

EXHIBITIONS AND NOTICES.

March 23, 1915.

R. H. BURNE, Esq., M.A., Vice-President,
in the Chair.

Colour-Variation in Partridges.

Mr. W. R. OGILVIE-GRANT, F.Z.S., exhibited a series of specimens of Partridges, including a number from the Tring Museum, kindly lent by the Hon. Walter Rothschild, D.Sc., F.R.S., F.Z.S., and drew attention to two notable colour-variations of the Red-legged Partridge (*Caccabis rufa*). He remarked:—"As most people are aware this species is not indigenous to Great Britain, having been introduced about 1770, and since spread over a large part of England, being especially numerous from Lincoln to Essex and in the Home Counties. The remarkable variation which I now exhibit has the head, eyebrow-stripes, cheeks, and throat black, and the rest of the plumage dull vinaceous-red with a patch of white feathers in the middle of the belly, forming an irregular horse-shoe-mark. The first example was killed at Braintree, Essex, on October 20th, 1908, by Mr. A. W. Ruggles-Brise, and presented by him to the Natural History Museum. On October 20th, 1914, an almost precisely similar specimen was killed at Higham, Kent, by Mr. H. M. Cobb, sent by him to the 'Field' office, and subsequently presented by Dr. H. Hammond Smith to the Museum. Higham is about 30 miles, as the crow flies, from Braintree, and it seems a remarkable coincidence that a second specimen of this quite unique variation of the Red-leg should have been killed exactly six years after the first, and in nearly the same locality."

Other variations of this species were also shown, but it was pointed out that colour-variations were very rare, although partial albinism sometimes occurred. The remarkable variation above mentioned had been described and figured in 'British Game-Birds and Wildfowl' (pl. xxi. fig. 2, 1912).

Mr. Ogilvie-Grant also exhibited a series of colour-variations of the Common Partridge (*Perdix perdix*), amongst which was the well-known chestnut form, *P. montana* Brisson. This form appeared to be comparable to the rufous variety of the Red-leg, but in this instance the variation was comparatively common, having been first described in 1760 from the mountains of Lorraine, and subsequently obtained in almost every county in England and some parts of Scotland.

Lastly, specimens of the Bearded Partridge (*P. dauurica*), from Manchuria, were exhibited. This species was being sold in

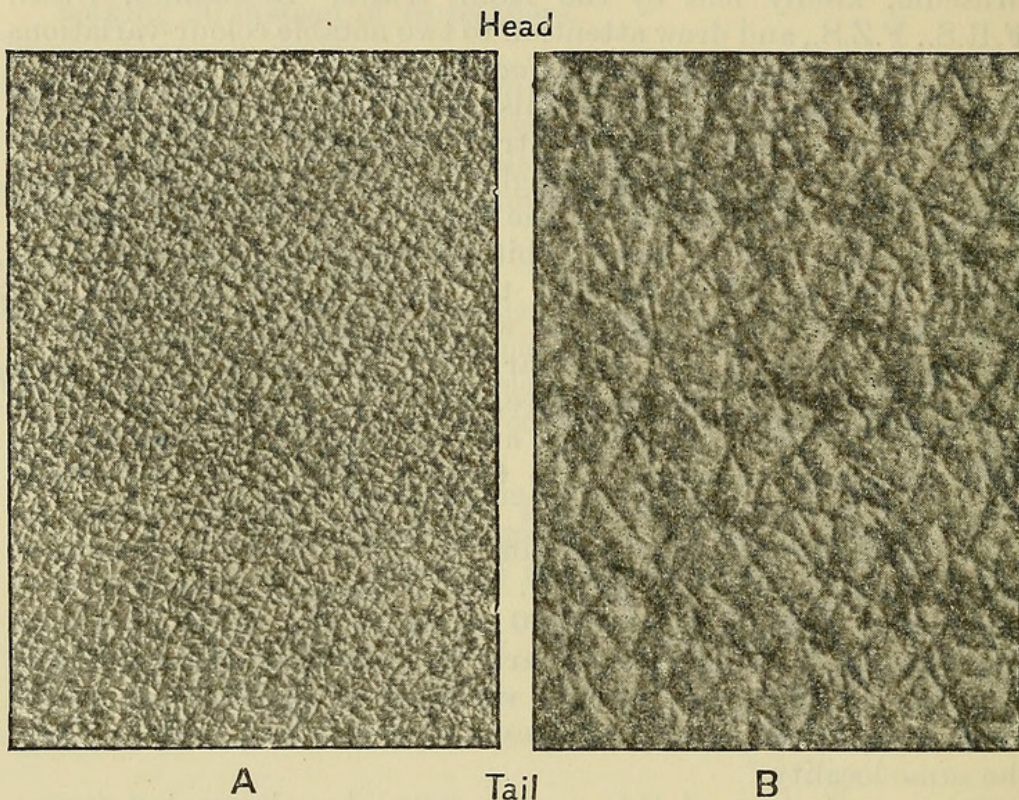
large numbers in the London markets, and the exhibitor had recently purchased a beautiful pale grey variety, which, however, had the black horse-shoe-patch normal.

