

June 29, 1886.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The Secretary exhibited, on behalf of Mr. John Brazier, of Sydney, N.S.W., C.M.Z.S., a series of 55 eggs of the Pacific Porphyrio (*Porphyrio vitiensis*), and read a note forwarded by Mr. Brazier showing the extraordinary fecundity of the individual of this species which had laid them.

The bird in question was obtained at Maré, Loyalty Islands, in May 1873, and had been kept in captivity in Sydney until December 1882, when she was accidentally killed by poison. She had laid eggs as follows:—

1876. June–December . . . . .	36
1877. June–December . . . . .	44
1878. June–December . . . . .	68
1879. January, February, and May–December . . . . .	83
1880. January, and March–December . . . . .	93
1881. January, February, and April–December . . . . .	101
1882. January, February, and April–October . . . . .	66
Total in 7 years . . . . .	491

The Secretary read the following letter, addressed to him by Captain J. A. M. Vipan, F.Z.S., on the nesting of a South-American Siluroid fish (*Callichthys littoralis*<sup>1</sup>) in this country:—

“Stibbington Hall, Wansford.  
June 25th, 1886.

“DEAR DR. SCLATER,

“Two Cascaduras (*Callichthys littoralis*), from Trinidad, that I have in my aquarium, commenced making a nest on June 6th; but that, and the one they made on June 9th, they soon pulled to pieces. On the night of the 11th they began a new one; it consisted of pieces of *Valisneria*, all the leaves of the *Nymphæa* that were growing in the tank, which they bit off close to the roots of the plants, and a great quantity of river-moss (*Fontinalis antipyretica*), each piece being two or three times the size of the fish, so that they must have had hard work to bring them to the surface. They worked these materials together by some mucous substance until the outside was hard, the whole being under a quarter of an inch thick; they next buoyed up the structure with a quantity of mucous foam until it was raised three and a half inches above the water. The whole nest was nine inches long and seven inches wide, and somewhat resembled a finger-glass turned upside down on the top of the water, with the interior filled with froth. The fish kept swimming close under it all the time on their backs and filling it with foam. When finished, on the 12th, the female

<sup>1</sup> Günther, Cat. Fishes, v. p. 227; Sclater, P. Z. S. 1885, p. 717.

shed her spawn between her ventral fins, which were clasped tight together, and, when full, swam to the nest, and, turning on her back, deposited the spawn in it; this occurred several times, the male each time putting the spawn in its proper place and covering it with froth. As soon as the female had dropped all her spawn the male took entire possession of the nest and would not let his mate go anywhere near it, and treated her so badly that I had to place her in another tank to save her life. Unfortunately the spawn was not good, only a few eggs hatching, and the young fishes dying soon afterwards.

"I have bred great quantities of the little *Callichthys punctatus* from the Amazons, but they never made the slightest attempt at making a nest, always depositing their spawn all over the tank, and even on the floating thermometer kept in it.

"Yours faithfully,

"J. A. M. VIPAN."

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The following papers were read :—

1. General Observations on the Fauna of Diego Garcia, Chagos Group. By GILBERT C. BOURNE, B.A., New College, Oxford.

[Received May 15, 1886.]

Diego Garcia is the southernmost atoll of the Chagos group in the Indian Ocean, lying in S. lat.  $7^{\circ} 13'$ , and E. long.  $72^{\circ} 23'$ . It is of irregular shape, 13 miles long and 6 miles wide, consisting of a strip of land of an average breadth of a third of a mile, which nearly encircles the lagoon. The opening lies to the N.W., and is divided by three small islets into four channels, the largest of which is more than a mile wide, and deep enough to allow the largest ships to enter the lagoon. The formation is wholly of coral, and the land consists in different localities of sand, accumulated coral-boulders, and sand-rock or shingle-rock. It nowhere rises to a greater height than the waves have been able to accumulate fragments of coral, except in some places, where sand-dunes have been piled up by the wind to a height of 25 or 30 ft. above high-water level. As is usual in coral-formations, a reef some 60 yards broad encircles the shores; this reef is nearly flat, is composed of a compact finely stratified coral-limestone, and is just left bare at the very lowest spring-tides. Growing coral is only found on the outer edge of the reef, but in some parts the Alcyonarian *Heliopora* and *Tubipora* are found in large numbers on its surface. Many Holothurians, Echinids, Ophiurids, and Sponges are to be found on the flat surface of the reef between the tide-marks, and large *Tridacnæ* are imbedded in it, showing the brilliant edges of their mantles above the rock. The naturalist who wades over the reef at low water will be abundantly rewarded in his search for Mollusca of all kinds, chiefly of the genera *Cassis*, *Oliva*, *Turbo*, *Nerita*, *Aporrhais*, *Aplysia*, and

*Peronia*; and, by searching among the holes in the reef-rock, tolerably large specimens of *Octopus* may be found. Small Scaroids and File-fishes of great beauty swim rapidly away from the approach of the observer, and Murænoids of various sizes, chiefly of the genus *Ophichthys*, are to be found lurking under the scattered boulders of the reef. A small species of *Periophthalmus* is very abundant, but is very difficult to capture, even in the pools which have been left by the retreating tide, for it escapes by leaping from pool to pool with great agility. This species of *Periophthalmus* appears to differ in habit from the Pacific species, in that its paired fins are not so well adapted for progression on land; it leaves the water but rarely, and is unable to sustain life in the air for a longer period than half an hour. The boulders at the edge of the sea are occupied by swarms of crabs of the genus *Grapsus*; and the strip of dazzling white sand that borders the shore is often covered with small white or grey crabs of the genus *Ocypus*.

The outer edge of the land is always composed of a heap of coral-boulders, many of them of considerable size, which have been heaped up by the waves. This heap of boulders forms a sort of rampart all round the outer edge of the island, which slopes down to the lower-lying land, raised only two or three feet above the level of the lagoon at high tide. The whole island is densely covered with vegetation, the bushes known by the native names of "Manioc" (*Scaevola kœnigii*), "Velouté" (*Tournefortia argentea*), and "Bois de feu" (*Guetarda speciosa*) forming impenetrable thickets near the shores. The central and interior parts of the strip of land are covered with cocoa-nut palms, beneath which, from the continual decay of the fallen leaves, a rich peaty mould has become established. The imported animals of the island are donkeys, hogs, fowls, and rats; the last-named swarm on the main island and do great destruction among the cocoa-nuts, but, curiously enough, they have not yet found their way to the islets in the mouth of the lagoon. Cattle do not thrive, but sheep have been imported and appear to do well on the herbage which covers the more open spaces; the first consignment was unfortunately destroyed by the donkeys, to whom sheep were utter strangers.

When I arrived at Diego Garcia on September 15th, 1885, Terns were breeding in countless numbers on some of the less frequented parts of the island. The dark grey Terns build rough nests, composed of a heap of sticks and leaves piled up in the forks of trees and bushes; in each of these a single egg is laid, on which the female sits. The black-and-white Terns lay a single egg on the bare ground, which is apparently hatched by the heat of the sun, for I never saw one of these birds sitting. But it was difficult to make observations, for the negroes soon took all the eggs, and wantonly destroyed hundreds of the birds, which could easily be knocked down with a stick as they flew screaming round one's head. As soon as the breeding-season was over, the number of Terns diminished very considerably; it seems that they assemble in these remote islands for breeding, and fly off to continents and larger islands for the remainder of the year.

Gannets and Frigate-birds breed at the southern end of the island; and although they are well known to be enemies on the wing, the Frigate-bird pursuing the Gannets and compelling them to disgorge the fish they have caught, yet they nest close together without molesting one another. The Gannets were hatching out on my arrival, but the Frigate-birds did not breed during my stay. The snow-white Tern, *Gygis candida*, breeds in considerable numbers; the peculiar situation in which this bird lays its egg has been described by Mr. Forbes in his recent work ('Wanderings of a Naturalist in the Malay Archipelago'), and I have nothing to add to his account. Although Whimbrels, small Plovers, Herons, and Sandpipers are numerous on the island, they do not appear to breed there. I was assured by the negroes that their eggs were never found; and M. Spurs, a former resident on the island and a naturalist of no mean order, tried during a stay of fifteen years to obtain the eggs or young of these birds, but without success.

There are no indigenous Mammalia or Amphibia. A species of Gecko (*Platylactylus mauritanicus*?) is common, and a Mud-Tortoise is abundant in some of the marshy pools. The former of these reptiles has probably come across in ships from Mauritius; but I cannot account for the presence of the latter, which is unlikely to have been brought over as a pet, for it is abundantly provided with stink-glands and emits a most unpleasant odour; it cannot have been brought over to serve any useful purpose, nor is it likely to have been accidentally imported. Yet, unless it was brought over by man, it is difficult to imagine how this animal can have found its way over the sea to so distant a spot as Diego Garcia. The insect life is not varied; huge cockroaches, mosquitoes, flies, and ants swarm everywhere and are a great pest. I found a few nests of Termites or White Ants in decayed cocoa-nut stems, but they are rare. Of Orthoptera there are two species of *Locusta*, one of *Acridium*, a *Forficula*, and a *Gryllotalpa*. Of Lepidoptera I found three species of Nocturnal and one of Diurnal Moths, and I noticed a few individuals of *Vanessa bolini*, and one individual of *Ænone*. Three species of *Æschna* were abundant in the marshes. Of Coleoptera I only found four species. Of Myriapods I found a *Scolopendra*, a luminous species of *Geophilus*, and an *Iulus*.

The most remarkable inhabitants of the land are the Crabs. Hundreds of Land-Crabs of the genus *Gecarcinus* are to be found in any part of the island, and are a great annoyance to the inhabitants, for they do great destruction in gardens, and prevent the cultivation of the potato or vegetables. There are several species of these crabs, one of which attains to a large size and gives a formidable nip with its large claws; it is so conscious of its power that it attacks any person who is walking through the grass in which it lurks, and is able to give the naked foot of a negro a severe wound. Large Hermit-Crabs of the genus *Cænobita* are found, some of them hiding their abdomens in broken cocoa-nut shells in lieu of the shells of mollusks, there being but few of the latter that are large enough. The close relative of these *Cænobite*,



*Birgus latro*, is also found and attains to a great size. I was never able to watch a *Birgus* opening a cocoa-nut, though I several times shut one up in a tub with a cocoa-nut for the purpose, but they will not feed in captivity. Being nocturnal in their habits, these animals are difficult to observe; the account of them given by the negroes agrees in all respects with that of Forbes in the work above quoted. Many people have doubted that these "crabs" are able to climb palm-trees; but I have seen them do so myself, and I have also seen one mount the slender stem of a "Bois de feu" till it arrived at a projecting branch, along which it then proceeded to climb, clinging underneath it like a sloth. *Birgus*, however, does not mount the palms in order to rob them of the cocoa-nuts, but to obtain shelter among the thick tuft of leaves at the summit.

The large lagoon of Diego Garcia affords an excellent harbour, in spite of the coral patches which rise to the surface in many places, the courses for ships having been carefully buoyed out. The lagoon abounds with fish, which are all eaten; the most common sorts caught by hook and line are the well-known Surgeon Fishes, "Vielles" (*Novacula*), and some species of Percoids. Large Hammer-headed Sharks (*Zygæna malleus*) are found in some parts of the harbour, and specimens of the common Blue Shark (*Carcharias glaucus*) are very common. On one occasion we captured twenty-three young specimens of this species in a single haul of the net.

The climate is very damp and oppressive; the thermometer rarely exceeds 86° F. by day, or falls below 78° F. at night; but although the heat is not excessive, the heavy moisture-laden atmosphere is very trying to European constitutions.

An incredible amount of rain fell during my four months' stay on the island; it was only during the last three weeks of my visit that we had anything like fine brilliant weather. On such days the bright green foliage illuminated by the tropical sun, the dazzling white sand bordering the lagoon, and the clear blue or, in the shallower parts, green waters of the lagoon afford a striking picture of peculiar beauty which is well worth seeing.

I have to express my thanks to the authorities of the Orient Steam Navigation Company, who facilitated my voyage in every way, and kindly permitted me to reside at their coaling-station during a large part of my visit; and to M. Jules Leconte, the kind and hospitable manager of the oil-stations on the main island, whose guest I was for a long time, and who spared no trouble in assisting me in my researches.

2. On the Birds obtained by Mr. G. C. Bourne on the Island of Diego Garcia, Chagos Group. By HOWARD SAUNDERS, F.L.S., F.Z.S., &c.

[Received June 14, 1886.]

I have had much pleasure in examining the small collection of birds obtained by Mr. Bourne on his visit, described in the preceding paper, to this little-known island or group of islets. As will be seen by the following list, the species are but few in number, and some of them are of either a pelagic or a regularly migratory nature; the general character of the avifauna is, however, Indian rather than Ethiopian, with the exception of one (doubtless introduced) Madagascar bird.

Mr. Bourne's remarks are added in square brackets.

1. *FOUDIA MADAGASCARIENSIS* (Linn.). "Cardinal."

This species was no doubt introduced from Mauritius.

[No. 4. ♂. Eye brown. Sept. 30th, 1885. One specimen in spirits.]

Common. They were building during my stay, but though I examined several nests I never found an egg. The negroes said that they could find me the eggs, but never did. The nest, loosely constructed of grass, is dome-shaped, with a circular entrance at the side.]

2. *FREGATA AQUILA* (Linn.). "Frigate."

[No. 2. ♂. Sept. 29th, 1885. Eye dark brown. Naked skin on the throat lavender-coloured.]

Common, and may often be seen chasing Terns and Boobies till they make them disgorge their fish, as described by Mr. H. O. Forbes in his recent work. I have never seen Frigate-birds fishing for themselves; they are said to do so sometimes, but very rarely. Their flight is magnificent; I have seen one wheeling round and round in circles for at least five minutes without once flapping its wings, during which time it must have covered a mile of ground.]

A bird in immature plumage, passing into the adult stage. A very similar example in this state is described in P. Z. S. 1880, p. 63.

3. *SULA PISCATOR* (Linn.).

[No. 15. ♂ adult. Common at the south end of the island.]

4. *ARDEA COROMANDA* (Bodd.). "Macaque blanc."

[No. 11. ♂. Eye lemon-yellow. Skin at base of beak yellow. Very rare on these islands, and appears only during the N.W. monsoons. It is supposed to come over from the Maldives.]

This specimen presents some difficulty, as it is in winter plumage, but I think it is the Indian species and not the African *Ardea bubulcus*. The latter is found in Madagascar, and is believed to breed there in September, so that the African species would be in

nuptial dress at the date of Mr. Bourne's visit, whereas this example is not so.

5. *BUTORIDES JAVANICA* (Horsf.). "Macaque."

[No. 1. ♂. Sept. 22nd, 1885. Eye light golden-yellow. Skin at base of beak yellow.

No. 10. ♀. East islet, 28th October, 1885.

These birds are common, and may be seen any evening standing by the rock-pools, or on the beach at low water, on the look-out for fish. They are rather shy, and when alarmed fly off with a shrill cry like *kac-kac kac-kac kac*.]

6. *TRINGA SUBARQUATA* (Güldenst.).

[No. 14. ♂. Eye black.

Tolerably common, frequenting spots where slimy mud is left bare at low water.]

7. *NUMENIUS PHEOPUS* (Linn.). "Corbijeu."

[No. 13. ♂. Eye black.

Common, but very shy and difficult to approach. I only got one shot during my stay.]

8. *STREPSILAS INTERPRES* (Linn.). "Alouette-de-Mer."

[No. 6. ♀. October 22nd, 1885. Eye dark brown.

