almost blackish, ears very large, tail very bushy and antlers quite simple, just a brow tine, no bez or trez but a fork at the end of the beam; there are possibly two species distinguished by the size of these antlers though as one can with care select a series of antlers intermediate in size between the two extremes the two species are not well founded. Usually over most of Sarawak antlers measure 20 ins. or more and about 5 or 6 ins. in circumference just above the brow tine but there occur in the Baram River perfect horns old and worn which scarcely measure 12 ins. to 15 ins. in length and some 3 or 4 ins. in circumference; as noted many tribes there will not have a deer horn in the house but some houses have nothing but these small horns, none of the large sort at all. I have remarked it is just possible to pick out certain aged specimens intermediate in length and thickness and the whole question is very likely complicated by the introduction of the Javan Deer, specially imported into parts of Dutch Borneo for sporting purposes; this Javanese animal (*C. hippelaphus*) is mainly distinguished by the thinness of its horns and one sees pairs of antlers which one might freely attribute to this species if one did not take into account the variability between the two extremes mentioned above. It happens that Hose distinguished a deer from Mt. Dulit as *C. brookei*, stating that the spotted fawn had a deep black chest and tail, the sides and rump a brilliant rufous, a form which Bartlett also recorded from Kuching; it is hardly possible to separate *C. brookei* on the character just recounted but the name might well be applied to the small antlered species if ever considered sufficiently distinct.

Horns are very variable in shape and often have supernumary tines, of which I have seen as many as eight in all on one beam; these extra tines vary in length and position, a sort of palmated antler being sometimes recorded. " Paiau lan " and " P. angu " are sometimes distinguished as large and small varieties by the natives, " Rusa ubi " and " belud " being used in some parts, the latter applying particularly to the short horned species.

23 ins. is the longest Bornean horn, * recorded by Roland Ward whereas they may reach 35 ins. in Ceylon and as much as 50 ins. in India; they only attain about 7 ins. in circumference, which is less than their neighbours. As noted the antlers have a brow tine, no bez or trez and just a simple fork at the end of the beam † differing in this respect from the European Red Deer (*Cervus elaphus*), as well as in colour, structure, absence of light coloured rump patch, long ears and tail and any marked seasonal difference; the Sambhur is not therefore an Eastern representative of the Red Deer, whose place is in India probably taken by the Asiatic Wapiti (*C. cashmiriensis*). It is further most likely that the Sambhur, as in India, does not shed its horns regularly every year, for many pairs of antlers exhibit an amount of wear not easily acquired in a comparatively short time and occasional individuals who have become prominent in some way have been noted with the same horns for considerably over that period. Whilst on the subject of antlers I may mention that no two are exactly alike and many curious aberrations occur more or less valued by the natives as charms; the Kalabits go one better and keep captive deer in low roofed cages to obtain the prized malformations.

Deer are common all over Sarawak though remarkably wary in cultivated districts, where their depredations on young rubber or padi make them little short of vermin; the Kayan country to the North is remarkable, for this tribe will not eat the meat and deer are consequently so numerous that I have heard of as many as twelve being shot in a night. In the Sadong River certain Land Dayaks have a similar " tabu " and deer may occur there in droves of a dozen or more, for there are a number of temporary lakes which in the hot season dry up to leave a level plain of grass on which the Deer love to feed. Deer are usually solitary or in twos or threes and may be hunted with dogs but the more usual practice these days is to go out with a reflector lamp during the night and loose off with buckshot at every pair of eyes that show up; in remote districts deer will come up to examine the lamp but others are much more wary. The jungle being continuous one never shoots at a distance of more than about 25 yards but it is astonishing how Deer will carry on after being badly hit; a Malay of mine once fired at a Deer's head showing round a bush and, having laid his gun aside, was about to cut the fallen animal's throat when the Deer disappeared round the next bush almost as if nothing had happened and was never recovered. It is an inoffensive animal as a rule, though does will defend themselves with their fore-hooves when bayed by dogs and bucks will occasionally use their horns

† There is a 25 inch pair in the Lundu Fort but details are lacking

* Bornean Sambhur are said to differ from Indian ones in that the upper tine never attains the same length as the tip of the main beam but antlers are so variable it would be unwise to place any reliance on this character though it is in the main true.

the dark chocolate brown hairs being irregular, a number of white hairs occurring amongst the brown. Perineum and abdomen dirty white. A pure white patch unconnected with the white of the hind legs appears on the hind quarters, sharply defined anteriorly, not oval in shape but changing direction at an obtuse angled turn: posteriorly and ventrally it shades off into dirty white or chocolate brown, nowhere reaching the root of the tail.* A thin black dorsal stripe is noticeable on the chocolate brown of the rump in front of the white patch. The root of the tail is covered with short brown hairs, becoming longer, coarser and blacker down the tail ending in a tuft just below the hocks, hooves black, ears dark grey, dirty white inside with some long yellowish-white hairs; nose dark greenish; colour of the iris not noted for the eye glazes in less than a minute. Between horns hairless, skin encrusted and dark grey; horns black, dark greyish at base; length measured on outside of curve 16·3 ins. circumference at base 10·4 ins., between tips 5·4 ins.; all these measurements taken on the dry skull some weeks after death.

The animal in question was a full grown bull; the skull had a strong, bony, transverse ridge between the horns, a feature lacking in the cow.

The cow was nowhere as black as the bull except for a dorsal stripe starting about half way down the back and getting thinner posteriorly, not extending onto the tail. The general colour in the region of the withers and underparts (except the abdomen) was dull blackish, chocolate just above the white stockings as in the male; the posterior part lighter, distinctly brownish on the hind-quarters, part of the abdomen, the base and proximal third of the tail being yellowish brown or ochre only about the distal third of the tail black, the whole much more hairy than that of the bull; a white patch astern but not so dead white nor so sharply delineated. Head with short dull brown hairs longer and yellowish brown between the horns The muzzle in this case dark greyish black, iris light sandy yellow with black flecks, the iris glazing and becoming indistinguishable within a minute or so of death.

The cow weighed 600 lbs without entrails, the horns only 10 ins. long, circumference at base 6·5 ins, distance between tips 3·9 ins.

Unlike the Rhinoceros the " Temadau " has no particular value and its meat, at some seasons perhaps, has a most unpleasant taste (like a Rabbit that hasn't been drawn) very slightly evident at all other times, facts which combined with its ferocity when wounded and the light weapons of the natives make it anything but an object for pursuit, wherefore but little is known of its life history. It is mainly dependent on the aborigines, doing a good deal of damage to their "padi" and when that is cleared, feeding on the secondary

* Javan and possibly Malayan ones may lack this patch

growth that springs up, living mainly in the larger growth of some older clearing; unless molested it is therefore little of an old jungle animal and if the natives desert one part of their country it is fairly certain that the " Temadau " will move on in time, as has happened in the Ulu Mukah. This predilection for secondary growth, which the Dayaks call "Temuda," and the Malays "Jerami" or "Blucher," may perhaps account for its name in the former instance.

During the heat of the day they lie up either in thick secondary growth or beside a stream on a wooded hillside, descending about five o'clock in the evening to feed either on the " padi " or the first years " Temuda," of which they are particularly fond. Herds usually number 8 or 10, very occasionally as many as forty or fifty, sometimes only pairs or a solitary one. The bull described descended one evening into a clearing, announcing its coming by calling twice, a short and very nasal " moo " not so deep as a domestic cow; he passed by in the " Temuda " about 10 yards away, all one could see being an immense cloud of flies and occasionally the tip of his tail as he brushed them off. Eventually he put his head round a bush and a .44 Winchester bullet took him near the base of one horn, knocking him off his feet; a Skapan Penghulu, by name Tama Guru, rushed in with a large spear and stabbed the beast on the ground and again as it got up, when it made off tail in air without making a sound, T. G. following hot foot and supplying plenty of the latter commodity. I shot it again through the lungs as it went by and it carried on about 50 yards to a small rise, stopped to have a look round, did a few prances and vanished over the rise, from whence came confused " mooings " followed by a very definite yell from the Penghulu as he found the corpse; to his courage and whole hearted efforts was the securing of the beast due and his remarks on my failure to accompany him in pursuit of the wounded animal don't bear repetition.

I afterwards followed the tracks back up the hillside, up a small stream, past a much trodden resting place under some rocks to a place where he had frequently rubbed against the muddy banks of the stream, disturbing a full grown cow, no doubt his mate: Deer and Pigs abounded in the clearing and neighbouring jungle but there were no tracks in the immediate vicinity of the lair. " Temadau " are much troubled by flies, more obviously so than are Deer, and this may account in part for their bad temper at times; both the Bull and Cow shot had rubbed the underside of the neck against low branches, the skin being bare and corrugated but in no way resembling the bare and often sore patch found on the underside of the neck in Deer.

Shortly afterwards in another district a herd of 8 were found living in some secondary growth and a pack of dogs was used to bay them; beyond a preliminary " moo " the herd made no sound but three times the dogs held them, on each occasion the herd breaking away before we got to them through the thick growth. Even-

tually they divided up in ones and twos, a cow with a full size calf becoming so angered with the dogs that she attacked them, and followed them back to their owners who were standing in an awkward place, enclosed in small bushes and shrubs and tall " Lalang " grass, with narrow runaways between the thickets; the cow was so intent on the dogs that she never noticed the men until she went down under a shower of buckshot, some spears and even a blowpipe dart, all fired at a few yards range. The calf was allowed to escape; it had no horns but was bright reddish brown, brighter than a Barking Deer, the reddish markings of the cow being no doubt the remnants of such a pelage.

Even the Dayaks could not say when the young were born.

The Wild Ox does not occur South of the Balleh in Sarawak as far as is known though being a good swimmer, rivers are no obstacles to it. It is found in the headwaters of most rivers to the North of this and is at first neither wary nor fierce, when encountered undisturbed in sparsely inhabited country; it does not as a rule descend to the sea shore, always a more thickly populated region, but is said to do so in the Niah district where it has some reputation for ferocity and is said to have occasionally killed natives. Near Merapok in the Lawas district are included some of the " Lalang " covered plains more characteristic of N. Borneo, the hollows of which are filled with a secondary growth sometimes used by the " Temadau " to lie up in during the day and from whence it issues forth at dusk, to the dismay of anyone who happens to meet it.

They must move about a bit but are found in the Ulu Trusan, sometimes in the Limbang, at various places in the Baram, above Tubau in the Ulu Bintulu, at Belaga and down to the head of the Pelagus Rapids but not at present into the neighbouring Mukah and Oya Rivers.

Not very much has been written of *Bos sondaicus* but it is found in Borneo and Java; its occurrence in Sumatra was once suspected but is now definitely denied and it has recently been shown to inhabit the Northern end of the Malay Peninsula. In Siam, Burma and Assam it is well known as the " Tsaine " which is a bigger more variable animal than ours; the bulls are seldom black but may be Khaki coloured, blue grey, copper beech or even with white spots, forms not found here—the cows are more like ours, light chestnut. The horns sometimes have a wide spread (not found here) recalling those of the Buffalo (*Bos bubalus*) but all sorts are found. The " Tsaine " may go up mountains to 2000 ft. or more but is usually a lowland animal, mixing to a certain extent with Seladang (*Bos gaurus*), the herds separating on being alarmed; Seladang are of course not found in Borneo and are elsewhere distinguished by lacking the white rump patch. " Tsaine " occasionally attack unprovoked and often fight each other; solitary bulls move fast when feeding and may lie down in the middle of the morning to watch their back tracks, which causes them to be regarded by

some as the most dangerous of Asiatic game to hunt.* Solitary bulls are generally regarded as outcasts but it is more likely they rejoin the herd at intervals and go off with one cow. Calves, possibly twins occasionally, are said to take about 10 months gestation, pairing taking place about June or July and the Births about March or April.

The "Tsaine" stands just over 6 ft. at the shoulder and its record horns from Upper Burma measure 33½ ins. along the outside curve; 21½ ins. is the longest I know of from Borneo and the Gaur or Seladang is a much longer horned animal up, to 40 ins. or more.

On the islands of Bali and Madura this otherwise fierce animal is kept tame, looking something like the wild form and is imported into Singapore for beef; the Kalabits of Central Borneo and others obtain these cattle from Dutch Borneo and keep herds of them round their houses, often at an elevation of over 3000 ft. The cows very much resemble Guernseys, yellow ochre with a dark brown line starting about half way down the back and reaching to the tail; they are lighter than the wild Bornean cows, the rump patch is almost absent or very ill defined, as are the white stockings: the calves are just like the mother, yellow ochre with a dark brown line down the back and Bornean calves appear to be much the same from all accounts. Kalabit bulls are often almost black with a buff coloured face and no white rump patch but they frequently have a fair sized hump indicating a cross with Indian cattle at one time. The horns are short, straight and don't curl in the bull but are more slender, slightly curled at the tip and spread sideways in the cow which therefore differs markedly from the wild Bornean cow which has thick straight upstanding almost goatlike horns.

Bos bubalus Linn.

WATER BUFFALO; Malay: *Kerbau.*

The wild ones differ in no way from the tame ones, big, slate grey beasts with thickset, barrel-shaped bodies and ungainly legs; the ears and tip of the tail are well tufted and the general appearance indicates their origin at once.

The Buffalo is found wild in various places in Sarawak notably at Baram Point and at Tanjong Sirik, though it has occurred at other localities such as the Ulu Mukah; like the "Temadau" it prefers the secondary growth that springs up in abandoned clearings. Water Buffaloes are fairly tame in this country but whether the feral ones are domestic ones run wild or the latter originally tame editions of the former (many have since been

* In Sarawak the "Temadau" is not particularly dangerous and even a cow with its calf or a wounded bull will nearly always prefer to run so that in the ordinary way they are a distinctly peaceful animal, if wounded and further molested they do definitely become aggressive constituting a very real danger but unless one goes looking for trouble the Temadau is not in the least likely to molest one.

imported) is not certain; from the restricted localities and the occasional domestic ones which take to the wild it is more likely that there were no indigenous buffaloes in Borneo. It is I believe uncertain if the Malayan ones are truly indigenous or just tame ones taken to the wild.

The horns are smaller in the female but I believe they are dimorphic elsewhere, some having the ordinary curved horns and some particularly wide spreading ones with a curl just at the tip.

A small and comparatively dark specimen from Baram Mouth is mounted in the British Museum as *B. b. hasei* but there seems to be no doubt that those at present to be found at Kuala Baram differ in no way from the tame ones from which they have descended. The Kalabits in the Ulu Baram keep large numbers of domesticated Water Buffaloes, some houses, such as Dalam Bah, must have nearly a hundred—which they obtain from Dutch Borneo and use for sacrificial purposes when someone dies; the Buffalo is essentially an animal of the secondary growth and it often happens that when the Kalabits move their house some distance to a patch of jungle, the Kerbau stay behind in the secondary growth of the old padi farms and eventually become quite wild. They differ in no way from the domestic ones but, as they are rather numerous, exert considerable influence on the country, keeping up open spaces and paths, cropping the grass and browsing on the leaves of the secondary growth which doesn't have so much chance to grow up and eventually develops into a park-like type of country not unlike the Buffalo "padangs" to be seen round many outstations. In some places they have produced a curious effect like a railway track with the sleepers taken up, for by walking along a path and each one putting his feet in the same place as his predecessor they have produced a most regular ridge and hollow arrangement across the paths they frequent.

ORDER V RODENTIA.

Gnawing Mammals.

Squirrels, Rats and Mice, Porcupines, Beavers, Rabbits and Hares.

The Rodents are distinguished at once by the two pairs of enormous front teeth, probably most developed in Beavers who are able to fell trees with them. Borneo is full of Squirrels, as may be seen in the accompanying table which however omits the Flying Squirrels since they may easily be recognized; Rats and Mice are also very numerous but so variable and uncertain that their identification is by no means easy: three Porcupines exist but of course no Beavers or Rabbits.

Some Squirrels run about in the branches, some on the ground, others glide from trunk to trunk, the size of the animal varying almost from as large as a Rabbit down to minute Mouse-like forms. Some Rats are also particularly large but the Spiny Rats are perhaps the most peculiar for many of the hairs have for some reason become

stiff and sharp-pointed very like the short flattened quills of one of the Porcupines (*Trichys lipura*), towards which they may represent a stage in development.

Actually Squirrels are the most interesting Rodents; the largest is a very bushy tailed animal with tufts of hair on its ears, a beast peculiar to Borneo, whilst the common Giant Squirrel (*Ratufa*) is nearly as large as a Rabbit. There are several medium size Squirrels, Prevost's Squirrel being the most notable, for it is divisible into half a dozen races and no two specimens are absolutely the same in colour; smaller Squirrels are numerous, the common little Coco-nut Squirrel together with a number of short tailed ground living forms. Finally one comes to the Pygmy Squirrels, amusing perky little animals no bigger than a Mouse but presenting all the Squirrel characteristics; somewhat different are the tiny Flying Squirrels also with medium and full size representatives.

Mr. Oldfield Thomas has made an interesting point in regard to the Pygmy Squirrels of the Sub-family Nannosciurinae; W. Africa and Malaysia present a few Mammalian resemblances and there occurs in the former a little Squirrel (*Myiosciurus*) apparently belonging to this Sub-family so characteristic of the latter region. America is full of Squirrels of the Sub-family Sciurinae, some of which such as *Microsciurus*, resemble the Pygmy Squirrels in appearance though belonging to the other Sub-family; in Guiana there appears to be a little Squirrel *Myiosciurus* actually belonging to the Sub-family Nannosciurinae rather than the prevalent Sciurinae, so that the true Pygmy Squirrels would appear to be found in Malaysia, W. Africa and Guiana.

This sub-family is unknown in the Malay Peninsula, but has representatives in Sumatra and the Philippines and in the Sulu Archipelago.

Hystrix mulleri Jentink.

PORCUPINE. Iban: *Landak dudul;* Kayan: *Kalong;* Tagal. *Kramok;* Murut: *Tautong*, *Lisis*, Dusun: *Garit;* Bajau: *Utun;* Selakau Dayak: *Penatam*, Sennah Dayak: *Bedah.*

The fore part of the animal is covered with stiff, slightly grooved, blackish bristles, the rear half with long thick quills white in the young and slightly yellower in the adults; in all cases with a black band about ½ in. long on each quill, rather nearer the extremity than the base. The tail is very short and has a rattle consisting of a number of short quills each converted into a hollow cylinder on the end of a stalk, the noise made by rattling these together serving as a warning; some of these cylinders have the pointed tips broken off irrespective of the age of the animal. The nuchal crest is white tipped, short haired, not long as in the European species; here and there all over the body are long, thin, supple, hair-like bristles about twice as long as the quills. The whiskers are very long, black in the young, some of them white in the adult, reaching back a long way behind the ear.

The feet are very short, plantigrade, armed with short stout claws in the young, the toes very wide spread on the forefeet; they can of course dig well and, if it were not for the quills, the hump behind the shoulders would be quite conspicuous, as in the Anteater. They live under fallen trees and between rocks as a rule but no doubt help to excavate their own earths. The head is very blunt, the incisor teeth large and capable of giving a sharp nip or gnawing a way out of most places; they eat almost anything, even poisonous "tuba" roots, holding their food if small (such as monkey nuts) between the soles of their feet but if larger between their feet and the ground, food though often carried in the mouth being always held down to be eaten. They seem to be poor climbers, at least I have never seen them make any attempt to do so.

Loose quills are often found lying about in the jungle and one is often told Porcupines are capable of projecting their quills at will against an enemy, a physically impossible feat, whatever natives may say; as a rule "Porky" runs away at first in a swift jerky gait, suddenly stops and runs backwards or sideways into its pursuer, the sudden change of direction being most disconcerting. They can sometimes be hunted with dogs who soon learn to go for the unprotected head, for the Porcupine cannot roll itself into a ball like a Hedgehog and is soon killed; though they look so clumsy they have a most surprising turn of speed which would usually carry them safely to their burrows were it not that they very easily get confused when pursued. In other countries they are eaten by Tigers and Leopards but take little notice of each other's quills—there is also a story, for which there is some justification, that once the quills stick well into an enemy they go on working into the body and may some days after cause the recipients death. They are noisy animals particularly at night, the alarm being a series of chuckles with an occasional grunt and a couple of stamps of the hind feet on the ground; they also squeal when hurt. Water is often drunk and they swim well, rather low with just the head out of water. The rattle on the end of the tail is a great feature and is in constant use as a warning; the tail can be cocked up straight in the air at right angles to the body. Though sociable and gregarious, too many cannot live together, a pair that I had spending their time nibbling all the bristles off the front and hind legs of a third without breaking the pink skin; the skin is as thin and delicate as tissue paper, making them very hard to prepare and set up.

They live for a long time in captivity, get quite tame and knowing. "pedada" leaves and the bark of the branches being a great delicacy. Most of the day they lie up, only coming out about 5 o'clock in the evening; mine would also eat almost any refuse, but would not eat a dead "Flying Fox" though they consumed a Flying Lemur (*Galeopterus*).

A captive female had noticeably shorter and more stubby quills on its rump than its mate for I found he used to nibble off the

points of the quills, apparently to facilitate coition. The teats in the female are situated far forward on the chest, noticeably on the side of the body rather than underneath.

Trichys lipura. (Plate XII).

THE BRUSH-TAILED PORCUPINE. Iban: *Ankis;* Sennah Dayak: *Mingis;* Dusun: *Lisis;* Kayan: *Buka.*

This extraordinary animal looks like a large rat, for though it is really a porcupine the whole body is uniformly covered with small, stiff, brownish quills, resembling in shape, size and structure those found on the fore quarters of the other porcupine; the long tail is covered with scales except for a terminal tuft of bristles about 3 ins. long. Like its congeners, it is a subterranean animal and there are a number of long, fine, tactile bristles mixed up with the ordinary defensive ones on the body.

Many of the Spiny Rats recall this Porcupine for in the same way the hairs of their coat have stiffened into bristles resembling those of this Porcupine in particular.

I saw one running about in the jungle in daylight, rippling along with a peculiar snake-like effect owing to its scaliness and disappearing with great speed on being disturbed. It is a noisy animal in captivity, not so prone to stamp its feet as the ordinary Porcupine but letting off a series of louder, fiercer grunts, knashing its teeth and taking the offensive with a considerable bite. The tufted tail is a curious feature for it makes no noise though often shaken; tail-less specimens are sometimes found, even a tail-less mother with a normal young one, indicating that the tail is apt to get lost accidentally. The tail is massive and offers the most convenient hold to catch and pick up the animal, which is then quite unable to part with its tail like any House Lizard. Although the bristles on the tip have no apparent use the animal is most solicitous of them and proceeds with the tail slightly up—curved so that the extremity is well off the ground.

Hystrix crassipinnis Gunth.

PORCUPINE. Kadayan: *Landak jirimban;* Iban: *L. Jurieng;* Land Dayak: *Bedak;* Dusun: *Garit;* Bajar: *Utun;* Selakau: *Penatam.*

Exactly resembles *muelleri* in size and shape, and as far as is known in habits and distribution, but instead of being black and white it is a greyish brown, dun colour all over, even the large quills are yellowish where they are white in the other species.

We have only three specimens, one of which is juvenile and resembles the adult; it seems on the whole to be rarer than the former kind and it is so far unknown what relation it bears to this though possibly belonging to a different genus. The Long and the Short tailed Porcupines may be found in the same burrows but the occurrence of the present species is so unusual that it is not so far known if it inhabits the same bury as its more common relative.

Family Sciuridae.
Squirrels.

A Tail as long as body	
a Size medium, Total length 1½ to 2 feet	
a¹ Underside white	Sciurus hippurus pryeri
a² Underside red	
b¹ No lateral or sub-lateral stripe	Sciurus hippurus grayi and hippurellus
b² White lateral stripe only	
c¹ Back black	Sciurus prevostii borneoensis
c² Back grey	,, ,, caroli
b White lateral & black sublateral stripe	
c¹ Back fawn	Sciurus notatus
	,, prevostii baluensis
	,, ,, atricapillus
	,, ,, griseicauda
c⁴ Back black	,, ,, pluto
B Tail nearly as long as body	
a Size large, Total length over 2 feet	
a¹ Ears tufted, tail bushy Krampu	Rhithrosciurus macrotis
a² Ears and tail plain Engrabak	Ratufa ephippium
b Size medium, Total length about one foot	
a¹ General colour rufous	Sciurus jentinki
a² General colour speckled	
b¹ Underside yellowish	Sciurus lowii
b² Underside grey	,, tenuis and brookei
c Size very small, Total length 6 inches	
a¹ No lateral or sublateral stripes	
b¹ Ears tufted	Nannosciurus whiteheadi
b² Ears not tufted	
c¹ Colour uniform	Nannosciurus exilis
c² Black and yellow patch behind ears	,, melanotis

a² Lateral and sublateral stripes	Glyphotes simus
C Tail markedly shorter than body	
a Total length about one foot	
a¹ Colour uniform	Funambulus laticaudatus & everetti
b¹ Back reddish with 3 black stripes	„ insignis
b² Back blackish with 4 yellowish stripes	„ hosei

Rhithrosciurus macrotis Gray.

The Tufted Ground-squirrel. Iban: *Krampu;* Land Dayak: *Pas* (*be*) *daum;* Tagal: *Tuaban;* Kadayan. *Basing baiong;* Kayan. *Penyamoh.*

There is no mistaking this large squirrel, the broad, bushy, almost fox like tail and the tufts of long black hairs on its ears at once distinguishing it The general colour is dull brown with a grizzled back, the underparts white with a well marked black lateral line down the flanks. The hind quarters and root of the tail underneath are bright chestnut red; the bases of the hairs of the bushy tail are dull brown or black, the tips grey in the young and yellowish in adults giving a grizzled appearance. The thumb is very short and small, provided with a nail.

This graceful animal has often been taken in Upper Sarawak, rather less often elsewhere, for in the former locality it is not uncommon to see its tail used as an ornament of the sheath of a "parang" It is at times an aboreal animal but is often seen on the ground, as stated by Dr. Abbott. It runs very swiftly, a specimen I saw carrying its tail straight out behind it, the undulation of this organ obscuring the rest of it as it ran straight away. It is more usually recorded as holding its tail bent over its back. It is usually found in pairs and if one is shot the other is sure to be seen in that vicinity within a few days. A rather immature specimen had a strong, musky, Stoat-like smell absent in other specimens.

Another specimen was observed feeding on some fruits that had fallen to the ground; it made off through the jungle on being disturbed, its bushy tail carried straight out behind giving an impression of an animal at least the size of a large Lotong monkey (*Pygathrix cristatus*), the Squirrel eventually vanishing among the crevices of some rocks. In some parts they are said to damage gardens and to be not at all shy, adopting a threatening attitude by sitting upright, so to speak enveloped in their bushy tail, the long black-tufted ears sticking out on each side.

Only a few mammals are peculiar to Borneo and this is one of them, being absolutely without any relations elsewhere.

Ratufa ephippium Muller.

The Giant Squirrel. Iban: *Engkrabak;* Tagal: *Tunta;* Kayan: *Begak;* Kenyah: *Mangka;* Kalabit: *Sagi.*

A very large and conspicuous squirrel, nearly three feet long with a long, dark, bushy tail; no two specimens are quite alike and it is not a simple matter to give descriptions that will fit the various forms.

In Western Sarawak is a form with a pale yellowish snout, black head and broad but indistinct black dorsal stripe, thighs and feet white or slightly buffish and a long, dark brown, hairy tail, flattened, compressed and sometimes ticked to form annulations; the fore parts of the flanks are much lighter when compared with the back. Frequently specimens are very light and whitish, others more rufous with a reduction of the black on the back approaching the next two forms to be described, whilst rarely typical forms may be recorded from outside localities.

The next form (*cothurnata*) is from the Saribas District and is much browner and more rufous, particularly on the fore parts of the flank, the black dorsal area being reduced in extent and intensity; this form again overlaps with the next and is not too well marked by the characters suggested. In the Baram area is a more or less uniformly coloured form rufous or ticked on the back with no dark area differentiated on the back; certain rather more ticked and rufous specimens from Mt. Dulit were thought to be peculiar but there is no reason for separating them as distinct. From Kinabalu and N. Borneo is a form (*sandakanensis*) in which the rufous markings have almost disappeared except just on the tip of the snout for the back is broadly black, thighs, forefeet and flanks grizzled dark grey and the very feathery tail is black with a number of buffish annulations; in the Merapok Mts. of Lawas this form occurs with a certain amount of buff on thighs and flanks indicating a leaning towards *baramensis*.

This is a common squirrel and being about as large as a Rabbit its passage through the tree tops is liable to attract the attention of the least observant, the obliging animal as a rule showing no particular fear of its pursuers; in fact in captivity it appears as a quiet, indolent and altogether amiable animal, mixing peacefully with the quarrelsome " prevostii " squirrels and sleeping in a heap together with three " Oucangs:" as a matter of fact this was deceptive for it resented handling, became most aggressive, attacked before ever it was touched, inflicted a severe bite and after a lot of chuckling gave vent to a clear string of loud rather bird like whistles either in fear or defiance; a wounded one attacked the man who tried to pick it up and inflicted a deep wound in his skin, particularly with its lower incisor. I have seen it climbing up the bare, branchless, trunk of a tree but it is most often found among the smaller leafy branches, on which it often but by no means always sits crosswise, the long tail hanging down as a balancing organ. In captivity it will often come on to the ground and even burrow under a pile of leaves and grasses but it hardly ever descends in a wild state; the usual things are eaten, pisangs, various shoots and leaves.