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"Pigskin" and Capybara Skin.

SIR EDMUND G. LODER, Bt., F.Z.S., exhibited the tanned skins of a Pig (text-fig. 2), and of a Capybara (text-fig. 1), and made the following remarks:—

Text-figure 1.



A portion of the skin of a Capybara: (A) natural size; (B) enlarged four times.

"In most parts of England and of America pigs are not skinned: they are scalded and scraped. It was therefore not clear where the pigskins used in trade came from.

One of my Capybaras having died, the skin was sent to the tanners and, on its return, it was suggested that this was perhaps what was used as "pigskin."

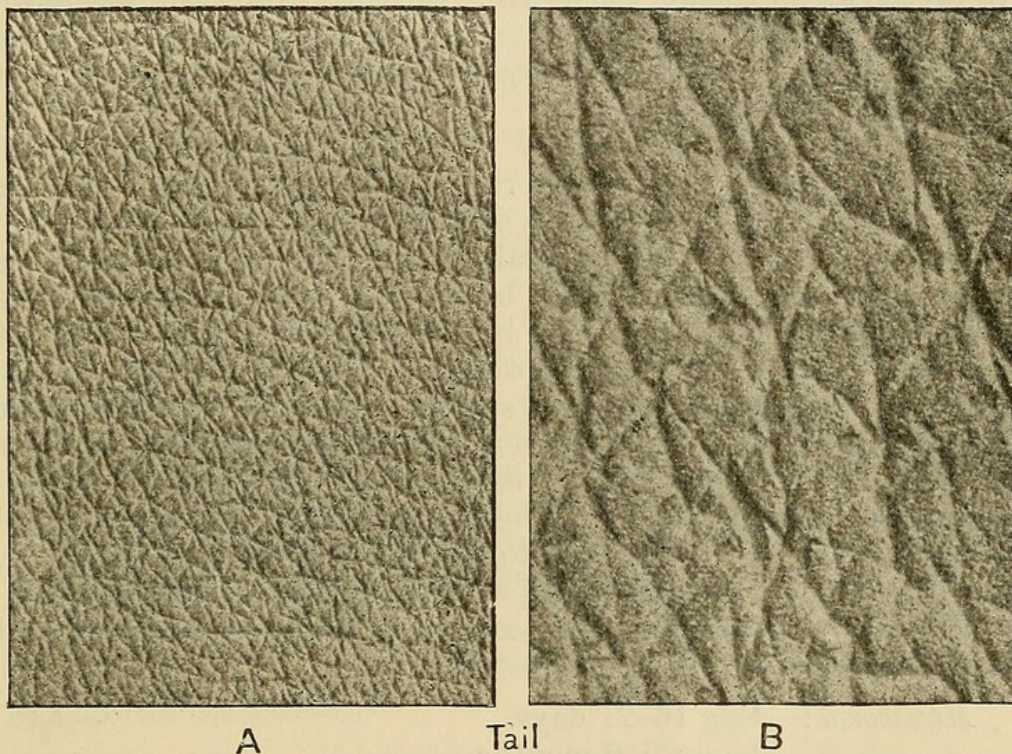
This idea was favoured by the knowledge that in South America saddles are commonly covered with Capybara skin, but after I had exhibited this Capybara skin at one of our meetings, a correspondent wrote to the 'Field' newspaper saying that in his part of Scotland it was the custom to skin pigs, the flesh being pickled for the Navy. I then procured a tanned pigskin

from Scotland, which is the skin now exhibited with that of the *Capybara* for comparison."