Common on soft marshy ground. They usually fly in flocks of twenty to thirty.]

9. *DROMAS ARDEOLA*.

[No. 12. ♂. Eye black.

Common along the outer shores and in marshy places. Wary and difficult to approach.]

The fact that the Crab-Plover breeds in burrows and lays a single white egg, similar to that of a Shearwater, has been known for some years. (See P. Z. S. 1881, p. 259.)

10. *STERNA BERNSTEINI*, Schlegel. "Goeland."

[No. 9. ♂. October 9th, 1885. Eye black. Not common.]

An immature specimen of this very rare Tern, the adult breeding-dress of which is still unknown. It is nearly of the size of *Sterna bergii*, from which it may be distinguished by the very light colour of the mantle and by the white tail-coverts. We have yet to learn whether the adult in nuptial dress has a white frontal band at the base of the bill, as in *S. bergii*, or whether the black of the forehead comes down to the bill as in most other Terns. The present species is known from Halmahera on the one side, and the Rodriguez waters on the other, and that is about all that can be said. The type from the first-named locality is in the Leyden Museum; there are two examples from Round Island and Ile de la Baleine, near Mauritius, in the collection of Messrs. A. and E. Newton; two more from the island of Rodriguez are in the British Museum of Natural History; the present is the sixth example I have examined.

11. *STERNA MELANAUCHEN*, Temm.

[No. 8. ♂. October 9th, 1885. Eye black.

Common. I have seen this bird pursued by the Noddy Tern, just as they themselves are pursued by the Frigate-bird.]

It would be interesting to know if this species breeds in Diego Garcia, because, if so, the locality would be the furthest S.W. as yet recorded.

12. *STERNA FULIGINOSA*, Linn.

[No. 7. ♀. October 8th, 1885. Eye black. Very common.

These birds were laying when I arrived on Sept. 15, and single eggs were scattered on the bare ground. The negroes soon took all the eggs, and I could not make observations on the breeding.]

13. *GYGIS CANDIDA* (Gm.).

[No. 3. ♂. Sept. 25th, 1885.

Very common, perching in the cocoa-nut trees, and laying a single egg in the axils of the leaves, as described by Darwin in his 'Journal of Researches.']

14. *ANOUS STOLIDUS* (Linn.).

[No. 5. ♀. October 2nd, 1885. Eye black.

Common on the island. It constructs a large rough nest of a heap of sticks and leaves, in the fork of a tree or bush, and on this it lays one egg, upon which it sits.]

[A bird called by the inhabitants the "Mangeur des Poules" was said to visit the island frequently during the N.W. monsoons, but I never saw one. Perhaps it may be *Tinnunculus punctatus*, which goes by the same name in Mauritius; but if so it is not easy to see why it should visit Diego Garcia only in the N.W. monsoons.

"Fouquets" are abundant on the Ile des Vaches marines at Peros Bauhos, and are said to have been seen on the Ile des Oiseaux, Diego Garcia, but I never saw one. From the descriptions given me they seem to be a species of burrowing Petrel.]

## 3. On the Intervertebral Disk between the Odontoid Process and the Centrum of the Axis in Man. By J. BLAND SUTTON, F.R.C.S., Lecturer on Comparative Anatomy, Middlesex Hospital Medical School.

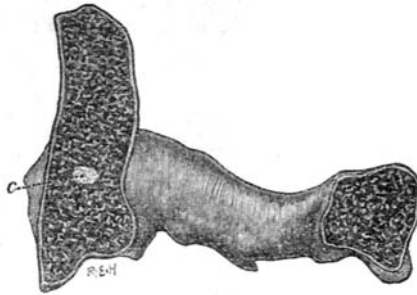
[Received May 29, 1886.]

There are few bones in the human skeleton which can boast a more extensive literature than the atlas and axis. Indeed so many investigations have been made concerning their nature, and so much has been written regarding the morphology of the first two vertebræ, that most anatomists have abandoned them for more fertile regions of the skeleton. Yet, in spite of this attention, a new fact in connection with the axis has recently been disclosed by Prof. Cunningham

in a paper published in the 'Journal of Anatomy and Physiology' for January of the present year. The object of this paper was to draw attention to the circumstance that if a section be carried vertically through the long axis of the second vertebra in an adult there will be found in the majority of cases a small strip of cartilage occupying the position indicated in the drawing (fig. 1).

Prof. Cunningham states that whilst engaged in an investigation into the curves of the spinal column in Man and the Apes he made mesial sections of a large number of frozen human spines. His

Fig. 1.



A vertical section through the body of the axis to show the lenticular-shaped piece of cartilage, *c*.

attention was attracted to a small lenticular-shaped plate of cartilage, which seemed in almost every case to be interposed between the os odontoideum and the body of the axis vertebra; on all sides it was surrounded by bone, so that it could only be brought into view by means of sections.

The observations were made on eighteen axis vertebræ, but three were eliminated on account of difficulty in ascertaining the age of the subjects. The fifteen remaining specimens were divided into three groups according to their age.

The first group comprised six axes, two from females and four from males, varying in age from twenty-four to fifty. In all the cartilage was present, measuring 4 mm. in length and 2 mm. in thickness.

The second set comprised three specimens from females, varying in age from fifty to sixty years. The cartilage was present, and of the same dimensions as in the younger bones in the previous set.

The third group consisted of six examples, two males and four females, the limits of age being from sixty to seventy. In four of the axes the lenticular disk was present, and measured in length 3 mm. and in width  $1\frac{1}{2}$  mm. In the two oldest examples the disk was absent.

The cartilage in the youngest specimen, a girl aged twenty-four years, was found to be of the hyaline type, with evidence in some of the sections of a sluggish ossific process around the margin; but remains of the notochord could not be detected.

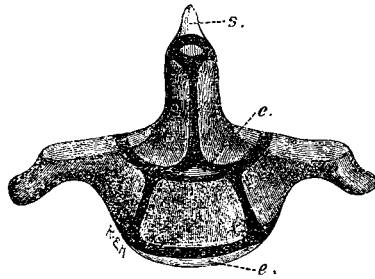
On becoming acquainted with these observations of Prof. Cunningham, I lost no time in testing the statements by independent observation, and am able to confirm them in every particular.

As in so many other instances, it is not remarkable that this piece of cartilage should exist, but that it has remained so long undetected.

My intention in bringing the subject under the notice of the Society is not merely to confirm Cunningham's statement, but to show that the presence of this piece of cartilage, in the midst of the axis, merely harmonizes with the condition of things found in situations where other vertebræ normally fuse together, as for example in the sacrum.

Before discussing the question it will be desirable to briefly review the chief facts connected with the development of the axis.

Fig. 2.



A diagram of the axis vertebra to show the various nuclei. The dotted portions represent cartilage. *s.*, the suspensory ligament, marking the former position of the notochord; *e.*, *e.*, epiphyses.

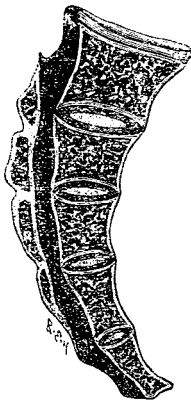
In common with the majority of the vertebræ, the axis ossifies from three primary centres—one for the centrum, and two lateral for the laminæ and processes.

Subsequently two nuclei appear for the odontoid process, arranged side by side as represented in fig. 2. After birth these centres fuse, and an additional nucleus, detected by Prof. Humphry, is deposited for the tip of the odontoid process, usually visible about the second year. Finally two epiphysial plates appear to complete the ossification of the true centrum of the axis, as shown in the figure. As growth proceeds the various nuclei fuse, the cartilage becomes replaced by bone, except the piece referred to at the commencement of the paper, and the growth of the bone is complete. The band of fibrous tissue passing from the summit of the odontoid process represents the thickened sheath of the notochord, and is known as the suspensory ligament.

Turning our attention to the sacrum, we shall find in that bone an explanation of the persistence of the piece of cartilage which remains unossified in the axis. The sacrum in man is composed of five fused vertebræ. The body of each of the segments has its centre for the

body and two additional centres for the epiphysial plates, as in other regions of the spine. When the segments of the sacrum commence to ankylose, the adjacent epiphysial plates fuse with each other before they join the bodies of the vertebræ to which they belong. This fusion of epiphyses is of a deceptive character, for it does not occur throughout the whole width of these bony menisci, but only around their circumferences. Hence if a section be carried through the sacrum, a piece of cartilage may be detected situated in a central cavity, the boundaries of which are constituted by the epiphysial plates; this piece of cartilage persists long after the various segments of the sacrum have, from all external evidence, become

Fig. 3.



A section through the human sacrum, showing the epiphysial plates uniting with each other peripherally before fusing with their centra.

firmly united. This remarkable arrangement of the epiphysial plates is represented in fig. 3.

It is quite possible that this mode of fusion is applicable to the cervical vertebræ of Whales; for an examination of this region of the column in a young Porpoise shows well-marked indications of peripheral union of the epiphysial plates, whilst they are still separate from the bodies of the vertebræ to which they respectively belong. My attention was first drawn to this question when examining the sacral vertebræ of a young skeleton of the Great Anteater, *Myrmecophaga jubata*. After the skeleton had been macerated, the sacrum broke up into its component elements, the epiphysial plates separated from the vertebræ, but the contiguous plates were firmly united in pairs.

So far as my observations on other mammals have extended, this mode of fusion appears to be general.

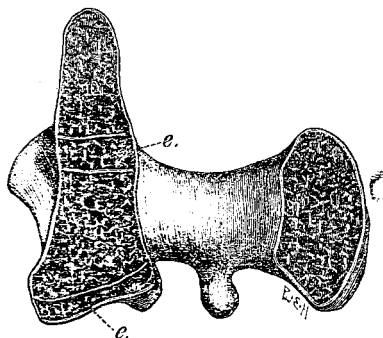
There are other points in the axis which demand some notice. I was unaware, until reading Prof. Cunningham's paper, that any

modern anatomist doubted the existence of two lateral nuclei for the main portion of the odontoid process; but if any one examine the axis of a human foetus at the eighth month of intra-uterine life, he will have all doubts as to the duplicity of this centre removed (see fig. 2).

Another matter of considerable interest is the existence or non-existence of an epiphysial plate for the upper surface of the *true* centrum of the axis. Cunningham considers it to be absent; but it is certainly present, and may be detected in section of the axis at the time the epiphysial plates make their appearance in other parts of the spine. In Cunningham's paper reference is made to Macalister's observation that the two epiphysial plates are present in the axis vertebra of *Balenoptera rostrata*, and that it can be detected in some cases in Man. Prof. Humphry has described and figured the upper plate in a Rabbit.

On the other hand, Prof. Flower<sup>1</sup> figures the axis of a man with

Fig. 4.



Axis vertebra of a young Seal in section, showing the epiphysial plates of the true centrum of the axis, *e, e*.

these plates present, as though it were an accepted fact, but describes the upper one as being represented by irregular ossifications.

In order to test this point I have secured the axis vertebra from many young animals. As a result of the investigation, I find two epiphysial plates for the axis present in the following:—

Primates.... Man. Spider-Monkey, *Ateles paniscus*; Bonnet-Monkey, *Macacus sinicus*.

Ungulata .. Horse. Axis Deer. Giraffe. Sheep.

Carnivora .. The Leopard. The Domestic Cat. Seal.

Other anatomists have reported it in:—

Ungulata .. Foetal Horse (Macalister<sup>2</sup>).

Cetacea .... *Balenoptera rostrata* (Macalister<sup>2</sup>).

Rodentia.... Rabbit (Humphry<sup>3</sup>).

<sup>1</sup> 'Osteology of the Mammalia.'

<sup>2</sup> Journal of Anat. and Physiology, vol. iii. p. 54; and Phil. Trans. 1868.

<sup>3</sup> 'The Human Skeleton,' p. 129.



As the upper epiphysis of the axis exists in forms so widely different as a Cat and a Whale, or a Monkey and a Horse, there can be very little doubt that it is a very general condition which has been overlooked simply because it has not been sought.

The reason why I have been able to give an account of the axis in the specimens enumerated in the preceding list is explained by the fact that for some time past I have been collecting immature axes for another purpose; thus, having a goodly stock, I utilized them for the purpose of this paper.

As a matter of convenience the following list of probable dates in the appearance of the individual nuclei of the axis is appended:—

Centres for laminae, 8th week.

Centres for body, 12th to 16th week.

Nuclei for os odontoideum, 5th month.

Centre for tip of odontoid process, 2nd year.

Epiphysial plates, about 16th year.

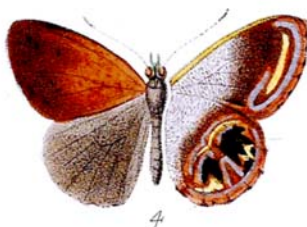
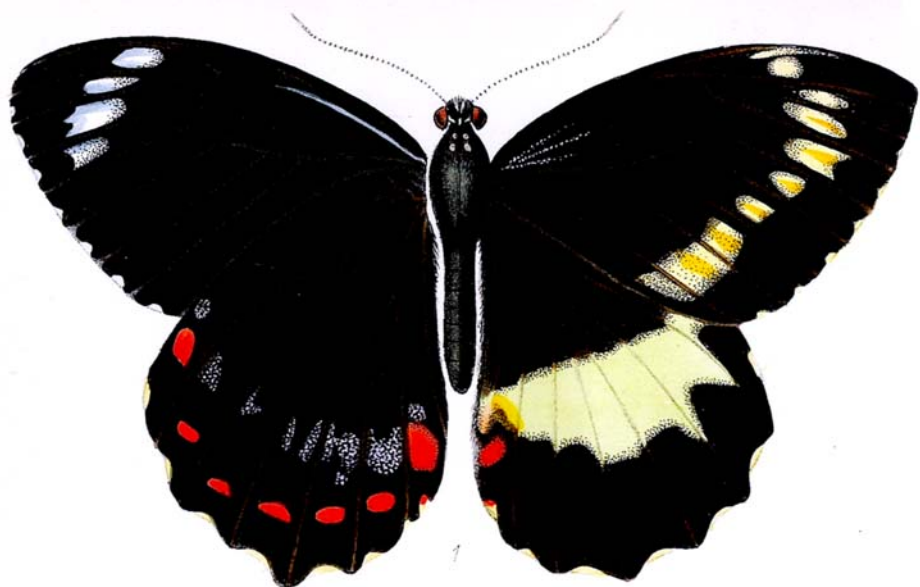
By the twentieth year all parts of the bone are consolidated, except the lenticular portion between the axis and the odontoid process.

The interest of the question centres itself around the additional evidence afforded to the view that the odontoid process is the body of the atlas united with the axis, as was hinted by Cuvier, but first clearly made out by the admirable researches of Rathke<sup>1</sup>, and subsequently confirmed by many competent observers.

P.S. (July 30th, 1886).—In the discussion which followed the reading of this paper, Mr. J. W. Hulke drew attention to the importance of the above observations in so far as they independently confirmed Prof. Albrecht's recent view expressed in a paper entitled, "Über die Wirbelkörper-epiphysen und Wirbelkörpergelenke zwischen dem Epistropheus, Atlas und Occipitale der Säugethiere." (See 'Die Comptes Rendus der achten Sitzung des internationalen medicinischen Kongresses, Kopenhagen,' 1884.)

At the time my paper was read I was ignorant of Albrecht's research in this particular direction. However, a careful perusal of the paper in question convinces me that the epiphysis in the midst of the axis really represents, as Albrecht insists, two epiphyses, viz., that belonging to the cranial end of the axis and that appertaining to the caudal end of the atlas (odontoid process). Regarding the "centroidal" masses more observations are required, and the subject is one of great interest.