The nest is a huge affair high up and far out along a branch, recalling that of a Magpie at home; a number of large sticks are very loosely set in the fork of a tree and the inside lined with some fine brownish fibres, the entrance opening downward. The whole is so loosely made that it falls to pieces when brought home and and the same applies to the nest of *Sciurus prevostii*, which moreover does not differ in appearance, construction or locality.

It is a lowland animal, seldom going above 3000 ft. and is absent from the Kalabit country, Ulu Baram, being apparently shut off by the Pamambo Range some 5000 ft. high.

Abbott records a hawk (*Spilornis cheela bacha*) stooping at one in a tree and I imagine these squirrels and their companions must figure as one of the main items in the fare of *Felis nebulosa*, the Clouded Leopard, and the several other Felines which are mainly arboreal in these parts.

Sciurus prevostii Desm. (Plate XII).

PREVOST'S SQUIRREL. This is rather a common squirrel in the jungle, very active and very noisy but keeping mostly to the trees though I have seen them on the ground; captivity seems to upset their normal habits and they readily take to the ground, even sleeping there. They soon get fairly tame but are intolerant to anything else resembling a squirrel, even of their own species, and they get up many bite and run fights among themselves without doing much damage in spite of the distinctly sharp bite they can give; opposite sexes are for some reason particularly quarrelsome at times. They tolerate Oucangs, tortoises and even the larger Ratufa Squirrel and the Mouse Deer but are even more antagonistic to a Tree Shrew than to each other, the most down trodden of them always helping to chivvy the Tupaia, who made no sort of a fight against them. They never curl the tail over the back like the English Squirrel but hold it out unbent behind and somewhat inclined upwards; the tail is very much of the flue-brush variety, hairs sticking out at right angles from the long axis of the tail and not feathery and flattened as in the large *Ratufa*.

Food is usually eaten sitting along and not across a branch and whether ascending or descending or even on the ground the fore feet are much splayed, so that the digits are at an angle to the direction it is proceeding and obtain a widespread grip on each side; the " thumb " has a nail instead of a claw which is prominent both in climbing and holding its food when eating. It progresses on the ground by a series of hops but runs easily on branches and it is much more usual for its forefeet to be splayed out sideways, sometimes quite at right angles to the body, rather recalling the position assumed in the flying relatives; ascending or descending a tree the forefeet are extended horizontally, the hind feet are vertical and the whole is cross shaped, the motive power supplied by doubling up the hind legs and position maintained by pressing the widespread forelegs and the body against the trunk.

When eating, the food is held between the palms of the two "hands" and pieces chipped off by the lower pair of incisor teeth working against the upper pair, much of the food being wasted by dropping; when "squatting" during feeding it is of interest to note that their "sit upons" do not rest on the surface of the branch but touch the back of the leg whilst the Tree Shrews actually sit with the ischial region definitely touching the branch or the ground on which they happen to be.*

This squirrel makes a huge Magpie-like nest usually high up in a tree, a nest as large and quite indistinguishable from the bigger *Ratufa* squirrel; the nest consists of a thick outer layer of fairly big sticks gnawed off by themselves and the inside is lined with much shredded bark and a few grass-like bents, the entrance being usually low down on one side of the bundle. Females are usually in milk during the first three months of the year but I do not know how many young they have, the young are recorded by my collector as being carried in the mouth by the scruff of the neck like a cat with a kitten. Pairs in captivity often assumed what appeared to be a copulatory attitude but the hinder one merely combed the hairs of the other with his long lower incisor teeth.

I have not described at length the many races of this squirrel but their distinguishing features may be seen in the "Key" to the various species of Sciuridae.

Sciurus tenuis parvus Miller

THE SLENDER SQUIRREL. Another medium size Squirrel more truly arboreal than many. In colour ticked fawn, some light and some dark with a light grey, almost white, underside, the tail with many buff or greyish hairs, there are no lateral stripes and the bright colour on the forelimbs and thighs distinguish it from *brookei*.

This appears to be a common lowland Squirrel though little is known of its habits except that it ascends the lower slopes of mountains to some extent.

Sciurus jentinki Thos.

JENTINK'S SQUIRREL. Judging by the Sarawak Museum specimens of this Squirrel (7 from Kinabalu and 1 from Murud) it has not a good claim to rank as the high altitude race of *Sc. tenuis: jentinki* is perhaps smaller, there is a rufous or orange-washed area on the back, the underside varies from greyish to ochraceous and the forelimbs and thighs are not markedly brighter than the rest of the body. The most distinctive feature is a light cream coloured ring round the eye and edge of the ear; in fresh skins these rings are pure white and the underside is whitish tinged with an almost salmon pink.

Undoubtedly this is a high altitude Squirrel and is stated to have been taken on Mt. Dulit and Mt. Murud; two from Mt.

* This is usual but not invariable.

The Brush tailed Porcupine *(Trichys lipura)*

Prevost s Squirrel *(Sciurus prevosti caroli)*

Murud Kechil, Ulu Akah, I am inclined to think are only *Sc. tenuis parvus*; True *jentinki* does not look to me anything like *tenuis* and the eye and ear markings are distinctive.

Sciurus lowii lowii Thos.

Low's Squirrel. This Squirrel, like *Funambulus laticaudatus*, appears to have been very common even round Kuching forty years ago but the fact remains that five years recent collecting has not produced a specimen and I cannot say much regarding its appearance or habits. Nearly all our specimens have shortened or broken tails, a natural feature unless obviously damaged but giving the whole animal a suggestion of the shape of the Ground Squirrels of the genus *Funambulus*.

The general colour is a very dark brown, heavily ticked, lighter on the flanks, the tail barred; the underside is usually light cream coloured, almost whitish. To look at it is very like *F. laticaudatus* but the underside and flanks particularly lack the yellowish buff suffusion of this ground Squirrel.

Mr. F. N. Chasen writes that this is extremely common in most parts of N. Borneo where *tenuis* could nowhere be obtained

Sciurus brookei Thos.

Brooke's Squirrel. A medium size, fawn coloured Squirrel with a clear French grey underside and no lateral stripes; as it is not a common Squirrel its altitudinal distribution is uncertain but as more specimens are obtained this may prove to be a mountain form of *Sc. tenuis*,* even though the two probably overlap in the transitional area

It is found among the trees usually above 3000 ft. and has been most frequently taken on Mt. Dulit but also on the Baram River and in East Borneo. My collectors staying at Long Akah in the Baram, only some 350 ft. high, procured a specimen which was quite likely obtained by a native on the adjoining mountains but gave a false impression of the lowland status of this Squirrel.

Sciurus adamsi Kloss.

Adam's Squirrel. This is a medium size squirrel very like *S vittatus dulitensis* but smaller and distinguished by the white patches behind the ears.

Two were originally taken by Dr. J. C. Moulton in the Baram River and subsequently named after Mr. C. D Adams, District Officer in Baram at the time; it has since been taken at low altitudes on Kinabalu and elsewhere in N. Borneo.

[Sciurus beebei Allen.

This squirrel appears to have been an ordinary *notatus* from the 10th mile, Kuching, but distinguished by having a median ventral black stripe; it has I am told been withdrawn by its creator as a foreign Squirrel with the wrong locality.]

* Mr. Chasen has since written that *brookei* is possibly not a Malaysian beast but an outlying member of a species with forms in Celebes, *adamsi* by a long stretch may be another outlying Celebean form.

Sciurus notatus dilutus Miller.

THE PLANTAIN SQUIRREL. Though this and the next squirrel vary a good deal they are both medium sized, usually a light Rabbit colour, the back ticked and the tail ringed; there is a rather broad, black sublateral and a pale buffish lateral stripe, neither of them sharply defined at their edges; the colour of the underparts distinguishes the two forms, those of *dulitensis* from the Baram and Mt. Dulit being bright chestnut red and those of *dilutus* sort of dirty greyish-red. *Dilutus* is said to be more characteristic of E. Borneo but both there and in Sarawak (Kuching, Saribas) there exist a number of specimens with ochraceous tawny underparts which should perhaps be referred to *dulitensis*.

We have one cream coloured specimen from Balingian, slightly red below and with but a faint lateral stripe and an even fainter sublateral. The young are very bright, the phalanges black, lateral and sublateral stripes well marked and the underside a clear chestnut. In a collection of 28 specimens in the British Museum, all from the Saribas, 3 have the underparts almost grey, 15 deep reddish and 10 are intermediate.

The "Tupai pinang" or "Tupai kelapa" does an enormous amount of harm to rubber trees and coco-nut palms, nibbling the young shoots of the former and attacking the "umbut" or growing point of the latter as well as boring holes in young nuts; they are most prolific breeders and have 3 or 4 young at a time in some hole in a hollow tree. In captivity they fought among themselves but didn't molest the Tree Shrews or larger Squirrels; the tail is peculiar in this species, rather sparsely covered with hairs sticking out in all planes at right angles to the long axis of this member and giving a sort of flue-brush appearance.

Sciurus notatus dulitensis Bonhote.

THE PLANTAIN SQUIRREL. As I have remarked above this squirrel resembles *dilutus* except for its bright red underside. It is found chiefly in the Baram district and on Mt. Dulit and even on Kinabalu. Except in the smaller size it much resembles one form of *Sciurus prevostii* (*baluensis*).

Sciurus nigrovittatus orestes Thos.

THE GREY-BELLIED SQUIRREL This is the Bornean representative (never found in the lowlands) of a species found in Java, Sumatra and the Malay Peninsula. The back is a uniform, rather warm, rabbit colour, the tail darker, the lateral and broad sublateral shading indistinctly off into a dark grey underside. There is a white patch behind the ears.

Mountains such as Kinabalu and Dulit from 3—5000 ft. are its home.

Elsewhere *nigrovittatus* and *notatus* (*vittatus*) forms occur side by side and the former cannot be considered the mountain form of the latter.

Sciurus (Tomeutes) hippurus hippurellus Lyon.

THE HORSE-TAILED SQUIRREL. This is a medium size Squirrel prettily marked in a delicate way; the back, flanks, fore and hind legs and even the base of the tail ticked much the same colour as a Rabbit, the crown, nose and sides of the neck grey, the tail black, some of the hairs at the tip being rather rufous. There are no lateral or sublateral stripes and the underside is red or chestnut.

It is a common lowland species but not found at any height on mountains in Sarawak proper: the Kapuas and Pontianak area are about its limits as it does not cross the Rejang River and is replaced in N. Sarawak by another race.

It is usually seen in pairs and is quiet and inoffensive as a rule, not making the usual chattering noise of most Squirrels; in captivity it was the easiest of all to tame and lived a most peaceful life, being far less aggressive than its relatives.

Sciurus (Tomeutes) hippurus grayi Bonh.

THE HORSE-TAILED SQUIRREL. Kayan: *Petitti;* Kenyah: *Pelabun.*

This pretty Squirrel has the crown, nose, sides of the neck, fore and hind legs a dark grey but the back ticked a bright rufous, much darker and redder than in the S. Sarawak race; the underside is of course red and there are no lateral stripes.

Though common in the Baram area its range is rather restricted elsewhere for it is unable to cross the high mountains of the interior; the district between the true right bank of the Rejang and the Sea is however occupied by it as far South as Mukah and the two races intermingle somewhere on the left bank of the Rejang River in the neighbourhood of Kapit and the head-waters of the Batang Lupar.

Sciurus (Tomeutes) hippurus pryeri Thos.

THE HORSE-TAILED SQUIRREL. This race has the grey head and cheeks of the other races but the back, fore and hind feet are more or less clear rufous without the tickings and the tail is well grizzled with grey; the underside is pure white instead of chestnut.

It inhabits the Northern part of N. Borneo and does not appear to occur in or near Sarawak.

Glyphotes simus Thos.

THOMAS' PYGMY SQUIRREL. In appearance this squirrel is very like a small *Sc. notatus* for which one of our specimens was mistaken; the very large incisor teeth above and below in so small an animal is distinctive, otherwise it is just a small drab coloured squirrel with drab ventral surface, dull white lateral and irregular black sublateral stripes.

We have one from the Merapok Mts. and another from Kinabalu, from whence the Raffles Museum has lately obtained another.

The skull of this animal is remarkable when compared with that of *Nannosciurus spp.* which is roughly the same size, for the former has comparatively much longer and thicker incisor teeth above and below than the latter.

Nannosciurus whiteheadi Thos.

WHITEHEAD'S PYGMY SQUIRREL. Dusun: *Pantin.*

This most peculiar little Squirrel is confined to Borneo and presents an extraordinary appearance; though only about six inches long it is the complete Squirrel with a bushy tail, generally grizzled dark brownish in colour with dark grey underparts but the tips of the actual ears are black and there is a tuft of greyish white hairs an inch long on the extremity of each ear.

This species is only found on mountain tops above 3000 ft. and would appear to be commonest on Kinabalu though found also on the Merapok Mts., Murud, Dulit and even Mt. Penrissen.

As far as I know there is nothing peculiar about its habits though from accounts it appears to be more arboreal than some of the other species.

Nannosciurus exilis exilis Muller.

PYGMY SQUIRREL. Iban: *Pukang;* Kayan: *Oho.*

This little Squirrel is uniformly coloured rufous on the head and back, lighter on the flanks, the underparts pale but suffused with rufous.

Everywhere on the lowlands one meets with this little Squirrel, a most cheery and inquisitive little animal, now and then letting out a long drawn squeak, one of the commonest jungle noises in the morning and evening. It is largely terrestrial, running about on fallen tree trunks, occasionally climbing trees, stopping every now and then to look around and flirt its tail. It is not at all shy and comes up to inspect ones feet if one sits quiet enough but for some reason it never goes into the traps set for it and seems to enjoy perversely playing about the wire cages without thinking of entering therein

Some Dayaks set a certain amount of value on this Squirrel alleging it to bore with its male organ minute holes in bamboo, such a bamboo being highly prized by the finder, particularly if as they sometimes assert the male organ remains fast in the hole. The holes so exhibited are I believe actually made by a boring Beetle in an old bamboo.

The Kayans will not kill this little animal—small reason why anyone should—and have woven a marvellous story about it. Apparently the Gods were once very angry at the waste of fruit by the various animals and had them "on the mat" in turn, proving to the Brok, the Deer, the Pig and a host of animals that they actually wasted much more fruit than they ate or even required Each denied the accusation but with the exception of the Mouse Deer was ingeniously shown to be in the wrong, whereupon the various Mammals concerned decided (as perhaps humans would have also) to be revenged on the "Pelandok," who thought himself so fine; but the Pelandok promised to fight all and sundry at one o'clock next day on the edge of a certain clearing and caused the men living in this clearing to dream of a most wonderful burn if they lighted

their clearing at mid-day on the morrow. The hosts of Pig, Deer, Brok and other animals issued forth to give battle at the appointed time but were consumed by the fire then at its height, only the "Oho" having had the sense to side with the Mouse Deer in this seemingly unequal contest.

Nannosciurus exilus sordidus Chasen and Kloss.

PYGMY SQUIRREL. This race was described from middle East Borneo. It is much duller on the whole than Sarawak and W. Borneo specimens.

Nannosciurus melanotis borneanus Lyon.

PYGMY SQUIRREL. This pretty Squirrel is grayish buff in general colour, quite buff below and on the head, two narrow buff stripes start on the nose and broaden out into creamy white beneath the eyes, becoming more buff again as they pass under and reach behind the ears. There is a deep black patch behind the ears and a greyish pointed dorsal marking between them and on the nape.

Though this Squirrel is so common in collections I have for some reason never seen a live one and cannot speak of its habits for certain, though they are doubtless much the same as those of *N. exilis* which is easier to observe.

Nannosciurus melanotis pallidus Chasen and Kloss.

THE BLACK-EARED PYGMY SQUIRREL. This race is recorded from middle East Borneo and is pale when compared with Sarawak specimens, particularly as regards the head and buffy ear stripe.

Funambulus (Lariscus) insignis diversus Thos.

Land Dayak: *Pass gegin.*

A medium sized but very distinct squirrel, for the flanks and thighs are bright chestnut and the back grizzled greyish with a median and two lateral black longitudinal markings, the belly and chest are creamy white The tail is short, the same thickness all along, more or less grey above and quite rufous below.

A not uncommon lowland squirrel, found usually singly as far as I know, all over Sarawak, almost entirely terrestrial or seen running about on fallen tree trunks

Funambulus hosei Thos.

GROUND SQUIRREL. This peculiar squirrel resembles *insignis* in size but in little else, in colour it is very dark, a dull rabbit colour, darker than the two light dorsal stripes of *insignis* but with no rufous at all, the underside washed with pale yellowish. There is a peculiar, median, dorsal, narrow, reddish-buff line with a fairly wide black area on each side, then outside that on each side a light almost dirty white longitudinal stripe from shoulder to tail and outside these another black one, the whole suggestive of late al and sublateral stripes not yet shifted down onto the flanks.

The tail is not fluffy, and the snout is short, not elongated as in an allied Malayan form, of which it is probably not the Bornean representative.

It has been taken on Kinabalu at 5000 ft. and at a similar altitude on Dulit and Batu Song but is not represented in our collections and seldom elsewhere.

Drenomys everetti Thos.

GROUND SQUIRREL. Dusun: *Mengaluton.*

The back is uniformly grizzled dark all over, the underside grey, the tail short and thick.

This is I believe an entirely terrestrial squirrel found apparently on all mountain tops above 3000 ft., Kinabalu, Pamambo Range, Dulit, Penrissen and Poi. It looks like a large rat running in and out of the fallen tree trunks and is I suppose one of the commonest high altitude animals.

Rhinosciurus laticaudatus Mull. and Schleg.

GROUND SQUIRREL. The back is very dark, slightly ticked and with long black bristles; the vent is cream coloured, a little fulvous on the flanks, the tail as usual short and thick. The snout is long.

This species in old days was very common round Kuching but, in keeping with many other animals, felling the jungle has driven it away and in five years including much collecting near Kuching only one specimen has been taken; it occurs apparently in other parts of Sarawak but I have never seen one and cannot say anything about its appearance or habits.

Petaurista nitida rajah Thomas.

FLYING SQUIRREL. Malay: *Kubong merah;* Dusun: *Tagaut.*

This large flying squirrel is a bright chestnut red all over, but the nose, a ring round the eyes, the ears, forefeet and hind feet are all tipped with black, and there are here and there a certain number of black hairs on the back; immature specimens are darker, more blackish whilst very young ones have the head and back black. The underside is paler as is also the tail which is much like it in colour. This species is of course famous for the cartilaginous support running back from the wrist supporting and extending the patagium during flight.

Though a common animal I have never seen it wild, but one in captivity proved a most surprising animal; it was remarkably fierce, growled and advanced threateningly when annoyed, curiously enough striking out suddenly with one or both of its sharp clawed forefeet; the blunt face, big black beady eyes and black upstanding ears gave it a most aggressive appearance. It of course climbed well, the patagium folded up so that it was neither obstructive or noticeable and the long tail mostly used as a balancing organ; when at rest on a branch or on the ground the tail was bent round over the back and the black tip recurled over the extremity of the tail: when asleep the tail was curled round the body and face. During the day it was not a very wakeful animal but in the evening used to come out and feed on bananas; I never saw it gliding but it used to make

prodigious leaps and progress on the ground in a series of rather awkward hops suggesting that it was not very used to the lower regions.

The habits of an allied species *P. philippensis* have been described in India; apparently it is nocturnal, lives in the hollows of trees or the dried fronds of tree ferns, often goes in pairs and returns to the same place night after night: it is sluggish and reluctant to leave its hole by day, can glide nearly 100 yards and alights with a slight "phut," as I have also noted in some of the smaller Flying Squirrels. It appears to breed all the year round, to have one young which remains with its parent until nearly full grown; the nest is said to be lined with leaves and a mixture of the animals own fur.

Petaurista nitida thomasi Hose.

FLYING SQUIRREL. Dr. Charles Hose described this species from the Silat, a tributary of the Baram River; it is apparently just like the big red Flying Squirrel but lacks the black tip to the snout, ears and tail, being therefore rufous all over.

Petaurista nitida lumholzi Gyld.

FLYING SQUIRREL. Another race has been described from Central Borneo remarkable in the main for having very poor black tufts to its ears. The validity of these races rests on single specimens and awaits further examples, for Flying Squirrels are no less subject to variation than other Squirrels.

Petaurista (Aeromys) phaeomelas.

FLYING SQUIRREL. This is a large Flying Squirrel only slightly smaller than *nitida* but as a rule dark chocolate brown in colour, with a varying amount of grey grizzling on back, hindlegs and tail.

It is not a common Squirrel but has been taken at various places in the lowlands of Sarawak. It has been put in a separate genus with a race (*tephromelas*) from the Malay Peninsula.

Hylopetes everetti Thos.

FLYING SQUIRREL. I think this medium size Flying Squirrel is the commonest in Sarawak; in colour a varying shade of yellowish brown to buffish on the back and head which may be grey, the feet and patagia black, or at any rate a very dark brown, as is the underfur. The underside is grey, the flattened tail varying from dark brown to umber, constricted at the root where it is either a pale clear grey or buff.

I have at times seen this Squirrel, running up a tree trunk and along a branch in the ordinary way but sometimes ones attention may be attracted by a falling leaf acting queerly, descending on a long slant, sometimes tilting in front and sometimes behind the supposed leaf may land on a tree trunk with a quite audible "phut" and the Squirrel scuttles upwards to be soon lost to sight until another flight is made.

Hylopetes (harrisoni) caroli Gyld.

FLYING SQUIRREL. A single specimen was described from E. Borneo notable for having the white area of the throat continued in a narrow line down the underparts: it is not much to found a race upon but we have a single specimen from near Kuching which would raise it to specific rank (*everetti* being there found also) if one believes in its distinctness, a course I do not follow.

Iomys lepidus Lyon.

FLYING SQUIRREL. Another race has been described from S. W. Borneo, differing mainly in being smaller than *thomsoni;* the name *lepidus* has also been used for the Javan form of *Hylopetes everetti* and I consider that this race is of doubtful value.

Iomys thomsoni Thos.

FLYING SQUIRREL. Next to *Hylopetes everetti* this is the common small Flying Squirrel; it is slightly bigger, a more uniform dark brown and the tail though constricted at the base lacks the pale clear buff characteristic of that region in *H. everetti.*

On the ground, which is not of course its natural habitat, it proceeds in a series of hops, the tail stretched out behind and sharply arched proximally. It of course climbs readily and takes prodigious leaps but when feeding the tail is curled over the back and the tip recurled just behind the head in a position exactly similar to that adopted in *Pteromys nitidus.*

Pteromyscus pulverulentus borneanus Gunth.

FLYING SQUIRREL A medium size Flying Squirrel about 18 inches long, the general colour of the underfur dark brown but obscured by masses of grey hairs which constitute the prevailing colour, except for the tail which is dark brown and very fluffy.

Malayan specimens are I believe more brown and not so grey, but so few specimens are known that I cannot say if the Bornean race is separable.

Petinomys genibarbis borneoensis Thos.

FLYING SQUIRREL. This is the first of the Pygmy Flying Squirrels, tiny little animals little more than six inches long. *Genibarbis* is a uniform reddish brown with many light hairs on the head and a pure white underside.

Petaurillus setosus Temm.

FLYING SQUIRREL There are a number of these Pygmy Flying Squirrels of which this is the one most often taken, though it is comparatively rare It is a very dark brown with an irregular mass of greyish hairs on the back, the head quite grey, the tail quite brown, constricted at the base, where it is white on the underside like the rest of the body.

Petaurillus hosei Thos.

FLYING SQUIRREL. All the Pygmy Squirrels have long and pointed ears but those of *hosei* are twice as long as in *setosus;* the white tipped tail is also peculiar to this and the next species.

Petaurillus emiliae Thos.

FLYING SQUIRREL. This is described as being exactly like *kosei* but smaller, a not very distinctive character when dealing with two " species " which both come from the same district, namely the Baram.

Family MURIDAE.

Rats and Mice.

Bornean Rats, all Oriental Rats, have long been the bane of systematists; colour, spines, skulls and length of tail all vary so much that there are a host of species most difficult to identify and it is not easy to name and describe the common Rats one may meet.

Non-Spiny Rats.

Rattus sabanus sabanus Thos.

JUNGLE RAT. A large and yellowish, buff coloured jungle rat with a sharply defined, creamy white underside, the hairs everywhere soft and not spiny. The clear bright colouring, large size and very long tail distinguish this species.

It has been taken all over Sarawak sometimes on mountains such as Kinabalu, Dulit and Poi, and sometimes on lowlands at Baram, Niah and near Kuching; there are races in Java, Sumatra and the Malay Peninsula.

Rattus muelleri borneanus Miller.

JUNGLE RAT. This is another large Rat whose colour I can only describe as " ratty " and whose underside as a pale creamy white; like *R. sabanus* it has a long tail, noticeably very large hind feet and soft non-spiny hair.

It occurs all over lowland Sarawak and Borneo but has also been taken quite high up on Kinabalu; houses and clearings are not frequented and this Rat is to be found mainly in old jungle

Rattus infraluteus Thos

JUNGLE RAT. This curious Rat is probably peculiar to Kinabalu; it is quite a large animal, very furry and spineless, dark brown above and below.

The " *rattus* " Rats come next and it must be confessed it is difficult to convey a clear account of the species as they occur.

Rattus rattus neglectus Jent

THE MALAYAN FIELD RAT

Definitely a field Rat, not found in towns though it may occur on the outskirts or be found round native houses, for example in rice fields, where it does a good deal of harm. Beyond being " ratty " in colour it is notable for a whitish or light grey underside, very distinct from the flanks and back The small hind feet clearly distinguish it from *R. muelleri* .

Rattus rattus diardi Jent.

THE MALAYAN HOUSE RAT.

Very similar to the last but the underside a dark grey almost ochraceous, not so distinct from the colour of the upperside. Strictly

speaking it is often difficult to determine specimens as one or the other species and it is quite possible interbreeding goes on, particularly on the outskirts of towns where the two overlap.

Rattus norvegicus Erxl.

THE SHIP RAT.

Occurs in the ports of Sarawak and is noticeable for its short tail, shorter in fact than its head and body, whereas that organ is the longer (or as long) in the Malayan House Rat.

Rattus concolor ephippium Jent.

Though distinctly " mousey " in colour this animal is actually a small Rat, larger than the European or Asiatic House mouse (*Mus musculus* or *humourous**) whose appearance in Sarawak is uncertain; this small Rat is very common in houses.

Spiny Rats.

Rattus surifer bandahara Robinson.

JUNGLE RAT. This was formerly confused with the next longer established species. Both are medium sized, long tailed spiny rats, a rather clear buff above and white below. The species in question was separated on account of a varying almost pinkish collar showing on the underside of the neck, the white of the underside further not reaching to the sole of the hind foot.

It is found with the next species on Kinabalu and certainly on the lowlands of Sarawak.

Rattus rajah rajah Thos.

JUNGLE RAT. As I have mentioned, this species is very like the above, with which it occurs, the characters separating them being very technical points.

Rattus whiteheadi Thos.

JUNGLE RAT. A very variable medium sized Rat—about the size of *R. concolor*. Some specimens are a pretty fawn colour, with a pinkish bloom on the ventral surface in life though this fades somewhat after death. Other specimens are more " ratty " in colour and greyer below, so much so that Thomas tried to separate those of Kinabalu from other parts of Borneo but the variations are found throughout the country and are not peculiar to any one locality.

Like *R. muclleri* it is found only in old jungle and never in houses or clearings.

There now follows a host of Rats, many peculiar to Kinabalu.

Rattus alticola alticola Thos.

Only known from the higher parts of Kinabalu, up to about 8—9000 ft.

Rattus alticola ochraceiventer Thos.

JUNGLE RAT. From Kinabalu below 3000 ft.

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* Recorded from Sandakan.

Rattus rattus baluensis Thos.

JUNGLE RAT. Found on Kinabalu only from 8—10,000 ft. and possibly a high altitude representative of *neglectus* which occurs up to 3000 ft.

Rattus baeodon Thos.

JUNGLE RAT. Kinabalu only.

Rattus cremoriventer kina Thos.

JUNGLE RAT. Described from a low elevation on Kinabalu but also found elsewhere in the lowlands.

Rattus rapit (jerdoni) Thos.

JUNGLE RAT. Kinabalu, Dulit and Penrissen as well as lowlands such as Lawas and Niah

Species of the genus *Ciropodomys* are all small and mostly so hard to identify that it is very uncertain how many species occur in Borneo, specimens are few, species being sometimes founded on single ones and the genus as a whole is distinctly rare.

Though small and mouse-like in size and in appearance they are remarkable mainly for the large ears and long whiskers and particularly for the presence of a nail instead of a claw on the " thumb " and " big toe," some species being undoubtedly arboreal: As in the Pen Tailed Tree Shrew (Ptilocercus) the tail is rather sparsely covered with hairs except for a vane at the end.

Chiropodomys major Thos.

PENCIL-TAILED MOUSE. Several taken at Sadong and one from Kuching, notable for the comparatively long tail. A specimen was taken alive in a trap set in the top of a tall tree and was kept for a long time, feeding on fruit and bananas. Normally it was not active until evening but on being disturbed during the day became very agile and quite savage for so small an animal, making determined efforts to bite its aggressor; ordinarily it was a scrupulously clean and rather dainty little beast.