Sir Edmund Loder, at the request of the Committee of Publication, has since had the skins photographed. The result is shown in text-figs. 1 and 2, which should be viewed so that the light falls on them from the right.

Text-figure 2.

Head



A portion of the skin of a Pig: (A) natural size; (B) enlarged four times.

Notes from the Caird Insect House.

Prof. H. MAXWELL LEFROY, M.A., F.Z.S., Curator of Insects, exhibited specimens of Insects that had been bred in the Caird Insect House and read the following notes, which had been extracted, with the assistance of Mr. C. J. C. Pool, from the records made:—

The Caird Insect House was opened in October, 1913, for the exhibition of living insects and other invertebrates. Owing to the difficulties of keeping living insects under artificial conditions, and to the death of the head keeper, Quantrell, we have not attempted to do more than maintain a large variety of species in good condition. The following few notes of interesting species that have been exhibited will illustrate some of the difficulties we have had to deal with, and some of our successes.

PHASMIDÆ.

Stick Insects.

Carausias morosus has been in the house continuously, and now occupies a whole bay. All are females, and no male has been seen. Part of the stock was reared in the open in July-August, and they do well under such conditions.

In the cages the green and brown insects place themselves irrespective of the colour of their background; in the open on large bushes the green insects invariably sit among the foliage or on the green shoots, the browns choosing the stem, low down near the ground. There are, as a rule, many more greens than browns, just as there is on a plant a much larger proportion of green area than brown.

Carausias will eat a variety of plants—roses, beans, privet, euonymus, lilac, ivy, hawthorn, rubber fig, *Coleus*, *Spiræa*, and *Aralia* being some of those on which they have thriven.

Owing to the shortage of mealworms, these stick insects have been used for feeding some birds and small mammals: the Curator of Birds is anxious to breed them on a large scale for his birds, the Curator of Reptiles wants them for his lizards, and the Superintendent covets them for some of the more delicate mammals. They are very prolific, laying some hundreds of eggs; but the life-history is long and they remain several months in the egg stage. Whether it will be feasible to breed them on a large scale remains to be seen; there is no difficulty, but they require fresh food and a certain amount of attention.

We may contrast the prospects of breeding mealworms and stick insects as follows:—

Mealworm:—Egg 16–21 days.

Larva 5–6 months.

Pupa 14 days.

Beetle lives 2–3 months, begins to lay in 10 days, and lays 50–100 eggs—say 60.

In 5 years a stock of 100 might have increased by 6 broods to 600 million individuals, assuming half of each lot were used as food when larvæ (*i. e.* 27 million) and half were females.

Every mealworm used as food has not bred, so there is a loss, and it requires two beetles, a male and a female, to produce 100 eggs; these two can only be used for feeding as beetles.

The mealworms require little attention—a very little meal as food, a few dead mice, sparrows, and other small game as luxuries, and quite simple boxes as cages.

Stick Insect:—Egg takes 2–3 months.

Nymph takes 5 months.

Adult takes 9 months, begins to lay in a few weeks, and lays 300–500 eggs.

In 5 years from 100 one might have 5 broods, the last amounting to about 10 billion, all of which could be used for food and none

of which would have been kept as adults after they had laid 100 eggs; for 100 eggs only one female is required, as there are no males.

They require fresh food, more attention, more space; they are much larger, and are greedily eaten by many of the animals and birds. On the whole, it looks as if at our Gardens, with lots of privet, it might be profitable to breed *Carausias*.

LEAF INSECTS.

Mr. E. G. B. Meade-Waldo has given us stocks of *Pulchriphyllium crurifolium*, and they appeal very much to the public. We have not been very successful with them, and large numbers of our brood vanished. We lost many young probably from a spider, *Psalmopœus cambridgii*, which "disappeared," hiding itself behind the cork fittings in the case and apparently coming out at night to feed on the young ones; the spider was found well and flourishing when the cork was taken down. Cockroaches (*Periplaneta americana*) also eat the living insects.

We obtained seed of guava from Bombay and plants were grown, but the insects do better on the oak their parents in England have fed on.

Many full-grown females have died as a result of injuries sustained by being nibbled by their fellows; not a single specimen has completely escaped this unfortunate mishap.

We are in possession of a number of ova, from which we expect a good stock for the coming season.

MANTIDÆ.

Sphodromantis guttata.

Of wide African distribution, and also found in Persia.