<sup>1</sup> 'Entwicklung der Schildkröten.'



W. Purkiss lith.

Hanhart imp.

NEW BUTTERFLIES FROM THE SOLOMON ISLANDS

## 4. Note on an Ectoparasite of the Menobranch.

By Prof. R. RAMSAY WRIGHT, F.Z.S.

[Received June 24, 1886.]

The specimens of *Menobranchus* recently brought by me from Toronto and presented to the Society's Collection were infested by an ectoparasitic Trematode, *Sphyrnaria osleri*, mihi, which I first described in the 'Proceedings of the Canadian Institute,' Toronto, 1878. The preserved specimens on which I founded my description enabled me to determine the zoological position of this parasite, which turned out to be an interesting form intermediate between *Gyrodactylus* and *Polystomum*; but I was obliged to postpone any closer investigation into its anatomy till I had access to fresh specimens. I have recently had abundant opportunity of securing these, and I propose shortly to publish elsewhere the results of my studies.

In view of the interest attaching to a certain parallelism between the phylogeny of the Polystomidæ and that of their hosts, I take the present opportunity of referring to the desirability of examining any Urodela which may die in the Reptile House, in case of possible additions to this interesting family of Trematoda.

## 5. Descriptions of some new Species of Rhopalocera from the Solomon Islands. By GERVASE F. MATHEW, Staff-Paymaster Royal Navy, F.L.S., F.Z.S., &amp;c.

[Received June 11, 1886.]

(Plate XXXIV.)

During nearly a four years' Commission on the Australian Station, H.M.S. 'Espiegle' was employed for a greater part of her time among the islands of the Western Pacific, and, upon two occasions, paid brief visits to the Solomon Islands. It is to be regretted that she did not prolong her stay at this charming group, for, from the little seen of them, they appeared to be, entomologically speaking, a perfect paradise, being clothed from water's edge to mountain's peak with the most luxuriant and varied tropical vegetation.

But a serious drawback to collecting was the hostility and treachery of the natives. At many places they were cannibals, and extreme caution had to be exercised when landing—indeed at some places collecting was quite out of the question, as it would have been almost certain death to have ventured into the forest alone. When the natives have had more intercourse with white men it is to be hoped that they will become more civilized, and discontinue their, at present, unpleasant customs. Now they look upon all white men

as their natural enemies, though it is a well-known fact that this state of feeling has to a great extent been created by the white men themselves, who have committed the gravest excesses, and often deliberate murders, while engaged in obtaining recruits for the labour vessels. Until this abominable traffic is abolished it would be unsafe to land at any of the larger islands, except under the escort of a strong and well-armed party. The natives are extremely revengeful, and recollect and treasure up an injury. Their notion of justice is blood for blood, a head for a head, so that in several instances in which white men have been murdered the innocent have suffered for the guilty.

The first place we called at was Ugi, one of the smallest and easternmost islands of the group. Here, fortunately, the natives were all friendly, and an English trader (Mr. Stephens) had resided there for several years, being employed as an agent buying and collecting "copra" for some Sydney firm. There is also a small depôt for coal at this island, and our men-of-war occasionally call, and no labour traffic is permitted, so that the natives at this island were beginning to trust white men.

Ugi is about twenty miles in circumference, for the most part hilly, and covered with dense forest. In the immediate vicinity of the villages there are small clearings where yams, taro (*Caladium esculentum*), and a little sugar is cultivated. Cocoa-nut palms grow all over the island, but especially near the beach, where, in some places, their waving crests form a graceful fringe. Bread-fruit trees are also plentiful near the villages.

We anchored just off Mr. Stephens's hut, at the back of which there was about a couple of acres of ground which had been cleared a year before, but which, at the time of our visit, was overgrown with a dense mass of weeds. Here Butterflies were numerous, especially *Danais chippus* and a species of *P. ida*, *Hypolimnas bolina*, *H. alimena*, &c. A very interesting case of mimicry occurred here. A dark-brown *Euploea* with broad white outer margins (*E. brenchleyi*, Butl.), and *Danais insolata*, Butl., with markings almost identical, were fairly plentiful; but, to add to the confusion of things, a *Hypolimnas*, which on the wing might have been mistaken for either, was flying with them! Which mimicked which it was difficult to say, or the reason of the mimicry, as all three genera are avoided by birds both in the larva and perfect states.

We remained at Ugi for three days, one of which was devoted to an expedition across the island to a large village on the other side. We breakfasted early and landed at 7 o'clock—a party of five of us, some being armed. On the beach we found a couple of natives, whom we had engaged the previous evening, waiting to show us the way. After leaving Mr. Stephens's hut the trail led through the dense forest, and was so narrow that we were seldom able to walk more than one abreast. Everything at this early hour was reeking with moisture, and in some places the trees were so thick overhead that the path below was enshrouded in gloom. At first no Butterflies were seen, but as the sun gained strength the heavy dew

disappeared, and a few were noticed flying high among the branches and quite out of reach. This was very tantalizing, and we must have walked nearly two miles before the first was captured. This was *Drusilla phorcas*, Westw., a low-flying but most conspicuous black-and-white species. Species of *Danais* and *Euplexa* were the next to appear; and then, whenever we passed any open spots, Lyceinidæ of various kinds became rather numerous; but altogether Butterflies could not be called abundant in this shady forest. A great many more were seen than captured, for every now and then a large *Papilio* dashed across the path, and was lost in the forest before one had time to make a stroke at it. Overhead cockatoos and parrots were screaming, and pigeons and doves cooing among the branches; but the trees were so lofty, and the leaves so thick, that it was almost impossible to see them, and only one of the latter was obtained.

Upon nearing the village, about noon, our guides set up a great shouting to apprise the inhabitants of our approach, and upon entering it we were surrounded by a crowd of naked savages, who seemed to be very pleased to see us. We walked through the village and examined the various huts, which were very well constructed, and were much better built than those we had previously met with at the New Hebrides. After seeing all there was to be seen, we sat down in the shade of one of the huts and discussed our lunch, the natives boiling our solitary pigeon and some yams which they gave us, and very good they were.

After lunch I strolled about the clearings near the village, followed by a crowd of natives, who were much interested in my proceedings, and soon began to take an active part in the sport, and it was amusing to see them running madly after Butterflies with small bushes in their hands, with which they made frantic efforts to knock them down. Of course they very often succeeded, for they were extremely nimble, and then the broken fragments were brought to me in triumph, and I had to pretend to be much pleased. Butterflies were fairly numerous in these clearings, and I captured among others several of the fine *Papilio erskinei* described further on. After the others had had an hour's rest, we started back and got on board again about six o'clock, pretty tired with our day's excursion, for in some places it was most fatiguing, especially up-hill, where the path frequently took us over slippery soap-stones, which made walking very difficult and unpleasant.

We left Ugi the following day, and after stopping for a few hours off Tesemboko in the island of Guadalcanar, proceeded to the Duke of York Islands.

Our next visit to the Solomon Islands was in September 1883, when we stayed for three days in Blanche Harbour, Treasury Island, at the entrance of the Bougainville Straits. The harbour is a very beautiful one, being almost landlocked by other small islands, all of which are hilly and densely wooded. Unfortunately it rained nearly the whole time we were there; but during the intervals of fine weather, when I was able to get on shore, I could not go very far, as I was only just recovering from a severe attack of fever, and was too

weak for much exertion. My hunting-ground was therefore confined to a slope on the hillside at the back of the native village, which had recently been cleared for yam-planting. Here Butterflies were more numerous than at Ugi; and if the weather had been more favourable, and I had been able to get about more, I believe I should have taken a large number. As it was I secured examples of several new species, *Papilio bridgei* being among them. The most plentiful were a *Precis* near *P. ada*, but very different to the Ugi form, *Hypolimnas alimena*, very fine, and several species of *Euploea*. *Danaüs archippus* was not seen at all in this place, although it was so common at Ugi; perhaps its migration had not yet extended so far in a north-westerly direction.

From the little I have seen of the Solomon Islands, I feel quite convinced that when they are properly worked they will yield a large number of new and interesting Rhopalocera, and I hope on a future occasion to be able to describe some more new species.

#### ARGYRONYMPHA, n. gen.

Head moderately large, hairy between the eyes; eyes rather prominent, smooth; antennæ long, slender, extending to beyond two thirds of costa, with a long, gradually-thickened club: palpi conspicuous, pea-green, porrect, ascendant, clothed outwardly at their base with fine short white hairs, the hairs less numerous towards the tip and dark grey; tip black, finely pointed: thorax rather short: abdomen almost as long as hind wings, slender, pinched in at base, and with a brush-like tuft of hairs at base of genital organs in male. Fore wings rather long and narrow in male, broader in female; costa moderately arched, convex at base; apex somewhat acute in male, truncated in female; hind margin entire, oblique; inner margin straight, hairy to beyond the middle; anal angle slightly obtuse; nervures of fore wings dilated at base; cell narrow, rather long; first subcostal nervule emitted just before end of cell; discocellular nervules pointing outwards; median nervure and first discocellular nervule forming a moderately acute angle. Hind wings: costa肘ed at base, very slightly concave at one third, and rounded off at apex; hind margin very moderately sinuate; inner margin slightly grooved. First pair of legs imperfect, rather pubescent, pale green; second and third pairs long, slender, smooth.

This interesting genus does not appear to come very near any yet described, but bears some relationship to *Hypocysta*, Westw., and *Nissanga*, Moore.

These beautiful little Butterflies were local in their habits and of retiring disposition, frequenting shady spots in the dense forest. When disturbed, they flew but a short distance and settled upon the leaf of some low shrub, always on its upper surface. They were rather restless, and generally walked several times round the margin of the leaf, and then flitted off to the next. While so engaged their wings were kept erect, and the bright metallic spots and stripes made them very conspicuous.

## ARGYRONYMPHA UGIENSIS, n. sp. (Plate XXXIV. fig. 3.)

*Male and female.*—*Upperside* orange-red : *primaries* with a black marginal border extending on costa from end of cell to rather beyond middle of inner margin ; border very broad at apex, constricted and narrowest at second median nervule, widening out again at first median nervule : *secondaries*, costa blackish brown, base and margins broadly clouded with dusky, and with some indistinct dusky markings across disk ; a black and rather indistinct submarginal line widening out between subcostal nervules into a linear-shaped blotch ; all the nervures dusky. *Underside* : *primaries* orange-red, not quite so bright as upperside ; a submarginal silvery stripe bordered outwardly by a narrow very dark fuscous line ; a short oblique silver stripe extends from inner margin near hinder angle to halfway between first and second median nervules, and with its apex almost touching the submarginal stripe : *secondaries*, basal half greyish ochreous, thickly irrorated with minute black dots ; an oblique reddish-brown stripe from near costa crosses the wing, and encloses upper part of cell and terminates near anal angle ; this is bordered outwardly by a curved or double crescent-shaped silvery band, which is again bordered by a pale ochreous-yellow band ; a narrow submarginal line of silver bordered outwardly by reddish ochreous, and inwardly, from submedian nervure to discoidal nervule, by reddish brown ; between the discoidal nervule and first subcostal nervule there are four jet-black and somewhat square-shaped spots, with their bases resting on the submarginal line ; between first and second subcostal nervules are two additional black spots, above the others, the space between them, which is ochreous, forming a complete St. George's Cross, and the whole inwardly bordered by a silvery band ; between submedian nervure and two median nervules a silvery horseshoe-mark bordered outwardly and inwardly by reddish brown ; all the wings margined by a line of dark reddish brown. The silvery markings have opalescent tints in various lights.

Exp. 42 millim.

*Hab.* Ugi, Solomon Islands.

## ARGYRONYMPHA PULCHRA, n. sp. (Plate XXXIV. fig. 4.)

*Male and female.*—*Upperside* dark brown ; basal third of fore wings reddish brown. *Underside* : *primaries*, basal portion, including cell and a little beyond on costa and inner margin, grey, thickly irrorated with minute black dots ; a silvery submarginal band from rather before apex on costa to hinder angle, where it forms an elbow and turns back and runs parallel to itself as far as third median nervule, this is bordered inwardly by dark chestnut ; a pale yellowish stripe from near apex to first median nervule, its lower half between the silver bands ; beyond this to grey part of wing a broad band of chestnut : *secondaries*, basal part, including half of cell to near anal angle, grey, thickly irrorated with minute black dots ; beyond this a band of chestnut from inner margin two thirds across wing towards anal angle ; this is bordered outwardly by an elbowed stripe of silver

which is continued round by anal angle, forming a submarginal stripe, to apex, whence it forms a curve as far as discoidal nervure; a silver  $\Lambda$ -shaped mark between second median and discoidal nervule, the bases nearly resting on submarginal stripe; a subcrescent-shaped silver stripe near anal angle divided by first median nervule; four small square black confluent spots just above submarginal stripe, between discoidal and second subcostal nervules; above these, two ochreous lunules bordered above, as far as outer edge of silvery curved band, by a large black irregularly-shaped blotch; space between arms of  $\Lambda$ -shaped mark, and inner edge of submarginal stripe between second median nervule and submedian nervure, deep chestnut; a large black lunular spot between first and second median nervules, its inner edge touching the subcrescent-shaped silver stripe. Thorax reddish brown; some bluish-green hairs on collar and between eyes; eyes dark reddish brown, bright red when the insect is alive.

Exp. 39 millim.

*Hab.* Treasury Island, Solomon Islands.

**PAPILIO XENOPHILUS, n. sp.**

*Male.*—*Upperside* dark brown: *primaries*—a straw-coloured transverse marginal band slightly curved inwards towards the apex, straight on the outer edge and nearly parallel with hind margin, rather clouded on inner edge; nervures crossing band dark brown and clouded at their edges: *secondaries* tailed, scolloped; a straw-coloured transverse and somewhat outwardly dentated band from costa, near apex, to inner margin just above anal spot; anal spot indistinct, composed above of blue and below of pinkish-yellow atoms; indentations whitish. *Underside*: *primaries*, same as above but band paler: *secondaries*, no band, but instead a series of seven whitish-yellow spots, the three near anal angle and one at apex near costa small and indistinct, the other three large and oblong-oval; beyond these spots patches of bluish atoms; a marginal row of indistinct orange-yellow spots, above each of which is a cloudy pyriform blotch; an orange-yellow spot at anal angle, bordered above by a few blue atoms.

Exp. 110 millim.

*Hab.* Ugi, Solomon Islands.

This species comes near *P. capaneus*, Westw., but differs in having the bands right across the wings, and in the markings of the underside.

**PAPILIO ERSKINEI, n. sp. (Plate XXXIV. fig. 1.)**

*Male.*—*Upperside* greenish black: *primaries* with a marginal band of eight large creamy-yellow spots curved inwards at the apex, extending from subcostal to submedian nervure, and with indications of another spot between submedian nervure and inner margin, and a short dash of the same colour between the subcostal nervure and costa, and just above the subcostal spot; base of cell dusted with a



few minute yellowish atoms: *secondaries* not tailed, margins scalloped; a broad transverse outwardly-sinuated greenish creamy-white fascia, its inner margin touching, but not extending into, discoidal cell; a conspicuous orange-red oval spot at anal angle. *Underside* black: *primaries* with four white apical spots, and a whitish streak at base of cell: *secondaries* with a row of seven orange-red marginal spots, the one at anal angle being much the largest, and above these a series of six lunules composed of pale-bluish atoms; indentations pale yellowish.

Exp. 144 millim.

*Hab.* Ugi, Solomon Islands.