Chiropodomys legatus Thos,

PENCIL-TAILED MOUSE. Found only on Kinabalu and apparently the largest species of the genus.

Chiropodomys pictor Thos.

PENCIL-TAILED MOUSE. So far found on Kinabalu and also at Balingian on the coast near Mukah. The tail is relatively very short, much shorter than the body.

Chiropodomys gliroides Thos.

PENCIL-TAILED MOUSE. One taken on Kinabalu at 1000 ft. agrees with some from Burma and Tennaserim.

Chiropodomys pusillus Thos.

PENCIL-TAILED MOUSE. From Kinabalu 1000 ft.

Haeromys margarettae pusillus Thos.

JUNGLE MOUSE. Found on Kinabalu and smaller than *m. margarettae.*

Haeromys m. margarettae Thos.

JUNGLE MOUSE. So far only known from Mt. Penrissen.

ORDER IV CARNIVORA.

(Cats, Dogs, Stoats, Badgers, Otters etc.).

This Order is made up of Flesh-eating Mammals, reaching their highest specialization in Cats, provided with long, sharp, canine teeth for stabbing and holding their prey together with knife edged molar teeth working against each other like the blades of a pair of scissors in cutting up their meat. All Carnivores exhibit these characteristics to some extent, in accordance with flesh-eating requirements.

The Order includes of course the Seals, Walruses and Sea Lions, Mammals entirely absent from Borneo and requiring no consideration here; Dogs, Jackals and Foxes are also unknown and call for no special mention. Cats however abound and, in the absence of Tigers and true Leopards, the largest is the Clouded Leopard, a beast some 6 feet long and probably a lowland representative of the Central Asian Ounce or Snow Leopard. Civet Cats are most numerous but differ from Cats in many ways: the latter have their claws retractile within a sheath usually absent in Civets whose claws are as a rule only partially if at all retractile. Cats further have a very short blunt muzzle, a few molar cutting teeth specialized in accordance with their flesh eating requirements whilst Civets have a rather long sharp-pointed muzzle and many not so particularly specialized teeth in accordance with their more omnivorous habits. Allied to the Civets is the Mongoose of Africa and the Oriental Region, but the Bornean representative has not the snake-killing propensities of some of its relatives.

Borneo possesses an unmistakable Bear, probably the smallest form there is; there are two kinds of Otters, a most offensive smelling Badger, a Ferret Badger, a large Marten and a Stoat which do not call for particular mention.

Ursus (Helarctos) malayanus Raffles.

Honey Bear, Sun Bear, Malay. Bruang; Iban: Jugam; Murut and Tagal: *Bawang*

This is one of the smallest of Bears and is covered with short, coarse shiny black hair except for the snout, which is grey as far back as the eyes, sometimes enclosing them in rings like spectacles; there is also a yellowish white, sometimes almost orange, usually V shaped patch on the throat. It has a large broad head, comparatively thin neck, narrow chest, long bow-legged forelegs, high shoulders, rather big stomach, very short hind legs, low, rounded hind quarters and the shortest of tails. Like all the bears its feet are plantigrade, provided with long curved claws which, combined with the bandy forelegs and rather inturned toes, give it a clumsy, rolling gait accentuated by holding the head low and swinging it from side to side as it walks. It is at all times a very restless animal, never still, its head and nose particularly being always on the move. The eyes are small and protruding, the ears very small and rounded,

the tongue surprisingly long when extended. Very old specimens become very wrinkled and almost grey on the forehead and crown, which gives them a most ludicrous, worried look.

The yellowish white patch is often comparatively larger in old animals but not always so; in the young it is usually V shaped set with the point backwards and other examples show various stages in the opening out of this V into a diamond shaped patch, the yellowish white arms of the V getting broader until in some cases there is a complete diamond. I should add that in all cases this yellowish white patch has a number of small faint black spots.

Usually the Bear presents a very broad head and an absurdly thin neck but when serious it may sit up on its hindquarters and stretch its head, the skin on the sides of its neck becoming flattened out like a Cobra's hood and serving to show off this throat marking. Some Dayaks say there is a larger kind of bear with no markings on the throat, and very rarely a completely reddish brown one is said to be encountered.

This species even when young is bad tempered, being a highly strung, sensitive, nervous animal easily frightened by anything unusual; when suspicious it sits erect on its hind quarters or even stands erect on its hind legs, makes a few passes with its forepaws, breaks into a harsh bark and rushes at its opponent in an attempt to bite. It is not really brave and I have seen one scared by a full grown "Brok" (*Macacus nemestrinus*—The Pig Tailed monkey) of its own size, the Bear putting its head between its forelegs and making peevish noises. In a wild state it sometimes runs off with a loud snort and being a clumsy beast is just as likely to run into some unoffending person, a Dayak in one case having been thus severely bitten When wounded it may charge and Dayaks have occasionally fought and overcome it with their hands. Bears can also be very playful, two together getting on well and even alone it will play with leaves, bits of wood or even its own foot, when pleased it makes a continued gurgling noise, often with one foot in the mouth as if sucking it. In captivity it is friendly with other animals such as Mias, Gibbons except at feeding time: the Mias is too quick for the Bear, fends him off with long arms if attacked or presents a shaggy back on which the Bear makes no impression.

Bears are wonderful climbers, swarming up a thick tree trunk in a series of jerks, the widespread, bow-legged forelegs encircling much of the trunk and pressing the chest close against it, the hind legs supplying the motive force; they do not dig their claws straight into the bark as do some Cats and Squirrels, the claws just preventing the Bear slipping and making it most difficult to detach. A thin branch is grasped by just the wrist and claws, the animal moving along a sloping branch back downwards and I have seen a captive Mias repeatedly try to shake them off this position with

only very occasional success: young ones that have fallen 20 ft. or so seem none the worse for it. There is great wrist play which helps them in climbing and hooking themselves over thin branches. Food is sometimes held in one forefoot, the sole bending round to almost touch the undersurface of the arm.

Almost anything serves as food, fruit of all kinds, meats, cock roaches and various insects, milk and anything sweet, captive ones taking scorpions, centipedes and any snake, poisonous or not, animals which would have given them a nasty shock had the poison organs not been previously removed. In a wild state they are fond of honey and certainly ants, their powerful teeth and strong claws soon enlarging the smallest of cracks in a log. Most animals, except true Rodents, presented with a flat surface, such as the palm of ones hand, are unable to bite it except where uneven or on the edge; not so the Bear who turns up his rather long nose and can gnaw through the flat surface of a plank.

The young are usually born singly and apparently at no particular season, being sometimes laid in a hollow tree or between the butresses at its foot. The disposition of the mother varies, she usually but not always being concerned in making her own escape and hoping the young will follow. They are said to make rough nests in trees but I have never seen them. Captive bears were very fond of playing about in shallow water: they could probably swim if given the opportunity.

Lutra sumatrana Gray.

The Sumatran Otter. Malay: *Bran Bran*; Tagal: *Ketong*; Dusun: *Bongkol.*

Two species of Otters occur in Sarawak, the present species having the usual claws on its fore and hind feet whilst the other species has no sharp, projecting claws, but only a series of very small rounded nail-like objects in their place.

The former species resembles the European Otter and is a uniform fawn colour, lighter below; it is of interest to note that just as in *Cynogale bennetti,* the Civet that has taken to an aquatic life, this Otter has very wide spread forefoot with large fleshy pads. Its whiskers are also like those of *C. bennetti* but less prominent.

Though Otters are extremely common, both in fresh water and on the sea-shore, their nocturnal habits and general wariness prevent them being often observed. The head is very rounded, muzzle broad and blunt, eyes small and beady with a general vivacious look that does not belie their activity. It is not uncommon to see one or both parents followed by three or four young crossing a path nor is it difficult to catch the offspring; they soon become most tame and make good pets but set up a squeaking noise all day until fed, stowing away such quantities of food that they eventually die of over-eating. Contrary to some statements, the young swim the first time they take to the water and soon become

quite swift on land; the gait is a quick but rolling rush, the body seemingly extending on each side beyond its limbs and giving a most nautical aspect to its movements. In the ordinary way it walks with its head down, back arched and comparatively short tail stretched downwards behind.

Very little is known of the habits of these animals, the average Malay never having got beyond some Rablesian stories connected with the number of its wives.

Lutra cinera Illig.

THE CLAWLESS OTTER.

As I have mentioned this animal is notable for the absence of its claws; size is a very variable factor but this species though equally common does not seem to run as big as the other species. In colour the adults are usually greyer but immature specimens are dark with a lightish patch on the throat

They may be met with on the sea shore or far upriver in the small side streams, this is the best place to see them, for the roar of the water drowns the noise of ones movements and the otters may be easily observed nosing about the water's edge. Sometimes solitary, sometimes in families of 5 or 6 they all take to the jungle in a sharp clumsy gallop on being disturbed, for the water as a rule is too shallow for them to find refuge. Most natives will not eat them and they are very tenacious of life, sure to escape if not killed outright. When surprised they sit upright on the hind legs and tail, the short forepaws hanging down free but in walking they assume the usual gait, head held low and back high arched and rounded.

Mydaus lucifer Thos.

THE BADGER; *Teludu*; *Sigoeng*, Kalabit: *Dengan ruit*.

The Badger is a comparatively small animal up to about two feet in length, black except for a white crown and complete or incomplete rather narrow white stripe down the back onto the short tail; the head is thickset, snout pink, hard and rounded, the claws especially on the forefoot being long and curved, giving a rather Bear-like impression. Frequently on the nape of the neck there is a marked whorl in the hairs, sometimes two whorls but sometimes no whorls are recognizable so that neither this character nor the variable size, nor the varying continuity of the white line down the back are safe guides in classification, a fact which has caused much confusion.

This is one of the most notorious of Bornean mammals and much remains to be found out about it; a single specimen was taken on the " mainland opposite Labuan " and given the above name. The late Dr. J. C. Moulton obtained some skins made into seat mats at Mein in the Kalabit country, Ulu Baram, and

to these gave a different name, whilst Dr. Mjoberg visited the very spot and obtained the whole animal, to which he gave yet a third name. A review of all these and some from S. E. Borneo however shows them to be really all the same and they are better united under the original name.

As far as I know it is only found in the one place in Sarawak—at the Kalabit house of Mein—and the Badger lives not in caves as sometimes stated but in holes in the ground dug either by itself or by the Porcupines with whom it is sometimes found living. The Kalabit dogs find the entrance to these earths and the smallest dogs will eagerly enter and bay the quarry underground whilst the men dig furiously down from above with the aid of sharpened sticks. Earths however are rarely found and not always occupied; according to Horsfield there is a globular smooth side chamber several feet in diameter with a passage about six feet long to the outside world and I agree with him in not finding the burrows at a depth of more than about two feet.

It is a strange looking animal not more than a foot or two long, short legged but it walks quite swiftly with the body well off the ground, when actually handled it may growl and attempt to bite but when merely molested it raises the tail straight up in the air, turns the head away from the intruder and may be induced to eject to a distance of some six inches or more nearly a teaspoonful of pale greenish fluid, the smell of which was nearly enough to make sick a neighbouring Dayak and also some Kalabits, who aren't as a rule particular. They say dogs are sometimes asphyxiated in this way or actually blinded if struck in the eye by the discharge. where numerous in other parts of the world they can become a nuisance by passing under houses at night but were put to some account in old Javanese Sultanates in the making of scent in suitable dilutions. The discharge apparently comes from paired anal glands and hydrogen sulphide is a prominent component; Kalabits nevertheless eat the animal and value its skin for sale to down country people, who mix the shavings with water and drink them as a cure for fever or rheumatism.

The Badger much dislikes the light and retires under a log when in captivity. One used to dig a hole and remain with its head buried. Only the fore claws are used in digging, working backwards and forwards not sideways like a Mole; the nose was distinctly pig-like with a hard ridge round the rim with which it loosened the earth at the apex of its pointed diggings; the snout overhung the nearest point of the mouth by three quarters of an inch. A mother and one young one were placed alive in closely-made separate bamboo cages where they were quiet enough in daytime but

the young one soon scratched its way out in the night; the mother was subsequently placed in a tin and her scratchings at night could be heard in many parts of the house by Kalabits anxious for sleep.

They would not touch food in the daytime but worms, grasshoppers, cockroaches and particularly the entrails of fowls dropped into the tin of an evening were always consumed by the morning; the one specimen lived thus for over a week and was allowed to go for an hours walk every evening.

Their external anatomy was peculiar, very short legs, hind feet plantigrade, thickset body kept off the ground, absurd little tufted tail, head raised, small eyes and ears and large, rounded, hard, pink snout; the female was peculiar with a pair of inguinal teats (in the groin), none on the stomach but two pairs a long way forward on the breast.

The animal has an unusual distribution; Mein is over 3000 ft. but it is found at much lower altitudes in N. Borneo and S. E. Borneo; it is also found in Java, Great Natuna Island, but not in the Malay Peninsula.

Nesictis (Helictis) everetti Thos.

THE FERRET BADGER.

This is a curious animal about two feet long and with a comparatively very long tail (about 6 inches) for a Badger; it has the usual foul smell of the Badger-Stoat tribe but more resembles the Badgers in the fleshy pig-like snout and long rather curved claws on the forefeet.

As far as I know it is in Borneo confined to Mt. Kinabalu, where it was at one time said to be common, and does not occur in Sarawak nor in Sumatra nor the F. M. S., but its relatives are found in Java, parts of India, China and in Formosa.

The general colour is brownish grey, quite brown on the crown, greyer on the tail; the underparts varying from ochraceous to dirty whitish. A prominent feature is a narrow white stripe beginning at the back of the crown and losing itself about half way down the back, being actually more often discontinuous than not; the face markings are distinctive, two white spots between the eyes, the spots confluent more often than not but in some cases, according to Everett, absent altogether. The white markings behind and below the eyes are also very variable.

Thomas has separated the Bornean form generically from the Indian and other ones on rather minute differences, largely dependent on the shape of the baculum or penis-bone, a character subject to great variation in other groups.

Putorius nudipes Cuv.

THE STOAT. Malay: *Munsang pisang*; Kayan: *Chok puteh*; Kenyah: *Hangangan*; Kalabit: *Toh.*

This is a small and very furry Stoat with the usual offensive smell of its kind. There is no mistaking it, for above and below

the colour is yellowish buff with the head, including the chin and ears, pure white, the tail being occasionally more yellowish at the tip.

Solitary individuals are taken in various places at wide intervals but it is nowhere very common and little seems to be known of its habits. It appears to feed on fruit to some extent. A single specimen was seen running about on the bank of a stream and it is noteworthy that the feet are webbed half way along the digits suggesting mildly aquatic habits

Mustela flavigula.

THE MARTEN Iban: *Bragok*; Kenyah: *Pasua*; Murik: *Bawah*.

This Marten is a comparatively large animal with a long tail. The head and shoulders are pale fawn colour streaked with silvery hairs the underparts similar but without the streaking, the back and hind legs dark brown, the tail black. The most distinctive feature is the pale yellow chin, throat and chest, the neck having a dark brown line down each side bordering the yellow.

The pointed alert face, long tail and pronounced musky smell are typical of the Marten It is mostly arboreal, generally to be seen high up in the tops of the tallest trees but apparently descends to the ground at times, when it is reputed to attack both Pigs and Deer, fastening on either to the eye or underneath the belly and even causing their death by sucking their blood, they must attack young animals for it is difficult to imagine so resourceful an animal as a Pig being thus overcome in his prime.

A specimen shot in April appeared to have been suckling two young ones

I observed one on a sand-bank beside a stream one evening; it carried the head very high, the neck long and sharply arched, showing the yellow underside very plainly: the forelegs were very bowed and the animal progressed in a series of rather awkward hops as if not very used to the ground. The back was fairly straight but the long tail carried at an angle of about 60°, the tip down curved and hook-like.

Cyon rutilans Mull.

HUNTING DOG. Dayak: *Pasun*.

There is one specimen of the Jackal, *Canis aureus* in the Leyden Museum, said to have been collected by Diard in Borneo. No further specimens have been seen or obtained but Dayaks and Kayans still assert that it does occur. It should be remembered that "Pasun" is the name applied by Dayaks to the pack of hounds usually associated with their legends of "Gerghassie," the Demon Hunter. If there be a Wild Dog in Borneo it is more likely to be a representative of the Malayan Hunting Dog than the Jackal of India and Ceylon; actually there is almost certainly no Wild Dog in this country.

Family VIVERRIDAE.

(Civet Cats with non-retractile unsheathed claws).

A Tail as long as body		
a Size large in adults, 4—5 ft		
a^1 General colour black	Binturong	Arctictis binturong
a^2 General colour dark brown, face white	Galling	Paguma leucomystax
b Size medium total length about 3 ft.		
b^1 General colour grey	Munsang	Arctogale leucotis
b^2 General colour darker fawn	do.	Paradoxurus hermaphroditus
c General colour dark brown		Hemigale hosei
c^1 Back with transverse stripes on general buff colour	Pangkat	Hemigale hardwickei
B Tail shorter than body		
a Black and White markings on throat	Tengalong	Viverra tangalanga.

Mungos (Herpestes) brachyurus rajah Thos.

THE MONGOOSE; Iban: *Dumbang*.

A medium size Ferrety looking animal, really black in ground colour but with a varying amount of yellow or rufous ticking, particularly on the flanks and tail, so that some specimens are almost wholly rabbit coloured whilst others in the right light look almost black on account of their fewer and darker tickings. The tail is characteristic, rather short, the hairs sticking out at all angles, long at the base and short at the tip giving the tail a very blunt tapering appearance It has a curious shaped head, very big and round from the front view, small thick ears, little eyes very light, almost sandy, set close together and with tiny pupils, the whole capped with a pink tipped nose more or less movable. The claws are long, the digits of the fore and hind feet greatly elongated, with bare pads reaching to the wrist and heel; there is furthermore a slight webbing to the toes

Things animate do not as a rule move swiftly in the East but the " Dumbang " has one of the best claims to be Borneo's little Speed King; occasionally it walks, even runs at times but mostly gallops (or may be does all three together) but to see it shooting in and out of holes, sliding round corners and twice round its cage in no time gives one an impression of a few passing shadows and would leave one quite unable to say what the animal looked like if one didn't know beforehand; one spent a whole afternoon skating

round a large cage before it was sufficiently exhausted to stay still for its picture ard proved one of the most difficult animals to photograph.

Though so restless it proved to be a most purposeful animal and cheerfully bit its way through two thicknesses of wire netting in a night, spreading destruction among some Mouse Deer and Prevost's Squirrels that it met outside; for all that it was not always a savage animal and when handled never bit its keeper in spite of easy opportunities, in fact it was a particularly fearless animal in all its doings. Food consisted mainly of fish and the only wild one I have seen was running about in and out among the stones on the bank of a stream; the stomach of this one was crammed full of Cockroaches and this species is recorded as less partial to Snakes than its better known Indian relative. It is further said to be partly aquatic and to fluff itself out when molested until all its hairs stand out on end; it is certainly a good climber and has rather surprisingly long legs compared with Stoats and Martens whose characteristic smell is furthermore not very noticeable in the Mongoose.

Two together were most amusing and for long kept up a continuous cackling like a Jay's alarm; actually they did not quarrel often but gave vent to most malignant explosive spits when really angry. There is something almost vulpine about this Mongoose, its facial expression of malignancy, shrewdness and alertness being a fair indication of its character.

Thomas proposed two races, *rajah* from the lowlands and *dyacorum* from the mountains, the former having light yellowish and the latter warmer rufous tickings. It is only fair to say further material was awaited and whilst I find the distinction good enough as regards colour it is not so distributionally, for we have from Kuching two dark specimens resembling most of our mountain specimens and a very lightly marked one from Mt. Dulit recalling the numerous lowland examples.

Herpestes semitorquatus Gray.

MONGOOSE. Iban: *Dumbang merah*; Sennah: *Sengangupp*.

We have one specimen of this from 4000 ft. on Mt. Dulit; it has the tail of *H. brachyurus* but its uniform yellowish buff colour above and below recalls *Putorius nudipes*, from which the larger size, absence of white face and the broader tail at once separate it; the soles of the forefeet are not elongated as in the "Dumbang."

There is here also a specimen in spirit from Kuching differing in no way from the Dulit one; Dr. Abbot took several in the Ulu Kapuas, whilst one in the Leiden Museum collected by Von Hasselt at Sukadana in S. W. Borneo is redder still and even more like *Putorius*. It has been taken on Mts. Poi and Penrissen but is not confined to mountains as a high altitude form of *brachyurus*.

Herpestes hosei Jent.

MONGOOSE. We have no specimens of this species but it is stated to differ from *brachyurus* in its skull, the lower jaw particularly and to be more brownish red with shorter hairs and less curved claws.

I have seen the type in the Leiden Museum, an adult female from Baram, but it did not differ externally from *M. brachyurus*.

Cynogale benetti Gray.

THE OTTER-CIVET. Iban: *Jellu labi or Padi bahru*; Kayan: *Dingin*.

This is a curious, very thickset, aquatic animal, a short tail, comparatively short forelegs but rather longer hind ones giving the back a high arched appearance as it stands up; the general colour is a very dark brown much grizzled with white above but not so much below and on the tail, which in a few cases has a suggestion of rings at the root. There are many peculiar features about it, notably the whiskers which almost recall Bairnsfather's "Old Bill;" they are yellowish white and very numerous, those from the snout being fairly long but those from a patch under the ear being the longest and reaching back to the shoulder about 6 ins. in length: Like the Otters, the upper lip is very thick, rounded and overhanging, it is said acting as a cushion to keep the water out of the mouth. The actual nostrils are peculiar, for instead of opening forwards in the same direction as the snout they are situated on top of the nose (just as in the Crocodile) and are provided with a valvular apparatus to keep the water out. Finally the feet are unusual; the claws on the forefeet seem at times partially retractile but not into a sheath and most remarkable is the wide expansion of the four digits—the first (really of course the second) being normally expanded in a straight line from the fourth *i.e.* making an angle of 180° with it; in addition the forefeet are webbed for the proximal half of the digits. The hind feet are similarly webbed but the digits more or less parallel and but little if at all expanded; the digits of the forefeet are capable of great flexion as the beast walks, those of the hind feet much less so.

In captivity a beast was distantly savage and uttered an explosive spit when annoyed; it would not eat various dead birds or a squirrel and only very reluctantly took a few pisangs, but frogs were taken with avidity, also prawns and a few fish (such as "semilang") but most small sea fishes were refused; it used to drink considerable quantities of water but I never saw it swim in the tub provided for that purpose. As a climber it was only fair and rather uncertain, in fact it ascended a sloping branch with considerable difficulty, frequently slipping backwards, but was quite ready to scramble on top of a couple of boxes and from there to a horizontal branch, where it would spend the day asleep curled up in the most extraordinary position, its head and nose pointing straight

down towards the ground, possibly because it objected to the light. Ordinarily when walking the head and tail are carried low and the back is high arched.

Nothing much is known of its habits in a wild state but its whiskers are presumably tactile and enable it to detect its food under stones and in crevices whilst the position of its nostrils on top of its snout suggest that it may lie in wait for its prey with only its nose showing. Comparison has been made between this animal and the Otter but what habits they have in common have apparently not gone very far in evolving similar structures.

Apparently two young constitute a brood and they have been taken in May; the kitten is brown without any grizzling, some grey on the forehead and ears with two longitudinal stripes down the sides of the neck extending underneath the throat.

Arctictis binturong Raffles.

Bear Cat; Malay: *Binturong*; Land Dayak: *Tun*; Dusun Saiap: *Pasiu*; Kayan: *Khaitan*.

This, the largest of Civets, is clad in long black hairs with a varying amount of dark yellowish grizzled ones, some specimens being almost yellowish and none entirely black as there is always some grizzling on the head. The long tail and the small, rounded, tufted ears with white hairs round the rims together with the long white stiff whiskers and shorter black ones are characteristic A specimen in captivity got steadily more grizzled This character is variable culminating in a specimen from Mt. Dulit covered with dirty white or yellowish hairs, so that it was more white than black, except on the tail.

The shape is peculiar, the head very small and so little marked off from the thick neck that an ordinary collar will not hold it. The animal is plantigrade and walks normally on the ground, not in a series of hops as do many other arboreal forms, the back is high arched and the tail carried outstretched but with the tip curled. It is however a nocturnal beast climbing stealthily about at night and using its tail as a break in descending immature specimens are certainly able to sustain their own weight hanging by the tail. Like the Ant-eater the soles of the hind feet are apposable to assist it in climbing. The hair is very long and thick, the animal panting heavily in the heat of the day though no doubt warm enough at night—not that other nocturnal animals are as thickly clad.

It is a fierce looking animal when roused and only when taken young is it easily tamed; freshly caught it is quite equal to tackling a man for it has a most powerful chewing bite: adults become only fairly tame even after a long time. When annoyed it utters a low growl followed by an explosive spit. In spite of this its favourite food is bananas and many is the bunch that has been eaten during the night hanging up in solitary houses; the mouth is quite small for such a large animal, scarcely accommodating a big pisang of which it squeezes out the contents and throws away the skin. It

will eat a bird, such as a Swift and a Moorhen, but a small Squirrel (*Sciurus notatus*) lived easily in the same cage for a fortnight and then escaped; a frog was refused in favour of a pisang. A savage one fresh caught that had not fed for four days took no notice of a live fowl, which was removed after two days and nights. It took no trouble either to avoid or attack a snake (*Dryophis prasinus*) and Ridley records that it is not a snake eater, covering its face with its paws when presented with one. The claws are not retractile but there is great wrist play, food being held either between the fore paws or in one " hand " with the palm bent round almost touching the under surface of the forearm; with this amount of play the " Binturong " can make a deep scratch. Sometimes it smells very strongly but it is a cleanly beast, usually depositing its faeces in the same spot in its cage. On encountering a half grown Bear cub in assumed a cat-like altitude, back high arched and all four feet close together.

It has lived for as many as fifteen years and is easy to keep once past the initial stages; having settled down it takes an easy going outlook on life and a " Munsang (*P. hermaphroditus*) shared its box with impunity, often lying on top of its neighbour.

A form *pageli* was described from Sandakan and has been recorded from Saribas, it differs from the ordinary Binturong by no external characters but in the shape and size of the bullae of its skull and its teeth, which are smaller and more rounded.

Hemigale derbyianus Gray.

Civet Cat. Iban: *Pankat tekalang;* Kayan: *Padungan tana;* Kalabit: *tekalang alud.*

This curious animal is rather larger than a domestic Cat and is coloured greyish buff with a lighter more buff underside, the skin there having a pinkish tinge which fades after death. Its chief characteristic is a number of black or dark brown *transverse* markings across the back originating from two longitudinal stripes down the neck, attempting to throw off posteriorly two transverse stripes, followed by five broad transverse bars on the back extending on to the flank, where they are thinner, paler and inclined to bifurcate. The tail usually has one incomplete bar the rest of it being dull black; there are a number of dull brown markings on the head. Its eyes are enormous and the animal being nocturnal it is most often seen in the rays of a lamp when its two shining eyes are big enough to do duty for a Deer.

A marked characteristic of this and the next species is the very long neck; the stomach of one contained the remains of some worms and some ants. The kitten has the same colour pattern as the adult and a foetus was taken in February.

" Tekalang " refers to the instrument shaped like a policeman's truncheon but much ribbed and used for rendering bark cloth soft; " Padungan tana " suggests I believe ripples on the land and " alud " means a boat, referring here to the transverse arrangement of the seats.

Hemigale hosei Thos.

Dusun: *Tani.*

The shape and size and particularly the long neck resembling *H. hardwickei* and the general colour being dark brown or dull black it might pass for a melanism of this species were it not that the ears, cheeks, some patches on the muzzle and the whole of the undersurface are white. It has the same whorl on the shoulders and the same black ridge down the neck as in *hardwickei;* sometimes white hairy ears as opposed to the grey sparsely covered ones, the nasal stripe broadening out on the forehead: the vestigial eye stripe and particularly the white on the muzzle at the base of the whiskers differentiate it from *hardwickei.* The whiskers are moreover very long, reaching back behind the ear, much longer than in the other species.

We have one specimen from 4000 ft. on Mt. Dulit and there are three more in the British Museum together with one from Kinabalu.

Arctogale leucotis Gray.

Civet Cat. Malay: *Munsang*; Iban: *Munsang akar*; Kayan: *Munin.*

This Civet Cat is usually about the size of a large house cat with a very long tail, longer in fact than the head and body together; the usual colour is grey or greyish brown with a dark brown tail and three broken (occasionally unbroken) dark lines down the back, starting from the shoulders or further back. The underside is lighter and there is a very characteristic white line down the middle of the face. The eyes are prominent, black and beady, the muzzle rather elongated and pinched in to form a snout.

Like most Munsangs it is nocturnal and arboreal, few animals that I have seen being better climbers: it is said to be able to walk along a strand of wire and I have seen it using some very thin sticks which only made it do a few extra acrobatics without falling. As a rule it walks upright but I have one picture of it underneath its perch using its tail in support, the only time I have seen it do so; on the other hand it sometimes used to walk about upside down on the wooden roof of its cage like a fly on a ceiling, except that the Munsang was making use of the cracks between the planks and its tail hanging down free. On the ground it progresses in a series of hops.