An egg-mass from East Africa, hatched on July 6th, 1914; the young were fed on Aphides, small caterpillars, the larvæ of *Cis*, and other small insects. One was loose in the bay containing caterpillars of *Attacus cynthia*, and thrived amazingly. It was eventually placed in solitary confinement. Two have survived up to the present, and one completed its development on March 20th; for the last three months they have been fed on stick insects and moths. It is an unusual thing to bring a Mantis through all its moults in captivity; the second appears likely to complete its development very soon.

These insects are bark-coloured, and rest motionless by day, feeding at night; probably in the wild state they do the same, differing from the commoner green variety, which sit among green foliage awaiting their prey during the daytime. These insects were green until half-grown, so doubtless in a wild state some change of appearance becomes necessary through a change of season and the colour of the foliage. Unfortunately, both our specimens are females. Before the penultimate moult one had

lost part of its antenna, after the moult this was found to be complete; a tarsus lost before the final moult was not regenerated, and the perfect insect is without it.

COLEOPTERA.

Dermestes frischii.

This very rare beetle was exhibited in all stages of development. The specimens came from Millwall Docks, where the larvæ were feeding in hard fungi on decaying aspen logs. The Port of London Authority very kindly granted permission for the logs to be removed to the Insect House, where they are now under observation. The fungus was inhabited by two other beetles, both of which are common British species—*Cis boleti* Scop. and *Cis villosulus* Marsh.; we have bred these for feeding the Mantides referred to above. Several pupæ of *D. frischii* were found no less than four inches from the surface of the logs. The larval borings resembled those of the oak timber pest *Xestobium tessellatum* F. It is interesting to note this remarkable departure from the ordinary habits of *Dermestes*. These beetles are usually found in dead animals and birds or in raw hides and natural history specimens.

Xestobium tessellatum.

We have been fortunate in getting material in an oak-tree of this beetle, which is doing so much damage in the roof of Westminster Hall. The live larvæ and beetles obtained from this tree have been of great use in testing methods of dealing with the beetle in Westminster Hall, as very little other live material has been available.

Dorcatoma punctulata.

The only known British specimens of this pretty little beetle were discovered at Enfield, Middlesex (Entom. Monthly Mag., July 1914, p. 167).

Two other British species, *D. chrysomelina* and *D. flavicornis*, are found in oak timber in the New Forest and other localities.

D. punctulata closely resembles *Chrysomelina*, but its habits appear to be different. The insects have been exhibited in all stages, inhabiting a hard dry fungus from the trunk of an old ash-tree at Forty Hill, Enfield. The beetle emerges in June and July: there are a number of larvæ in the fungus which should produce beetles shortly.

Eryx fairmairei.

The only known British locality for this beetle is Sherwood Forest, Notts. The larva, which closely resembles a mealworm, is very destructive to the bark of old growing oak-trees. A number of the larvæ were collected in July 1913, and beetles bred from them have been shown. The beetle, which resembles

the other British species *Eryx ater* F. (and with which it was confused in some of the old collections), appears to have received little or no study as to its habits. It is therefore as well to draw attention to the different conditions under which the larvæ of the two species were found.

Eryx ater is common in the New Forest and other well-wooded districts, but has not been taken at Sherwood. It was formerly very rare in collections, as owing to its nocturnal habits it usually escaped the notice of collectors; but it was taken at sugar by lepidopterists. The larva, which appears to be indistinguishable from that of *E. fairmairei*, is common in hollow trees, where it is usually found associated with a Lamellicorn beetle, *Dorcus parallelipedus* L., in ash or beech, or with *Sinodendron cylindricum* in apple. The burrows of these two beetles appear to form ideal conditions for the *Eryx* to establish itself. It never attacks the Lamellicorn larvæ, and is entirely a wood-feeder. It has been found in more than twenty trees in the Enfield district, but always in the hollows and never in the bark.

At Sherwood Forest, with *E. fairmairei*, the conditions are always completely reversed. A hollow oak-tree there contained some larvæ which appeared to be *Eryx*, but which afterwards produced specimens of an allied species, *Cistela ceramboides* L.

The bark of this tree was infested with groups of *Eryx* larvæ, the eggs having been deposited in crevices in various parts of the trunk.