This fine Butterfly belongs to the *Erectheus* group. It was tolerably common at Ugi in June 1883, but difficult to catch on account of its powerful flight, and its habit of keeping in the thick forest, where it could not be easily followed. I saw several of what I believe were the females of this insect; they were much larger than the males, of a dark brown, and with more white across the wings.

I have named this species in honour of Admiral James E. Erskine, who commanded the Australian Squadron at the time I was on the Station.

*PAPILIO BRIDGEI*, n. sp. (Plate XXXIV. fig. 2.)

*Male*.—*Upperside* deep black, appearing greenish black in certain lights: *primaries*, a marginal band of eight somewhat square-shaped pale greenish-white spots curved inwards at the apex, the apical spots being small and indistinct; base of cell and apex dusted with a few whitish atoms: *secondaries* not tailed, scalloped; a broad transverse outwardly-dentated pale greenish-white fascia, its inner margin enclosing lower part of cell, and its upper portion running between costa and subcostal nervure nearly to base. *Underside* black: *primaries*, subcostal nervure inwardly bordered by a narrow whitish streak from base to near middle of cell; a few whitish atoms at apex: *secondaries*, a marginal row of seven pale pinkish-orange spots, the three nearest the apex small and obscure, the one at anal angle large and nearly square-shaped; above these a row of seven ill-defined lunules of pale-bluish atoms, the one at apex nearly obsolete; indentations conspicuous, white, crescent-shaped.

Exp. 118 millim.

*Hab.* Treasury Island, Solomon Islands.

This is another fine species, and also belongs to the *Erectheus* group. It was not uncommon, but, like *P. erskinei*, frequented the thick forest and was difficult to capture. I only obtained one, a very perfect example. I saw a larger insect, of a dark brownish-black hue and with larger spots and fascia, which was probably the female of this.

I have named this species in honour of Captain Cyprian A. G. Bridge, who commanded H.M. ship 'Espiègle' during her long and interesting Commission of nearly four years, a great portion of which time was spent among the islands of the Western Pacific.

## PAPILIO HICETAON, n. sp.

*Male*.—*Upperside* deep olive-brown: *primaries*, an oblique row of nine spots from apex to inner margin, the spot contiguous to inner margin greenish yellow, the remainder paler; a submarginal row of five small pale-yellow spots between subcostal, discoidal, and first and second median nervules; two small spots outside upper end of cell, and another larger spot beyond, near the apex; the cell contains six spots and streaks, at the base a long oblique streak pointing towards the apex, next a minute perpendicular dash, this is followed by two narrow subrescent-shaped spots near subcostal nervure, and at end of cell two spots, the upper irregular in shape, the lower oval, all these spots yellow with the exception of basal streak which is pale green: *secondaries*, basal half light brown, dotted with golden-brown atoms, the rest deep velvety brown, the nervules paler; a small suboval and slightly raised patch of scales at upper end of cell; inner margin and base thickly clothed with fine golden-brown hairs. *Underside*: *primaries*, same as above, but spots paler, and row of submarginal spots extends to inner margin; a small crimson streak at base: *secondaries*, a large and somewhat square-shaped pale-green spot at base, bisected by subcostal nervure and bordered outwardly by black and crimson; an opalescent lunule with dusky pupil at upper end of cell; a discal band of dusky lunules, bordered below with some metallic-blue atoms, the lunule at anal angle edged above with crimson atoms; apex with marginal patches of opalescent atoms; fringes reddish.

The primaries are narrow, and the costa is much arched.

Exp. 100 millim.

*Hab.* Ugi, Solomon Islands.

Near *P. browni*, but quite distinct.

## EXPLANATION OF PLATE XXXIV.

Fig. 1. *Papilio erskinei*, ♀, p. 348.

2. — *bridget*, ♀, p. 349.

3. *Argyronympha ugiensis*, ♂, p. 347.

4. — *pulchra*, ♀, p. 347.

6. Notes on some Birds from Perak. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Zoological Department, British Museum.

[Received June 15, 1886.]

Thanks to the exertions of Mr. Davison, who explored the western side of the Malayan peninsula, we have a tolerably complete list of the birds of this portion of the Indian Region, and a list of his collections has been given by Mr. Hume ('Stray Feathers,' 1879, pp. 37, 151). The series of Malayan birds in the Hume Collection, now in the British Museum, is an extremely valuable one, and it is

to be regretted that Mr. Davison was never able, through political obstacles, to reach the mountains on the eastern side of the peninsula and explore the high ridge or "backbone" which runs down its entire length. Considerable speculation has been excited respecting the fauna of these Malayan mountains, because all the collections hitherto made in Malacca have proved that, as regards the birds, there are very few species which are not common to Borneo, Sumatra, and the Malayan peninsula. Sumatra, however, has always enjoyed a certain distinction from possessing at least one genus, *Psilopogon*, peculiar to itself; and, again, in the mountains several Himalayan genera have been found with species identical with, or only slightly differing from, those which occur in the Eastern Himalayas and extend down the mountains of Tenasserim. Many Malayan species range into the southern portions of the last-named province; but as regards the Himalayan genera, such as *Niltava*, *Liothrix*, *Proeopyga*, *Sibia*, &c., all traces of them are lost after leaving Tenasserim until they turn up again in Sumatra.

Many prognostications have been made that when the mountains of the Malayan peninsula were explored, the above-named genera and many others common to the mountains of Tenasserim and Sumatra would be found to extend along the eastern side of Malacca; but of this the first actual proof has been furnished by Mr. L. Wray, who has sent a small parcel of birds from the mountains of Perak to the British Museum. Although so few in number, the revelations which they disclose are of the greatest value, for they show that in Perak, at least, and probably throughout the mountain-range, there is a curious mixture of Himalayan and high-Sumatran forms. Thus the *Psilopogon*, hitherto supposed to be a peculiar Sumatran genus, is accompanied by *Rhinocichla mitrata* (*Ianthocinclla mitrata*, auct.), another species hitherto believed to be confined to Sumatra; and the *Sibia* is also the Sumatran *S. simillima*, and not *S. picata*. The affinities of the Perak species being therefore so markedly Sumatran, it is not a little surprising to find that the *Mesia* is *M. argentauris* of the Himalayas, and not *M. laurinae* of Sumatra as one would have expected.

The following is a list of the specimens sent by Mr. Wray, who informs us that they were mostly obtained at an elevation of 3000 feet, and that his native collector, after an experience of 30 years' work, had not met with some of the species before.

#### Fam. MUSCICAPIDÆ.

*NILTAVA GRANDIS*, Hodgs.; Sharpe, Cat. B. iv. p. 404.

"No. 11. Male. Irides red; legs and feet nearly black; beak black. The female is brown, with a blue spot on each shoulder and a patch of ash under neck; head blackish and slightly glossed with blue. Specimens obtained at 4000 feet."

Compared with males from Sikhim and Tenasserim in the Hume Collection, and apparently identical in every respect.

*RHINOCICHLA MITRATA* (S. Müll.); Sharpe, Cat. B. vii. p. 452.

*Ianthocincla mitrata*, Bp. Consp. i. p. 371.

"No. 12. Males. Irides brown; beak orange; legs yellow; skin under eye pure white. Common above 3000 feet."

Two specimens sent, identical with others in the Museum from Sumatra, to which island the species has hitherto been supposed to be confined.

#### Fam. TIMELIIDÆ.

*HYDROCICHLA RUFICAPILLA* (Temm.); Sharpe, Cat. B. vii. p. 319.

*Henicurus ruficapillus*, Temm. Pl. Col. iii. pl. 534.

"No. 17. Female. Irides brown; legs nearly white; beak black; Rocky streams in the jungle on the hills."

Agrees with the females of this species as described by Messrs. Hume and Davison.

*SIBIA SIMILLIMA* (Salvad.); Sharpe, Cat. B. vol. vii. p. 402.

*Heterophasia simillima*, Salvad. Ann. Mus. Civic. Genov. xiv. p. 232.

"No. 13. Female. Iris brown; beak black; legs plumbeous. Flies about among the tops of trees in parties of from 20 to 30. Above 3000 feet."

The two specimens sent agree precisely with a Sumatran example in the British Museum collected by Mr. Carl Bock.

*MESIA ARGENTAUROS*, Hodgs.; Sharpe, Cat. B. vii. p. 642.

"No. 10. Female. Iris brown; feet and beak of same colour as throat of female. Male bird has red under tail-coverts; throat orange. From the hills of Perak over 3000 feet. Flies about in small parties of 10 or 12."

The female sent is absolutely identical with Himalayan specimens, and the note given by Mr. Wray as to the colouring of the male also suits the Himalayan bird and does not agree with the Sumatran *M. laurinae*, Salvad. (Ann. Mus. Civ. Gen. xiv. p. 231), which is the species one would have expected to find along with *Sibia simillima*.

#### Fam. CAPITONIDÆ.

*PSILOPOGON PYROLOPHUS*, S. Müll.; Marshall, Monogr. Capit. p. 133, pl. 53.

"No. 14. Male and female. Iris brown; legs dull green; bare skin under eye green. On the hills over 3000 feet."

This species has only been recorded from Sumatra up to the present time.

#### Fam. ALCEDINIDÆ.

*CARCINEUTES PULCHELLUS* (Horsf.); Sharpe, Monogr. Alced. p. 251, pl. 96.

"No. 16. Male. Irides white; bare skin under eye pale brown;

beak crimson-red. Had just caught and partly eaten a large spider."

Fam. TROGONIDÆ.

HARPACTES DUVAUCELI, Temm.; Gould, Monogr. Trogon. 2nd ed. pl. 40.

"No. 15. Male. Irides brown; bill pure cobalt-blue. Hills up to about 2000 feet."

7. Notes on Specimens in the Hume Collection of Birds.

By R. BOWDLER SHARPE, F.L.S. &c.

[Received June 18, 1886.]

(Continued from p. 97.)

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No. 2. On some Rose-Finches.

In 1881 Colonel Biddulph (Ibis, 1881, p. 156, pl. vi.) noticed the differences between the large Rose-Finches of Yarkand and those of the Gilgit district, in which he had been resident for some time, and named the former bird *Propasser rhodometopus*. Having lately had occasion to examine the series of Rose-Finches in the Hume Collection, I was able to discriminate the *P. rhodometopus* of Biddulph as distinct from *P. rhodochlamys* of Indian authors, from the Himalayas. The two species are very nearly allied, but the Yarkand bird has silvery pointed feathers on the forehead, which the Himalayan bird has not.

At the same time Colonel Biddulph has, I believe, fallen into an error in his identification of the true *P. rhodochlamys* of Brandt, which was described from the Altai Mountains, and appears to me to be identical with the Yarkand bird, but not with *P. rhodochlamys* (so-called) from the Himalayas.

Brandt in his original description (Bull. Phys.-Math. Acad. Sci. St. Pétersb. 1843, p. 363) distinctly says "*Pennæ frontales, verticis, gutturis &c. acuminatæ*;" and this seems to point undoubtedly to the species afterwards called *P. rhodometopus* by Biddulph. Consequently the Himalayan species must require a separate designation, which is forthcoming in *Propasser grandis* (Blyth, J. A. S. Beng. xviii. p. 810).

Mr. Seebohm has lent me specimens of *Carpodacus rubicillus* from the Caucasus, and on comparing them with examples of so-called *C. rubicillus* from Turkestan and Yarkand, which have the back almost entirely uniform, and narrow black shaft-streaks on the under tail-coverts, I find that the two species are not identical.

Both races are figured by Gould in the 'Birds of Asia,' but, like other ornithologists, he considered the differences between them to be of insufficient specific value. They are, however, so well marked that I propose the name of *Carpodacus severtzovi* for the Central-Asian bird, and Mr. Seebohm agrees with me that it ought to have a different name from that of the Caucasus form (*C. rubicillus* of G黚lenstadt).

#### No. 3. On *Lalage melanothorax*, Sharpe.

In registering and arranging the splendid series of Campophagidæ in the Hume Collection, I naturally looked out for additional specimens of the fine *Lalage* which I described in 1879, from Madras, naming it *Lalage melanothorax* (Cat. B. iv. p. 91).

Not finding any additional specimens in the Hume Collection, I had another look at the type in the British Museum, and at once recognized that it must be an artefact! The body is that of *Lalage sykesi*, but the head and neck are those of *Buchanga atra*. That I should not have noticed this before is as surprising as the fact that I have shown the specimen to many ornithological friends, most of them intimately acquainted with the two species above mentioned, and that none of us have detected the fraud. On re-examining the specimen, as I have done many times before, it is impossible to detect where the birds have been joined together. *Lalage melanothorax*, however, is a name to be suppressed.

#### No. 4. On some Flycatchers of the Genus *Siphia*.

Seven specimens of *Siphia olivacea* (Hume) are in the Hume Collection, and I find that I had rightly identified the species in the 'Catalogue of Birds,' vol. iv. p. 458.

*Cyornis albo-olivacea*, Hume, Str. F. 1877, p. 488, is *Setaria pectoralis*, Salvad. Ucc. Born. p. 233, and *Rhinomyias pectoralis* of my 'Catalogue,' vol. iv. p. 368.

*Cyornis poliogenys*, Brooks, Str. F. 1878, p. 469, seems to be a good species, and is closely allied to *S. olivacea* (Hume), but has a grey head and face, and is orange-rufous on the breast, the throat also being washed with the same colour and not white as in *C. olivacea*. This species will have the following synonymy:—

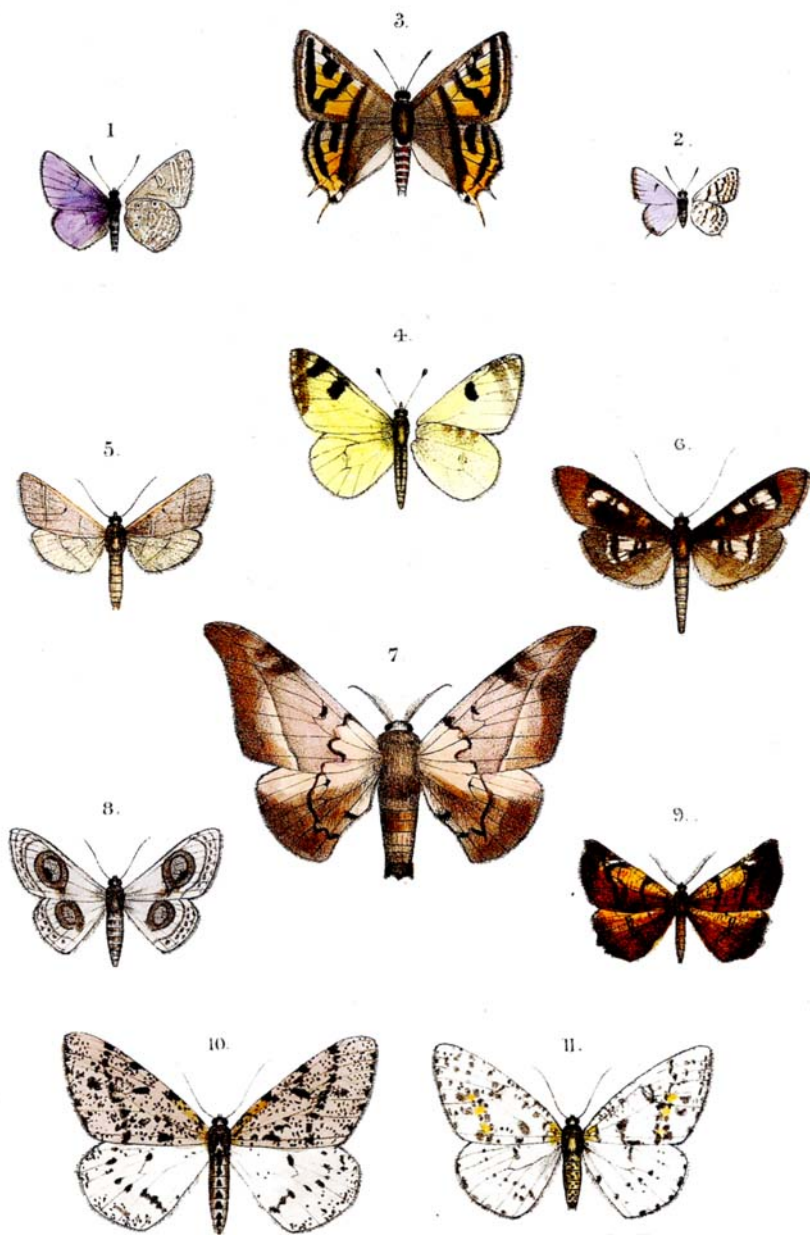
#### SIPHIA POLIOGENYS.