It will eat almost anything and is fond of bananas (skin as well), frogs, various birds, a Flycatcher (*Terpsiphone affinis*), an Ant Thrush (*Pitta* sp.) and a Blue Bird (*Irena violacea*) and a "Flying Fox" were welcome but it refused a Hornbill (*Anthracoceros convexus*); even Dayaks won't eat this bird, so nauseous is the smell and the Munsang rolled it on the floor of the cage, generally fouling it. It would not allow a harmless green tree snake (*Dryophis prasinus*) to get away and put a foot on it to haul it back; the snake repeatedly missed the Munsang in striking and the two at last faced each other about 6 ins. apart, the snake head in air, when

with a deceptive quickness the Civet leant casually forward, caught the snakes head far back in its jaws, killed it with one bite and then ate it.

When taken young it makes a good pet but if older is savage and intractable, very old males reaching an enormous size, nearly as large as a " Binturong." It makes a harsh vehement expectoration in the back of its throat which seems to shake the whole animal when annoyed but has also a petulant high pitched scream used only when it has exhausted its vocabulary in the former way; like most of the family it is provided with scent glands and gives off a strong not unpleasant mousey smell. As with all the long tailed Munsangs if picked up by the tip of the it is unable to bend round and bite.

This species is one of the omen animals of the Kayans and Kenyahs though not of the Punans and Dayaks; to the two former tribes it signifies sickness and they particularly object to the noise of it squealing though it is luckily ineffectual after certain good omens.

Paguma larvata leucocephala Gray.

Civet Cat. Iban: *Galling*; Dusun: *Mengulok*; (Saiap) Sennah: *Toon berubok*.

This is, with the Binturong, the largest of our Civet Cats, easily recognizable by the yellowish white head, ears, throat and whiskers, the neck and shoulders being dark brown, the back dark fawn coloured, the underside lighter and the long tail darker with a yellowish white tip; in one specimen there is no white tip.

The hairs are variously arranged, sometimes with no whorls but usually two just in front of the shoulders, making a longitudinal ridge up the neck and a shallower V shaped ridge where the neck hairs meet the backwardly directed ones of the forehead and ears.

The Bornean form is the largest form, except perhaps *P. musschenbroeki* from Celebes, and is found in Malaya and Sumatra but not in Java. Two young, said to have both had the white tipped tail were found by Everett in a female in October, 1895.

Captive ones were uniformly docile even for Civet cats and the young and half grown ones were easily tamed; though so quiet by day they used to get out at night, exhibiting in his respect a much greater ingenuity than their relatives, in fact their sluggishness by day was rather deceptive. Like the Binturong they showed a preference on the whole for bananas as food rather than fish or dead animals.

Paradoxurus hermaphroditus sabanus Thomas. (Plate XIII).

Civet Cat. This is one of the smaller, long tailed Civets and is very variable in colour; the back is fawn coloured with dark indistinct longitudinal markings, sometimes as a continuous line and sometimes as an indistinct line of confluent spots. The ears, neck and tail are black, there are some white markings on the forehead, cheeks and under the eyes; the length of the lines

down the back is very variable, in one specimen there are faint neck rings recalling those of the " Tengalong " and in another there is a yellowish white tip to the tail, just as in *Paguma* (*Paradoxurus*) *leucomystax*.

It is a common animal and may often be seen on the edges of river banks at night.

Lonnberg has separated certain animals from the Barito as *P. h. baritensis* on account their larger size but this is variable and it is hard to recognize two races of this Palm Civet.

In habits it is very like *Arctogale leucotis*, mainly arboreal with a very long tail, making the same noise when annoyed and with the same explosive " spit " that seems to shake the whole animal when it is thoroughly vexed. Fruit or meat from the food as in *Arctogale*, to whom it is quite an equal in climbing acrobatics, making the same use of its tail not as a true prehensile but as a balancing, steadying organ. The different proportions of the legs, and the general altitude assumed is markedly very different from the more terrestrial *Tengalong*.

Linsang (Prionodon) gracilis Horsf

THE LINSANG. Dusun: *Gurat gurat*.

This is a much smaller animal than *Hemigale* but it has the same long neck and has a comparatively longer tail with seven dark brown bars, the body has five broken, transverse bars on each side, not joining across the back as in *Hemigale hardwickei* but each bar with a suggestion of a backward prolongation at its inner (or upper) end suggestive of two parallel dorsal stripes. As in *H. hardwickei* there are two dark longitudinal lines down the neck which join onto sections of these transverse bars and give rise to what might just as easily be called longitudinal broken flank stripes. Some are more heavily marked than others, the colour pattern is the same in the young and and the general ground colour is a dull yellowish white.

Its habits seem to be unknown but it has been taken on Dulit and Kinabalu at about 3000 ft.

A live female taken near Kuching in February refused all food, fish, frogs, squirrels, birds or even cockroaches; it appeared to have had two young and the two inguinal teats were exposed and worn, whilst the abdominal ones were disclosed on turning the hairs back. Not much was observed of its habits save that it ran about at night, was a good climber, had enormous ears, large eyes and a menacing aspect altogether; it slept with the long tail curled round its fore-feet and face The claws were wholly retractile and the animal made no sound or smell.

Linsang is remarkable first for the characters it has in common with *Hemigale* and secondly that in external appearance it almost exactly parallels the African Viverrine genus *Genetta*.

The Civet-Cat (*Paradoxurus hermaphroditus sabanus*)

The Civet-Cat (*Viverra tangalunga*)

Viverra tangalunga Gray. (Plate XIII).

CIVET CAT. Sarawak Malay: *Tangalong*; Iban. *Sinang*; Land Dayak: *Kasui*.

This is one of the comparatively short tailed Civets and is larger than a house cat. The general colour is grey with a well marked black line down the back and tail, a series of longitudinally arranged more or less confluent black spots completely covering the flanks. The throat is very characteristic, having in the adult conspicuous black and white markings; there are three parallel black patches starting just behind the ear, going down the side of the neck, leaving pure white interspaces—the two lower markings turn at right angles, broaden out and meet across the white underside of the throat, the upper marking taking the turn but not quite joining or doing so very indistinctly; the chin and rest of the underside are grey with numerous black spots The head is dark grey with the base of the whiskers whitish, the ears rounded with a white border, there is as a rule a double line of black spots down the middle of the neck, the two parts converging into the black dorsal stripe The sides and underneath the tail are grey with broad bands of black, complete distally, the feet grey and spotted, the claws very small. Not all Munsangs in life have the erectile crest of upright hairs down the back, and so very noticeable in this species

This animal is less arboreal in its habits than the "Binturong" and others, as its short tail would seem to indicate; it is however much more carnivorous, only after some time in captivity taking to pisangs raw fish and raw meat it would not touch but fur or feather was always taken though it failed to catch a Squirrel (*Sc notatus*) loose in its cage, even when the Squirrel used to snuff the Civet's tail. A dead Lemur ("Oukang"—*Nycticebus tardigradus*) was eaten except for its head, just the particular part it usually first goes for in other animals, a dead Flying Lemur (*Galeopterus temmincki*) was neatly skinned inside out, the leg bones left attached and the rest eaten. It also attacked a Porcupine and pulled out a number of quills A Pheasant Cuckoo (*Rhopodytes sumatranus*) it was shy of eating but a small Woodpecker (*Iyngipicus aurantiiventris*) and a Bulbul (*Pycnonotus analis*) were eagerly eaten; live snakes were attacked and eaten, all except the head of a Black Cobra, whilst frogs were eaten with great avidity, as many as a dozen for a meal Scorpions and Centipedes without their poison organs were also eaten with great ferocity. The fondness for Frogs together with an enlargement of the sides of the upper lips to produce an overhang as in an Otter (where it is supposed to keep the closed mouth water tight) all suggest that its habits are mildly aquatic; this overhang of the upper lip is absent in the young. It is also very fond of water and drinks a good deal, rather often. It is less sensitive to the sun than many of its tribe and doesn't retreat at once to a dark corner. it is a compara-

tively poor climber getting little assistance from its tail or claws; neither does it attempt to hold down its food nor use its feet to stop stray frogs jumping away, just making a quick and usually successful snap at them. The animal is terrestrial, may be partially aquatic, carnivorous and probably by no means wholly nocturnal.

This is one of the animals used by Malays for making " obat " and also perfume, the excretions of the anal glands—according to them in the ♀ only, the ♂ being useless—being separated from the faeces and giving the animal some pecuniary value.

Family FELIDAE.

True Cats with claws retractile within a sheath.

A	Tail as long as body		
	a Ground colour greenish yellow, black blotchings		
	a^1 Large, exceeding 5 ft. from nose to tail tip	Rimau dahan	F. nebulosa
	a^2 Medium, less than 5 ft. total length	„ akar	F. marmorata
	b Ground colour reddish brown, no black blotchings	?	F. badia
B	Tail shorter than body		
	b Size small, not exceeding two feet		
	b^1 General colour reddish with black spots	Kuching batu	F. bengalensis
	b^2 General colour uniform umber brown	Jellu maio	F. planiceps

Felis (Pardofelis) badia Gray.

WILD CAT. We have no adult specimens of this cat, which is about the size of *P. marmorata* but much rarer. Wallace collected one in Sadong and Everett one in Baram, both of which were bright chestnut all over, darker down the back, light on the underside and white on the underside of the tip of the tail as in *Profelis temmincki*. It was thought at first to be the kitten of *P. temmincki* but adult skulls were obtained and in the flesh it lacked the distinctive four face streaks.

Like many of these Cats it is known from Indo-China and also has a gray as well as a rufous phase; one from Baram is ticked grey all over, slightly more rufous on the back and the tail almost rufous, a rufous line extending along the flanks, neck, limbs and tail at the junction of the under and upper surfaces.

A most peculiar kitten was brought in alive to Kuching and was included in the Museum collection on its death; it was completely black except for a few reddish hairs on its feet and flanks and a grey face with two black eye stripes. Certain skull characters led Mr. Boden Kloss to be believe it to be the kitten of this species.

Felis (Profelis) temmincki Vig. and Horsf.

THE GOLDEN OR BAY CAT.

This large cat is almost as big as *Neofelis nebulosa*, the Clouded Leopard and is reputed elsewhere to be very fierce and a match for a Tiger; this is almost certainly incorrect for it is quite placid in captivity and was at one time though to be the ancestor of the Siamese Cat, though this is not very likely.

The tail is very long and the animal varies from a complete yellowish buff with a dark line down the back to some which are ticked a rabbit colour (like the Kra or Long Tailed Macaque) or even completely dark grey with a dark line down the back; a most distinctive feature is four black stripes down the face with white in between.

They are known from Sumatra and are fairly common in S. China but I do not know on what evidence they are included in the Bornean fauna, though it seems to have been the custom.

There is no denying that but for its much larger size the above mentioned greyish form does strongly recall the domestic " Tabby " cat, complete of course with a long straight tail instead of the " kink," as in the domestic Siamese Cat's tail.

Felis bengalensis.

THE LEOPARD CAT; Malay: *Kuching Batu.*

The Leopard Cat is rather bigger than a domestic cat but has a comparatively short tail, the general colour is a pale buff, the neck and back streaked with discontinuous, longitudinal black markings, the flanks and feet with series of black spots, the underside white with varying black or dark brown markings. The face is prettily marked, two white eye stripes and two sets of black ones, the ears black, whitish at the base As a rare variation specimens are occasionally taken in which the ground colour is grey or fawn coloured instead of buff, the pattern of the black markings remaining the same.

As Cats go this is one of the commonest in Borneo though not often seen for it is mainly nocturnal; comparatively small as it is, adults are so savage as to be quite untamable but kittens taken young can be turned into amusing pets. Apparently the mother accompanied by three or four young is sometimes met with and captured kittens, spitting and yowling with characteristic ferocity, are offered for sale by natives.

The rather large eyes, upstanding ears and perky expression are characteristic for there is nothing furtive about this species; it assumes a curious attitude when walking and standing still, the head and shoulders held high, fore legs quite stiff and straight, the back and rump sloping sharply away and the hind legs held somewhere out behind the body instead of directly supporting the weight of the hinder part, an attitude exactly portrayed in an illustration of Mr. F. W. Champion's remarkable work " With a Camera in Tiger-land."

Even small kittens do not thrive on a milk diet and take to meat at an early age; a pretty and fairly tractable little Cat becomes a perfect fiend when presented with pieces of raw meat and domestic Cats—not at all conspicuous in his presence—give him a wide berth at this time.

Felis (Ictailurus) planiceps Vig and Horsf.

FLAT-HEADED CAT. Iban: *Jelu maiao*; Kayan: *Using*.

This cat is about the size of a domestic one but has a very distinctive square shaped, buff coloured head with two white markings over the eyes, the back is dark brown, the sides grizzled greyish, underneath white with light brown spots running into rings on the underside of the feet. The tail is very short and rounded, the same thickness at all points.

This cat is fond of fruit and also of fish, having sometimes been caught in the " bubu " or conical fish traps into which it may have got by accident or in an attempt at any easy meal.

A single kitten was born to one in January and the mother was not unnaturally very fierce at the time, though on the whole this cat has a reputation for being quiet and not very aggressive.

Felis (Pardofelis) marmorata Griff

This very beautiful cat is much larger than a domestic one though considerably smaller than the Leopard. It is difficult to describe but the general colour is greyish buff with black markings on the head, black spots on the breast and long hair on the abdomen. There are two black longitudinal stripes down the neck and shoulders, one down the back which breaks up to go flankwards, some of the offshoots opening up to form buff coloured islands, each enclosed in a dark ring with light buff again inside, some of these islands are independent of lines and some are due to their curling round. The feet and tail have black spots, uniting into vague rings near the tip of the tail The markings throughout are only roughly symmetrical

Kittens are much more heavily marked on the back and sides with large dark brown markings separated by light buff and white markings, the tail is profusely ringed

It is said to be very savage in captivity and doesn't live long, it is known to frequent clearings in the jungle.

Elliot in his monograph of the Felidae figures a red form of this cat but I have never seen a specimen.

Felis (Neofelis) nebulosa Griff.

CLOUDED LEOPARD. Malay: *Rimau dahan*; Iban: *Enkuli*; Kayan: *Kolih*; Tagal: *Takinan*.

The Clouded Leopard is a modified Snow Leopard, not quite as big as its better known relative but much the largest cat in Borneo. The ground colour is yellowish with two deep black lines down the back. To the flanks are large blotches of deep black enclosing a patch of yellowish hairs with a few black dots, very much as in *marmorata*, only the colours are brighter, the spots much larger

and closer together. The tail is comparatively very long, the ears small and rounded. I should imagine from its mottled colour that this is a most difficult beast to see.

A shy and retiring species seldom seen and of unknown habits; beyond that it does not attack men here and is almost entirely arboreal even the natives know little of it, though it is sometimes shot at night on river banks and very occasionally caught in snares on the ground. It is mostly found in old jungle but in some parts such as the Lawas District occurs commonly in "blucher" or secondary growth.

The canine teeth are much prized by Kayans, Kenyahs and others but not by Dayaks for ear ornaments, the roots of these teeth being decorated with beads and fastened together with a string of beads passing behind the wearers head and just long enough to permit the teeth to be inserted up to the root in special holes drilled in the upper part of the lobe of the ear; the points hanging downwards and forwards give the wearer a ferocious appearance and the wearing of this emblem together with others was said in old times to have indicated that the owner had taken a head. As much as $20 and more is paid for a pair of long, subequal teeth; only the upper canines are used, not the lower ones, but although much prized by Kayans, they will not themselves shoot this animal and always obtain the teeth from the Punans or others.

Though perhaps commoner inland this animal occurs almost everywhere, even on Mt. Matang near Kuching, where there is once supposed to have been a black one, it is not common anywhere and owing to its retiring habits, the value of the teeth to the natives and the skin as seat mats together with the Chinese regard for bits of it as medicine, the Museum does not contain a complete specimen.

It has occasionally been taken captive and is not particularly fierce, whilst the young are easily tamed, its food is said to consist of small mammals and birds but the chipped condition of some of its teeth point to it having fed on larger boned animals. It is said comparatively speaking to have the longest canines of all the cats, placing it near the extinct Sabre Toothed Tiger (*Machaerodus*) in this respect. A fine photograph of one from Burma is given in the Journal of the Bombay Natural History Society—the animal attacked a woodcutter "crouched and approached him cautiously pushing a bundle of branches and leaves in front of it either as concealment or to puzzle its prey." It is further said to have taken cattle in that neighbourhood but its behaviour here is exemplary as it is not recorded as molesting children or dogs, much less man. A live one was once brought to Kuching but was cut up by the Chinese for "obat;" one shot realized $30 in Song bazaar, being brought for the same purpose by a Chinaman.

It is said sometimes to construct a large nest of sticks in a tree top, whether as a place of rest or for concealment or both is not clear, but it has been recorded as suddenly sallying forth and taking a Kra Monkey, immediately returning to its lair.

Felis tigris.

THE TIGER. Kayan. *Lıjan.*

A. H. Everett records a number of traditions, usually associated with caves, about this animal, notably that of the Limbang Muruts who have a Tiger's Leap Various Simunjan Sea Dayaks at Pupok Hill and the Land Dayaks of Serambo—in fact almost anywhere one will find stories of the " Rimau Antu " mostly (as in the Pupok Hill and Bukit Rimong in the Ulu Mukah) of a flying variety that makes weird noises in caves during the night at certain seasons of the year but is nevertheless an object of considerable veneration to the Dayaks, who don't care about going near the places as a rule.

Real Tiger skins imported and made into war coats are occasionally heard of and are objects of such veneration that many natives will not enter the same house, charms of imported teeth and claws are also in evidence.

Everett describes a Tiger's skull in the Land Dayak house on Singghi not far from Kuching but the owners will on no account part with it, owing to the disaster which would inevitably follow and to examine it even is a matter of considerable difficulty It is not known if it is fossil. It consists of just the skull 13½ ins. long, the teeth and lower jaw being missing The Singghi Dayaks to-day deny all knowledge of such a skull and I am unable to give further information about it.

ORDER VII DERMOPTERA

(FLYING LEMUR)

Galeopterus variegatus borneanus. (Plate XIV)

FLYING LEMUR *Colugo*, Iban *Kubong Plandok*, Dusun: *Langah*

Systematists have been at a loss where to place the so-called Flying Lemur but this curious animal has been generally put in a Sub-Order by itself, it presents so many Bat-like features (for the thumb of a Bat has the same function as the forefoot of the Colugo) that it has been regarded as the living representative of the ancestral patagiate form from which Bats have been derived, they have in fact passed though a somewhat similar stage.

It is a curious looking animal for the blunt, flattened head and the entire back are covered with a very soft woolly grey fur with which is irregularly intermixed a large amount of black and buff hairs giving not only a beautiful appearance but breaking up the general colour of the animal until it looks just like a piece of lichen or giving the same effect as stray shafts of sun light on the tree trunk to which it is clinging The arms and legs terminate in sharp curved claws. The hands are joined to the neck and to the hind feet by a thin membrane covered with a darker fur than on the back and the tail is also included to its extremity in a pointed membrane extending from each hind foot.

The Flying Lemur *(Galeopterus variegatus borneanus)*

The Moon Rat *(Gymnura rafflesi)*

The aptness of the Dayak name " Kubong Plandok " becomes more evident if one holds the accompanying plate upside down when the hunched back and to a certain extent general appearance is characteristic of the Mouse Deer; it is not quite certain that the attitude protrayed is a natural one though the animal moved about and seemed quite at home. Wild it is usually found clinging with its breast to the trunk of a tree and is able to glide to the next tree trunk it is said as much as 70 yards away if it starts at sufficient elevation, on its arrival swarming up in a series of jerks, both hind limbs moving together, the limbs are very weak and will not support it upright on the ground. The tail at rest is always curled, the large membrane enclosing a hollow, the whole affair it is supposed serving as a rudder and to alter the plane of flight, there is no evidence that it is prehensile nor that the membrane is used for catching crepuscular insects in flight, as in the case of some Bats. The anus opens into a large pouch on the underside of the tail but this area is apparently not glandular though some specimens have a faint rather sweet smell whose of unknown origin. Stomach contents indicate that it is herbivorous or frugivorous, bananas being eaten fairly regularly in captivity whilst they are said at times to damage young coconut trees Or some reason they do not live long in captivity but are very tenacious of life on other occasions. The comb like lower incisor teeth prize off pieces of banana which are squeezed against the serrated edges acting as a sort of strainer, these teeth may possibly be used as a sort of comb for the fur though they have not been observed in the act of combing.

There is usually a single young one though Horsfield has recorded two, there being a large teat under each armpit. The only cry I have heard from young or old is a kind of harsh grating squeak several times repeated, rather like the quacking of a very hoarse duck.

The " Flying Lemur " apart from not being a Lemur does not even fly but only glides with outspread membrane Several races have been described, *hantu* from N Borneo and *leachei* from E. Borneo but the Bornean Flying Lemur is very variable in colour and these races cannot be upheld, there is a curious brown or rufous phase characteristic of males only it is said, females sometimes approaching this shade but being always much paler than the males

ORDER VIII. INSECTIVORA.

(Shrews, Hedgehogs, Moles)

Gymnura rafflesi. (Plate XIV)

Moon Rat. Malay. *Tikus bulan;* Brunei Malay and Kadayan: *Kedurna;* Iban *Haji bulan;* Tagal· *Turu;* Dusun: *Temparulik;* Kayan *Duroi,* Kendah. *Buri.*

The Moon Rat is a good deal larger than an ordinary rat, has a naked pinkish tail, short feet with subequal toes and a long pointed nose with wide pink nostrils which together with a rather abrupt forehead is very suggestive of a young pig; add

to this that its colour is usually white and the casual observer would be at a loss where to place the animal (so long as it was as far from himself as possible for it has a most offensive odour).

The iris is black, ear tinged with yellow, the nose pink, the feet paler and the claws light horn.

There is a short woolly yellowish-white underfur and a number of more sparsely distributed long coarse white hairs mixed, particularly posteriorly, with a smaller number of black ones. It is not found in Java but in Sumatra and Malaya they are I believe dark brown. We have only two parti-coloured ones from Kuching; these are dark brown except on the head, neck, throat and shoulders which are dirty white: there are two dark brown patches on the crown and just above the eyes, the proximal half of the tail being also dark brown and the rest white. The scaly tail has a number of very short hairs longer on the sides than above and below, one hair being inserted on each side of the root of the scale and one in the middle.

This is one of the most generalized Insectivores and is related to the Hedgehogs, Moles, Shrews, having really nothing to do with Rats. Its most marked characteristic is the awful smell proceeding from its anal glands and lingering in its box and on its skin for a long time after. It is nocturnal and I believe partly aquatic; in captivity it shows a great affection for its bath tub, gets right into it, and is fond of frogs and fish (cockroaches too) Its claws are grooved, a characteristic distinguishing fish eaters as a rule. Altogether it is dull and unintelligent, makes no noise but opens its mouth threateningly when disturbed and can give a very sharp bite; it is plantigrade and proceeds on the ground at quite a swift gallop.

So far as is known they are usually found in pairs, either under a fallen tree or in a hole in a bank and they may sometimes be seen about at night The young appear to be unknown but a female in June had two embryos one about 1 in. long and the other somewhat smaller.

Dayaks tell a story how the Gymnura got its offensive smell. He was elected director of operations by all the animals in building a boat for themselves and caused them to fell a very large tree and shape it. He then said it was too big and a bit was shaved off and they had to do this so often that there was finally only a small stick left with which "Aji Bulan" began to pick his teeth, whereupon all the other animals fell upon him and smeared him with the sweat of their armpits.

Hylomys suillus dorsalis Thos.

GROUND SHREW. Kiau Dusun: *Limpungor.*

I believe this animal is nearest to the Moon Rat (*Gymnura*) but is much smaller, the general colour very dark brown and the tail only about an inch long, in fact the whole animal is not much more than 6 inches in length. The underparts are dark greyish brown and there is the usual pointed snout, naked ears and longish

grooved claws on the forefeet. There is also a black stripe down the back but its extent is very variable though I believe always present to some degree.

In habits it is described as nocturnal or crepuscular, living in holes in rocks and very numerous on Mt. Kinabalu having been taken elsewhere only in the Merapok Hills as far as I know; usually it frequents the lower slopes but may reach as high as 5000 ft. Relatives are found in Java and Sumatra and I believe in the Philippines.

Family SORICIDAE.

Ground Shrews are perhaps less common in Borneo than most places, though they are not very noticeable anywhere. All are small, some very much so, some aquatic, some terrestrial but one rarely sees more than a corpse killed by mistake by some predaceous animal, lying in the middle of a path. Shrews on account of their musky odour—said to taint unopened beer!—are not eaten by other animals but may be killed in mistake for a mouse wherefore they are said to give rise to loud squeaks when pursued to warn their tormentor that he is on the wrong trail.

Shrews are remarkable mainly for their very soft fur and long, sharp pointed muzzle with mobile tip instead of the round blunted muzzle of Rats and Mice; they of course also lack the two large gnawing teeth of Rodents.

Many species have been recorded from Borneo often on single specimens and owing to their rarity it is impossible to substantiate them all They do not frequent houses here as they do in neighbouring parts where apart from their odour they may do some good in eating noxious insects such as cockroaches.

Chimarrogale himalaica phaeura Thos.

WATER SHREW. Apparently only found on Kinabalu and a rather smaller form of the Himalayan Water Shrew.

Crocidura baluensis Thos.

PYGMY SHREWS. So far peculiar to Kinabalu and like the common *C. juliginosa* but larger.

Crocidura fuliginosa Blyth.

This is much the commonest lowland Shrew.

Crocidura doriae Peters.

Crocidura foetida Peters.

Crocidura monticola Thos.

Said to have been taken by Everett in Sarawak: indistinguishable from the Javan form.

Crocidura hosei Thos.

A very small short tailed Pygmy Shrew from the Baram lowlands.

Pachyura krooni Kohlb.

ORDER IX. CHIROPTERA.

BATS.

At one time th. Bats and the Insectivores were lumped together but they are now widely separated and any characters they have in common, such as the similarly shaped teeth, are due to similar habits. One approaches this Order with a certain amount of diffidence for there is nowhere a really complete collection of Malayan Bats and so very many species have been described on minute differences that identification is not easy even for an expert.

Roughly there are two kinds of Bats, Insect and Fruit Eaters, the former more numerous in species. Insect eating Bats are small, have many fine pointed little teeth and as they have to exercise considerable discretion in procuring their food in the twilight they are provided with what are regarded as special perceptive organs—either a nose-leaf of some sort or a tragus—the exact use of which whether in avoiding obstacles or catching their prey is so far unknown. Such organs are quite unknown in the Fruit-Eating Bats such as the Flying Fox

Bats vary very much in shape. Some have a plain tail, some have it enclosed in a membrane stretching between the hind-limbs and some have it in a kind of sheath partly free and partly inserted in this interfemoral membrane The interfemoral membrane in some is said to be used to entrap insects during flight and to hold them against the body until they are eaten, the wings being also used in this way

Every Bornean cave has swarms of bats, the droppings of the fruit-eaters in particular being sometimes collected as good for the garden. Usually there is a great chorus of squeaking going on inside the caves—some Bats squeak in such a high pitch as to be inaudible to the human ear—and a very musky smell in spite of which the natives do not disdain "Bat Pie" Some caves are occupied exclusively by one species, others have one kind in abundance and but a few other kinds present, quite possibly there is some sort of zonal distribution within the caves various species selecting their sites near or far from the entrance according to taste.

I am unable to give descriptions of the Bats I have not seen and there are comparatively few whose habits have been observed.

SUB-ORDER MICROCHIROPTERA

As mentioned all these Bats are Carnivorous or Insectivorous. There is always a frill round the nose or else a Tragus or sometimes both, most important characters in sorting out the Families.

Family EMBALLONURIDAE.

Like the next Family (Vespertilionidae) the bats of this Family have a Tragus but no Nose Leaf but the tail is free or in a sheath outside the interfemoral membrane and not contained within the membrane.

Bats of the Genus Emballonura are very small, not exceeding two or three inches in length. As in *Taphozous* the tail is partly

contained in a curious sheath; after following the interfemoral membrane for some time it diverges into a pocket on the upper surface of this membrane within which pocket it is partially retractile.

Nyctinomus plicatus Buch.

This curious Bat is like *Taphozous* in size, in the long wings and big ears but is remarkable in that the latter almost unite across the forehead.

I believe it is this species which has been so well described from the " birds'-nest " caves of N. Borneo, they are described as wheeling round before coming out about sunset, flights breaking off now and then to emerge, something like twenty flocks each of many thousands moving off before dusk. At sundown a number of Hawks collected for the fun, two Brahminy Kites (*Haliastur intermedius*) being clumsy compared with a particularly agile Buzzard (*Macaeramphus alcinus*) which caught and ate its prey on the wing. The affair was reversed at sunrise, Bats coming at great speed for over two hours and dropping straight into their caves.

Cheiromeles torquatus Horsf.

THE HAIRLESS BAT There is no mistaking this revolting looking Bat, some six inches or more in length and quite naked, only a few scattered bristles representing the furry covering of other species; I have never myself seen the beast alive and must rely on Shelford's clear description of its peculiarities.

It appears that the membranes of the wings are attached in such a way to the sides of the body, arms and thighs as to form a large pouch extending from under the armpits to the back of the shoulders and sides of the chest, the young are carried in these pouches, present in both sexes, the teats of the female being situated under the armpits. More remarkable still is a strange Earwig which has taken up its abode in these brood pouches of the Bats but it is quite unknown how they fare for food though it is suspected they leave their host at times in search of living insects

In addition to the brood pouches both sexes of this Bat have a pouch opening on the underside of the neck, into which pouch certain glands secrete a fluid with a most offensive odour, compared by Hose to the smell of burning leather This Bat is said to form small colonies in hollow trees and not to use the caves frequented by most other Bats

THE TAPHOZOUS BATS are distinguished by their greater size (exceeding three inches) from the rest of the Family.