The larva feeds upon the growing bark, and the work of destruction is more complete than that produced by the elm-bark pest *Scolytus destructor*. There are many fine old trees at Sherwood upon which the bark was held together merely by the strength of its outer layers, the whole of the inner layer having been devoured by the *Eryx* larvæ. Only a little effort was needed to bring the whole mass to the ground, when amidst a cloud of dust and spiders one might hope to find a few of the beetles, but more often the larvæ of several generations together.

Aulonium trisulcum.

The following extract from Fowler and Donisthorpe's 'British Coleoptera' is of interest in connection with the specimens now exhibited:—"Enfield. Under elm-bark in the burrows of *Scolytus multistriatus*. Subsequently, Mr. Pool took it both at Edmonton and Winchmore Hill. This very interesting addition to our list (Ent. Record, xvi. 1904, p. 310) was made by Mr. C. J. C. Pool in July 1904. The insect is found rarely under elm-bark in Central and Southern Europe in the burrows of *S. destructor* and *S. multistriatus*. The larva of this species is briefly described by Westwood. It is long, subdepressed, and slightly curved, with three pairs of thoracic legs and a pair of short, recurved, horny points upon the terminal segment of the body. The pupa is very much elongated, with two short obtuse points at the extremity."

The elm post from which the original British specimens were taken at Enfield was made from a portion of a very large prostrate bough close at hand. The bark was infested with the Scolytids and a colony of about thirty of the *Aulonium* in various stages.

Many elm-trees are standing in the Zoological Gardens from which boughs have been removed, for use as perches in various out-door cages for birds and mammals.

This habit of using fresh material has the effect of producing exactly the right conditions for the Scolytid pests to flourish.

We have collected some infested branches, and in the burrows of the *Scolytus* the *Aulonium* (larvæ and remains of beetles) has been rediscovered.

This interesting discovery will add something to our knowledge of the habits and distribution of this rare beetle.

Material is now exhibited in the Insect House, from which the beetles will be emerging from May to July.

Anthia sexguttata. (Six-spotted Ground-Beetle.)

We received five specimens from India in July 1914, one of which is still alive (March 17th, 1915). It burrowed down into the sand on August 10th, and reappeared on October 1st. They have this burrowing habit in India, but this specimen alone of the five exhibited it. All the others died before the middle of October. *Anthia* is fed on sugar and live insects.

Geotrupes sylvaticus. (Forest-Geotrupid.)

In September, 1914, we obtained this species from the New Forest. Unlike their brethren, which feed on cattle-dung, these beetles eat fungus and decayed vegetable matter. This colony is laying eggs in a mixture of decaying leaves and banana-skins, and promises to become a permanent addition.

Enceladus gigas. (Giant Ground-Beetle.)

A specimen arrived alive and in robust health from Trinidad; it had devoured all the many insects with which it had been sent, and alone survived. It has flourished with us; it escaped once, and was recaptured in the Small Mammal House.

Hæmonia appendiculata.

This rare beetle has been represented by four specimens living in a small tank since October 13th, 1914, when they were received from Oxford. It is probable that they will breed here.

Sphodrus leucophthalmus.

This rare Carabid beetle has been collected at Woolwich, and is now exhibited with two allied species, *Læmostenus complanatus* and *Pristonychus terricola*. All are doing well upon a diet of sugar and water.

April 13, 1915.

E. T. NEWTON, Esq., F.R.S.,
in the Chair.

The SECRETARY read the following report on the Additions made to the Society's Menagerie during the month of March 1915:—

The number of registered additions to the Society's Menagerie during the month of March was 49. Of these 26 were acquired by presentation, 15 were received on deposit, 3 in exchange, and 5 were born in the Gardens.

The number of departures during the same period, by death and removals, was 127.

Amongst the additions special attention may be directed to:—

1 Philippi's Tucutucu (*Ctenomys mendocinus*), new to the Collection, from Cordova, Argentina, presented by Wilfred A. Smithers, C.M.Z.S., on March 2nd.

4 Black-backed Jackals (*Canis mesomelas*), born in the Menagerie on March 26th.

Dr. A. SMITH WOODWARD, F.R.S., F.Z.S., exhibited an anterior horn of a Woolly Rhinoceros (*Rhinoceros antiquitatis*), obtained for the British Museum, from frozen earth in Northern Siberia, by Mr. Bassett Digby. The horn must have measured originally nearly a metre along the curve of the anterior border. It has been cut and trimmed in places by the finders, but is sufficiently well preserved to show its laterally compressed shape and sharp posterior border.