*Cyornis poliogenys*, Brooks, Str. F. 1879, p. 469.

*Siphia cacharensis*, Madarász, Zeitschr. ges. Orn. i. p. 52, Taf. 1. fig. 2 (1884).

*Hab.* Sikhim Terai (*W. E. Brooks*); Bhootan Dooars (*Mandelli*); Dibrughur, Assam (*J. R. Cripps*); Shillong; Cachar (*A. O. Hume*); Manipur (*A. O. Hume*); Tippera.

The plate of *Siphia cacharensis* does not agree with the description. The latter, however, is very good, and leaves no doubt as to the identity of the species.



8. On Lepidoptera collected by Major Yerbury in Western India. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received June 25, 1886.]

(Plate XXXV.)

Major Yerbury has recently presented to the Museum a fine series of Lepidoptera collected by himself at Campbellpore; along with the specimens he has forwarded numerous notes of considerable interest; therefore it is the more desirable that an account of the collection should be published. Unfortunately some of the specimens were pinned, and amongst these were several specimens of *Caligula simla*; the usual result naturally followed—the abdomen of one of these large Saturniids broke off, and not only more or less damaged the other specimens of this species, but made such havoc amongst some of the smaller Moths as to render their identification hopeless.

Major Yerbury has sent the following notes on the various localities mentioned by him:—

“*Campbellpore*. A military station about 40 miles from Rawal Pindee. Height above sea-level, 1200 ft.; situated on a cultivated sandy plain. The river Haro flows past the cantonment at a distance of about 2 miles to the southward and eastward; the country across the river is very much broken up by water-courses and with rocky spurs running down to the river.

“*Attock*. A military station to the N.W. of Campbellpore and 12 miles off; situated among barren hills on the banks of the Indus.

“*Khairabad*. Railway-station across the Indus, opposite Attock; barren hills all round.

“*Lawrencepore*. An abandoned military station 9 miles from Campbellpore, on the banks of the Haro.

“*Chittar Pahar*. A range of hills running east and west; the nearest point to Campbellpore about 7 miles across Haro. The highest peak of this range is about 3600 ft., but Kala Dilli, Lum-bahdun, and other places mentioned are probably only from 1500 to 1800 feet above sea-level. Limestone, thickly covered with vegetation to the north; barren, with scattered bushes of baubul and jiu-netta, on the south side.

“*Thundiani*. Hill-station near Abbottabad (8700 feet?).

“*Kala Pani*. Stage between Thundiani and Abbottabad (6000 feet?).

“*Bugnoter*. First stage from Abbottabad on the Abbottabad and Murree road (6000 feet?).

“Murree and Rawal Pindee road.—*Tret*, 5000 feet?, first stage from Murree; *Chittar*, 3000 feet?; *Barracoo*, 2500 feet, second stage; *Rawal Pindee*, 1800 feet?

“*Dewal*, 6000 feet; first stage on Murree and Cashmere road.

“*Hassan Abdal*, 1600 feet?; midway between Rawal Pindee and Campbellpore.



"*Nisan Jani*. Mountain near Kalabagh, Abbottabad and Murree road; highest point nearly 10,000 feet."

The collection contains examples of 178 species, many of them represented by a fair series of specimens, mostly identified for the collector (but frequently erroneously) by Mr. de Nicéville. Six of the Butterflies and nineteen of the Moths are described as new, and several other species probably new to science, but in bad condition, are indicated in order to show that there is still much to be done in that part of India by any one who will take the trouble to collect Lepidoptera.

## NYMPHALIDÆ.

### EUPLEINÆ.

#### 1. LIMNAS CHRYSIPPUS.

*Papilio chrysippus*, Linnæus, Syst. Nat. 1758, p. 471.

♂, Campbellpore, 19th and 26th July, 1885; ♀, 20th June and 26th July, 1885; Dewal near Murree, 24th August.

One of the females has a tawny subapical patch beyond the white band on primaries, exhibiting a slight tendency to modification in the direction of *L. klugii*.

#### 1 A. LIMNAS ALCIPPOIDES.

*Limnas alcippoides*, Moore, P. Z. S. 1883, p. 238, pl. xxxi. fig. 1.

♀, Campbellpore, 17th and 21st June and 18th July, 1885.

The specimens of this form obtained by Major Yerbury tend to confirm my expressed opinion that it is a reversional sport of *L. chrysippus*; the three specimens differ as follows:—

a. Primaries as in *L. alcippus*; secondaries with the veins, internal area, and centre of median interspaces snow-white.

b. Primaries as in *L. chrysippus*; secondaries with the veins, internal area, and centre of median interspaces whitish.

c. Primaries as in *L. chrysippus*; secondaries above pale, below white.

Major Yerbury says of *L. chrysippus*:—"Very common, May, June, July, October, November, December. Caterpillar common in July, feeds on *Calotropis gigantea*; agrees with the description given in 'The Butterflies of India,' and appears to be the same as that reared at Aden, where it fed on either this or some closely allied plant." Of *L. alcippoides* he says:—"Some eight specimens taken in all during May and June 1885; varies greatly in the amount of white on the hind wing."

#### 2. LIMNAS KLUGII.

*Limnas klugii*, Butler, P. Z. S. 1885, p. 758. n. 2.

*Euplœa dorippus*, var., Klug, Symb. Phys. pl. 48. fig. 5.

♀, Campbellpore, 11th June, 1885.

"Not so common as *L. alcippoides*; only four specimens taken during May and 2nd to 11th June, 1885. All these specimens have curious leprous-like spots on their wings."—*J. W. Y.*

I am surprised to find that this species extends so far to the east as Campbellpore; that it is rare (where *L. chrysippus* is common) is only natural, if this is the limit of its range eastward from Afghanistan. I cannot agree at all with Col. Swinhoe's statement that typical *L. dorippus* is variable; I never saw a doubtful specimen.

#### SATYRINÆ.

##### 3. AULOCERA SARASWATI.

*Satyrus saraswati*, Kollar in Hüg. Kaschm. iv. 2, p. 445, pl. 14. figs. 3, 4 (1848).

♀, Dewal, 26th August; ♂ ♀, Murree, 5th September, 1885.

"Common at Murree in August. Some of those obtained towards Thundiani, though under this number (42) were noted by De Nicéville as *A. padma*."—*J. W. Y.*

The four examples sent to us by Major Yerbury are all typical *A. saraswati*. *A. padma* is so perfectly distinct from that species, that Mr. de Nicéville can hardly have mistaken one for the other; at the same time I cannot include it without proof.

##### 4. AULOCERA SWAHA.

*Satyrus swaha*, Kollar in Hüg. Kaschm. iv. 2, p. 444, pl. 14. figs. 1, 2 (1848).

♂, Murree, 8th and 28th August and 8th September; Atabul, 9000 feet, 16th September; Thundiani, 24th September.

"Common at Murree in August and September; found higher up the hill than *A. saraswati*."—*J. W. Y.*

The six specimens received are all males.

##### 5. HIPPARCHIA PARISATIS.

*Satyrus parisatis*, Kollar, Denkschr. Akad. Wien, math.-nat. Cl. i. p. 52. n. 7 (1850).

♂ ♀, road between Bugnoter and Abbottabad, 4000–5000 feet, 20th September; ♀, between Abbottabad and Kala Pani, 25th September, 1885.

"Common between Bugnoter and Abbottabad; also on the lower slopes of Thundiani; seen near Tret, 8th October, 1885."—*J. W. Y.*

##### 6. LETHE DYRTA.

*Debis dyrta*, Felder, Reise der Nov., Lep. p. 497. n. 860 (1867).

♂, Bugnoter, 19th September, about 4000 to 5000 feet; between Bugnoter and Abbottabad, 20th September; Kala Pani, about 5000 feet, on 24th; Tret, 8th October, 1885. ♀, between Murree and Tret, on same day.

"Two specimens taken at Dewal, 26th August; afterwards found commonly below Bugnoter, 20th September, and between Abbottabad and Kala Pani."—*J. W. Y.*

The specimens sent are all males excepting one dwarfed example.

7. *AMECERA SCHAKRA*.

*Satyrus schakra*, Kollar in Hüg. Kaschm. iv. 2, p. 446, pl. 15. figs. 3, 4 (1848).

♂ ♀, Murree, 4th, 5th, and 11th August, and 7th September; ♂, between Abbottabad and Kala Pani, 25th September, 1885.

"Very common in August and September. Found all along the hill as far as Thundiani, and as low as Tret and Bugnoter; probably not above 5000 feet."—*J. W. Y.*

8. *CALLEREBIA ANNADA*.

*Erebia annada*, Moore, Cat. Lep. E.I. Co. Mus. i. p. 226. n. 475 (1857).

♂ ♀, between Abbottabad and Kala Pani, 25th September, 1885.

"Not uncommon about Kala Pani; here its habits appeared different from those of *Callerebia* in general, as it was flying about over stones and low bushes, not affecting the shade; near Tret (8th October), however, it affected the shade much like *C. nirmala* and *C. daksha*."—*J. W. Y.*

It is an interesting fact that Major Yerbury sends the above species under the name of "*C. hybrida*;" because his identifications are, to a great extent, derived from Mr. de Nicéville. A short time since I was severely taken to task for having described *C. hybrida* as a species (not that I ever did so, for I distinctly stated my opinion that it was a hybrid and an inconstant one); now if the gentleman who attacked me obtained his identification from the same source, it is clear that what he considered a very bad species is *C. annada*. Who shall decide this point?

9. *CALLEREBIA NIRMALA*.

*Erebia nirmala*, Moore, P. Z. S. 1865, p. 501. n. 91.

♂ ♀, Murree, 6th, 9th, and 12th August, 1885.

"*Callerebia daksha* and *nirmala*. These two species appear to me to merge into one another. They were common at Murree in shady places in August 1885."—*J. W. Y.*

Major Yerbury sends seven specimens, some of them rather worn, but all perfectly typical *C. nirmala*; whether the female has been identified for him as *C. daksha* or whether he actually possesses the latter species, I cannot say; but I am much inclined to accept the first as the more probable explanation of his note. I should be glad to obtain specimens of *C. daksha* for our collection, as we only have one male labelled by Mr. Moore and received from him in 1877; from this one specimen it is impossible to decide how far the differential characters of the species can be relied upon; if constant, they are amply sufficient to distinguish it from *C. nirmala*.

10. *YPETHIMA ORDINATA*.

*Ypthima ordinata*, Butler, P. Z. S. 1880, p. 148, pl. xv. fig. 3.

♂ ♀, between Abbottabad and Kala Pani, 25th September, 1885.

♀, between Murree and Tret, 1st October.

"Common on the 25th September about Kala Pani and on the road between Abbottabad and Bugnoter."—*J. W. Y.*

The incorrect identification of *Y. avanta* has been given to Major Yerbury for this species; though common in India, it is a very rare species in European collections, as also is *Y. avanta*—a smaller Butterfly, more nearly resembling *Y. newboldi* in form, the under surface of its wings ash-grey, densely striated with brown and distinctly crossed by olive-brown bands; the ocelli of the secondaries small, oval, and with large silver pupils.

The four (unfortunately rather worn) specimens in the present collection, though they differ from one another in minor details, correspond in all their principal features with my type of *Y. ordinata*.

#### 11. YPTHEMA NAREDA.

*Satyrus nareda*, Kollar in Hüg. Kaschm. iv. 2, p. 451 (1848).

♂, Dewal, 26th August, 1885.

"Common at Murree in August."—*J. W. Y.*

#### 12. YPTHEMA SAKRA.

*Ypthima sakra*, Moore, Cat. Lep. E.I. Co. Mus. i. p. 286. n. 508 (1857); Hewitson, Trans. Ent. Soc. ser. 3, vol. ii. pl. 18. fig. 18 (1865).

♂, Murree, 12th September; Thundiani, 24th September, 1885.

"*Ypthima nikæa*, Dewal, 26th August. Not uncommon about Murree and towards Thundiani, end of August and beginning of September. The form *Y. sakra* (differing in having no intervening yellow bands to the ocelli) was also obtained."—*J. W. Y.*

The true *Y. nikæa* is unknown to me, but Mr. Moore describes it as having the "underside grey," whereas in this species (*Y. sakra*) it is distinctly yellow; he also says that the apical ocelli of the hind wings are "joined together, though having a yellow band between them," the only part of this description which is to me unintelligible, but to which Major Yerbury evidently refers as the distinctive character between the two named forms. In the Hewitson cabinet there is a series of five *Y. sakra*, the smallest specimen, labelled "*nikæa*, M.," differing in having the two apical ocelli separate though enclosed in an 8-shaped yellow zone: though the under surface is still yellow instead of grey, this may be the typical *Y. nikæa*; if so, it is connected with *Y. sakra*, of Marshall and De Nicéville, by one of the two specimens now sent, in which the ocelli, though not absolutely confluent, touch one another upon the vein as in Hewitson's figure. Hewitson's type of *Y. sakra*, therefore, is clearly one of these intermediate specimens.

#### NYMPHALINÆ.

##### 13. HYPOLIMNAS MISIPPUS.

*Papilio misippus*, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

♂, Campbellpore, 9th November, 1885.

"Flew to light at night during R. A. Mess." "Rare: only four specimens in all taken—3 ♂ and 1 ♀. November and December."—*J. W. Y.*

14. *SEPHISA DICHROA*.

*Limenitis dichroa*, Kollar in Hüg. Kaschm. iv. 2, p. 429, pl. 8. figs. 1, 2 (1848).

♀, Murree, 11th August, 1885.

"Not common; some half-dozen specimens, nearly all damaged, taken at Murree (9th and 11th August), all on the trunk of the same tree—a species of willow. Two or three seen on the wing: the flight appears to be particularly rapid."—*J. W. Y.*

15. *ATHYMA OPALINA*.

*Limenitis opalina*, Kollar in Hüg. Kaschm. iv. 2, p. 427 (1848). ♂, Murree, 5th and 12th August; ♀, 1st October, 1885.

"Fairly common at Murree in August."—*J. W. Y.*

16. *NEPTIS MAHENDRA*.

*Neptis mahendra*, Moore, P. Z. S. 1872, p. 560, pl. 32. fig. 3.

♂, Murree, 13th August; ♀, 8th September, 1885.

"Common at Murree, August and September; seen as far as Thundiani."—*J. W. Y.*

The following species was sent under the same number and name (*N. mahendra*), but is perfectly distinct both in pattern and coloration, being more nearly allied to *N. nandina* of Darjiling and Nepal, which it apparently represents in Western India.

17. *NEPTIS YERBURII*, sp. n.