Taphozous longimanus albipinnis Thos.

As far as I have observed these Bats are solitary as a rule and I have most often seen them fly out of the crown of a coconut Palm as someone ascended the tree, the white wings are particularly noticeable in flight and give the beast an unmistakable piebald appearance.

Taphozous saccolaemus Temm.

Differs in having a large pouch under its chin.

Taphozous melanopogon.

Taphozous affinis Thos.

Emballonura monticola Temm.

A very small and fluffy dark brown bat with black wings, the whole very like *Vespertilio muricola* but at once distinguished by the sheath tail; it is found in caves and under overhanging ledges of rock, being a fairly common species.

Emballonura semicaudata Peale.

This is said to be a larger species than *monticola* found in Polynesia, the Fiji Islands and Mergui Archipelago.

Emballonura rivalis.

Family VESPERTILIONIDAE (TRAGUS-EARED BATS).

Like the Fam Emballonuridae just described these Bats have a tragus but no nose-leaf and differ in having the tail enclosed within the interfemoral membrane instead of in a loose sheath of its own.

Kervioula pusilla Thos.

Kervioula whiteheadi Thos.

Kervioula papillosa Temm

Kervioula hardwickei Horsf.

Kervioula bombifrons Lyon.

Bats of this genus have a comparatively long tail, as long or longer than head and body, than which it is definitely shorter in other Vespertilionids.

Myotis adversus Horsf.

Harpyiocephalus suillus Temm.

THE TUBE-NOSE BAT distinguished by the very rounded, pipe like slightly elongated external nostrils.

Hesperoptenus doriae Peters.

I believe this is the Eastern form of the EUROPEAN PIPISTRELLE BAT.

Pipistrellus tenuis Temm.

Pipistrellus imbricatus Horsf.

Glischropus tylopus Dobson.

Pterygistes stenopterus Dobson.

Tylonycteris pachypus Temm.

A peculiar CLUB-FOOTED BAT with strange sucking pads on its hands and feet

Pachyotis kuhli Leach.

This small Bat some 3 ins. long is unfortunately not so common here as in Java and India where it has a praiseworthy predilection for White Ants. It is distinguished from the above mentioned Bats in having only one instead of two pairs of upper incisors.

Family NYCTERIDAE.

Notable for the possession of a nose-leaf as well as a tragus.

Nycteris javanica.

Nycteris tragata.

Megaderma spasma L.

This curious species is sometimes erroneously called the VAMPIRE BAT and has been recorded sucking the blood of smaller Bats and even I believe of Frogs; true Vampire Bats attacking Man and his domestic animals are natives of S. America. *Megaderma spasma* is of medium size, has a simple nose-leaf, large ears whose inner margins are united at the base and further lacks a tail.

Family RHINOLOPHIDAE (NOSE-LEAF BATS).

These Bats are remarkable for the great specialization of the Nose-Leaf but corresponding absence of the tragus; they include the " Horse-Shoe " Bats of Europe, are very numerous in species and perhaps represent the most highly specialized of Bats.

Hipposiderus dayacorum Thos ; **coxi** Shelford; **sabanus** Thos., **speoris** Schneid.; **bicolor** Temm ; **doriae** Peters; **cervinus** Gould; **galeritus** Cantor; **larvatus** Horsf ; **insolens** Lyon; **Hipposiderus diadema vicarius** K. Anderson.

A very common Bat in the Birds Nest Caves near Lawas, the male is very dark brown above, fine grey, almost white below, the female much more ochraceous above and below. Of a dozen collected at random only one was a male.

Rhinolophus minor Horsf.; **creaghii** Thos.; **affinis** Horsf.; **borneensis** Thos.

Rhinolophus luctus Temm.

Rhinolophus trifoliatus Temm.

This is a very fluffy light grey Bat, the commonest species of the genus, occurring solitary or in pairs hanging some 6 feet or so above the ground on some twig in either old or secondary jungle and not frequenting caves or even hollow trees.

SUB-ORDER MEGACHIROPTERA.

These are the Fruit-Eating Bats, comparatively few in species but almost incredibly numerous in numbers. All Bats of this Sub-Order lack a Nose-Leaf and the Tragus.

Everyone knows the Flying Foxes to which Sub-Family belong a number of smaller species of which the two following are typical and very common representatives.

THE FRUIT-BATS.

Cynopterus (Penthetor) lucasi Dobson.

A small Bat some five inches long, sparsely clad in short coarse fur very different from the hairy or woolly appearance of the Insectivorous Bats. The general colour on head and back is dark brown with a greyish collar round the neck, the wings very dark brown but the underside dark grey in the female, light grey in the male.

Cynopterus brachyotis brachyotis Muller.

The common lesser Fruit Bat is very like *C. lucasi* but of a more greenish brown above having a distinct buffish (not whitish or grey) collar round the neck.

A most common and voracious little Bat recorded as eating more than its own weight of bananas in a night. There is on Pulau Salak near Santubong at the mouth of the Kuching River a large crevice

in the rock and a hole in the ground (now filling in) occupied by enormous numbers of this bat.

Cynopterus spadiceus Thos.

Cynopterus macuiatus Thos.

are two Bats of which I know nothing.

Cynopterus ecaudatus Temm.

This Bat appears to have been taken on Mt. Kinabalu and is found in Sumatra and the Malay Peninsula.

Eonycteris spelea Dobson.

Carponycteris minima Geoff.

These two Bats belong to a different sub-family and are notable for their very long tongues capable of protrusion for half an inch or more. Both have square blunt almost Dog-like muzzles and the former is remarkable in that it has no claw on the second index finger.

Pteropus edulis Geoff. (Plate XVIII).

FLYING FOX; Malay: *Kaluang*; Tagal: *Kawat*; Murut: *Bangkaut;* Dusun: *Paniki;* Kayan: *Hawat.*

These huge bats have a wing spread of about four feet; the crown dark but the nape and neck yellowish buff, more rufous on the sides, the back black and the underside a very dark brown. The eyes and ears are large, the whole appearance menacing and repulsive; there are two enormous claws on the " thumbs " of the wings and the hind feet are provided with five curved claws but there is no tail

During the fruit and flowering season from October to February these may be seen almost anywhere about dusk, sometimes during the day and solitary individuals may be seen at other times of the year, the flock no doubt splitting up and scattering when the fruit is off. Colonies of thousands roost together and all at dusk flight towards various fruit trees, notably " Kayu ara," for the evening meal; those already there set up an awful squealing to the late comer who flies up to the projecting tip of a branch, checks its flight, hooks itself on with the long curved claws of its hind feet and hangs head down for a moment Then it reaches up and with the aid of the long curved claws on its thumbs proceeds to walk back downwards along the underside of the branch until it reaches fruit fit for food The flight is straight and deliberate, the wing beats slow and deceptive as regards pace which is considerable, the weather effects them little though I think rain and high wind make them fly low, nevertheless some mounting as high up in the air as they often do in fine weather and maintaining their way in very strong winds and rain, a sufficient tribute to their wing power. The heavier species of the various orders of birds have a relatively smaller wing area than lighter species of those orders. The male " Kaluang " being as a rule slightly heavier than the female has about the same relative wing area as his mate, a fact which can only be accounted for by the female having at times the additional weight of the offspring clinging to her which makes her for a time scale as much as the male. The

clinging young are found at any time from December to about March, as a rule just the time when their parents join in huge flocks; half grown ones may also be flying in October.

In the flesh it is a repulsive animal but its meat is said to be good eating in spite of its musky smell. Though it has no real fleas the sight of the numerous apparently bloated wingless flies running about in its fur is unpleasant. The teeth are very powerful and can give a nasty bite Its method of feeding is to hook its food towards itself with one of its thumb claws on the outstretched wing, surplus food being stored in its cheek pouches. When hanging from a branch its hind feet are always apposed, gripping opposite and not the same sides of its perch, to defecate (a very frequent happening) when hanging head down it hooks the claw on one thumb over its perch raises itself up until the operation is over thus avoiding soiling itself.

Whitehead describes thousands resting on the hanging ends of the Nipa Palms, seeming to court the full glare of the sun and gently fluttering one wing as if fanning themselves, they took off with a rattling noise of their wings and had their mouths open when flying as if they were panting in the heat

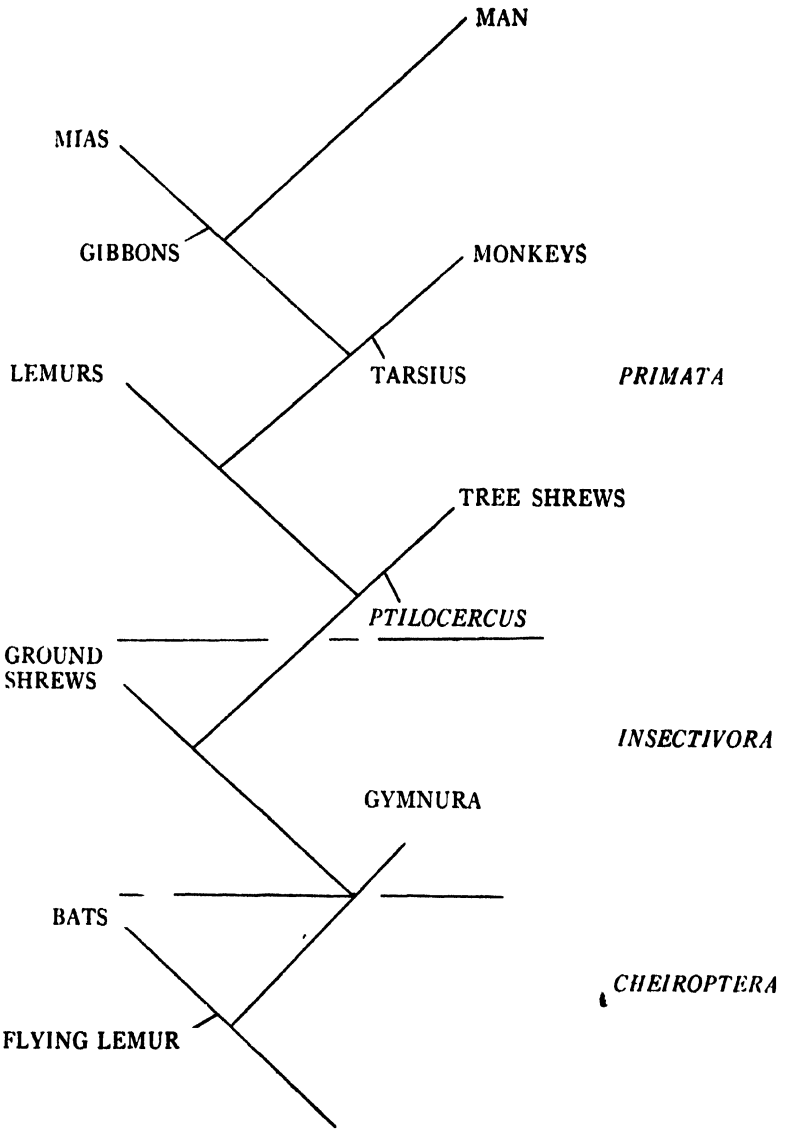
They do considerable damage when roosting in the Nipah Palms for several may hook themselves onto each frond which may ultimately die or in time give way, leaving the bare spikes of the Nipah without a single leaf for several feet from its tip and the leaves lower down broken, bent and dying.

ORDER X PRIMATA.

Man, Apes, Monkeys, Tarsius, Lemurs and Tree Shrews.

The Primates are divided by many investigators into the Anthropoidea (Man and Apes), the Pithecoidea (Monkeys, these last sometimes including Tarsius and sometimes leaving him between themselves and the next, as the Tarsioidea) the Lemuroidea (Lemurs) and possibly the Tupaiidae (Tree Shrews), which recent research strongly suggest should be included in this Order.

One cannot build an entire evolutionary tree out of the strange inhabitants of Borneo but their place in such a tree would be somewhat as follows· Nearest to Man the Apes, of which the Mias comes first in Borneo preceded some way off by the Gibbons then the Long Nose Monkey, the Lotongs and the Macaques (Kras and Broks); close to them in a little section to himself, Tarsius, looked on by some as being nearer than the Apes to the point of Man's origin; further away the Lemurs, represented here by the Loris. Then a fairly big gap to the Tree Shrews with the Pen Tailed species perhaps in a little section to himself slightly nearer the still distant Order Insectivora; follows this Order, the true Ground Shrews and the *Gymnura,* whilst further off the Order Cheiroptera or Bats, and the most archaic of all, the Flying Lemur. Not for one moment does one suppose that the forms mentioned are in the direct line of evolution, being of course but offshoots of it represented graphically somewhat as follows:


MAN
MIAS
GIBBONS
MONKEYS
LEMURS
TARSIUS
PRIMATA
TREE SHREWS
PTILOCERCUS
GROUND SHREWS
INSECTIVORA
GYMNURA
BATS
CHEIROPTERA
FLYING LEMUR

SUB-ORDER TUPAIIDAE.

TREE SHREWS.

Great interest has been taken in the so-called Tree Shrews or Tupaiidae and an intensive study of their anatomy, notably by Dr. W. E. Le Gros Clark, has thrown much light on their position in the Animal Kingdom. They are really only very distantly related to the Shrews they outwardly resemble and they have not as many affinities with the other Insectivora as was thought, for a study of the skull, the brain and their general anatomy suggest they should be included in the Primate Phylum with Man, the Apes, the Monkeys and the Lemurs whom they parallel in osteology, myology, vascular and genital systems. They have many primitive and many Primate features, some possibly due to adaptation to their habits and they may be regarded either as the most primitive of Primates, the nearest living representative to the ancestral form from which was derived the Primate stem, or perhaps better still as a representative of a generalized group of Insectivorous mammals which are an offshoot from the stem of the Primate Phylum after the latter had differentiated from other Phyla: all of which means that the Tupaiidae are not Insectivores as formerly thought, but are primitive Primates.

Tree Shrews and Squirrels are much about the same size and when just seen passing in the jungle not unlike to look at, "Tree" Shrew is an unfortunate name for though they can and do run about in the trees most species spend the greater part of their time on the ground running over and under fallen tree trunks. In this connection it is notable that in three cases to be mentioned later where there is a similarity in colour pattern between Tree Shrew and Squirrel it has usually been the ground Squirrels (*Funambulus*) which have been unconsciously chosen as models.

Tree Shrews are all small and bear a superficial resemblance to Squirrels from whom they may at once be distinguished by the pointed snout and the numerous, sharp pointed little teeth quite different from the enormous pair of incisors or "Rabbit" teeth carried by the Rodents.

The superficial resemblance is carried even further, in fact it is even possible that certain Squirrels are mimicked by certain Tree Shrews or vice versa; Squirrels can be insectivorous and Tree Shrews frugivorous but if any advantage is gained it probably goes to the latter. *Tupaia minor* and *Sciurus tenuis* form one pair, *T. montana* and *Funambulus everetti*, both confined to certain mountain tops, are another couple, *T. dorsalis* and *F. insignis* a third, somewhat similar in appearance and habits. Of actual mimicry we have no proof but the specimens laid side by side are certainly suggestive. Squirrels and Tree Shrews often fight in captivity and as I have said the latter name is certainly a misnomer, for trees are probably less frequented by *Tupaia* than the ground, in two cases the habitat of the Squirrels supposed to be mimicked.

A short key is given here to the forms that may be met:

A	Tail naked except for terminal tuft	Ptilocercus
B	Tail hairy	
b	Size large (Fifteen inches length)	
b^1	Black dorsal stripe	
b^2	Underside red	Tupaia tana
b^1	Underside yellowish	Tupaia picta
b^1	No dorsal stripe, colour uniform	Tupaia glis
c	Size medium, colour uniform	Tupaia montana
d	Size small (Length one foot)	
d^1	Black dorsal stripe	Tupaia dorsalis
d^2	No dorsal stripe, colour uniform	T. minor & gracilis

Ptilocercus lowii lowii Gray. (Plate XV).

THE PEN-TAILED SHREW.

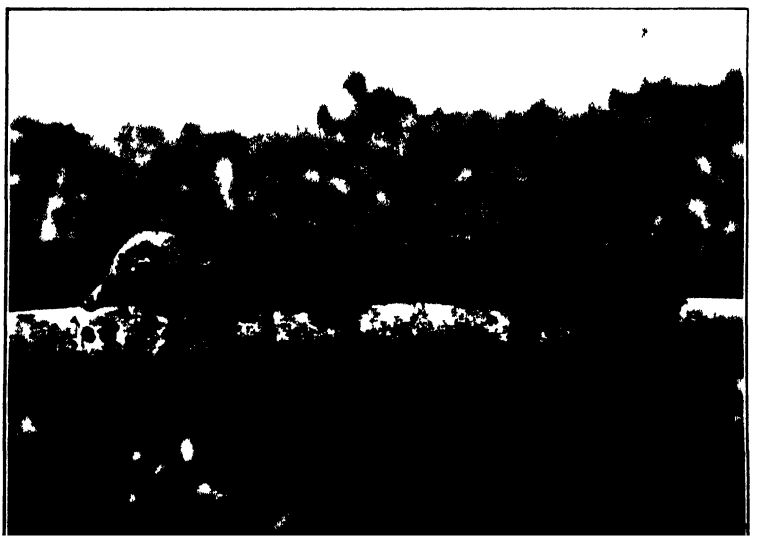
This curious looking little animal has also been the subject of a great deal of controversy, in certain aspects being even more Lemuroid than *Tupaia* but in other ways much more primitive * The latest account would seem to emphasise its primitiveness and perhaps ascribe its Lemuroid features to its nocturnal adaptations, as opposed to the more Primate-like features of the diurnal *Tupaia*. *Ptilocercus* is a generalized and primitive arboreal animal and represents a slightly earlier stage than *Tupaia* in the evolutionary development of a Lemuroid from a primitive insectivorous animal compared with *Tupaia* it has a more primitive brain, smaller elaboration of the neopallium and is much less Lemurine in skeleton, musculature, genital system and other anatomical features *Ptilocercus* has the visual regions of the brain less developed than in *Tupaia*, the auditory centres and peripheral sense organs better developed, the olfactory regions being little reduced; *Tupaia* on the other hand is most sensitive to visual stimuli and has suffered a corresponding reduction in the olfactory apparatus of the brain.

Actually it is a little animal not much bigger than a small rat, covered in greyish mouse coloured fur, the tail naked except for the terminal inch or so which bears a whitish plume, sometimes with a few black hairs proximally. The nose is pointed, the eyes and ears rather prominent and the feet rather noticeable for the wide expansion of the digits.

Some that I had in captivity used to spend most of the day asleep and only come out in the evening to eat up a few cockroaches

* The late Mr Oldfield Thomas considers the many cusped tooth, such as in this animal, to be the primitive original form of tooth and the simple tooth to be much specialized, he would therefore not consider Ptilocercus to be more primitive than *Tupaia*

The Pen-tailed Tree Shrew *(Ptilocercus lowi)*



The Tree Shrew *(Tupaia tana utana)*

and small bananas; when asleep the tail was curled round till the "feather" covered the face, I imagine to ward off mosquitoes and flies. They were expert climbers, up and down the surface of a door and apparently only using their tail as a support when at rest; on the ground they proceed in a series of hops, the tip of the tail inclined upwards and the digits being so bent that the claws touched the ground sufficiently to interfere with them walking normally on their palms

A fuller account of its habits may be found in the latest contribution to the subject.

Dendrogale melanura Thos.

TREE SHREW. This a small rather rufous Tree Shrew, buffish below, lacking the shoulder spot and possessing a normal cylindrical tail neither fluffy nor feathery as in so many *Tupaia*, this last character together with the large claws are responsible for the separate genus.

The animal is rather variable and is said to be common on Mt Kinabalu, occurring also on Mts Dulit and Murud but nowhere below 3000 ft.

Dendrogale murina Mull and Schleg.

TREE SHREW A single specimen, much smaller than the above, came from Pontianak and is in the Leiden Museum

Tupaia montana montana Thos

TREE SHREW Somewhat resembles *T. glis saltana* in being unicolorous but rather darker, it lacks the long snout, hands and feet and has quite a short tail A shoulder spot is faintly indicated The general colour varies according to the angle from which the specimen is viewed but it is usually rather dark with a number of coarse black hairs which in many cases but not all form a dorsal black patch or stripe, the black markings are always absent in the allied form, which has further minor differences

Little is known of its habits beyond that it is mainly terrestrial, inhabits Mts Penrissen, Poi and Dulit above 3000 ft and does not occur in the lowlands

Tupaia montana baluensis Lyon.

TREE SHREW Dusun *Temburoih.*

The distinctiveness of this sub-species is not very clear, but depends on minor details except for the invariable absence of the dorsal marking sometimes present in the other.

It is found on Mt Kinabalu and doubtfully on Mt. Murud, at an altitude of over 3000 ft

Robinson and Kloss were to have named this *T. m moultoni* but Lyon preceded them with his describtion by about a month

T montana bears a remarkable resemblance to *Funambulus everetti*, a Squirrel likewise found only on mountain tops above 3000 ft. and not on the lowlands; both the Shrew and the Squirrel are almost entirely terrestrial, running about on and under tree trunks lying on the ground, the similarity in appearance and habits

suggesting some kind of mimicry not yet worked out. The Squirrel is perhaps a little the commoner of the two and possibly has a lowland form in *F. laticaudatus*, whereas the *Tupaia montana* has no lowland representative.

Tupaia picta Thos.

TREE SHREW. This species somewhat resembles *Tupaia tana* but is not rufous being inclined more to black and buffish; in fact the underside is ochraceous instead of rufous. The size is about the same, the snout is short and a black dorsal stripe is present except in one whose back is all black, the sides and flanks usually have a number of buffish hairs and the terminal half of the tail is rufous. The shoulder spot is present but unlike *tana* the area between it and the black of the dorsal stripe is concolorous with the rest of the body and not split into a lighter and darker patch; the shoulder spot in fact is not bordered by black or ferruginous along its inner margin.

Very little seems to be known of its habits but it appears to inhabit the Baram area in N. Sarawak and is absent from the rest of the State.

Tupaia splendidula lucida Thos. and Hart.

TREE SHREW. Somewhat resembles *ferruginea* but has a dark red brown tail something like *tana* than which it is a good deal smaller.

Tupaia dorsalis.

TREE SHREW This species is rather bigger than *T. minor* but has a narrow black dorsal stripe from nape to root of tail. There is a buffish shoulder stripe, the forequarters are fawn coloured, the hind quarters and tail rather rufous; the underside is buffish yellow.

It appears to be a terrestrial species found in most parts of Sarawak, usually on the lower slopes of hills but not noticeably above 3000 ft.

Like *Tupaia tana* and *T. picta* the dorsal stripe suggests an imitation of the colour pattern in the Squirrel *Funambulus insignis;* from observation perhaps *T dorsalis* is the most likely mimic but possibly only in a very general way. Like the squirrel and *T. tana*, this species is largely terrestrial.

Tupaia gracilis gracilis Thos.

TREE SHREW Very like *T. minor* but not so rufous and perhaps rather larger; the shoulder patch in the present species is grey and not at all outstanding.

Like *T. minor* it is generally distributed over Sarawak, the two being taken in the same area.

Tupaia minor minor Gunther

TREE SHREW Dusun: *Tigi.*

This is one of the smallest of Tree Shrews less than a foot in length but quite one of the commonest, often seen running on the ground, on fallen tree trunks and even in trees. It is uniformly

coloured something like a Rabbit but sometimes more rufous, with a white marking on the shoulder and a greyish white underside. The snout is short and blunt for a Shrew and the tail is not so feathery as in other species.

I have twice had a pair of young of this species, both taken from hollow trees, in one case during September. The young made a little cheeping noise and throve on milk (which used to get up their noses and lead to snorting matches) and bananas; they were particularly active at night and often used to find a way out of their cages though they didn't stray far. On the ground movement consisted sometimes of a series of hops when in a hurry but normally they walked in the ordinary way.

The cry of the old one is a rather piercing squeak often to be heard about dusk. They are found all over Sarawak up to a fair height on mountains.

T. minor and *T. gracilis* somewhat resemble *Sciurus tenuis* in appearance, especially if only just glimpsed in the jungle but they are on the whole less arboreal than their Rodent model.

Tupaia tana utara Lyon. (Plate XV).

TREE SHREW. This is one of the largest Tupaias and is almost wholly terrestrial. The head is fawn coloured, there are two buffy or greyish white whorls on the side of the neck meeting in the mid line a characteristic median black marking running about half way down the back; there is a large light patch on the shoulders subdivided on each side by a short black lateral line which at once distinguishes it from *T. picta* which has only the median dorsal line and a minute light shoulder streak corresponding to only the more remote part of the larger patch in *T. tana*. The flanks are dark chestnut the underside light chestnut, the lower back almost black, covered with coarse bristly hairs, the tail above and below usually bright chestnut but sometimes darker. Specimens from Mt. Dulit do not differ though immature specimens are often very bright.

In a wild state they are most often seen running on the ground, head and tail up, on occasions probably when near their nest showing no fear of man but scurrying round a yard or so away and uttering low chirps. In captivity they are mostly frugivorous but do not touch anything hard such as sugar cane; pisangs and tomatoes, also sundry small ants sharing the pisangs, were intentionally licked up off the floor, bits of fruit being prised off and squashed to a pulp or strained before eating rather recalling the use of the depressed comb-like lower incisor teeth of *Galeopterus*. Though terrestrial they climbed well, were thoroughly at home on horizontal branches and slept at night in the top of their cage. They quarrelled somewhat among themselves and were generally routed by either *Sc prevostii* or *Sc. notatus*, their alarm note being a harsh cackle rather like that of a Jay at home. At rest the tail was curled round under the chin, when walking the tip bent straight up, back arched

and head raised. The thumb has a claw instead of a nail as in Squirrels and the walk is normal not splay footed as in the latter; the tail is of the bushy " flue brush " variety, though in skins it appears feathery and flattened. When taken at the end of November the parts of the male were conspicuous and he frequently, often unsuccessfully, tried to cover his mate who was already pregnant. When curious and sometimes when eating they sat bolt upright on their hindquarters, the back almost vertical not bent as in Squirrels; when sitting up to feed this *Tupaia* definitely sat upon its sit-upon whereas *Sciurus prevostii* does not but squats resting the back of its thighs against the back of its legs as in the illustration.

A very beautiful variety *chrysoura* was taken by Everett in N Borneo and described by Gunther, it is duller, darker, less chestnut but in moulting has a number of soft grey hairs on its lower back The tail is bright golden yellow and Everett in his notes says it is confined to Bukit Lumbidan in the Padas Delta and is the only form found there.

Lyon (1913) described several other forms, *pattana* from N. E. Borneo and the Bulungan River differing in having the shoulder stripe bordered by the light colour of the back and not the reddish colour of the flanks; *besara* from the Kapuas River distinguished by its smaller size.

Tupaia glis salatana (longipes) Lyon.

Tree Shrew. One of the largest of Tree Shrews, it is about 18 inches long but uniformly drab coloured above except for a whitish or almost rufous mark on each shoulder, the actual fore and hind feet, the carpus and tarsus appear to be extra long in this species, as is also the snout.

In habits it does not appear to differ from others of the genus, being found equally on the ground and on tree trunks, it is not as common as *Tupaia tana* but is distributed throughout Sarawak.

SUB-ORDER LEMUROIDEA.

(Lemurs).

All the true Lemurs live in Madagascar but they have a number of allies on the African mainland some of which reach the Oriental Region and are represented in Borneo by the Loris. there is a near relative in India and Ceylon and these two with the Potto of W. Africa form a group to themselves differing a good deal from other Lemurs.

Lemurs on the whole are low in the Primate scale of organization but have every right to be considered Primates in respect of their brain and in some other characters; certain fossils are however doubtfully placed among Lemuroidea and Insectivora.

Nycticebus tardigradus borneanus Lyon. (Plate XVI).

Malay: *Oukang;* Dusun: *Tandaiundong;* Sennah: *Sesir.*

The appearance of this little animal is rather well known, a rounded, tailless ball of fur with a blunt, square head and short

The Slow Loris (*Nycticebus tardigradus borneanus*)

legs. The colour is very variable owing to there being two different kinds of fur, there being a dense, short, wooly under-fur everywhere but on the head and limbs and a longer, sparser, usually brownish set of hairs; these hairs are sometimes quite whitish giving the animal a " frosted " appearance most common in the young but present in some adults independent of age, sex or season and there is every gradation. There is a broad white stripe down the forehead onto the nose, a large brown patch enclosing each eye, a white patch in front of each ear and then two brown markings meeting on the crown to form a single dorsal stripe which may reach onto the shoulders.

The hands are most efficient, fingers provided with rounded nails and the thumb capable of wide expansion, one toe on the hind foot supports a claw. Both the feet and the leg-joints constitute a mechanism by which the Loris performs strange acrobatic feats and really assumes almost impossible contortions as it moves about.