Mr. D. SETH-SMITH, F.Z.S., Curator of Birds, exhibited a series of lantern-slides, from photographs taken in the Gardens, showing the nuptial display of the male Great Bustard (*Otis tarda*).

Mr. E. HERON-ALLEN, F.L.S., F.Z.S., exhibited, and invited suggestions relative to, a lantern-slide representing a specimen of *Miliolina circularis* (d'Orb.), the final chamber of which, being dissected off, revealed a fully-grown second individual inside. It was suggested that it represented a case of arrested twinning. The exhibitor was convinced that it had nothing to do with the phenomenon of viviparous reproduction recently exhibited by him.

April 27, 1915.

Prof. E. A. MINCHIN, M.A., F.R.S., Vice-President
in the Chair.

The SECRETARY exhibited lantern-slides of young Grey Seals (*Halichærus grypus*) prepared from photographs taken by Mr. H. M. Banbury, F.Z.S., off the West Coast of Scotland. The seals were about five feet in length on the 24th of October, 1914.

Mr. H. J. ELWES, F.R.S., F.Z.S., read the following extract from a letter that he had received from Mr. J. R. P. Gent, Forest Officer of the Darjeeling Division, on the possible existence of a large Ape, unknown to science, in Sikkim:—

"I have discovered the existence of another animal but cannot make out what it is, a big monkey or ape perhaps—if there were any apes in India. It is a beast of very high elevations and only gets down to Phalut in the cold weather. It is covered with longish hair, face also hairy, the ordinary yellowish-brown colour of the Bengal monkey. Stands about 4 feet high and goes about on the ground chiefly, though I think it can also climb.

"The peculiar feature is that its tracks are about eighteen inches or two feet long and the toes point in the opposite direction to that in which the animal is moving. The breadth of the track is about 6 inches. I take it he walks on his knees and shins instead of on the sole of his foot. He is known as the jungli admi or sogpa. One was worrying a lot of coolies working in the forest below Phalut in December, they were very frightened and would not go into work. I set off as soon as I could to try and bag the beast, but before I arrived the Forester had been letting off a gun and frightened it away, so I saw nothing. An old choukidar of Phalut told me he had frequently seen them in the snow there, and confirmed the description of the tracks.

"It is a thing that practically no Englishman has ever heard of, but all the natives in the higher villages know about it. All I can say is it is *not the Nepal Langur*, but I've impressed on people up there that I want information next time one is about."

Prof. WILLIAM BATESON, F.R.S., F.Z.S., exhibited a number of drawings illustrating the heredity of "hen-feathering" in Cocks.

Foraminifera of the Kerimba Archipelago.

MESSRS. E. HERON-ALLEN, F.L.S., F.Z.S., and ARTHUR EARLAND, F.R.M.S., read the second portion of their memoir on the "Foraminifera of the Kerimba Archipelago, Portuguese East Africa."

As noted on a previous occasion, the similarity existing between the general facies of the gatherings and those which form the subject of the late Mr. F. W. Millett's Monograph on the Foraminifera of the Malay Archipelago* and the reason for that similarity still defy explanation. The zoological interest of the district lies in the fact that since d'Orbigny published the result of his examination of sands from Madagascar in 1826 †, the district never received attention from protozoologists until Brady reported the result of his examination of some shore sands from Tamatave, Madagascar, sent to him by Mr. Kitching, in which he rediscovered the comparatively rare and beautiful form *Pavonina flabelliformis* ‡. D'Orbigny gave an unsatisfactory description and figure of this species in 1826 §, and an equally unsatisfactory "Modèle" which was discussed by Messrs. Parker and Jones in their "Nomenclature of the Foraminifera" ||, who thought it "possibly a symmetrical *Peneroplis* but more probably a semidiscoidal modification of *Orbitolites*." We have searched the d'Orbigny collections both in Paris and La Rochelle in vain for any type-specimens. It was reserved for Brady to rediscover the species in many tropical localities and it is one of the most frequent of the striking Kerimba types.