♂. Wings above of the size, form, and general aspect of *N. mahendra*, but the discoidal streak and spot beyond it as in *N. duryodana*, which it also resembles in having a pale irregular line across the primaries between the discal and submarginal spots, and a pale submarginal line on the secondaries. It differs from both species in having a complete submarginal series of white spots on the primaries, and a pale line through the centre of the black belt on the secondaries; further, it differs from *N. mahendra* in the greater obliquity of the subapical discal spots of the primaries: on the under surface the markings are very different, corresponding in almost all respects with those of *N. nandina*; the brown colouring, however, is olivaceous instead of rufous, and the brown belt across the secondaries does not taper towards the costa as in the Darjiling insect. Expanse of wings 54 millim.

Murree, 16th August, 1885.

As we possess Moore's types of *N. nandina*, and as this species is certainly confounded with others in at least one large collection, it may be useful to point out that it is more closely allied to *N. soma* (the types of which we also have in the Museum) than to any other named species; in fact it differs from the latter only in its broader and yellower whitish bands and larger spots (of the same colour); the ground-colour below is a shade darker, but of a similar rufous hue. It is a larger, longer-winged species than *N. yerburi*, has narrower bands and spots on the upper surface, and these markings are of a sordid yellowish tint instead of being snow-white.

## 18. VANESSA CHARONIA.

*Papilio charonia*, Drury, Ill. Ex. Ent. i. pl. 15. figs. 1, 2 (1773).

Murree, 22nd August and 10th September; Dewal, 26th August.

"Common at Murree in August and September; found along this hill as far as Thundiani, also at Dewal.

"This butterfly is fond of pitching on the trunks of trees, particularly of the ilex when the tree has been wounded and the sap is exuding. I have taken several in company with *Pyrameis indica* and a large greenish beetle (*Cetonia*, sp.?) while thus engaged."—*J. W. Y.*

## 19. VANESSA KASCHMIRENSIS.

*Vanessa kaschmirensis*, Kollar in Hüg. Kaschm. iv. 2, p. 442, pl. 11. figs. 3, 4 (1848).

♂ ♀, Mir Jani above Kalabagh, about 9000 feet, 16th September;

♂, Thundiani, 23rd September, 1885.

"Rare in Murree, ten specimens taken end of August; very common at the top of Thundiani, 23rd to 24th September."—*J. W. Y.*

Major Yerbury sent us two perfect specimens and one much broken; in their fresh condition I hardly recognized them as conspecific with the dingy series of very old specimens in the Museum, and I much regret that our good friend did not send as long a series of this species as of *Libythea lepita*.

## 20. JUNONIA ALMANA.

*Papilio almana*, Linnæus, Mus. Lud. Ulr. p. 272 (1764).

Hassan Abdal, 14th October; Campbellpore, 17th November, 1885.

"A few in October and November near Campbellpore."—*J. W. Y.*

## 21. JUNONIA SWINHOEI.

*Junonia swinhoei*, Butler, Ann. & Mag. Nat. Hist., Oct. 1885, p. 308.

♂, Campbellpore, July; ♂ ♀, Murree, 5th August, 1885.

"The commonest Butterfly in Campbellpore; found in May, June, July, October, November, and December. Probably the commonest fly on the Murree hills in August and September."—*J. W. Y.*

## 22. PYRAMEIS INDICA.

*Papilio atalanta indica*, Herbst, Natur. Schmett. vii. pl. 180. figs. 1, 2 (1794).

Murree, 16th and 26th August and 10th September, 1885.

"Fairly common all over the hills in August and September."—*J. W. Y.*

## 23. ARGYNNIS NIPHE.

*Papilio niphe*, Linnæus, Syst. Nat. i. 2, p. 785. n. 208 (1767).

♂ ♀, Campbellpore, 23rd May; ♂, Murree, 10th September, 1885.

"Common (at Campbellpore) May and June ; at Murree in August."—*J. W. Y.*

24. ARGYNNIS KAMALA.

*Argynnis kamala*, Moore, Cat. Lep. E. I. Co. Mus. i. p. 156. n. 324 (1857).

♀, Thundiani, 23rd September, 1885.

"A few at Murree and along the slope of Thundiani in September."—*J. W. Y.*

25. ARGYNNIS ISSÆA.

*Argynnis issæa*, Moore, Cat. Lep. E. I. Co. Mus. i. p. 156. n. 323 (1857).

Murree, 5th, 23rd, and 28th August, 3rd September ; melanistic var., 1st October, 1885.

"*Argynnis lathonia* apud de Nicéville ; *Argynnis issæa* apud Swinhoe. Common at Murree, August and September, and found along the hills as far as Thundiani."—*J. W. Y.*

No lepidopterist familiar with *A. lathonia* of Europe could fail to note the differences which exist between this form and the European one : it is, of course, a local representative of *A. lathonia* as every species of butterfly is of some other, so far as I have been able to ascertain, but it never really corresponds with European specimens.

26. ATELLA PHALANTA.

*Papilio phalanta*, Drury, Ill. Ex. Ent. i. pl. 21. figs. 1, 2 (1773).

♂, Hassan Abdal, 14th October, 1885.

27. MELITÆA PERSEA.

*Melitæa persea*, Kollar, Denksch. Akad. Wien, math.-nat. Cl. i. p. 52. n. 6 (1850).

Campbellpore, Khairabad side near Attock Bridge, 1st November, 1885.

"*Melitæa robertsii* apud de Nicéville ; *M. didyma* apud Swinhoe. Not uncommon."—*J. W. Y.*

This species may readily be distinguished from *M. robertsii*, apart from other characters, by the black markings on the basal two thirds of secondaries, which do not exist in the Candahar species. After comparing it with our series of thirty-four *M. didyma* and fifteen *M. trivialis*, I have not the least hesitation in supporting Mr. Kirby's opinion that it is much more nearly allied to the latter than to the former species.

The two specimens sent by Major Yerbury, though not absolutely agreeing with any of our nine typical examples of *M. persea*, differ only in characters which the series before me proves to be variable, the principal of these characters being the ill-defined submarginal spots on the upper surface of the secondaries and the less perfect row on the under surface of the primaries ; no two specimens, however, absolutely correspond in these points.

## 28. CYRESTIS GANESCHA.

*Amathusia ganescha* (part.), Kollar in Hüg. Kaschm. iv. 2, p. 430, pl. 7. figs. 3, 4 (1848).

♂, Murree, 9th August, 1885.

"Rare, only three specimens taken; probably not more than four specimens seen in all."—*J. W. Y.*

Kollar apparently regarded *C. thyodamas* as the other sex of this species, and in this error he has been largely followed. If it proves to be a seasonal form or dimorphic representative of that species, it will indicate a similar condition of things as probably existing between *C. lutea* and *C. nivea* of Java, which differ precisely in the same way, although in a more marked degree.

*C. thyodamas* is a white species compared with *C. ganescha*; the apical area of its primaries is always suffused with blackish, which has the effect of a quadrate apical patch; this character does not appear in Kollar's figure, which is evidently taken from what I (on that account) regard as typical *C. ganescha*—the more or less yellow-tinted form; but in the description—"Vor dem Ausseurande ist das Feld ausserhalb der fünften Linie mehr oder weniger schwarz getrübt"—it is evident that both types are included; and the remark, "between male and female I find no other difference than that in the latter the marking is more lively and intense," shows that *C. thyodamas* was supposed to be the female, whereas this sex seems to be very much rarer than the male in either of the Indian forms.

## ERYCINIDÆ.

## LIBYTHEINÆ.

## 29. LIBYTHEA LEPITA.

*Libythea lepita*, Moore, Cat. Lep. E. I. Co. Mus. i. p. 240. n. 519 (1857).

♂ ♀, 2nd, 12th, 16th, and 23rd August, and 8th September, 1885; ♀, Lumbahdun, 27th November.

♂ var. (without hatchet-like termination to discoidal streak), Thundiani, 24th September.

"Common at Murree in August and September. Only two specimens of this Butterfly were taken in the neighbourhood of Campbellpore—one near Lawrencepore 22nd November, and one at Lumbahdun in the Chittar Pahar, 27th November."—*J. W. Y.*

Major Yerbury appears to think that *L. myrrha* exists in his series of this species; the latter, however, is easily recognized by the unbroken tawny stripe on the primaries, intersected by the median vein and its two first branches, and by the larger, entirely tawny, sub-apical spots; the direction of the tawny stripe on the secondaries differs a little, and it is longer and not zigzag along its outer edge. No lepidopterist possessing examples of the two species could possibly confound them.



## NEMEOBIINÆ.

## 30. TAXILA EUGENES.

*Dodona eugenes*, Bates, Journ. Linn. Soc., Zool. ix. p. 371 (1867).

♀, Murree, 10th September, 1885; Thundiani, low down near Kala Pani, 24th September.

"*Dodona dipcea*: uncommon, a few at Murree in August, and two or three below Thundiani in September."—J. W. Y.

Although Hewitson, in his collection, associated three examples of *T. eugenes* with his type of *T. dipcea*, the two species are so well marked that there ought to be no difficulty in distinguishing them. Though rare, *T. eugenes* is common compared with *T. dipcea*: it differs most prominently in the pattern of the under surface of the secondaries; these wings in *T. dipcea* are of a dingy grey-brown colour, and the bands across it are very narrow and of a creamy yellowish tint; the short band between the cell and the apex is bounded internally by three dark brown angular spots, and the anal lobe has no tail; in fact, strictly speaking, it is a *Dodona*, whereas *T. eugenes* is a *Taxila*<sup>1</sup>.

## 31. TAXILA DURGA.

*Melitæa durga*, Kollar in Hüg. Kaschm. iv. 2, p. 441, pl. 13. figs. 3, 4 (1848).

♂ ♀, Murree, 18th, 22nd, and 23rd August; Dewal, 26th August; Bugnoter, 20th September, 1885.

"Common at Murree in August and September; found along the hills to Thundiani; also at Dewal."—J. W. Y.

## LYCENIDÆ.

## 32. PANCHALA? DODONÆA.

*Amblypodia dodonæa*, Moore, Cat. Lep. E. I. Co. Mus. p. 43. n. 65, pl. 1a. fig. 8 (1857).

♂, Thundiani, 23rd September, 1885.

This species in Mr. Kirby's Catalogue is indicated as female of the following; in our series are both sexes of each species, which are totally different. Major Yerbury's note refers to both.

## 33. PANCHALA? RAMA.

*Thecla rama*, Kollar in Hüg. Kaschm. iv. 2, p. 412, pl. 4. figs. 1, 2 (1848).

♀, Dewal near Murree, 26th August, 1885.

<sup>1</sup> Practically, however, the two genera are synonymous, as, in spite of Scudder's oversight of the following important facts, I shall now show:—In Doubleday's List the following species stand under the then undescribed genus *Taxila*—*T. fatua*, *egeon*, *erato*, *cesennia*, *fylla*, *drupadi*, *orphna*, *esther*, *echerius*, *tantalus*, *neophron*. This genus was adopted and described by Westwood in the 'Genera of Diurnal Lepidoptera,' the three italicized species being figured in the same order as above; and *T. orphna* (under which name two species are confounded on the plate) is not figured as a *Taxila* at all, though placed with that genus in the letterpress; it, moreover, stands last in Mr. Westwood's notes on the genus; yet Mr. Kirby admits this species alone into the genus *Taxila*, whilst Scudder admits only *T. drupadi*, an insect in no way brought prominently forward as typical.

"Common at Dewal, a few seen near Murree, and several on the lower slopes of Thundiani (*P. dodonæa* ?); two taken 24th September. Prefers ilex trees; scarcely ever seen on any other tree."—*J. W. Y.*

#### 34. *POLYOMMATUS BÆTICUS*.

*Papilio bæticus*, Linnæus, Syst. Nat. i. 2, p. 789. n. 226 (1767).

♂, Campbellpore, 29th October, 1885.

"Common, May, June, and July."—*J. W. Y.*

#### 35. *CATOCHRYSOPS CNEJUS*.

*Hesperia cnejus*, Fabricius, Ent. Syst. Suppl. p. 430 (1798).

♂ ♀, Campbellpore, 31st May, 15th July, and 27th October ;  
♂, Murree, 5th August.

This and the following are mixed up; one of them being identified for Major Yerbury as *C. strabo*, an insect to which they are by no means nearly allied.

#### 36. *CATOCHRYSOPS HAPALINA*.

*Catochrysops hapalina*, Butler, P. Z. S. 1883, p. 148, pl. 24. figs. 2, 3.

♂, Campbellpore, 27th October; ♀, 21st November, 1885.

"Common on baubul bushes in October."—*J. W. Y.*

The female was numbered as possibly *Zizera putli*; but as it was unset, the difference between the two was not so easily seen as might be supposed from the mounted specimens.

#### 37. *CATOCHRYSOPS ELLA*.

*Catochrysops ella*, Butler, P. Z. S. 1881, p. 606. n. 17.

♀, Campbellpore, 21st November, 1885.

One beautiful specimen, confounded with the preceding, from which, however, its brighter colouring above and smoky grey under surface at once distinguish it.

#### 38. *EVERES DIPORA*.

*Lycæna dipora*, Moore, P. Z. S. 1865, p. 506. n. 108, pl. 31. fig. 8.

♀, Murree, 20th August, 1885.

"*Catochrysops patala*? ♀, rare."—*J. W. Y.*

I cannot understand how any lepidopterist can have given to Major Yerbury an identification so wide of the mark as the above; the very colouring of the under surface at once points out to what group of *Lycænidae* the species belongs, apart from all structural distinctions.

#### 39. *AZANUS ZENA*.

*Lycæna zena*, Moore, P. Z. S. 1865, p. 505. n. 107, pl. 31. fig. 9.

♂ ♀, Campbellpore, 17th and 21st November, 1885.

"Common on baubul bushes in October."—*J. W. Y.*

40. *AZANUS URANUS*, sp. n. (Plate XXXV. fig. 1.)

♂. Allied to *A. zena*, but differing from all specimens in the Museum series, or that of Mr. Moore's collection, in the much brighter and more uniform lilac colour of the upper surface<sup>1</sup>, in the brighter blue at the base, the browner tint of the under surface, on which the white-edged markings are consequently less well defined, and in the obsolete character of the black spots, which are either reduced to minute points or wholly absent. Expanse of wings 21–22 millim.

Hassan Abdal, 13th October; Campbellpore, 17th and 29th November, 1885.

41. *AZANUS UBALDUS*.

*Lycæna ubaldus*, Cramer, Pap. Exot. iv. pl. 390. figs. L, M (1782).

♀, near Attock Bridge, Khairabad side, 15th November, 1885.

This species was unidentified, and specimens of *A. uranus* indicated as *A. ubaldus*, whilst others of the same species were simply recorded as "*Lycæna* sp."

42. *TARUCUS NARA*.

*Lycæna nara*, Kollar in Hüg. Kaschm. iv. 2, p. 421 (1848).

♂, Campbellpore, June; id.? (worn), 17th November, 1885.

"*Tarucus theophrastus*, very common May and June; it is probable that *T. nara* was also among some of the captures placed under this number."—*J. W. Y.*

*T. theophrastus* is an African species; the Butterflies so named by Col. Swinhoe probably represent two or more new species, of which the following is one:—

43. *TARUCUS EXTRICATUS*, sp. n. (Plate XXXV. fig. 2.)