This little animal is often brought in alive but owing to its sulky and retiring diposition is not very exciting to keep. The young ones can be tamed but as they are nocturnal not very much is seen of them, though they often return from their wanderings after an absence of several days. A single young one is born and clings tightly to its mother occasionally giving a loud squeak whilst its parent utters a low rumbling growl which cannot be heard at some distance. It is very hunched up in shape wiith its head hidden between its legs, the unhappy animal according to the Malays hiding its face because it is always seeing " antus " or ghosts; when really awake its activity is considerable and I have seen it catching butterflies and cockroaches in its cage with great skill. It lives mainly on bananas but will eat almost anything else, being capable of giving a comparatively very sharp bite for so small an animal. The bite is definitely not poisonous as sometimes stated.

There are legions of amusing stories about the Loris, mostly unprintable; in Assam he is supposed to have attended a great feast at night and so much did everyone enjoy themselves that the Sun was asked to stay down a little longer when morning was due; but he couldn't resist having a peep, disclosing the Loris, then nimble and sprightly, doing a " pas de seul," whereupon the Loris was furious with the Sun who only replied that he should neither dance nor see the Sun again, which accounts for his ungainliness and love of darkness.

Bock states that the Loris is covered beneath its skin by a layer of nauseous-smelling fat which renders it unpalatable, it is true that the stomach cavity of one specimen was richly loaded with fat and that a " Tenggalong " (*Viverra tangalunga*) refused to eat much of it but other normal specimens were consumed in the ordinary way, save for their heads, the very part usually first eaten in other animals.

SUB-ORDER TARSIOIDEA.

(Tarsier).

Tarsius is the only living representative of this Sub-order and has come in for more scrutiny than most animals; originally put among the Lemurs, he has at times been transferred to the Monkeys, with whom he has apparently more affinity and has been cited as being more nearly like the ancestors of Man than the Apes and Monkeys, usually credited with the nearest resemblance to that mythical being.

It is perhaps fairly clear that he is no longer a Lemur and has a great many characters common to Monkeys; the claim to a prominent place in Mans ancestry rests on the labours of anatomists and on certain Tarsioid fossils but there still remains a vast amount of evidence provided by Monkeys, Apes and by fossil human skulls as to Man's Simian ancestry.

Tarsius spectrum borneanus Elliot. (Plate XVIII)

THE TARSIER, Iban· *Ingkat*, Kadayan. *Sempalih*, Senrah. *Lakud*, Dusun *Tindok rokok*.

Few animals have excited more comment in their appearance or str in the scientific world than the Tarsier, which has now come to be popularly regarded as a sort of missing link between the Lemurs and the Monkeys and though rather nearer the latter, has appealed to evolutionists as being a relative perhaps of the common ancestry of Man, The Apes and the Monkeys. Prof. Wood-Jones has I believe assumed that the Anthropoid Apes, living or extinct, have at no time played a part in Man's ancestry and assumes the many common anatomical features to have been independently acquired, though anatomists will not agree with him thus far, he proceeds to contend that Man's independent origin must be sought for among the small Tarsioid animals of the Eocene Period, a contention which however improbable redoubles the interest in Tarsius as a survival of those animals just possibly long ago responsible for Man's development The little beast has been and still is being studied intensely and whilst it would not be seemly here to repeat some of the things written about him some general account is included because of his notoriety.

He is only a little buff coloured animal about 15 ins. long with a comparatively big round head in which are set two enormous brownish eyes; the thin fingers and toes are very elongated, their tips widening out into small adhesive rounded suckers, the nail still remaining but being prominent on two toes only. The tail is about as long as the body but except in the young is quite hairless on the underside and almost so on the upper side save for the last two inches; it is in no way prehensile but the underside is applied to the upright stick to which he most often clings and thus helps to keep him in position. The fur is soft and wooly often leaving a bare or sparsely covered area all down the inside of the

The Flying Fox
(Pteropus edulis)

The Tarsier
(Tarsius spectrum borneanus).

limbs and under the throat. The ears are rounded and fairly prominent but the nose resembles those of Monkeys rather than Lemurs; in the latter the nose overhangs the lower jaw, and the upper lip is adherent so that drinking is done by lapping, whereas the Tarsier has a free, uncleft upper lip probably capable of partial protrusion as in monkeys. Some authors would divide the Primates into two groups, the Lemurs by themselves in one and Man, Apes, Monkeys and the Tarsier in the other but others favour putting the latter in a Sub-order by himself between the other two divisions.

The Tarsier seldom lives long in captivity, about a fortnight if one is lucky though it will eat Cockroaches and Grasshoppers with apparent zest; the Dayaks keep it on rice and bananas, which latter it does occasionally touch and though it may live for a week or so thus it is generally offered for sale when at its last gasp. It is at times most obtuse in taking any notice of its food, though at other times it is quite smart, irrespective of its hunger; sitting upright on its stick it sees a Cockroach meditating on the floor and after staring at the prey for a few moments the Tarsier without further warning takes a flying leap—may be as much as a yard—and lands near its food when the long fingers with the curious pads close on the Black Beetle, for whom there is then no escape A few nips quieten the Cockroach whilst its captor nibbles round the wings until they drop off, the victims body being held in one or both hands; here it may be remarked that it is characteristic of the Tarsier, the Loris, the Tree Shrews and some Civet Cats that when biting their teeth do not penetrate very far but that there is considerable crushing power, perhaps enough to almost numb ones finger, and no doubt quietening an active insect even more quickly than a sharp piercing bite would do. The Tarsier seems to close its eyes when biting but opens its mouth when threatened as do most animals, it has I believe been recorded picking dead insects out of Pitcher Plants but this requires confirmation

The Tarsier is fond of drinking and licks up any drops of water sprinkled on its fur. It is of course entirely crepuscular and nocturnal, being most usually found solitary by Dayaks clearing secondary jungle but sometimes in old jungle too, though it does not ascend mountains. They apparently breed as do most Mammals from about October to March and the young are born in a well advanced state, learning to feed and jump about in a months time; Hose recorded the mother carrying its young by the scruff of its neck like a cat with its kitten but this statement has been denied and the young are certainly usually carried clinging to the mothers underside. They have a slight mousy smell but make no noise in captivity beyond the squeak of the young one for its mother; the natives have called attention to its cry about dusk, a croak rather like that of a frog followed by a whirr like the stridulation of grasshopper, or a fishing reel running out, and if this really be their note they must be fairly common. I have twice let specimens go

in the secondary growth at the back of my house and in one case heard this noise for many nights after and the other case for only a few, but have of course been unable to bring it home to the Tarsier. though I have not heard the sound at other times.

As an example of the intermediate position occupied by the Tarsier its mode of vision is of interest; monkeys have stereoscopic vision, each eye gets the same picture but the lower mammals have panoramic vision, each eye receiving a slightly different picture Certain nerve cells known as the " nucleus of accomodation " are in Primates divided into two, correlated with the independent focussing necessary for stereoscopic vision but are undivided in other mammals where the eyes in the sides of the head register different views, that of the Tarsier is single but broadened out as though trying to divide and if stereoscopic vision is not yet attained there is at least some advance on the mammals lower than the Primates.

Finally there are the blood precipitation tests which proved to be positive for Man, The Orang Utan and Gibbon but negative for Kras and Broks (*Macacus*) the Loris (*Nycticebus*) and for Squirrels and Cats.

SUB-ORDER PITHECOIDEA.
(MONKEYS).

Monkeys are clearly divided into two groups, those inhabiting the Old World differing so markedly from the New World Monkeys that their origin has been attributed to two different stocks of ancestors, particularly as no intermediate fossils have been discovered The tail is never prehensile in Old World forms as it sometimes is in the New World ones and the former have the nostrils close together and pointing downwards as against the widely separated, outwardly directed nostrils of the latter: one has a narrow and the other a broad nose

The Old World monkeys are again divided into two families, the Macaques (curious word) and the Langurs or Lotongs; the former includes the Gibraltar Ape, the usual " Jacko " like animal of caricatures and barrel-organs, and the " Kra " and " Brok " so common out East, whilst the Lotongs or Leaf Monkeys are slender animals now confined to the Oriental Region but found fossil in France

Though Man is not " descended from Monkeys " and their common origin is some way off, the human characteristics of these animals are apt to make one uneasy, for so far as I can see it is hard to exactly delimit a monkey's capabilities Their intelligence and reasoning power, poor though it is in comparison of course, is yet a distinct advance on the limited associations of dogs and cats (who scarcely reason at all) but as with all captive animals stories of their marvellous " intelligence " are seldom to be taken seriously for it is impossible as a rule to know what associations the subject had formed during it captivity prior to the time of any particular

actions; stories of pets however amusing are seldom of real value for one has no record of how much the animal has learnt by association in the past.

Monkeys, like most animals, can communicate with each other about food and enemies, one investigator even going so far as to credit them with a vocabulary which he was able to imitate by his own voice and by gramaphone records to the extent of being able to "open a conversation" with stranger captive Monkeys; the "speech" rather differed for different kinds and was limited to only about ten sounds, indicating in a very general way such things as food etc. without specifying any particular kind, an ability hardly superior perhaps to that of other gregarious wild animals such as Deer or Dogs—one can for example tell from the cries of a Dayak's dog whether Wild Ox, Deer, Pig, Barking Deer or Mouse Deer is being hunted.

It may be as well to give a short "key" to the various Bornean Monkeys.

a Tail short		"Brok"	Macacus nemestrinus
b Tail long	Colour uniformly tawny	Kra	Macacus irus
	„ „ red	Jellu merah	Pygathrix rubicundus
	„ „ black		
	The young white with a black cross on the back . . .	Bijit	Pygathrix chrysomelas
	Colour red and black	Bijit	Pygathrix cruciger
	Colour uniformly grey, no white spot on forehead, young orange coloured	Lotong	Pygathrix cristatus
	Colour uniformly grey with much white hair on forehead . . .	Bangat	Pygathrix hosei
	Colour uniformly grey with little white hair on forehead	Bangat	Pygathrix everetti
	Colour general dark grey with bare white spot on forehead . .	Puan	Pygathrix frontatus

Pygathrix frontatus Mull.

LANGUR. Iban: *Puan*; Kayan: *Perut.*

This monkey has no obvious affinities in colour pattern with other species, its distinguishing feature being that the hair retreats on its forehead leaving a diamond shaped patch of bare milky white skin, from which it derives its name; this patch and the face and nose are sometimes divided by a dark vertical line made by the junction of two inwardly pointing sets of hairs. Elliot has named the Sarawak specimens *nudifrons* and those from East and Central Borneo *frontata,* the former distinguished by a triangular face spot undivided by this vertical line of hairs, and by various colour differences. There is much variation in colour, the vertical hairy frontal line may be present in specimens I have seen from both localities and is independent of age or sex, its shape varying somewhat with general hairiness and the specimen should be seen in the flesh to record the correct shape of its patch—in fact it is impossible to separate specimens from these localities either on the characters given or on any others.

The general colour is a delicate bluish grey, rather lighter below, the limbs black except the actual shoulders and inside of the arms and thighs, which latter are covered with sparse grey hairs. The crest and cheeks are black or very dark brown, the beard white Half grown young are very similar, rather dark brown where the adult is black and there are a pair of whorls on the forehead as in *P. femoralis.*

The eyes are dark brown, the ears black and as I have said the diamond shaped frontal spot milky white.

The " Puan " is not rare in certain restricted localities but is at all times shy, particularly of cultivation, and appears at one time to have had a much wider range having now withdrawn into the unoccupied head-waters of such rivers as the Mukah, Oya and Bintulu, though formerly and still occasionally occuring in the Saribas area; its headquarters at present are probably the Ulu Batang Lupar, where it is much persecuted for its Bezoar stone. It is most expert in the old jungle but like some others of the genus, on disturbing a troop or even single ones, it comes down to the ground and makes off along the floor of the jungle where to give it its due all trace is lost much sooner than if it had gone crashing off through the trees; Panthers in India are alleged to try to catch members of this genus by emitting a sudden roar in their vicinity in the hope that some of them will fall or take to the ground in their fright. It is a lowland inland species, usually going in troops of 4 or 5, rather fewer than in the other species; the noise is a loud chuckle, shrill as in *P. hosei* and the animal in the flesh has a faint sickly smell like the Long Nose Monkey.

The young are carried about September and the foetus occurs in February; gallstones are occasionally found in this species.

Pygathrix hosei Thos.

LANGUR. Brunei Malay: *Kikok*; Kadayan: *Singaggar*; Dusun: *Minusop* Kayan and Murut: *Bangat.*

The back, limbs and tail of this monkey are grey varying a good deal in depth of colour; the hands are black as are the hind legs from the knee down, except on the inside; the underside appears yellowish white or white—as I shall explain later—and this is continued down the inside of the limbs. The crown is black but the sides of the neck, cheeks, parts of the crest and the very broad forehead are white, turning creamy yellow in some specimens. The young are remarkable in that they have a greyish black crown, dorsal stripe down the back, tail and upperside of limbs, the rest being white recalling in pattern the young of *P. femoralis.*

This is the common monkey of the Baram District though not coming very much further South; it is still very numerous—except in the immediate vicinity of the nomad Punans—and is much persecuted on all sides for the sake of its flesh but more particularly for the stone sometimes to be found in the small intestine. The large oval stones, a shiny green colour and as much as an inch in greatest length, may realise as much as $30 and $40 being rather easily friable and ground up by the Chinese for medicine. Specimens from special localities are said to nearly always have such stones, those from other localities seldom or never and the origin of these stones is obscure, salt springs, in which the water is quite bitter, are visited by numbers of this monkey in particular, one place that I saw having the neighbouring small trees worn quite smooth and black by the frequent visits of these monkeys but so far as I know it is impossible to correlate the occurrence of bezoar stones with the presence of such springs The habits of this species are much as in the others of the genus, the " Bangat' keeping to old jungle either on plains or up to some 3000 ft on mountains and as far as I have noted never descending to the ground even when alarmed; it makes the usual prodigious leaps and I have observed this kind and *P cristatus* keep up a side to side movement of the tail during long leaps, thus assisting momentum or direction very much as does the common squirrel (*Sc. notatus*). Some that I saw in the Lawas District were rather noisy, their cries somewhat resembling the loud chuckles of the black " Bijit," *P. femoralis;* in the Baram they were much less noisy, giving fewer and less noisy chuckles, together with a sort of snoring sound not altogether unlike the noise the Long Nose Monkey makes through its nose.

Pygathrix everetti Thos.

LANGUR This species resembles *hosei* but is much darker, except on the tail; the general grey colour is darker and so is the black of the limbs whilst there is an indication of a black dorsal stripe. The crown and nape are black but there is only a small yellowish white spot on the forehead instead of the large white area of *hosei*; as in this species the underside varies from white to creamy-white.

The young appear to be of the *hosei-femoralis* type, white with black markings down the head and back and on the upperside of the limbs.

Everetti has a similar distribution to *hosei* being not found much further South than the Baram District; it differs markedly in that it is never found on the lowland plains or in coastal areas but inhabits only the hilly districts and mountains from their foot up to as much as 4 and 5000 feet.

The three species *P. hosei, everetti* and *sabanus* merit special attention; the first has a completely white forehead and cheeks, the second black forehead and cheeks, with the exception of a very small white spot on the forehead; the third has a white forehead divided down the middle by a black marking, the cheeks being black. *Hosei* and *everetti* are the two most doubtful species and there is strong if not complete evidence to show that they are really one kind, *everetti* being perhaps but the old female of *hosei.*

Shelford in some unpublished notes first had the idea that all was not well with these two species, pointing out that the head markings in both *hosei* and *everetti* were so variable that it was not unreasonable to consider the latter an extreme melanic variation of the former; Everett must also have seen suspicious for he mentions in his notes that of ten Kinabalu specimens, the eight females were *everetti* and two males *hosei.* Mr. F. N. Chasen also noted the relations of these two supposed species in N. Borneo drawing my attention to the need for investigation and I therefore made a point of collecting these monkeys and comparing the skins already collected.

We have in the Sarawak Museum five adult skins of *everetti,* all fairly typical and female by sex; the frontal spot is always small and in one case almost absent, varying a little in size in other specimens Of three half grown and five adult typical *hosei* all are male except one and this female was only obtained from the headwaters of the Baram River after four males had been secured We have however two female specimens of *hosei* in which the white forehead is separated from the white cheeks by a dark marking reaching from ear to face recalling *sabanus* (though of course without the median frontal black marking) and suggesting an intermediate between *hosei* and *everetti.*

I have only seen one *everetti* alive, when a single individual left its troup and descending to a low level in the trees actually offered defiance to our party; not only did it prove to be a very large female (weighing 14 lbs against the 10 lbs. and 11 lbs. of ♂ *hosei*) but a typical white-fronted immature ♂ *hosei* was shot from the same flock to which this *everetti* belonged. The cry appeared to be much the same in both species as are the colours of the soft parts; the edges of the eyes, nose and and lips yellowish white and the rest of the face a very dark chocolate brown, almost dull blackish.

Nearly all *hosei* are male, all *everetti* are female; *hosei* lives on lowlands and mountains, *everetti* only on mountains, mixed flocks being recorded where their distribution overlaps. *Everetti* (judging from a single specimen) is larger than *hosei* and whilst typical female *hosei* do occur, two intermediates between the two are female and it all rather suggests that *everetti* is the old female of *hosei*. What old *hosei* do down on the plains where *everetti* is absent is so far uncertain but it appears that the female of this species is dimorphic.

One further point: Shelford (unpublished) points out that Thomas' statement that the white markings of *hosei* are replaced by cream in *everetti* is incorrect, for both white and cream marked *hosei* can be seen in Museum specimens, the yellowish suffusion in his opinion being due to drying the skins over a wood fire in the jungle. He very aptly adds "It is perhaps worthy of note that this mistake of Mr. Thomas' has resulted in the production in Mr. Forbes "Monkeys" (Allens Naturalist Library) of a figure of *P. everetti* with absurdly brilliant yellow markings: a good illustration, if not of the Monkey, at least of the fact that published errors share with scandal the privilege of growing in size with advancing age." As far as I recollect both *hosei* and *everetti* have white markings in the flesh and judging by certain specimens subsequently relaxed in a bath of alum, it is these in particular that have the yellowish tinge as opposed to the whitish untreated ones.

Pygathrix cristatus Miller. (Plate XVII)

LANGUR Malay: *Lotong*.

This is a pretty long haired Monkey clothed in long silvery grey hairs, the hands and feet are often almost black in the adult. The young are peculiar, light orange colour with no sign of a crest and a fine fluffy tail very different from the almost rat-like appendage of a young Macaque Monkey, such as the Kra (*M irus*); at first the babies are quite unlike their parents in colour but soon go grey at the extremities, the crown, tip of the tail and the hands and feet, passing into a particoloured stage

It is a common lowland form in Sarawak and so far as I have seen partial to swampy jungle beside rivers and on the sea coast; it is common in the mangrove and Pedada swamps close to Kuching. In captivity it was rather fearful and indolent, not by any means aggressive though capable of giving a fairly severe bite on provocation. It was distinctly active among the trees but did not thrive, being too frightened to eat most things except the shoots and young leaves of the Pedada tree, of which like the Long Nose Monkey it required an immense quantity. Some but not by any means all individuals of this species alone in the Genus had the enormously distended stomach so characteristic of the Long Nose Monkey. I have not heard a wild one make a noise, nor did a captive one get beyond a few Gibbon-like plaintive squeaks, there being no sign of the harsh chuckling alarm note of others of the genus.

Some Lotongs when fired at take to the ground out of fright but this species does not as a rule do so; the captive one I had was however obtained in this way, having inadvertently descended deeply into a mud bank from which he was abstracted by the nearest Dayak.

The head of this species is notable for the pointed crest, the beard and the two outstanding tufts under the ears which give it a rather bonneted appearance. It is unfortunate they will not live for they soon get used to being lead about and lose a certain amount of shyness. The tail is used in this and other species as a support, being at times curled loosely round a branch as a sort of balancing organ.

Elliot described a form *ultima* from 3000 ft. on Mt. Dulit and I am not really clear whether he wished to separate this from other Bornean Lotongs, for which I can see no particular justification.

Pygathrix cruciger Thos.

The colour of this monkey is most variable, no two specimens being quite alike, generally they are rusty red, more yellowish than the chestnut coloured *P. rubicundus*, with a black line variable in extent reaching down the back and tail and continuing onto the upper surface of the forearms to give the impression of a cross. It is possible to show an adult series in which at one extreme are more reddish specimens with incomplete broken up black dorsal markings and at the other extreme are specimens with an extra broad black back leaving only the head, flanks and thighs a rusty reddish. The calf of the leg is reddish but blackens probably with age; there is a dull whitish stripe down the inside of the limbs as in *P. chrysomelas*. The young resemble the adult, rusty reddish with a black cross.

This animal is very local in its distribution, occurring in the Batang Lupar and Saribas area, also in the Pelagus in the Ulu Rejang and near Miri; it is neither a mountain animal nor a plains animal, living chiefly in the foothills and lower slopes of mountains, a region where the black *P. chrysomelas* mainly of the plains overlaps with the red *P. rubicundus* mainly of the mountains. There is considerable evidence that this species is a hybrid of some sort, the particoloured young one, reddish with a black cross, perhaps representing the black cross of the white young of *P. chrysomelas* transplanted onto the red ground colour of the young of *P. rubicundus*. Mixed flocks of *P. cruciger* and *P. chrysomelas* have been recorded and on one occasion a female *P. cruciger* was found carrying a typical young one of *P. chrysomelas i.e.* white with a black cross, but with a few characteristic reddish hairs to indicate ownership.

Actually this species closely resembles the black *P. chrysomelas* having the same coloured face and eyes, the voice being indistinguishable, all characters slightly different in *P. rubicundus*.

This particoloured species nearly always if not invariably takes to the ground on being shot at and thus makes its escape.

Pygathrix chrysomelas.

LANGUR. Lundu Dayak: *Penyatat*; Iban: *Bijit*; Kayan *Pant*.

The upperside of this monkey is entirely black, the hair long, that on the underside shorter and duller. The abdomen is also grey but a narrow yellowish white line runs down the inside of the legs in a stripe though this is variable in width and may be only dirty white in colour. The amount of white varies in all these markings but is always present to some extent; they usually cover the whole of the inside of the thigh but in two cases the whole of the shank inside as well which as a rule has only a faint or no marking at all. We have a peculiar male from Lingga (No. 5.216) in which the bases of the hairs instead of being black or blackish brown are rust coloured on the shoulders, down to the elbows, and on the thighs and flanks so that only the extremities of the hairs are black. If turned aside they disclose rust coloured markings faintly suggestive of *P. cruciger;* the hairs on the rump have only a little rust colour just at the base and there are few of these. The tail is dark brown at the base and more grizzled brownish at the extremity; the crest is very well marked but yellowish white in front with a white patch behind each ear.

The young are very pretty, white with a black line down the back and the upperside of the forearms is also black, the whole suggestive of a cross; when a little older the white turns a delicate French grey and the black extends onto the crest and tail.

This is easily the commonest Leaf Monkey found here, anywhere from old jungle on the mountains at 3000 ft. down to the Pedada and mangrove trees on the shore. It has a noisy stacatto chuckle like that of a big squirrel and goes in parties of three to six or more, it will come down on the sea shore in uninhabited parts and sometimes comes down onto the ground when shot at. The young make a querulous mewing rather cat-like noise, sometimes to be heard at night; *P. cristellus* the common Indian Langur is recorded as playing with its young, tossing it up in the air and catching it.

Pygathrix rubicundus ignita Dollman.

LANGUR. Iban: *Jellu merah*; Kayan: *Khalassie*; Kadayan and Dusun: *Merogang*.

This monkey is coloured uniformly dark red, rather darker chestnut on the limbs and lighter below. The young vary, some being quite red, lighter below with a light ruff round the neck: another has the limbs, under surface, and part of the tail whitish, the neck and back of the head being quite light. This specimen is probably much faded.

Most of our specimens are from Baram, one from Mt. Dulit 3000 ft. and two from Mt. Murud 6000 ft.: these last are darker chestnut and very much longer haired than the others; in only one

from Malinau in Upper Baram are the feet almost black. The distribution in Sarawak is peculiar for if not a mountain animal it is mostly confined to hills and is absent from the coast and neighbouring lowlands whereas in parts of Dutch Borneo it is said to be the common lowland mangrove swamp monkey. It is doubtfully recorded from Penrissen, does not occur in Western Sarawak, is common in the Kalinkang Mts. and occurs in parts of the Saribas area, such as the Ulu Awik where there is no flat land but a series of broken hills about 1000 ft. high whose tops are still enclosed in jungle forming a retreat for these monkeys

Three forms have been proposed for Borneo, *rubicundus* with black hands and feet in S. E. Borneo but not Sarawak, *ignitus* from Baram with uniform red hands and feet and *rubida* from S. W. Borneo differing only from *ignitus* in skull characters. The last one should probably be omitted and Elliot would unite the first two on alleged specimens of both from Mt. Mulu but he has not been followed in this

It varies in disposition, sometimes going in troops and being most noisy, sometimes singly and almost mute, in any case it is one of the most active of the genus and is not always easy to secure, particularly as it is an inland species avoiding human habitation and only occasionally touching the rice crops.

The Kayans call this and others of the genus "khalassie" meaning in their language "a quarrel" and referring to the scolding, rather truculent cry of the animal; the cry of this species is characteristic of the genus, a loud series of resonant chuckles, the first note as in *P. chrysomelas* and the succeeding three or four much sharper and shriller, at once distinguishing the animal.

A female specimen had four holes, one above each collar bone and one on the inside of the knee, the two former ones quite ½ in. deep and showing as a bluish pocket when the animal was skinned; it is suggested that the young when carried inserts its fingers into these two holes, just of such a size, and is able to take a grip on the collar bone of its mother, its toes no doubt bracing itself against the parental legs I have no idea if these holes are seasonal though they are certainly present during pregnancy and I have not found them in males, whilst an immature female Long Nosed Monkey certainly had indications of them.

Pygathrix natunae.

LANGUR. We have a pair of these collected by Dr. Hose in the Great Natuna Islands in 1895; they are light brownish above with the limbs and tail dark brown (possibly black when fresh); the underside is yellowish white as are also the inside of the limbs, and the posterior surface of the thighs which last is a very distinctive feature. The crown is rather dark brown with no frontal spot; the young are unknown.

Nasalis larvatus Wurmb.

THE LONG NOSE MONKEY; Sarawak Malay: *Orang Blanda*; Brunei Malay: *Bankatan*; Iban: *Rasong;* Tagal: *Bukala;* Murut: *Dungoih;* Dusun: *Magang.*

In the adult male the back and crown of the head are rich chestnut brown, lighter and more brindled on the shoulders; the arms and legs are greyish or fawn coloured, the tail and a patch on the rump yellowish white, often quite white. The cheeks, sides of the neck and the hairs on the throat form a light yellowish ruff sharply marked off from the darker upperside and lighter undersurface. The head is very square, the crown flat, the sides and face upright, the actual colour of the face is a sort of dark pink giving in general the appearance of a most grotesque masque. The nose is tongue-shaped, 2·3 in. long, but rather pinched in at its origin, the tip is rounded, depressed and slightly expanded, and there is a shallow groove down the centre: the paired nostrils are situated on the underside. The eyes small, the iris yellow ochre and there is a distinct forward pointing tufted beard under the chin. The female has a rusty brown crown, less well marked ruff, brownish back and greyish rump-patch and tail, in fact is less strongly and less richly marked than the male. The young of both sexes are lighter and more yellow, particularly on the legs and though the crown is reddish brown the back has a greyish tinge; the upper surface of the tail and the rump-patch so conspicuous later on are dark grey and the ruff in some is hardly differentiated.

The Long Nose Monkey and the Brush Tail Squirrel (*Rhithrosciurus macrotis*) are peculiar to Borneo and have no near relatives elsewhere, the Long Nose Monkey is distantly related to the Langurs or Lotongs or Leaf Monkeys of the genus *Pygathrix.*

The shape is most peculiar for the lower part of the chest where the breast bone ends is enormously distended by the huge stomach, almost as in pregnancy, the abdominal and pelvic region being comparatively narrow and slender as in the Macaques, *Semnopithecus* Monkeys and Gibbons, distension in Man and the Mias is abdominal and neither the Rasong nor the Mias have the stream-lined appearance of some of the Lotongs. It frequently walks on the ground when the thickset appearance is most marked, the heavy rounded hind quarters and massive forequarters giving it a rolling, clumsy gait.

In the flesh this monkey often has a sweet sickly not unpleasant smell which may sometimes be so strong (possibly according to season) that it indicates the animals presence before they are visible in the swampy jungle they frequent. Being protected they are quite numerous even close to Kuching, being chiefly found near river banks and neither far inland nor up-country; for some reason they are absent in many parts of the coast division from Igan to Kedurong. They may frequent either large trees or low mangrove swamps but are always found near water; in the Lawas district they swarmed in the mangrove swamps where there were numerous

small platforms of sticks and though the animals in the evening often frequented trees containing fresh nests, I never saw the nests used. A captive male used to gather the surplus Pedada leaves to sit on and I should not be surprised if some sort of platform is used in a wild state.

The most remarkable feature is the nose of the male, about which there are many illusions; it does not hang down in front of the mouth and impede feeding, it is not inflatable and is not to my knowledge held in the hand as the animal leaps from tree to tree: all these assertions have been made. When angry it opens its mouth, slightly raises the tip of the nose so that numerous wrinkles occur at its base, draws in a deep breath through its nose making a loud resonant snore; the inhaling and exhaling of its breath may be heard at some little distance and the whole performance is distinctly menacing, especially as it may be accompanied by a frothy champing of the jaws. The female has a milder, petulant, rather resounding cry faintly suggestive of a Goose.