The romance attaching to it is, however, insignificant compared with that which surrounds an organism to which d'Orbigny gave the *nomen nudum*, *Rotalia dubia* ¶. Unlike the case of *Pavonina flabelliformis*, of which there is a finished *Planche inédite* in Paris but no type-specimens, of *Rotalia dubia* there is a water-worn type-specimen in Paris but no finished *Planche inédite*. D'Orbigny's original sketch of the organism, however, is there, and Fornasini of Bologna has published a tracing of it,** sent to him by Berthelin †† with a statement that he doubted whether it was a foraminifer at all, and not an ostracod, and this appearance is certainly borne out on a superficial view of the type-

* F. W. Millett, 1898, etc., J. R. Micr. Soc. 1898-1904.

† A. d'Orbigny, Tableau Méthodique des Céphalopodes, Ann. Sci. Nat. 1826, vol. vii.

‡ This is his account in the "Challenger Report," 1884 (p. 375). In his Preliminary Report, however, on the Reticularian Rhizopods of the Challenger Expedition (Q. Journ. Micr. Sci. n.s. vol. xix. p. 282), he states that he found it in shallow-water sand dredged by Dr. E. Perceval Wright in the Seychelle Islands and refers to Ann. & Mag. Nat. Hist. 1877, ser. 4, vol. xix. p. 105 (error for p. 41).

§ Loc. cit. p. 260, pl. x. figs. 10, 11, Modèle no. 56.

|| Ann. & Mag. Nat. Hist. 1863, ser. 3, vol. xii. p. 440.

¶ d'Orbigny, Tableau Méthodique des Céphalopodes, 1826, p. 274, no. 34.

** See Fornasini, "Specie Orbignyane," Mem. Acc. Sci. Ist. Bologna, 1908, ser. 6, vol. v. p. 46, pl. i. fig. 14.

†† See Fornasini, Rend. Sess. Acc. Sci. Ist. Bologna, 1897-8, vol. ii. p. 11.

specimen and the sketch. It has been reserved for us after the lapse of 90 years to rediscover this organism in the Kerimba sands, and though there can be no doubt about its rhizopodal nature, its affinities and structure are so obscure that in the absence of further specimens we are unable at the present time to do more than record it under d'Orbigny's original name. It will almost certainly require the establishment of a new genus.

The leading zoological feature of the gatherings is perhaps the great abundance and variety of the Miliolidæ, of which we publish notes upon 122 species, no less than 77 belonging to the genus *Miliolina*, of which six are new to science. Interesting specimens of Millett's species *Miliolina durrandii* have been found containing ingested smaller Miliolids and other organisms, comparable with the occurrence of a specimen of a rare variety *Cassidulina bradyi* var. *elongata* Sidebottom, which we found by accidentally crushing a shell of *Cymbalopora bulloides* d'Orbigny. The immense abundance of the genus *Peneroplis* and the generosity of the Council of the Society with regard to space have enabled us to publish with all necessary text-figures a revision of the litiiform species of this genus. The conclusion we have arrived at, after considering every record from Linnæus's *Nautilus lituus* and his very confusing earlier authorities, is that the short stout spirilline forms must be included under *P. arietinus* Batsch, the long narrow forms must be *P. cylindraceus* Lamarck, and the specific name *lituus* must lapse altogether, its place being taken by Chapman's genus and species *Monalysidium polita**.

In connection with the new genus *Iridia*, discussed at length in Part I. of this Paper, a new point has arisen since the publication of that part. As regards the abnormal specimens ascribed to the genus and figured in pl. xxxvi. (fig. 10), in which the arenaceous investment is limited to an encircling wall, the two faces of the shell being formed by transparent chitinous pellicles, a figure given in 1905 by Dr. Rhumbler of a new genus and species named by him *Vanhoeffenella gaussii*† appears to be identical with them. Rhumbler's specimens were from a depth of 400 metres in the Antarctic, and he states that the pellicle is so transparent as to be visible only with special illumination. He suggests that the object of the pellicles is to serve as windows by which the animal may obtain some benefit from the last rays of sunlight penetrating to this depth‡.

In the Kerimba specimens the pellicle is a stout chitinous membrane distinctly visible with ordinary illumination, both dry and in balsam, and in no way differing from the chitinous lining which is present in all stages in *Iridia*. It does not appear from Rhumbler's paper that he was acquainted with any other form

* F. Chapman, 1899, Funafuti Foraminifera, Journ. Linn. Soc., Zool. vol. xxviii. p. 4, pl. i. fig. 5.