Paler than *T. nara* above, varying in size even more than *T. balkanica*; readily distinguished on the under surface by the much greater regularity of the markings, those of the primaries being arranged nearly as in *T. theophrastus* (*i. e.* the central stripe is often unbroken, the subcostal spot beyond sometimes confluent with it so as to form a **Γ**-shaped marking; the dashes beyond the central stripe placed transversely and always confluent instead of forming an interrupted **<**-shaped character); the markings of the secondaries vary in colour from rust-red to black, but correspond in character with those of *T. nara*. Expanse of wings, ♂ 15–25 millim., ♀ 28–30 millim.

♂, Campbellpore, 31st May, 1885.

We have two females of this species from Kurrachee, collected by Col. Swinhoe, and a male collected by Sir John Hearsay at Landoor; thirteen other specimens also representing the *T. theophrastus* of Indian lists, but apparently belonging to another unnamed form, are in our collection.

<sup>1</sup> In *A. zena* it is chiefly confined to the centre of the wings, and has almost the appearance of a brand.

## 44. CYANIRIS VARDHANA.

*Polyommatus vardhana*, Moore, P. Z. S. 1874, p. 572, pl. 66. fig. 5.

♂ ♀, Murree, 28th August, 3rd and 8th September, 1885.

“Not uncommon at Murree at the end of August; was for a long time passed over as *C. caelestina*.”—*J. W. Y.*

*C. vardhana* is rather a rare species in collections.

## 45. CYANIRIS KOLLARI.

*Lycæna kollari*, Westwood, Gen. Diurn. Lep. p. 491. n. 69 (1852).

*Lycæna caelestina*, Kollar (*nec* Eversm.), Hügel's Kaschm. iv. 2, p. 423 (1848).

♂ ♀, Murree, 12th August; ♀, 28th December, 1885.

“Very common, August and September.”—*J. W. Y.*

This species being new to the Museum collection, I cannot question the identification, more especially as Kollar's description would do just as well for half a dozen other species; at the same time Kollar's name having been already used by Eversmann, cannot possibly be admitted. *C. kollari* is more like typical *C. pseudargiolus* than any other species known to me, but is smaller; it should probably stand next to *C. levettii* in collections.

## 46. ZIZERA DILUTA.

♂. *Lycæna diluta*, Felder, Reise der Nov., Lep. ii. p. 280. n. 353, pl. 35. figs. 12, 13.

♀, Campbellpore, 17th June and 23rd July; ♂, 9th October; ♀, Murree, 2nd, 5th, and 6th August, and 20th September.

“*Zizera maha*, De N., *diluta*, Swinh. Common at Murree in August and September.”—*J. W. Y.*

In spite of Felder's very poor figure of the upper surface, I have never seen any other than this species that could be identified with *Z. diluta*; it has hardly a feature in common with *Z. maha*, which is much nearer to *Z. chandala*. The specimens of this species were all females, with the exception of two worn ones, and one of these was labelled as probably a Moth; the females stand under the numbers 7, 72, 12 a, and 527.

## 47. ZIZERA KARSANDRA.

*Polyommatus karsandra*, Moore, P. Z. S. 1865, p. 505. n. 106, pl. 31. fig. 7.

♂ ♀, Campbellpore, 21st May and June; ♀, Murree, 1st October, 1885.

“*Zizera maha* and *Z. sangra* apud de Nicéville; *Z. decreta* and *karsana* apud Swinhoe: very common in the grass and lucerne-fields in May and June; though many of them differed, still they all seemed linked to one another, and I put them all under one number.”—*J. W. Y.*

Major Yerbury was perfectly correct in so doing; I find only males

and females perfectly normal in colouring, size, pattern, and everything; amongst those sent to me are no *Z. maha*, *sangra*, or *decreta*. The name "*karsana*" is probably meant for *karsandra*, to which species the whole series belongs.

#### 48. CUPIDO ARIANA.

*Polyommatus ariana*, Moore, P. Z. S. 1865, p. 504. n. 103, pl. 31. fig. 2.

♂ ♀, Murree, 8th to 11th August, and 3rd September, 1885.

Major Yerbury says that he caught this and the following species flying together at Murree in August.

#### 49. CUPIDO NAZIRA.

*Polyommatus nazira*, Moore, P. Z. S. 1865, p. 504. n. 102, pl. 31. fig. 4.

♂, Murree, 5th and 11th August, 1885.

#### 50. PLEBEIUS TROCHILUS.

*Lycæna trochilus*, Freyer, Neuere Beiträge, v. pl. 440. fig. 1 (1840).

♂ ♀, near Attock, Khairabad side, 8th November, 1885.

These are the first Indian examples that I have seen of this species.

"Common in stony nullahs near Attock Bridge."—J. W. F.

#### 51. PLEBEIUS PUTLI.

*Lycæna putli*, Kollar in Hüg. Kaschm. iv. 2, p. 422 (1848).

♂. Campbellpore, 18th October and 14th November, 1885.

"Common in October and November."—J. W. F.

#### 52. CHRYSOPHANUS TIMEUS.

*Papilio timeus*, Cramer, Pap. Exot. ii. pl. 186. figs. E, F (1779).

♂, Campbellpore, 4th June; Murree, 9th and 11th August and 24th September, 1885.

The Campbellpore specimen was numbered "527" (referring to *Zizera maha*); doubtless an oversight. Major Yerbury says that the species is "common at Murree and along the hills to Thundiani in August and September." *C. timeus* has been identified for him as "*C. phlæas*"; it appears, however, to be a tolerably constant form, so far as I can judge from our present series; on the upper surface it much resembles *C. stygianus* of Kandahar, but the darker colour and red band on the under surface of the secondaries at once separate it.

#### 53. ILERDA TAMU.

*Polyommatus tamu*, Kollar in Hüg. Kaschm. iv. 2, p. 417, pl. 5. figs. 7, 8 (1848).

♂ ♀, Murree, 11th, 12th, and 14th August, and 3rd September, 1885.

Common, according to Major Yerbury, but certainly not so in

European collections; it has been named *I. coruscans* for him, but is not even nearly allied to that species, of which we possess the types. Kollar's figure is not good, having been taken from a worn and broken specimen, but the identity of the species is settled by the "sky-blue gloss" of the basal half of the wings<sup>1</sup>; as a matter of fact the colour is ultramarine, but a little inaccuracy in colouring is perhaps admissible in the description of a rubbed insect. Kollar says, "We possess only a single example of this beautiful species, and it has suffered severely in transport, so that in fact only the wings are preserved," and from the description we find that the hind wings, at least, are "badly rubbed."

54. *ILERDA SENA*.

*Polyommatus sena*, Kollar in Hüg. Kaschm. iv. 2, p. 415, pl. 5. figs. 3, 4 (1848).

♂, Dewal and Murree, 8th, 16th, and 30th August; Bugnoter, 20th September, 1885.

"Rather rare at Murree, very common on the lower slopes of Thundiani, and as low as Tret and Bugnoter, probably not above 5000 feet."—*J. W. Y.*

55. *SPINDASIS HYPARGYROS*, sp. n. (Plate XXXV. fig. 3.)

Allied to *S. acamas* and *S. epargyros*. Larger; the male differing from both in the whitish costal area of primaries and both sexes differing in the darker bands on all the wings; on the under surface the wings are chalky white instead of cream-colour, all the markings are darker and edged with black; the submarginal band of the secondaries is not angulated as in *S. acamas* and the secondaries themselves are longer. Expanse of wings, ♂ 36 millim., ♀ 35–38 millim.

♂ ♀, Campbellpore, 19th, 20th, 25th, 26th, and 28th July, 1885.

This is the representative of *S. acamas* in N.W. India; Col. Swinhoe obtained it at Kurrachee and Chaman; Major Yerbury says that it is common<sup>2</sup>. At the time when I identified it as *S. acamas* we did not possess that species, and I supposed that the differences which existed in Klug's figures were due to inaccuracy of delineation. The Zeller collection has, however, now put us in possession of specimens of the true *S. acamas* and the allied *S. epargyros*, and I am able to see at a glance that here we have a series of those constant local races which constitute the only existing species in the Order Lepidoptera, but which, for that very reason, are always as thorns

<sup>1</sup> In *I. coruscans* the colour is shining metallic emerald-green.

<sup>2</sup> Another allied species occurs at Suakim; it has recently been presented to the Museum collection by Surgeon Manders. It may be called *S. bellatrix*. This species is smaller than *S. acamas*, is bright tawny above, with a black marginal stripe and white fringe; the primaries show dusky indications of the ordinary markings upon the costal half; there is also a whitish spot in the cell and a white subapical costal spot; wings below chalky white, with pale sandy-brownish markings edged with black and enclosing the usual silver streaks and spots; all the bands are a little wider than in *S. acamas*, the central band of primaries is abbreviated; the subapical band of secondaries more angular and the submarginal band interrupted. Expanse of wings 30 millim.

in the sides of those who believe that the species of Butterflies are widely distinct.

56. *RAPALA NISSA*.

*Thecla nissa*, Kollar in Hüg. Kaschm. iv. 2, p. 412, pl. 4. figs. 3, 4 (1848).

♂ ♀, Murree, 16th, 18th, and 25th August, 1885.

"Common at Murree."—*J. W. Y.*

Rare in European collections.

57. *DEUDORYX EPIJARBAS*.

*Dipsas epijarbas*, Moore, Cat. Lep. E.I. Co. Mus. i. p. 32. n. 30 (1857).

♂ ♀, Murree, 11th, 12th, and 22nd August, 1885.

"Common at Murree."—*J. W. Y.*

PAPILIONIDÆ.

PIERINÆ.

58. *COLIAS EDUSINA*.

*Colias edusina*, Felder, Wien. ent. Mon. iv. p. 100. n. 55 (1860).

♂ ♀, Murree, 2nd, 5th, 11th, 14th, and 18th August; ♂, Campbellpore, 30th May and 17th November; ♀, Chittar Pahar, 1500 feet.

"Common at Murree up to October; found all along the hills at Campbellpore, common May and June; fairly common October, November, and beginning of December."—*J. W. Y.*

This is the normal western type of *C. feldii*; the latter is represented by a species near to *C. aurorina*, which, though found in the west, extends as far eastward as Assam; whether the two forms are distinct or not can only be decided by breeding. Of course the present form is generally called *C. feldii* in Indian collections; but if it be that species, it should stand as var. *edusina*.

59. *COLIAS ERATE*.

*Colias erate*, var. ♀ *pallida*, Staudinger, Cat. Lep. eur. Faun. p. 3. n. 54 (1861).

♂, Murree, 16th August; Dewal, 26th August; ♂ ♀, Campbellpore, 29th October, 20th and 21st November, 1885.

One male of typical *C. erate* was obtained at Murree on the same day as the male of var. *pallida*; Major Yerbury says that it does not appear to be so common at Murree as the latter; a second fragmentary male from Campbellpore was also sent with specimens of *C. pallida*. Both Col. Swinhoe and Mr. de Nicéville seem to have wrongly identified the form, though, as *C. sareptensis* was mixed up with it, I may be mistaken in the case of the former gentleman: Major Yerbury, however, quotes the species as "*Colias hyale* apud de Nicéville, *C. sareptensis* apud Swinhoe"; he says that at Murree it is not common. He further remarks as follows:—"When first I arrived in Campbellpore and began to collect, I had no setting-

boards; so I placed all my captures in envelopes and consequently put all the pale clouded-yellows under one number; it was only when my attention was drawn to it, that I discovered that I had two species under the same number. I then went through all the pale forms I had, but only succeeded in finding three specimens of *C. erate*; so I presume this species is the rarer of the two. I have taken it in May, June, and November."

60. *COLIAS SAREPTENSIS*.

*Colias hyale*, var. *sareptensis*, Staudinger, Cat. Lep. eur. Faun. p. 5. n. 48 (1871).

♂, Campbellpore, 14th November; ♀, Murree, 12th August, 1885.

This form again seems to be rare as compared with *C. pallida*, so that not only does my original suggestion that the latter was a hybrid between *C. erate* and *C. sareptensis* seem to be probable, but also that the intermediate form thus produced is supplanting both the parent stocks.

61. *TERIAS FIMBRIATA* (var. ?).

*Terias fimbriata*, Wallace, Trans. Ent. Soc. ser. 3, vol. iv. p. 323, n. 16 (1867).

♂ ♀, Attock Bridge, Khairabad side, 15th November, 1885.  
 " *Terias asiope* apud de Nicéville, *T. fimbriata* apud Swinhoe; common in October and November."—*J. W. Y.*

This species only differs from typical *T. fimbriata* in the little pronounced subapical brown dash or stria on the under surface of the primaries; and as, in some species, this marking certainly does vary in intensity, it is safer to regard the Campbellpore form as a variety, at any rate until we have proof that the difference of pattern is locally constant.

The following was placed by Major Yerbury under the same number, but with a note of interrogation.

62. *TERIAS IRREGULARIS*.

*Terias irregularis*, Moore, P. Z. S. 1882, p. 253.

♂ ♀, Campbellpore, 9th November, 1885; 13th January, 1886.

63. *TERIAS SUAVA*.

*Terias suava*, Boisduval, Sp. Gén. Léop. i. p. 670. n. 28 (1836).

♂, Campbellpore, 17th June, 1885.

" *Terias rotundularis* (!), a few in June and July."—*J. W. Y.*

64. *TERIAS PURREEA*.

*Terias purreea*, Moore, P. Z. S. 1882, p. 252.

♂, Attock Bridge, 8th November; ♀, Campbellpore, 11th November; Hassan Abdal, 13th October, 1885.

The Campbellpore specimens were mixed up with *T. fimbriata*,



and probably represent the *T. æsiope* of De Nicéville. Major Yerbury says of it, "*Terias rotundularis* not uncommon at Murree and along the hills to Thundiani in September. *T. æsiope* apud Swinhoe."

I think there must be a slight error in the above note, for Col. Swinhoe knows *T. purreea* quite well; at the same time he may have labelled the insect in haste. *T. æsiope* is not known from India.

#### 65. TERIAS HECABE.

*Papilio hecabe*, Linnæus, Mus. Lud. Ulr. p. 249 (1764).

♀, between Abbottabad and Kala Pani, 25th September, 1885.

With this is a male, taken at Bugnoter on the 20th September, and which I think must be a very abnormal specimen of the same species. It wants the black border, and therefore, on the upper surface, resembles *T. excavata*; certainly, with only one example before me, I do not feel justified in separating it.

#### 66. TERIAS EXCAVATA.

*Terias excavata*, Moore, P. Z. S. 1882, p. 252.

♂, Campbellpore, 9th November; ♀, Chuttar, 9th October, 1885.

This species was mixed up with *T. purreea* and *T. fimbriata*.

#### 67. TERIAS VAGANS.

*Terias vagans*, Wallace, P. Z. S. 1866, p. 357. n. 10.

♀, Chuttar, 9th October, 1885.

We previously only possessed males of this species; it has been incorrectly named *T. læta* for Major Yerbury; he says that it is rare, two specimens having been taken at Chuttar on the Murree and Rawal Pindee road. *Terias læta* is a species in which the apical area of the primaries and whole of secondaries on the under surface are of a bright rusty-reddish colour; in the male of *T. vagans* they are lemon-yellow, and in the female of a sericeous creamy-whitish tint; in *T. jægeri* they are flesh-tinted in both sexes.

#### 68. TERACOLUS PROTRACTUS.

*Teracolus protractus*, Butler, P. Z. S. 1876, p. 137, n. 37.

♂ ♀, Chittar Pahar, Lumbahdun, 2000 feet; 28th November, 1885.

The specimens of this species are not perfectly typical, the colouring of the under surface being of a nearly yellow tint instead of flesh-pink; the third black spot of the primaries, in the male specimens, is expanded so as to reach the inner margin, as in the form from Beloochistan and Kutch; but the female has three isolated spots as in the type form.