Contrary to some statements I have seen a wild one drinking on the river bank and a captive drank freely; he wrinkled and turned up his nose as far as possible but the entire tip was often under water and the nostrils always. Its food in a wild state is apparently the young shoots of the Pedada tree on which it thrives in captivity, choosing particularly the buds and green growing tips thus requiring an enormous bundle of foliage to get enough to eat though it takes in the younger leaves as well; it will make an effort to eat most young leaves or grasses or bananas or fruits such as Rambutans but tires of them in a short time. I have never heard of one reaching Europe alive and it is by no means easy to keep at any time. On the whole it is indolent and fearful, usually inoffensive and by no means aggressive; it is however savage in defence of its mate and on one occasion is recorded as coming down out of a tree and attacking a Chinaman's hunting dogs with deft grabs, seizing their paws, conveying them to its mouth and inflicting a bad bite. This is its usual method of offence and I should judge the bite sufficiently strong to break ones finger if it had the chance. The female has been recorded as being most solicitous for its young, snatching away with almost unnecessary violence any food it doesn't think fit.

Rivers are no obstacles to it, for it swims in a powerful sort of " dog paddle " and is able to dive if necessary

A " Bezoar " stone (*gelaga*) is sometimes found I believe in the stomach, egg shaped, dark green, about 1½ ins. long, quite light and easily broken; as with all such stones it is much prized by the Chinese as medicine.

Macacus irus.

CRAB-EATING MONKEY. Sarawak Malay: *Kra*, Brunei Malay: *Ambok*; Dusun: *Ka*; Tagal: *Kala*; Murut: *Jibulau*.

This is the long tailed monkey most often seen wild on river banks and in captivity; it may be greyish drab or even a mild golden yellow, the colour varying individually, specimens from 4000 ft. being almost rufous. No two are quite alike, the male as a rule having the underside of the eyebrows white, becoming startingly apparent when he raises his brows: sometimes the female also has it. The young are sparsely covered with dark brown or black hairs, the long tail lacking the furry appearance of that of the young Lotongs.

The Kra expresses considerable range of feeling by a series of grunts, more numerous than in its neighbour the "Brok," than whom it is perhaps more refined and less grotesque. Any jungle will do for it from mangrove and nipah swamp to old jungle up to 4000 ft. or more on mountains: it descends to the shore and walks about on the mudflats where it is of course wary, putting up a sharp gallop for a short distance, the tail carried in a graceful curve with the tip just clear of the ground, though when walking it may drag. I have never actually seen it put the tip of its tail down a crabs sand hole but there is not much doubt it does sometimes entice the crab to take a grip, whereupon he is jerked out and eaten; I have heard of a Kra's tail being thus seized by a monster crab who detained the monkey, barely releasing him in time to avoid the incoming tide. The Kra's tail sometimes has a tuft of hairs on the end and may be it is this the crab gets hold of for if you tweak the end of the monkeys tail he jumps like any other animal.

They go in the usual family troops, one old male, various females and half grown ones, all repairing to the same sleeping place—generally a bare tree—for several consecutive nights. The males are savage among themselves, as are also the females, an intruder being set on by both parties as a rule though it is comical to see the old male with a new wife and the old ones trying to drive her away. One young is born, not infrequently to captive ones, usually up in a tree sometime in the night or very early morning. A large Kra weighing 12 lbs. and carrying a young one proved to be a fully adult male.

They probably do have a few "things" in their fur at times but don't scratch themselves much although they hunt assiduously through each others hair; it has been pointed out that they are then seeking newly growing hairs to suck or squeeze out whatever moisture there may be in the root and they will also pluck out hairs on ones arms and legs in the same way.

A lot of harm is done to padi fields and fruit trees, more being wasted than is eaten and the Dayaks have a cruel way of driving them off: one of a troop is caught and an inch or so of a prickly rotan inserted in its anus, the rest protruding—the monkey is then loosed and its friends subsequently try to remove the obstruction

when the recurved thorns of the rotan immediately grip and the screams of the victim cause the whole troop to leave the neighbourhood.

Pulo Kra at Santubong is associated with an alleged white specimen.

The Kra has considerable intelligence and I have heard of some children playing hide and seek with a tame one, the monkey staying behind till the children called him when he started off to look for them.

Malays say that if a captive one has his tail docked it is no use letting him go for no wild troop will take it in, a thing not easily accomplished by a normal one. Ridley records Kras as swimming and diving well on some occasions doing it for fun and staying under water for some time; on another occasion for hours a party of Kras fought a party of Lotongs (*Presbytis femoralis*) for possession of a Rambuntan tree in fruit, the combatants biting fiercely and sometimes falling to the ground together immediately to ascend and carry on; the Kras did not win.

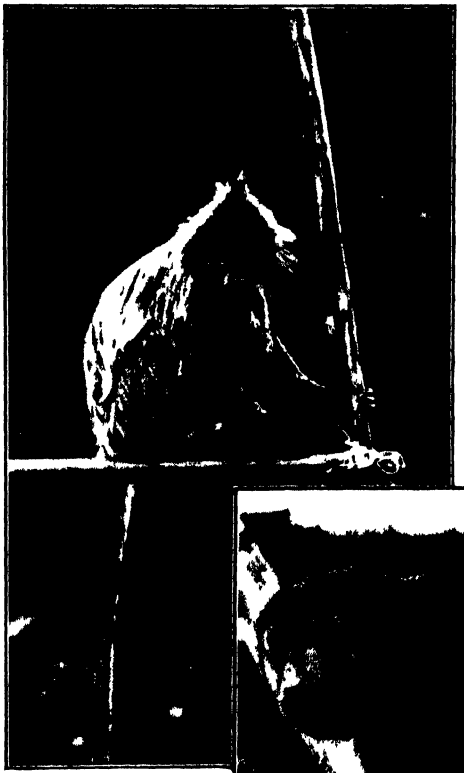
Macacus nemestrinus broca Miller (Plate XVII).

THE PIG TAILED MONKEY: Malay: *Brok*, Iban: *Empau*; Murut, Dusun *Gobuk*, Tagal *Basuk*

This monkey is very thickset with a short usually curly tail. The general colour is rather dark fawn, very dark in old specimens, the crown of the head black or a very dark brown, the back, rump and dorsal surface of the tail similarly marked, the black of the back being broader in old specimens and shading off into the dark fawn of the rest of the body. The young have these dark markings restricted forming a marked contrast to the light fawn of the rest of them. There is in all a very pronounced whorl on the crown, all the hairs in front of the ears pointing forwards, no crest is present except in one case in which I noted two collateral whorls

The Brok has not such a good vocabulary as the Kra but is if possible more vivacious, and certainly more grotesque, the tail is a good indication of its feelings hanging down limply when the animal is uninterested and curling up S shaped, as in the Plate, when excited The full grown animal is very thickset, with heavy chest and shoulders, and a high stern with long hind legs; it is equally as partial to the ground as the Kra, where its gait is a swift but rather clumsy rush. The canine teeth are exceptionally large, particularly in the male and just like those of the African Baboon may be associated with a partly terrestrial life necessitating meeting more possible enemies than it would in the tree tops.

It is found in almost any kind of country, less frequently in nipah and mangrove than the Kra and is as a rule fond of the sea-shore. It grows to a very large size, nearly as large as small examples of the Chacma Baboon of S. Africa, particularly solitary old bad-tempered males known as *Brok tingall*, which are reputed to molest native women at times though I know of no such authentic



Lotong Monkey
(Pygathrix cristatus)

The Pig-tailed Macaque
(Macacus nemestrinus broca)

case. White ones do occur, one came from Samarahan years ago and another recently from Kapit: the latter was the property of a Chinaman who regarded it as lucky and worth a considerable price ($250).

This species is the one used in coconut picking, being taught when young to pluck the ripe nuts at a signal from its owner, usually a tug at a string around its waist or by voice, a few trained ones are exported to the Natunas Islands (Sirhassen). They are not in any sense delicate animals but there are few that are more amusing and grotesque especially when young, stories of their doings being legion for they are amenable to captivity and can in time be loosed to follow their owner about like a dog, even in the jungle.

The Brok has only one young at a time and the period of gestation is about 7-8 months· parturition occupies about fifteen minutes as a rule, generally in the very early morning and does not appear to be unduly painful, the afterbirth being as a rule devoured, the young are quite active when born, learn to cling in about half an hour and to eat solid food in about a month, being in fact one of the most precocious and amusing pets one could wish for when small. The father is not offensive to his offspring and barring illness and accidents Broks may live for as much as thirty years and in times of stress will cross freely with the Kra (*M. irus*) to produce offspring

Males are rather larger than females and the latter in some cases have a red subcaudal swelling absent in the near relative the Kra (*M. irus*). Females on heat and solitary old males can be vicious and quite a match for most dogs one finds out here.

The Bornean form apparently only differs from the Peninsula form in some small skull characters, but there are other forms in Sumatra, various small islands and right away to India. Quite a number of forms have been described from Borneo such as *arctoides*, *melanurus* and *maurus* but there is probably only one Pig Tailed Monkey in Borneo.

SUBORDER ANTHROPOIDEA.

(Man and Apes).

Leaving out Man the members of this Sub-Order include the Gorilla, the Chimpanzee, the Mias and more remotely the Gibbons or little Wa-Was, much more like Monkeys in their small size and presence of hard callosities on their "sit upons" but differentiated at once by the absence of a tail.

Naturally considerable interest attaches to the Mias and the Wa-Wa as being mixed up in Man's ancestry for whilst nobody seriously believes these days that Man is descended directly from Apes it is fairly well accepted that both have descended from the same ancestor—which I have been told is the "same thing"—and are cousins some few or many times removed.

I find it impossible to decide which of the Apes is nearest to Man though anatomically the Gibbon is perhaps the most remote; each one of them is like Man in some characters but differs in many others so that it needs no mean effort to sum up the possibilities. Even the Wa-Wa has the chin most like Man, more or less vertical or even protruding a little and the form and arrangement of its molar teeth is said to be very human; the Mias has the most man-like brain of them all but is undoubtedly inferior in intelligence to the Chimpanzee.

Wa-Was are great favourites in captivity and if the same cannot be said of the Mias it is a point of general interest to note their common ailments in captivity. They usually succumb eventually to pneumonia, which takes the form of short and very quick breathing, coughing and gasping, high temperature to be felt on hands or face, the lips blue and the nose hot and dry, frequently exuding or coughing up mucous which is particularly dangerous owing to bacterial infection; animals in this state should be separated and should they happen to die, they and their belongings should be burnt and the cage well disinfected, if not burnt as well to avoid infection. Mias or Wa-Wa effected in only one lung always lie on that side of the body to give the other lung a chance to function; when both lungs are effected they sit upright but the arms, head and shoulders droop forward markedly. Very little can be done for them when really ill, quinine and aspirin may be safely given, a couple of grains twice a day and as they nearly always die of heart failure a teaspoonful or so of Brandy twice a day bucks them up and will also induce them to eat a little if they have been off their food. Perhaps the best one can do is to make some sort of a flannel waistcoat with armholes and hope they will not be too liverish when you try to put it on but unfortunately the Mias at any rate does not take kindly to this treatment· every effort should be made with sacking to somehow keep the body at an even temperature and damp or cold cement floors avoided as sleeping places.

Worms, colds and fever seem to come and go without hurting them if care be taken but diarrhoea particularly in Wa-Was is a thing to avoid; both animals greedily eat any number of bananas and a diet of these always brings it on. Unpolished rice, boiled but not steamed and served slightly warm, seems a good diet but lumps of cold, wet, soggy rice are harmful as these apes do not chew their food much.

Hylobates cinereus abbotti. (Plate XIX).

GIBBON. Malay: *Wa-Wa*, Iban: *Empliau*; Murut, Kadayan and Dusun: *Kalawat*, Kayan: *Wok Wok*.

As with the Mias no two Gibbons are quite alike in regard to colour and skull characters so that altogether four races have been proposed from Borneo, all allied to the now rather rare Javan

H. c. cinereus. With *mulleri* from S. E. Borneo, distinguished by its brownish lower parts and extremeties and with *albibarbis,* paler and with white whiskers from S. W. Borneo, I have nothing to do; Sarawak has two Gibbons, *abbotti* and *funereus.* The former is found in the Kapuas River, in the Kuching and Saribas area even up into the Baram and is usually mouse grey in colour, though occasionally a much lighter silvery grey, with a very indistinct dark cap on the head; *funereus* the common north Bornean from is usually a dark almost chocolate colour often with a paler grey patch on the rump: there are no all black specimens and the Wa-Wa is remarkable on the whole for being darker coloured below than above.

There is probably no more popular pet than a Wa-Wa, its cleanly habits, bright beady eyes, perky, intelligent expression and its engaging ways soon endearing it to its owner. On the ground it walks upright with rather rolling gait, its long arms bent upwards at the elbow but its hands rather drooping downwards, in the trees its agility is astonishing and it will leap outstretched between branches 40 feet apart it is said, executing incredible and most graceful attitudes as it outstrips terrestrial followers. Wa-Was are highly strung, almost a bundle of nerves and on sudden, abrupt or alarming movements are capable of inflecting a severe bite with their long canine teeth, for the most part they are however exceptionally affectionate mixing when wild with other monkeys and even the Mias, whilst in captivity dogs, cats, bears, and even the surly Binturong fall for its charm as well as its human owners, nor is it above going to the assistance of its friends and helping them in their fights.

One of its most notable features is the almost bird-like, cheery, bubbling call it makes early in the mornir; or when disturbed and it is impossible to convey by words this most characteristic early morning noise, unfortunately Wa-Wa's flesh when in condition is preferred by the natives even beyond pork and the Kayans construct a bamboo call to allay its suspicions as they approach it; the fat stores in the armpits and groin are also much valued by them as a cure for rheumatism and there is a marked absence of Gibbons in the neighbourhood of those nomad hunters the Punans.

Its food in a wild state seems to consist of fruits, shoots and young leaves though it seems to eat most things in captivity and clears out all the Spider webs in ones house; it most frequently dies of pneumonia or of diarrhoea, this last helped on by too many bananas of which it is very fond. Although undoubtedly delicate they are said to have been acclimatized in France, where some run loose in a large park; drinking is usually performed by dipping the back of the hand in the water and licking the drops on the hairs. Asleep it sits with its knees all humped up under its chin and arms folded across its chest and though it makes no sort of a nest for itself a captive one used to loll on its back in the old nests left by a Mias.

The young are said to be born after from 7-9 months gestation and may stay with the mother in some cases for upwards of two years, the male sometimes leaving the troop and accompanying her for a time after the birth. A young one clinging to its mother appeared in size to be half grown and quite helpless: it couldn't walk on the ground, over-balanced itself but learnt in three days and became quite tame in that time; its teeth were quite large enough to draw blood when it bit but its food such as a Rambutan fruit at first to be skinned for it.

A fossil Ape from the Miocene of France does not appear to be generically separable from the Wa-Wa.

Simia satyrus.* (Plate XIX)

Malay: ORANG UTAN, Iban: *Mias*; Sennah: *Marah*; Kayan: *Koyang*; Dusun: *Pagiuh*.

No two Mias are alike and it would be difficult to say even now how many kinds there are or if those found in N. Sumatra differ from the Bornean ones. In general their appearance is much the same, covered with usually long hair either of a light sienna red or some shade down to a dark chestnut, the legs are short the arms comparatively long and thick, making the short barrel shaped body look insignificant. The head is the most prominent feature and varies considerably; it is by no means certain but generally accepted that both Sumatran and Bornean females have the ordinary rounded head and snout as in the illustration but that males may have either a similar head or else enormous lateral cheek pouches producing a most grotesque appearance. These expansions are described by Beccari as due to accumulations of fat over the masseter muscle just in front of the ear and he is inclined to regard them as analagous to the hump of the Indian cattle, the protruberances (warts ?) on the face of *Sus verrucosus* (The Javan Warthog) and I have even heard them compared with the enlarged tail of the Fat Tailed Sheep or the occasional accumulations of fat in the lumbar region seen in Kalahari desert tribes; Beccari even points out that "steatopygia" (or accumulation of fat) sometimes becomes apparent in humans between the cheeks and ears. The storing of fat is usually associated with hard times and is frequently only temporary but there can be no doubt that the face expansions of the Mias are quite permanent and that there is always an abundance of food for the animal so that it is by no means clear why only some of the males, often in an immature state, should apparently needlessly start to store up fat whilst the more fortunate majority of its relatives have no need to do so—in fact it is difficult to see any reasonable argument for supposing the facial expansions are for the purpose of fat storing. They are nevertheless most extraordinary and rather resemble half a plate tacked on to each side of the face, thicker nearer the head and not more than about

*I believe "Pongo pygmeus" was selected by the International Nomenclature Committee.

The Gibbon
(Hylobates (mesens abbotti)

The Orang Utan
(Simia satyrus)

an inch or so at the rim, which does not carry the external ear as is sometimes stated; from the flattened nature of these expansions it is supposed the name " Mias tjaping " meant " pappan " or planks, and as an alternative theory it is said " tjaping " refers the shape of the face to the small object thus known and used to cover the parts of very small female children, but this object is however little used among Bornean tribes and is known to them as " takup "

Descriptions of dissections of the lateral face expansions and the laryngeal sacs are always of interest· the former consists of masses of fatty tissue on a fibrous framework, the fat cells being particularly dense within and more sparsely arranged round the edges. Paired lateral sacs are situated under the chin and accessory sacs may extend as far as the arm-pits; their use is unknown and they appear to be absent in females. in outward appearance they are covered with a thin, white, wrinkled almost blister-like skin, which wobbles like a jelly at every movement.

As far as its habits are concerned, the Mias is for practical purposes arboreal, only descending to the ground on exceptional occasions; travellers stories and the travesties portrayed of its certainly unusual appearance have led to a general belief in its ferocity, a belief totally incorrect though when wounded or molested the Mias can very naturally exert such strength as to make him a fearsome opponent Normally encountered in the tops of its native trees there are few more benevolent animals and the Mias if unmolested merely temporarily suspends its occupation to examine his relative down below, regards him with no show of fear or anger but a mild and wholly benevolent curiosity which one imagines at times to extend to an amiable grin or its rather grotesque countenance. After a time it may become so bored as to resume its former occupation and pay no further intention to the intruders. He is nevertheless a cunning fellow, for when the Macaque or Lotong Monkeys suspect a man about they quite needlessly go bounding off through the trees, at once betraying themselves by the loud rustling of the branches—not so the Orang Utan who sits dead still where he is when suspicious and in this way I am certain very frequently escapes detection. With a party of Dayaks I once sat and smoked a cigarette at the foot of a tree and it was not until nearly time to move on that someone noticed a large Mias peering benevolently at us from the next tree; even when he had satisfied himself the only further indication of his presence was the light rain of small sticks and twigs that were occasionally broken off in feeding operations and he made very little greater commotion in eventually moving off at a speed which outstripped us along the steep hill side. I believe on river banks and more thickly populated parts they do show a quite evident desire to get out of sight of man and I have even heard of a mother parting with its clinging offspring at the sight of a boatload of men, leaving the little one to

follow at its own pace; in fact it is said that the female not infrequently abandons its young when harassed by close pursuit but this I do not believe without further evidence for the Dayak is maybe providing an excuse for the non-appearance of the female which he is not supposed to shoot for the purpose of taking its young. Under ordinary circumstances the Mias is however an excellent citizen and I have seen a full grown male and female contentedly eating the " Kayu Ara " berries in the same tree with a troop of Wa-Was unconcernedly mixing within their reach on neighbouring branches, the contrast between the cheery Wa-Wa and solemn old Mias being almost ludicrous but in no way leading to bad feeling between them. The captive young ones have a most engaging way of rolling their eyes, pursing their lips, and drawing up the corners of their mouths when feeding time approaches and I have seen just this comic, demure child-like or senile expression on the face of huge captive males of enormous strength, an expression which if recognized would call forth such expressions as one applies to a nicely behaved child or some dear old man rather than the harsh epithets of those who can see no further than the bizarre appearance of brutishness. In a wild state and unmolested, Mias exhibit little more than a benevolent curosity towards man and the extremely child-like and almost pathetic expressions that can be assumed in captivity point to the Mias as an extremely peaceful and gentle animal when left to himself, always remembering of course that both temper and strength are there in reserve for use when aroused. I have not noticed it as a particularly noisy animal: when annoyed it is liable to purse its lips out into a point, cover the opening with one hand, noisily suck in a deep breath, and let out an enormous coughing belch closely followed by another whistling intake of breath. Stories of Mias molesting native woman have not been authenticated and are probably only a product of the Rablesian sense of humour rather characteristic of Dayaks.

Mias as everyone knows make a kind of platform of sticks on which they sleep at night and even during the day but I have never seen captive ones make any sort of roof or make use of leaves to keep the rain off, as is sometimes alleged. Nests are of two kinds, either a flat platform ,or more usually a deep triangular shaped affair in the upright fork of a tree; the nest is neither always situated very high nor in a big strong tree and what the Mias aims at is to have several branches handy which it can grip with its hands and feet as it sleeps so that sometimes a ridiculously small but much branched tree may be chosen even by a full grown animal, the whole outfit not thirty feet from the ground far below tree top level. The branches are bent over and crossed to make the foundations of these nests and neighbouring branches or twigs are bitten or torn off and laid on top, the Mias flattening them down with the outer postaxial border of its forearm, testing the nest for comfort and if necessary altering the arrangement of the leaves; a

fresh nest is almost certainly made every night and I counted eleven such nests still with green leaves all close together near a "Kayu Ara" fruit tree where a pair were feeding: there was one very large nest big enough to fill a bullock cart and situated in the arm of a large branch of a tree but I am not certain it belonged to the Mias and it was certainly much older than the other nests.

The distribution of the Mias in Sarawak is peculiar in its relations to the rest of Borneo; it occurs in parts of N. Borneo † though I don't know the details and it is common in W Borneo, the Landak River and right up the Kapuas River. Now the Mias is very sensibly fond of neither cold nor rain, in fact the damp is his worst enemy and for this among other reasons the occurrence of Mias at 3000 ft. is very exceptional* nor is he as common in the immediate lower vicinity of mountains as he is at the foot For some 70 miles the Kalinkang mountains run N. E. and S. W. forming a watershed between that part of the Kapuas river running S. W. and numerous short Sarawak Rivers running West into the Sea and it is obvious that these mountains from an obstacle to the movements of Mias which are common on the Kapuas and curiously enough on the Sarawak side. The explanation lies I think in a gap in the Kalinkang Mts. which towards Lobok Antu slope away almost to sea level eventually to rise on the other side as the Batang Lupar Mts. and stretch away unbroken Northwards into Central Borneo. It is therefore more or less true that the Mias is confined to a range bounded on the N. E. by the Rejang, R., on the W. by the Sadong River: the Orang Utan has flowed through from Dutch Borneo and filled up suitable and available places, his distribution as a matter of chance exactly paralleling that of the early Sea Dayaks, who originally occupied the Saribas area and whose further migrations have been a matter of history. The Kalinkang Mts. lose their continuity at the Sadong River and there remains but a few broken hills to prevent the Mias of the Landak River straying into upper Sarawak; it is therefore paculiar that reports of its occurrence there are confusing: a few were supposed to have been found in the old days according to Beccari but they are certainly only occasionally found there now and most of the natives have nothing but the most unreliable records of their appearance. That they did occur is certain, for Everett

† There is a single large ♂ "Mias Pappan" skull hanging in the Leppu Tau house at Long Mou in the Ulu Baram, it was said to have been taken in the neighbouring S Silat two generations ago and it is difficult to see how it got there for Mias are unknown and always have been in the Baram district Some Ulu Baram Punans, the nomad hunters, also had a story of how they once saw a big bundle of sticks in a tree from which a Mias emerged, the Punans ran helter-skelter dropping "parang" and blow-pipe quivers in their terror, a fact which indicates the animals rareness to even the keenest hunters

* Whitehead however records them at 8000 ft and Haviland at 6000 ft on Mt Kinabalu.

records two imperfect skulls belonging to the British Museum taken from Chinese goldwashers who had found them in a crevice of the Limestone hills at Paku but nowadays though a possibly stray one may be found, the Mias is absent from all that region adjacent to the watershed of the Landak River which offers no obstruction to it passing into Sarawak.

As I have remarked elsewhere it is useless to quote the antics of ones pets as instances of intelligence for one has no record of what it has previously assimilated but there is no doubt a young Mias can become a most endearing object once one gets over its undoubtedly repulsive first impressions; having gained its confidence it behaves with a most child-like simplicity, and is fond of food and play. sudden rages are quickly forgotten and it has a most appealing sympathetic demeanour when in difficulties. One that I had for four years seemingly existed without a dull moment. It would smoke native cigarettes—a pinch of Tobacco in a palm leaf, grasp the "roko" between thumb and forefinger, put the unlighted end in its mouth holding it with the hand palm upwards, draw and blow the smoke out of its nose and hastily consume the ash presumably for the sake of the salt; it demanded a light when the cigarette went out but had no use for European cigarettes, always tearing them open to see the inside. Originally, it had an expanded metal cage but it used to hook a forefinger through the mesh, brace its two hind feet against the cage and "ping" went the piece of metal and then the corners of her half open mouth used to turn up a bit as always when amused, the openings made were closed by wire, the two ends being twisted together but she very quickly learnt to untwist them or to make use of a nail or piece of wood as a lever to help. All snakes and a small crocodile were carefully avoided: a banana was placed beside one of the latter, the Mias tried to scrape it away from the "croc's" vicinity with a short stick and easily succeeded with a longer one with which the "croc." was heartily beaten from an overhead position. She used to tease a small Honey Bear and the two used to roll about locked in pretended combat and though friendly with a Gibbon she had no use for any other Mias, larger or smaller, in her cage and displayed an almost devilish ingenuity in biting her opponents fingers and toes till the other could hardly climb She was not a mischievous animal like Monkeys when loose but had her share of devilment; when I was away once she objected to the temporary occupant of the house, climbed up into the roof with a light rotan chair and endeavour to drop it on the unsuspecting man as he entered; she is also said to have spent a Sunday afternoon hammering with a piece of wood on the tin roof below which the same man was trying to sleep, the Mias descending now and then and poking her head round the door to see how he was getting on. Telephone wires were a strong point and she used to swing on them until she could catapult into an adjacent

tree, affording one much relief from the ever tinkling bell; the gardener's tiffins were frequently unearthed and eaten whilst she once pulled some shingles off the kitchen roof and was caught clutching a pine-apple and a bottle of vinegar as she tried to climb a nearby tree.

Mias are intensely ticklish and rather enjoy it up to a point, the neck region being particularly sensitive but for this reason they should *never* be tied up with a collar round the neck for the miserable animal is in a state of torment for a long time and as it is almost impracticable to tie them round the waist—they always get away—Mias should be kept in cages or better still quite free. As a matter of fact it is now forbidden to catch, keep, kill or export Mias except in special circumstances, a not unreasonable restriction for it has but a very limited distribution in a few districts of Sumatra and Borneo and though not uncommon in places, a slow breeding animal of such interest can hardly hope to last for long when a single consignment of over 70 is shipped to Europe from one place, a corresponding number having been no doubt killed or maimed in the procuring of even these.

The intimate details of a Mias' life are unknown and owing to the extreme difficulty of observation will probably remain so; one never meets more than three in a party but how far they are monogamous, pair for life and so on is quite unknown. Moreover the age of Mias is almost impossible to estimate for the closing of the cranial sutures—the lines marking the limits of the bones of the cranium—is no guide to age as it is in man, for some sutures that close in the latter before second dentition remain open long after that event in the Mias; the new teeth appear before he is half grown, in fact at about 8-10 years judging by captives and it is very possible that Mias take nearly as long to mature as humans (anyway Asiatics) and barring accidents live just as long: the front incisor teeth are the first to change and the cutting edges are not level but each have four " cusps " regularly disposed, one on each lateral edge and two equally spaced in between. Dropped teeth are never found. The median sagittal crest is a fair sign of age in males but varies in females: the angle of the jaw is no indication of sex as it is in man; moreover extra molar teeth are not uncommon, sometimes even incisors too so that a Mias skull is a poor guide to age and sex as a rule.

Notwithstanding this and other variations, neither fur nor skull characters being distinctive, out of a mass of some 280 skulls from the right bank of the Kapuas River at least six races were made, founded chiefly on cranial capacity: none of these races can be expected to stand for one of the most variable of Mammals.

I have mentioned the impossibility of here summing up its anatomical relations to Man but it appears to exhibit a number

of primitive, specialized and retrogressive features which on the whole place it perhaps further from Man than the Chimpanzee and Gorilla, two Apes which except in the matter of size have much in common: though less intelligent perhaps than its neighbours the brain of the Mias is to look at the most human of the three.

A broken canine tooth from the lower Pliocene of the Siwalik hills in Upper India has been said to closely resemble that of the Mias, all the more astonishing as remains of Apes belonging to the same genus as the Chimpanzee have also been found, these two Anthropoid Apes therefore once occurring in the same region.

APPENDIX A.

Alphabetical list of Native names for Bornean Mammals, with corresponding common and Scientific names.