† Verh. d. Deutsch. Zool. Ges. 1905, p. 105.

‡ Cf. his description and text-figure 57 on page 216, in his "Foraminiferen der Plankton-Expedition," pt. i. 1909.

of the organism, whether free or attached, and in the absence of information on this point and the impossibility at the present time of communicating with Dr. Rhumbler or of examining his specimens, the question of the identity of the two forms must remain temporarily unsolved. If it turns out that *Vanhoeffenella gaussii* is identical with the abnormal form of *Iridia* represented by our figure 10, it will become a question for experts in the rules of nomenclature whether or not his name should have precedence, but we do not feel inclined to accept his views on the window theory to account for the existence of the membrane. The glare of tropical sunlight in the shallow waters of the Kerimba reefs would certainly not be an advantage to the organism, and we prefer the theory we have expressed, that these are abnormal forms which have grown between two large sand-grains and have subsequently become detached. Of course any astrorhizid growing under such conditions would have a tendency to form a structure similar to *Vanhoeffenella*, and unless Dr. Rhumbler found other specimens attached or free similar to the adult *Iridia* which we have figured, the identity of the two organisms remains unproved and our genus *Iridia* holds good.

The Kerimba material has supplied us with a very fine series of those double shells of *Discorbina* which one of the authors has recently exhibited in support of his conviction that the so-called phenomenon of plastogamy is in truth a process of budding. We have prepared a series of such pairs from the earliest primordial emerged chamber to the young but adult and almost independent shell.

The other important observations arising out of the material are afforded by the study we have been able to make of the vast quantities present of the various species of the genus *Cymbalopora*. We have been able to make a series of sections and dissections showing most clearly and in all its stages of development the peculiar dual nature of the large terminal balloon-chamber of *Cymbalopora bulloides* d'Orbigny. It was Earland who first (in 1902), called attention to this feature*, which had curiously enough escaped in turn the observation of d'Orbigny, Brady, Möbius, and Sir John Murray, all of whom paid special attention to the species. The detailed results of our observations are in course of being published† and are too elaborate and far reaching to go into at length on this occasion. We have found many specimens the float-chamber of which has been found on dissection to be filled with desiccated remains of *Xanthellæ* such as were noted by Sir John Murray in his 'Challenger' Note Books. And we have separated as a new species, a smaller and more compact form of *Cymbalopora*, in which the inner float and outer balloon chambers are so closely connected as to be practically

* A. Earland on "*Cymbalopora bulloides* d'Orbigny and its Internal Structure," Journ. Quek. Micr. Club, ser. 2, vol. viii. 1902, p. 309.

† Heron-Allen, in Phil. Trans. Roy. Soc. London, 1915. (*In the press.*)

homogeneous, the surface of whose balloon is characterized by a wrinkled dendritic pattern, and the rotalian portion of which is uniformly acervuline instead of rotaline as in the type-form *C. bulloides*.

The most remarkable phenomenon, however, which has presented itself in the gatherings is that exhibited by certain specimens of *Cymbalopora tabellæformis* Brady, which have been found in a condition which, so far as our researches go, has never been observed before in connection with any other rhizopod. Certain comparatively large fragments of molluscan shells coated or not, as the case may be, with nullipore corals, we found to be dotted with little pits, some filled and others empty and showing canals radiating from them in all directions. The occupied pits were discovered on examination to be filled each with one specimen of *Cymbalopora tabellæformis* which had encrypted itself at an early age and had by some obscure means not only enlarged its crypt to accommodate the growth of its shell, but had excavated tunnels, often exceeding in length many times its diameter, in all directions in the solid substance of the host-shell for the accommodation of its pseudopodia. It can only be assumed that the solvent and assimilative powers of the protoplasm which enable the animal to secrete the carbonate of lime of which its shell is composed, enable it to dissolve the solid calcareous substance of the host-shell in the manner which is seen in the specimens. The suggestion that the boring of the tunnels and enlargement of the crypt may be effected by the carbonic acid generated by the action of the chlorophyll of the minute symbiotic algæ which are almost invariably found in the protoplasm of this foraminifer, is an interesting and a suggestive one, but it is doubtful whether we have need of this hypothesis to explain the phenomena.

In conclusion we may say that the outcome of our labours upon this material amounts to over 470 species and varieties, of which 32 are new to science.

This memoir will be published in the "Transactions" in due course.



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