Aam	Milano	Bear Cat	Arctictis binturong
'Aji bulan	Iban	The Moon Rat	Gymnura rafflesi
Angkis	,,	Porcupine	Trichys lipura
Ambok	Malay	" Kra "	Macacus irus
Babi utan	Malay	Wild Pig	Sus barbatus
Babui	Kayan	,, ,,	,, ,,
Badak	Malay	Rhinoceros	Rhinoceros sumatranus
Bakah	Kalabit	Wild Pig	Sus barbatus
Bakass	Dusun	,, ,,	,, ,,
Balukun	Murut	Scaly Ant-eater	Manis javanica
Bangat	Kayan	Hose's Monkey	Pygathrix hosei
Bangkaut	Murut	Flying Fox	Pteropus edulis
Bankatan	Brunei Malay	Long Nose Monkey	Nasalis larvatus
Banteng	Malay	Wild Ox	Bos sondaicus
Basing	Tagal	Various Squirrels	Sciurus sp.
Basing baiong	Kadayan	Brush Tailed Squirrel	Rhithrosciurus macrotis
Basuk	Tagal	" Brok "	Macacus nemestrinus
Bawah	Murik	Pine Marten	Mustela flavigula
Begulu	Kenyah	Leopard Cat	Felis bengalensis
Belabangan	Dusun	Small Mouse Deer	Tragulus kanchil
Belaloh Asing	Kenyah	A Small Squirrel	Sciurus notatus
Besalong	Tagal	Wild Ox	Bos sondaicus
Bijit	Iban	Black Monkey	Pygathrix chrysomelas
Binturong	Malay	Bear Cat	Arctictis binturong
Bragok	Iban	Pine Marten	Mustela flavigula
Bran bran	Malay	Otter	Lutra cinerea
Brok	,,	Pig Tailed Monkey	Macacus nemestrinus
Bruang	,,	Honey Bear	Ursus malayanus
Bukala	Tagal	Long Nose Monkey	Nasalis larvatus
Buri	Kenyah	Moon Rat	Gymnura rafflesi
Caloni	Tagal	Scaly Ant-eater	Manis javanica
Camansur	,,	Rhino.	Rhinoceros sumatranus
Chok puteh	Kayan	Stoat	Putorius nudipes
Dengan ruit	Kalabit	Badger	Mydaus lucifer

Doyong	Malay	Sea Cow	Halicore dugong
Dumbang	„	Mongoose	Herpestes brachyurus
Dungoih	Murut	Long Nose Monkey	Nasalis larvatus
Engkarabak	Iban	Giant Squirrel	Ratufa ephippium
Enkoyong	Kayan	Mias or Orang Utan	Simia satyrus
Enkuli	Iban	Clouded Leopard	Felis nebulosa
Entamba	„	Flying Fox	Pteropus edulis
Enturun	„	Bear Cat	Arctictis binturong
Empau	„	" Brok "	Macacus nemestrinus
Gajah	Malay	Elephant	Elephas indicus
Galling	Iban	White faced Civet Cat	Paradoxurus leucomystax
Gobuk	Murut	" Brok "	Macacus nemestrinus
Gurat-gurat	Dusun	Slender Civet Cat	Linsang gracilis
Haji bulan	Iban	Moon Rat	Gymnura rafflesi
Hangangan	Kenyah	Stoat	Putorius nudipes
Hawat	Kayan	Flying Fox	Pteropus edulis
Ingkat	Iban	The Tarsier	Tarsius spectrum
Jabu	Land Dayak		Sciurus prevostii kuchingensis
Jani	Iban	Wild Pig	Sus barbatus
Jellu	„		Any animal
„ labi	„	An aquatic Civet Cat	Cynogale barbatus
„ miau	„		A Cat, *Felis planiceps* in particular
„ merah	„	The Red Monkey	Pygathrix rubicundus
Jibulau	Murut	" Kra "	Macacus irus
Jugam	Iban	The Honey Bear	Ursus malayanus
Kalam	Tagal		Rats and Mice
Kalassie	Kayan,	The Red Monkey	Pygathrix rubicundus
Kalawat		Gibbon	Hylobates cinereus
Kamaya panas	Iban	Large Mouse Deer	Tragulus javanicus
Kasui	Land Dayak	Civet Cat	Viverra tangalanga
Kawat	Kadayan	Moon Rat	Gymnura rafflesi
Keduran	Tagal	Flying Fox	Pteropus edulis
Khaitan	Kadayan	Bear Cat	Arctictis binturong
Kijang	Malay	Barking Deer	Muntiacus muntjac
Kikok		Hose's Monkey	Pygathrix hosei

Kleho	Iban	Wild Ox	Bos sondaicus
Kluang	Malay	Flying Fox	Pteropus edulis
Koyong	Kayan	Orang Utan	Simia satyrus
Kra	Malay	Long Tailed Monkey	Macacus irus
Krampu	Iban	Brush Tailed Squirrel	Rhithrosciurus macrotis
Kubong	Malay		Most Bats
„ merah	„	Red Flying Squirrel	Pteromys nitidus
„ plandok	Iban	Flying Lemur	Galeopterus volans
Kuching batu	Malay	Leopard Cat	Felis bengalensis
Landak	Malay	Porcupine	Hystrix mulleri
„ dudul	Iban	„	„ „
Lakud	Sennah	The Tarsier	Tarsius spectrum
Langah	Dusun	Flying Lemur	Galeopterus volans
Limpungor	„		Hylomys suillus
Lomba lomba	Malay		Any Porpoises or Dolphins
Lotong	„	A grey monkey	Pygathrix cristatus
Magan	Dusun	Long Nose Monkey	Nasalis larvatus
Mangka	Kenyah	Giant Squirrel	Ratufa ephippium
Mantok	Dusun	A Pygmy Squirrel	Nannosciurus whiteheadi
Marah	Sennah	Orang Utan	Simia satyrus
Merogang	Kadayan & Dusun	Red Monkey	Pygathrix rubicundus
Mias	Malay	Orang Utan	Simia satyrus
Munin	Kayan	A Civet Cat	Arctogale leucotis
Munsang akar	Malay	„ „	„ „
Munsang pisang	„	Stoat	Putorius nudipes
Munsang	Iban		Any Civet Cat
Oho	Kayan	Pigmy Squirrels	Nannosciurus sp.
Orang blanda	Malay	Long Nose Monkey	Nasalis larvatus
„ utan	„	" Ranga-tang "	Simia satyrus
Oucang	„	Loris	Nycticebus tardigradus
Padi bharu	Iban	Aquatic Civet Cat	Cynogale barbatus
Padungan tana	Kayan	Barred Civet Cat	Hemigale hardwickei
Paguih	Dusun	Orang Utan	Simia satyrus
Pankat	Iban	Barred Civet Cat	Hemigale hardwickei

Pankat tekalang	Iban	Barred Civet Cat	Hemigale hardwickei
Paniki	Dusun	Flying Fox	Pteropus edulis
Pas daum	Land Dayak	Brush Tailed Squirrel	Rhithrosciurus macrotis
Pasiu	Dusun	Bear Cat	Arctictis binturong
Pasua	Kenyah	Pine Marten	Mustela flavigula
Pasun	Iban	Wild Dog (Mythical)	
Paus	Malay	Any Whale	
Pelabun	Kenyah		Sciurus hippurus
Penyamoh	Kayan		Rhithrosciurus macrotis
Penyatat	Lundu Dayak	Black monkey	Pygathrix chrysomelas
Perut	Kayan	A Monkey	Pygathrix frontata
Piau		Sambhur Deer	Rusa equinus
Plandok kanchil	Malay	Small Mouse Deer	Tragulus kanchil
Plandok tamping	Iban	Small Mouse Deer	„ „
Plandok napu	Malay	Large Mouse Deer	„ javanicus
Puan	Iban	A Monkey	Pygathrix frontata
Pukang	„	Pygmy Squirrel	Nannosciurus exilis
Rasong	Malay	Long Nose Monkey	Nasalis larvatus
Rimau akar	„	Marbled Cat	Felis marmorata
„ dahan	„	Clouded Leopard	„ nebulosa
Ringin	„	Otter	Lutra cinera
Rusa	„	Sambhur Deer	Cervus unicolor
Salum	Tagal		Sciurus prevostii rufoniger
San	Miri	Wild Pig	Sus barbatus
Sapuan	Kenyah		Sciurus prevostii griseicauda
Schimaru	Iban	Rhino	Rhinoceros sumatranus
Sempalili	Kadayan	The Tarsier	Tarsiur spectrum
Sinang	Iban	A Civet Cat	Viverra tangalanga
Singaggar	Kadayan	A Monkey	Presbytis sabanus
Tagaut	Dusun	Red Flying Squirrel	Pteromys nitidus
Tagurog	„	A Monkey	Pygathrix sabanus
Tambang	Dusun & Murut	Sambhur Deer	Rusa unicolor

Tamparulik	Dusun	Moon Rat	Gymnura rafflesi
Tampik (doubtful)	,,	Wild Ox	Bos sondaicus
Tana	Tagal	Large Squirrel	Ratufa ephippium
Tekalang alud	Kalabit	Banded Civet	Hemigale hardwickei
Teli	Kayan		Sciurus prevostii ,, griseicauda
Telaoh	Murut	Barking Deer	Muntiacus muntjac
Teledu		Badger	Mydaus lucifer
Tembaiungan	,,	Rhino	Rhinoceros sumatranus
Temadu	Malay	Wild Ox	Bos sondaicus
Tengalong	,,	A Civet Cat	Viverra tangalanga
Tengiling	,,	Scaly Ant-eater	Manis javanica
Tikus bulan	,,	Moon Rat	Gymnura rafflesi
,, blanda	,,	Rabbit or Guinea Pig	
Toh	Kalabit	Stoat	Putorius nudipes
Tuahan	Tagal		Rhithrosciurus macrotis
Tupai kelapa Tupai pinang	Malay	Plantain Squirrel	Sciurus notatus
Tupai kenyulong	,,		Most Tree Shrews
Tupai tana			Tupaia tana as a rule
,, labang	Iban		Sciurus prevostii caroli
,, chelum	Tagal		Sciurus prevostii rufoniger
Tupai bekarang	Iban		Sciurus prevostii atricapillus
Tun	Land Dayak	Bear Cat	Arctictis binturong
Ulak	Tagal	Wild Pig	Sus barbatus
Wawa	Malay	Gibbon	Hylobates cinereus
Wok wok	Kayan	,,	,, ,,

APPENDIX B.

Measurements and Weights of Bornean Mammals including notes on the colours of their soft parts.

		Total length in inches	Tail in inches.	Height at Shoulder.	Weight in pounds	Collector.	Colour of Soft Parts.
Manis javanica (Ant Eater)	♂	3′ 6·4″	1′ 8·4″		16 lbs. 8 ozs.	Dr. Abbot	
Halicore dugong (Sea Cow)	♂	9′			325 lbs.	Prater	
	♀	8′ 4″			280 „	„	
Balaenoptera musculus		66′				S. M.	
Sus barbatus (Bearded pig)	♂	4′ 7·8″		2′ 6·5″	185 lbs.	Dr. Abbot	Iris quite white in old specimens, not so clear in immature ones.
		4′ 7·4″		2′ 4″	140 „	„	
		4′ 10″		2′ 4·5″	178 „	„	
		4′ 9·8″		2′ 6·3″	138 „	„	Snout white to flesh coloured.
	♀	4′ 8·6″		2′ 5·1″	182 „	„	Hooves horn.
		4′ 4″		2′ 2″	126 „	„	
		4′ 3″			126 „	„	
		4′ 5″		2′ 5·5″	135 „	„	
Cervus unicolor equinus (Sambhur Deer)	♂	5′ 6″	10″	3′ 6″	280 „	S. M.	Iris brown.
					117 „	„	Nose horn with greenish tinge.

	♀	5′ 11″		4′ 10″	200 lbs.	Dr. Abbot	Hooves horn.
		6′ 2″		4′ 1″	150 „	„	
Tragulus kanchil (Mouse Deer)	♂	1′ 7″			4 lbs. 8 ozs.	„	Iris dark brown.
		1′ 6·7″	2·6″		4 „ 3 „		
		1′ 5″	2·6″		3 „ 8 „		Nostrils grayish horn.
			2·6″		4 „ 6 „	S. M.	Ears pale horn, edged with black.
		1′ 6″			4 „ 2 „		
		1′ 5″	2·5″		3 „ 11 „	S. M.	
Tragulus javanicus borneanus (Mouse Deer)	♂	1′ 10·2″	3·3″		9 lbs.	Dr. Abbot	Iris very dark brown.
		1′ 8·7″	2·5″		7 „	„	Hooves and Muzzle pale horn.
		1′ 9·5″	3·25″		8 „ 8 ozs.	„	
		1′ 9·5″	3·5″		7 „ 8 „	„	
		1′ 10·2″	2·75″		7 „ 8 „	„	
		1′ 9·5″	3·?″		10 „ 1 „		
		1′ 10″			10 „		
		1′ 9″	3·3″		6 „		
		2′ 4″	3·3″		7 „ 12 ozs.	S. M.	
		1′ 11·3″	3·1″		8 „ 10 „	„	
					7 „ 8 „	„	
		1′ 11″	2·5″		7 „	„	
	♀	1′ 9·5″	3·3″		9 „ 8 „	Dr. Abbot	
		1′ 7″	3·9″		6 „	S. M.	

		Total length in inches.	Total inches.	Height at Shoulder.	Weight in pounds.	Collector.	Colour of Soft Parts.
Muntiacus muntjac (Barking Deer)	♂	3′	6·7″		28 lbs. 10 ozs.	Dr. Abbot	
		2′ 11·7″	6·7″	1′ 8·4″	35 ,, 3 ,,	,,	Iris dark brown.
		2′ 11·4″	5·9″	1′ 9·2″	32 ,,	,,	Snout black.
	♀	3′ 1·7″	5·3″		28 ,,	S. M.	Hooves horn.
Bos sondaicus (Wild Ox)	♀	6′ 10·4″	2′ 2·8″	4′ 3·2″	386 ,,		
					600 ,, (gutted)	Dr. Abbot S. M.	Iris light sandy yellow with black flecks. Muzzle dark greyish black.
Rhinoceros sumatanus (Rhinoceros)							
Trichys lipura							
Hystrix muelleri (Porcupine)	♂	2′ 4″	3·1″		22 lbs.	Dr. Abbot	
	♂	2′ 6″	7″		17 ,, 8 ozs.	S. M.	Iris very dark brown.
Hystrix crassipinis	♀	2′ 3″	7″		13 ,,	S. M.	
Rattus muelleri borneanus	♂	1′ 6·3″	10·5″		12 ozs	S. M.	
Rhithrosciurus macrotis	♂	2′ 10″	1′ 1″		2 lbs. 2 ozs.	S. M.	
	♂				2 ,, 4 ,,	,,	
	♂	1′ 10·8″	12″		1 ,, 6 ,,	,,	
Nannosciurus exilis (Pygmy squirrel)	♀	5·2″	2·3″		¾ ,,	,,	
Funambulus insignis diversus	♂	11·5″	4·8″			,,	Iris very dark brown.
	♀	1′ ·25″	4·8″			,,	

Funambulus everetti						
Sciurus tenuis						
Sciurus lowi						
Sciurus brookei	♀	1′ ·2″	5·2″	5.75 ozs.	S. M.	
Sciurus jentinki						
	♂	1′ ·ﾚ″	6·1″			
Sciurus notatus	♀	1′ 4·1″	7·3″	8 ozs.	„	Iris dark brown, claws pale horn.
Sciurus prevostii						
borneoensis	♂	1′ 7·4″	9·4″	1 lb.	S. M.	Iris dark brown.
	♀	1′ 8·1″	10·5″	1 lb.	„	Claws horn, paler at tip.
	♀	1′ 7·4″	9·5″	14.75 ozs.	„	
Sciurus atricapillus	♂	1′ 6·5″	9″	13 „	„	
	♀	1′ 6·4″	9·5″	15 25 .,	„	
Sciurus caroli	♂	1′ 7·9″	9·9″	1 lb.	S. M.	Iris dark brown.
	♂	1′ 4″	8″	1 „ 1 oz.	„	Claws horn, pads black.
	♀	1′ 6″	9·2″	14.5 ozs.	„	
Sciurus rufoniger	♀	1′ 6·5″	9·5″	1 lb.	„	Iris dark brown, Pads and claws black, latter tipped with horn. Ears and muzzle black.
Sciurus gr.seicauda	♀	1′ 6·2″	9·2″	12½ ozs	S. M.	do.
	♀			1 lb. 2 ozs.	„	
Sciurus hippurus	♂	1′ 8″	10″	14.5 ozs	S. M.	Iris dark brown.
	♂	1′ 7 1″	10″	13 „	„	Pads and claws pale horn, tips of claws black.

		Total length in inches.	Tail in inches.	Height at Shoulder.	Weight in pounds.	Collector.	Colour of Soft Parts.
Ratufa ephippium	♂	2′ 8″	1′ 5″		2 lbs. 12 ozs.	S. M.	Iris very dark brown.
		2′ 6·5″	1·2″		2 „ 10 „	„	Pads and claws horn,
		2′ 5″	1′ 3·5″		2 „ 6 „	„	muzzle black.
		2′ 6·3″	1′ 4·6″		2 „ 5 „	„	
		2′ 4″	1′ 5″		3 „	„	
		2′ 4·6″	1′ 3·5″		2 „ 8 „	„	
		2′ 4″	1′ 3·5″		2 „		
	♀	2′ 6·5″			2 „ 8 „	„	
		2′ 7″			2 „ 9 „	„	
		2·8″	1′ 2″		3 „		
Iomys thomsoni (Flying squirrel)	♂	1′ 1·8″	7′ 2″		4 „	S. M.	Iris very dark brown.
Ursus malayanus (Bear)	♂	4′ 5·2″	3·5″		124 „	Dr. Abbot	
Lutra cinerea (Otter)	♀	2′ 6·4″	1′ 2″		5 „ 8 „	„	
Lutra sumatrana	♀	2′ 6″	1′		6 „	S. M.	Iris dark brown.
Mydaus lucifer (Badger)	♀	1′ 5″	2″		3 „ 8 „	„	
Mustela flavigula (Marten)	♀	2′ 5·7″	1′ 5″		3 „		
	♀	2′ 6·5″	1′ 1·4″		2 „ 6 „	Dr. Abbot	
Putorius nudipes (Stoat)	♂	1′ 10″	8″			S. M.	Iris brown, nose pink; claws flesh coloured, horn at tip.

Mungos brachyurus (Mongoose)	♂	1′ 5·5″	9·3″	4 lbs.	S. M.	Iris light yellow ochre; claws horn, pads whitish. Nose pink.
	♂	1′ 4·6″	9·6″	2 „ 4 ozs.	Dr. Abbot	
	♂	1′ 5·5″	9·1″	3 „ 6 „		
	♀	1′ 3·5″	8·2″	2 lbs. 15 ozs.	Dr. Abbot	
	♀	1′ 5·5″	9·8″	3 „ 2 „	„	
	♂	2′ 9″	8·2″	7 „ 8 „	S. M.	
Cynogale barbatus	♀	2′ 7″	5·5″	10 „	Dr. Abbot	
	♀	2′ 9·4″	7·9″	12 „ 4 „	„	
Arctictis binturong imm. (Bear cat)	♀	4′ 6·5″	2·3″	13 „	„	Iris light yellowish brown.
Hemigale derbyanus	♂	2′ 6·8″	1′ 2″	3 „ 6 „	S. M.	
	♂			5 „ 8 „	„	
	♂	2′ 6·9″	1′ 25″	3 „ 5 „	Dr. Abbot	
	♀			6 „	„	
	♀			6 „ 9 „	S. M.	
Arctogale leucotis	♂	2′ 9″	1′ :0″	6 „ 8 „	S. M.	Iris dark brown muzzle black.
	♂			6 „	Dr. Abbot	Claws pale horn.
	♀			3 „	„	
Paradoxurus hermaphroditus	♂			4 „ 8 „	S. M.	Iris brown.
	♂			4 „ 1 „	„	
Linsang gracilis	♀	2′ 3·3″	13·5″	1 „ 3 „		Iris dark brown. Nose pink, pads and claws white.

		Total length in inches	Tail in inches.	Height at Shoulder.	Weight in pounds.	Collector.	Colour of Soft Parts.
Viverra tangalanga	♂	2′ 2·5″	1′ 1·75″		8 lbs. 3 ozs.	Dr. Abbot	
		2′ 2·1″	1′ 4″		9 „	„	
		2′ 1″	11·8″		6 „ 8 „	„	
		2′ 2·2″	10·8″		9 „	„	
		2′ 4″	11·9″		7 „ 2 „	„	
		2′ 4″	1·4″		7 „ 2 „	„	
		1′ 9·8″	1′ 4″		7 „ 2 „	„	
		2′ 1·3″	1′ 3″		8 „ 1 „	„	
	♀	2′ 3″	1′ ·75″		9 „	„	
		2′ ·75″	1′ 4″		7 „ 2 „	„	
		2′ 1·2″	11·75″		8 „ 1 „	„	
		2′ 1·6″	1′ 2″		10 „ 6 „	„	
		2′	1′ 2″		6 „ 3 „	„	
		2′ 6″	1′		9 „	„	
Felis planiceps	♀	1′ 11·5″	5·4″		5 lbs. 10 ozs.	S. M.	Iris pale grey with almost a pinkish tinge.
		1′ 7·8″	5·4″		4 „ 12 „	Dr. Abbot	
		1′ 5·5″	5·8″		4 „	„	
		1′ 6·3″	5·8″		4 „ 8 „	„	
		1′ 5·8″	5·1″		3 „ 12 „	„	
		1′ 7·1″			4 „	S. M.	
Felis bengalensis (Leopard Cat)							
	♂				7 „ 3 „	„	
	♀	1′ 3·2″	7·?″		4 „	Dr. Abbot	

Felis temminki							
Felis marmorata							
Felis nebulosa (Clouded leopard)		5′ 7·5″	2′ 6″	1′ 2·5″	44 lbs. 8 ozs.	Blandford	
Galeopterus volans (Flying lemur)	♂	1′ 10·5″			2 „ 3 „	S. M.	
	♀	1′ 11·4″			2 „ 4½ „	„	
Gymnura rafflesi (Moon rat)	♂				2 „ 8 „	„	Iris black. Ears flesh coloured, tinged with pale yellow.
	♀	2′ 1·1″	9·5″		3 „	„	Nose pink; feet paler, claws horn.
Ptilocercus lowi							
Tupaia picta		1′ 4·5″	7·75″				Iris brown. Pads and claws horn.
Tupaia dorsalis		1′ 3″	6·05″			S. M.	Iris very dark brown.
Tupaia gracilis							pads and claws horn.
	♂	11·5″	6·2″			S. M.	Iris very dark brown.
					2.25 „	„	
Tupaia minor		11·85″	6·75″		8.5 ozs.	S. M.	Iris dark brown. Nose,
Tupaia tana	♀	1′ 3·4″	7·0″				feet and claws horn. Pads pale horn.
Tupaia ferruginea							Iris very dark brown,
Cheiromeles torquatus							
Taphozous longimanus albipinnis	♀	3″			1 oz.	S. M.	Iris dark brown. Muzzle dark brown.
Vespertilio muricola		2′2″			136 grains	S. M.	

		Total length in inches.	Tail in inches.	Height at Shoulder.	Weight in pounds.	Collector.	Colour of Soft Parts.
Rhinolophus trifoliatus	♂	3·6″			1 oz.	S. M.	Nose Leaf pale yellow, ears dull yellow. Elbows, knees and edge of tail membrane yellow.
Pteropus edulis (Flying Fox)	♂	11·6″			1 lb. 4 ozs.	S. M.	
	♂				2 lbs. 3 „	„	
	♀	11·6″			1 lb. 7 „	„	
	♀				1 lb. 13 „	„	
Cynopterus brachyotis	♂	3·6″	·3″		1.6 „	„	Iris dark coffee coloured, claws horn. Feet dull black.
	♀	3·8″	·3″		1.5 „	„	
Tarsius spectrum (Tarsier)	♀				3 „	S. M.	
Nycticebus tardigradus (Loris)	♂	1′ 4·7″			14¾ „	„	Iris light yellow ochre. Nose and feet dull flesh colour.
Macacus frus	♂	3′ 9·5″	1′ 10·5″		11 lbs.	Dr. Abbot	
(“ Kra ”)	♂				12 „	S. M.	
Macacus nemestrinus	♂	2′ 8·9″	8·7″		24 „	Dr. Abbot	
(“ Brok ”)	♀				18 „	S. M.	
Pygathrix frontatus	♀	3′ 11·2″	2′ 3·2″		13 „ 8 „	„	Iris dark brown, Ears black, ◇ shaped white spot on forehead. Pads black, claws horn.

Pygathrix everetti	♀	4′ 5″	2′ 3·5″	14 lbs.	S. M.	
Pygathrix hosei	♂	4′	2′ 4″	11 lbs.	S. M.	Iris dark brown.
	♂	4′	1′ 6″	10 „	„	Pads black. Face dark grey, Eyelids, nose and brows light grey. Upper lip and chin whitish.
Pygathrix cristatus	♂	3′ 9·3″	2′ 1″	11 lbs. 8 ozs.	S. M.	
	♀			12 „ 8 „	„	
Pygathrix chrysomelas	♂	3′ 10·5″	2′ 3·3″	14 „	Dr. Abbot	Iris very light almost yellowish ochre. Face dull black. Feet and hands black.
		3′ 10·6″	2′ 4·5″	14 „	„	
		4′ 2″	2′ 6·1″	14 „	„	
		4′ 1·8″	2′ 5·5″	15 „ 12 „	„	
		3′ 9·5″	2′ 3·4″	13 „	„	
		3′ 9·4″	2′ 2·5″	15 „	„	
	♀	3′ 9·7″	2′ 3·4″	15 „ 4 „	„	
		3′ 7″	2′ 2·5″	10 „ 6 „	„	
		3′ 7″	2′ 2″	10 „ 4 „	„	
Pygathrix cruciger	♀	3′ 5″	2′	10 lbs. 4 ozs.	Dr. Abbot	Iris dark brown. Face dark greyish. Pads black.
Pygathrix rubicundus	♂	3′ 8″	2′ 1·5″	10 „	S. M.	
		4′ 6″	2′ 3·4″	16 „ 6 „	Dr. Abbot	Iris brown.
		3′ 11· 2″	2′ 3·5″	14 „ 6 „	„	Ears greyish blue.
		3′ 11· 4″	2′ 3·7″	15 „ 8 „	„	Face greyish blue, chin and round eyes whitish. Pads black claws horn.
		4′ 8″	2′ 4″	15 „	„	
		3′ 10·4″	2′ 2·6″	15 „	„	

		Total length in inches.	Tail in inches.	Height at Shoulder.	Weight in pounds.	Collector.	Colour of Soft Parts.
	♀	4′ 1·4″	2′ 5″		16 lbs.	S. M.	
		4′ 4·1″	2′ 5·5″		12 „ 4 ozs.	Dr. Abbot	
		3′ 11·3″	2′ 3·2″		14 „ 2 „	„	
		3′ 10·6″	2′ 3·1″		17 „ 8 „	„	
		3′ 10·1″	2′ 2·3″		16 „ 6 „	„	
		3′ 9· 9″	2′ 2·2″		11 „ 7 „	„	
Nasalis larvatus (Long Nose Monkey)	♂	4′ 6·3″	2′ 2·2″		42 „ 12 „	„	Iris dark yellow ochre.
		4′ 1· 5″	2′ 6″		29 „ 4 „	S. M.	
		4′ 5·6″	2′ 2·4″		38 „	Dr. Abbot	Face brick red Claws dark horn. Pads black.
		4′ 5·5″	2′ 2″		44 „	„	
		4′ 8·25″	2′ 4·5″		52 „	„	
		4′7″	2′ 3·5″		45 „	„	
		4′ 6″	2′ 2·5″		46 „	„	
		4′ 6″	2′ 2·5″		48 „	„	
	♀	3′ 7·6″	1′ 9·6″		21 „ 8 „	„	
		3′ 10″	1′ 11·8″		13 „ 1 „	„	
		3′ 9″	1′ 11·2″		20 „ 4 „	„	
		4′	2′ 4″		23 „	„	
		3′ 7·6″	1′ 10·4″		22 „	„	
Hylobates cinereus (Gibbon)	♂	1′ 7·7″			12 „ 4 „	S. M.	Iris brown. Face, Pads of feet hands, black.
		1′ 6·5″			11 „ 4 „	Dr. Abbot	
		1′ 8·1″			15 „ 5 „	„	
		1′ 6·1″			11 „ 4 „	„	
		1′ 7·1″			11 „ 9 „	„	
		1′ 5·3″			11 „ 9 „	„	

	♀	1′ 6·4″		13 lbs.	8 ozs	Dr. Abbot
		1′ 6·4″		12 ,,	2 ,,	,,
		1′ 5·7″		12 ,,	2 ,,	,,
		1′ 6·1″		12 ,,	8 ,,	,,
				12 ,,	8 ,,	,,
Simia satyrus (Orang Utan)	♂	3′ 1·6″		450 ,,		Dr Abbot
		3′ 2·1″		405 ,,		,,
		3′ 2·2″		450 ,,		,,
	♀	2′ 5·3″		162 ,,		,,
		2′ 6·7″		184 ,,		,,
		2′ 9·5″		225 ,,		,,
		2′ 6·9″		192 ,,		,,
		2′ 5·7″		135 ,,		,,
		2′ 6·7″		188 ,,		,,

APPENDIX C.

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