"A single specimen, Campbellpore, 29th June, 1885; found commonly in the Chittar Pahar near Lumbahdun, Kala Dilli, &c., at the end of November and beginning of December."—J. W. Y.

69. *TERACOLUS FAUSTINUS*.

*Idmais faustina*, Felder, Reise der Nov., Lep. ii. p. 190.

♂ ♀, Campbellpore, 17th and 21st November, 13th December ; and Chittar Pahar, Lumbahdun, 2000 feet, 28th November, 1885.

With a series of each species before one, it is easy to distinguish this from the Turco-Persian *T. fausta* ; it differs in its superior size and more heavily marked primaries on the upperside (which, as Felder says, more nearly resembles the female of *T. fausta* than the male), the much more dusky bases to the wings, blackish body, greyish costa to primaries and interno-basal area to secondaries, altogether duller and darker coloration below, the secondaries being flesh-tinted on basal two fifths and irrorated with grey atoms throughout, the conspicuous clay-coloured spots across the disk, and the white instead of pale sulphur colour of the ventral surface of the abdomen.

70. *TERACOLUS FARRINUS*.

*Teracolus farrinus*, Butler, P. Z. S. 1876, p. 159. n. 112, pl. 7. fig. 2 (1876).

♀, between Tret and Barracoo, Murree and Rawal Pindee road, 9th October ; Attock Bridge, 8th November ; Campbellpore, 14th November, 1885.

This was identified for Major Yerbury as "*T. etrida* ?"

71. *TERACOLUS BIMBURA*.

*Teracolus bimbura*, Butler, P. Z. S. 1876, p. 161. n. 117, pl. 7. figs. 3, 4.

♀, Campbellpore, 27th October ; near Attock Bridge, Khairabad side, 8th November ; ♂, Chittar Pahar, Lumbahdun, 2000 feet, 28th November, 1885.

This and the following are confounded together and labelled doubtfully as *Teracolus etrida*. Major Yerbury says of them :—

"Common in June, July, October, and November. There seem to be Butterflies corresponding to the following species under this number, viz. :—*purus*, *etrida*, *pernotatus*, and *bimbura* ; but I should be doubtful whether, here at any rate, they do not all belong to *T. etrida*. I have taken these small orange-tips at Hassan Abdal ; (single specimen), on the road between Murree and Rawal Pindee near Barracoo (single specimen), near Attock Bridge, Khairabad side (a few), in the Chittar Pahar between Choi and Lumbahdun (very common), neighbourhood of Campbellpore (common)."

Taking specimens in so many localities, it is not surprising that three species should be obtained ; as to their being all one, that is a question only to be decided by most careful breeding ; they differ far more than our three British White Butterflies *Ganoris brassicæ*, *rapæ*, and *napi*, yet there is not the slightest doubt of the distinctness of the latter.

72. *TERACOLUS PURUS*.

*Teracolus purus*, Butler, P. Z. S. 1876, p. 160. n. 113, pl. 7. figs. 14, 15 (1876).

♂, Campbellpore, 26th June and 17th July, 1885.

It is interesting to note that whereas this species was obtained in June and July, *T. farrinus* and *T. bimbura* were caught in October and November; at the same time we have a specimen of *T. farrinus* taken by Col. Swinhoe in July; so that they cannot be regarded as seasonal forms, as seems to be the favourite plan now-a-days with many allied species. The brown colouring of the underside in *T. bimbura* sufficiently distinguishes it from any of its allies to prevent confusion.

73. *IXIAS PYGMÆA*.

*Ixias pygmæa*, Moore, P. Z. S. 1882, p. 254, pl. xii. fig. 1.

♂ ♀, Campbellpore, 17th November and 13th December; ♀, Chittar Pahar, 1500 feet, 1st December, 1885.

"*Ixias*, n. sp. allied to *dharmsalæ*, apud Swinhoe. This *Ixias* is not uncommon near Campbellpore in November; almost all the males taken were caught in this neighbourhood; whilst at Kala Dilli in the Chittar Pahar the females were very common and there were no males. The females were, almost without exception, taken on the same plant (*Croton* sp.?), a plant with spikes of white labiate flowers and broadish dark green leaves. I have taken this species near Campbellpore in the bed of the Haro; near Attock Bridge, Khairabad side, two females; and at Kala Dilli in the Chittar Pahar, all females, very common."—J. W. Y.

The type of this species, from Kangra, is a dwarfed male; a similar one is sent to us by Major Yerbury; the regular size of the species, however, for both sexes is about 59 millim., so that *I. pygmæa* is a misnomer. The species is allied to *I. moulmeinensis*, but differs in the broad inner black border to the orange belt of the male and the bright sulphur-yellow of the female; the absence of the heavy black bordering to the secondaries removes it from the neighbourhood of *I. dharmsalæ*.

74. *BELENOIS AURIGINEA*, sp. n.

♀. Allied to *B. taprobana*, but differing in the whiter colour of the primaries on both surfaces, the almost total absence of the grey basal suffusion on these wings, the more oblique and rather narrower discocellular patch, the narrower external border divided by six indistinct pale spots, the abrupt narrowing of this border (so as to leave only a greyish border on the interno-median area); the secondaries, which are either cream-coloured or ochreous, have a much narrower border with zigzag inner edge and enclose four spots of the ground-colour, the grey veins are similar, but the discocellular vein is only partly blackened and the subapical bar uniting the subcostal branches is represented only by greyish scales; on the under surface the whole disk of primaries is white, and the black and brown markings are all much narrower than in *B. taprobana*, but

the basal and apical areas of primaries and the whole surface of the secondaries are bright ochreous, only a little paler than in that species. Expanse of wings 56 millim.

♀, Campbellpore, 29th and 30th May, 1885.

It is evident that this form is regarded by collectors in India as the spring brood of *B. mesentina*; but, so far as I have been able to ascertain, this is not an ascertained fact, whilst the existence of a species representing it in Ceylon is strong evidence to the contrary.

Though apparently commoner in the North-west Provinces, this form does occur in the East; the male, though very like *B. mesentina* on the upper surface, has the apical area of the primaries and whole surface of secondaries on the underside of a deep cream-colour more or less tinged with chrome-yellow.

#### 75. BELENOIS LORDACA.

*Pieris lordaca*, Walker, Entomologist, v. p. 48.

♂, Campbellpore, 11th June; ♀, Chittar Pahar, 2000 to 3000 feet, 28th November, 1885.

This is the common form of India, of which it is possible that *B. mesentina* may be a variety; the latter, however, differs on the under surface in the great breadth of the brown veins on the apical area of primaries and the whole of secondaries.

"Common in May, June, and July, and again in October and November; a few to be seen in December: the spring brood is much the darkest. The caterpillar feeds on a caper with dark red blossom (*Capparis horrida*?)."—*J. W. Y.*

It is a significant fact that the only male sent to us in this collection should not belong to the dark form supposed to be the spring brood.

#### 76. SYNCHLOE DAPLIDICE.

*Papilio daplidice*, Linnæus, Syst. Nat. i. 2, p. 760. n. 77 (1767).

Campbellpore, 11th and 12th June and 11th July, 1885.

#### 77. GANORIS AJAKA.

*Pieris ajaka*, Moore, P. Z. S. 1865, p. 490. n. 21, pl. 31. fig. 16.

♂ ♀, Murree, 23rd August and 3rd September, 1885.

Rather less strongly marked than usual.

"*Mancipium ajaka* common at Murree in August under the shade of trees."—*J. W. Y.*

#### 78. GANORIS GLICIRIA.

*Papilio gliciria*, Cramer, Pap. Exot. ii. pl. 171. figs. E, F (1779).

♀, Campbellpore, 9th June and 14th November; ♂ ♀, Murree, 15th and 25th August.

"Fairly common, May and June; common, October and November."—*J. W. Y.*

The name of *Mancipium canidium* has been given to Major Yerbury for this species. Now the name *Mancipium* was first employed by Hübner in his 'Tentamen,' the publication of which

is extremely doubtful, and the genus (in any case) was not described in that list of names; if adopted, it should be used in the Stephensian sense (*i. e.* either for *daphidice*, or *cardamines*), and Westwood's action would fix the type as *cardamines*. Secondly, the identification of *Papilio canidia* is doubtful, and would probably apply to two or three species with equal accuracy, and therefore I prefer to give this species the name applied to it by Cramer.

79. *GANORIS NIPALENSIS*.

*Pieris brassicae*, var. *nipalensis*, Gray, Lep. Ins. Nepal, pl. 6. figs. 1 & 3 (1846).

♂, Campbellpore, 22nd and 29th May and 12th June, 1885.

"Common in May, June, July, October, November, December. The cabbages in my garden are covered at the present time (11th January, 1886) with the caterpillars of some white butterfly<sup>1</sup>, and there are some half-dozen chrysalides on the walls of the bungalow; they all probably belong to this species."

80. *EUCHLOË LUCILLA*, sp. nov. (Plate XXXV. fig. 4.)

Allied to *E. charlonia* of Algeria, from which, however, the following characters readily distinguish it:—Wings above gamboge instead of lemon-yellow; the discocellular black patch broader, regular, and quadrate; the apical area browner, and, instead of forming a triangular patch, widely excavated and diffused on its inner edge and truncated at its inferior extremity; the yellow streak across it much as in *E. charlonia*: under surface differing, at a glance, in the absence of the apical grey-green patch of primaries, the yellow instead of grey-green secondaries, the larger pale costal spots, the better marked grey-edged white discocellular spot, and the absence of the pale spots on the median interspaces. Expanse of wings 35 millim.

Campbellpore, 27th May, 1885.

"*Anthocaris charlonia*: rare, only three specimens taken—the first on the 21st May, the second on the 23rd, and the third on the 27th.

"Nos. 1 and 2 were found on the same plant of *Stachys parviflora*, No. 3 taken on the wing about a mile away."—*J. W. Y.*

I can only suppose that the name *A. charlonia* was given by Mr. de Nicéville; yet it would seem strange that a gentleman who claims to be almost an arbiter in questions relating to geographical distribution, should unhesitatingly give the name of an Algerian insect to a species obtained in North-western India.

PAPILIONINÆ.

81. *PAPILIO CLOANTHUS*.

*Papilio cloanthus*, Westwood, Arc. Ent. i. pl. 11. fig. 2 (1841).

Murree, 10th September, 1885 (very ragged).

<sup>1</sup> "Black: dorsal line white or yellow, spiral line yellow; yellowish-green irregular  $\Delta$ -shaped patches speckled with black running up into the black from the spiral lines, but never reaching the dorsal lines; length about two inches."

"Rare: only three specimens taken, end of August and beginning of September."—J. W. Y.

#### 82. *PAPILIO ERITHONIUS*.

*Papilio erithonius*, Cramer, Pap. Exot. iii. pl. 232. figs. A, B (1782).

Campbellpore, 18th October, 1885.

"A few in June and July; common in October and November."

J. W. Y.

The single example sent in the present collection belongs to a rather rare sport of the species, in which the usual orange spots on the under surface are replaced by greyish testaceous spots.

#### 83. *PAPILIO ASIATICUS*.

*Papilio machaon*, var. *asiatica*, Ménétriés, Cat. Mus. Petr., Lep. i. p. 70 (1855).

Campbellpore, 9th July; Murree, 1st October, 1885.

"A few at Campbellpore in June and July; common at Murree in August; found commonly on the lower slopes of Thundiani in September 1885."—J. W. Y.

#### 84. *PAPILIO ARCTURUS*.

*Papilio arcturus*, Westwood, Ann. Nat. Hist. ix. p. 37 (1842).

♂, Murree, 13th August, 1885.

Major Yerbury sends this and the following under the same number, which accounts for the different identifications received by him from Mr. de Nicéville and Col. Swinhoe.

#### 85. *PAPILIO POLYCTOR*.

*Papilio polyctor*, Boisduval, Sp. Gén. Lép. i. p. 205. n. 18 (1836).

♀, between Abbottabad and Kala Pani, 25th September, 1885.

Respecting these two species Major Yerbury says:—"Fairly common at Murree in August; a few seen along the hills as far as Thundiani in September." It would therefore appear that *P. polyctor* is a month later than *P. arcturus*; only the single specimen of the former sent to us is much worn and must have been quite a month on the wing.

### HEPERIIDÆ.

#### 86. *PARNARA MANGALA*.

*Hesperia mangala*, Moore, P. Z. S. 1865, p. 792.

Murree, 8th and 10th September; Thundiani, 24th September; Hassan Abdal, 13th October, 1885.

Major Yerbury has received the names of *P. bada* and *P. beavani* for this species, and he says:—"There are two 'skippers' under this number: both species were common at Murree in August and September." Neither of these species is represented amongst the five examples in this collection, all of which are quite typical *P. mangala*, the row of spots on the secondaries being larger and

more nearly in line than in either of the above-named species. Whether with a large series it will be possible to unite the three forms remains to be seen; so far they hold their own as tolerably constant types. *P. mangala* always has the lowest spot on the primaries larger and more quadrate than in the other two.

#### 87. GEGENES KARSANA.

*Hesperia karsana*, Moore, P. Z. S. 1874, p. 576, pl. 67. fig. 6.

♂, Campbellpore, 21st July, 1885.

"A few in June and July; common in October and November."  
—J. W. Y. As, however, the following is placed under the same number, the later dates probably refer exclusively to it.

#### 88. GEGENES NOSTRODAMUS.

*Hesperia nostradamus*, Fabricius, Ent. Syst. iii. 1, p. 328. n. 246 (1793).

♂, Campbellpore, 29th October; near Attock Bridge, Khairabad side, 15th November, 1885.

The two males now sent are the first Indian examples of *G. nostradamus* that I have seen; it is a tolerably common species in Southern Europe, whereas *G. karsana* appears to be confined to India.

#### 89. PYRGUS EVANIDUS.

*Pyrgus evanidus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 223.

♂, Campbellpore, 31st May, 1885.

"Uncommon; a few seen in June (three specimens taken)."  
—J. W. Y.

### SPHINGIDÆ.

#### 90. HEMARIS SAUNDERSII.

*Sesia saundersii*, Walker, Lep. Het. viii. p. 83. n. 7 (1856).

♂, Murree, October 1885.

"Not uncommon in August and September."—J. W. Y.

This is rather a rare species in European collections: only one of our few specimens is in good condition.

#### 91. MACROGLOSSA STELLATARUM.

*Sphinx stellatarum*, Linnæus, Syst. Nat. i. 2, p. 803. n. 27 (1766).

Murree in September.

"Not uncommon in August and September."—J. W. Y.

#### 92. RHOPALOPSYCHE NYCTERIS.

*Macroglossa nycteris*, Kollar in Hüg. Kaschm. iv. 2, p. 458, p. 19. fig. 5.

Murree in September; Campbellpore, 20th November, 1885.

"Common in August and September."—J. W. Y.

## 93. CHÆROCAMPA ALECTO.

*Sphinx alecto*, Linnæus, Mus. Lud. Ulr. p. 357 (1764).

♀, Murree in August.

"One specimen taken."—J. W. F.

## 94. CHÆROCAMPA CELERIO.

*Sphinx celerio*, Linnæus, Syst. Nat. i. 2, p. 800 (1766).

♂ ♀. Campbellpore in May.

## 95. DEILEPHILA LIVORNICA.

*Sphinx livornica*, Esper, Ausl. Schmett. ii. pp. 87, 196, pl. 8. fig. 4 (1785).

♂ ♀, Campbellpore in May.

## 96. NEPHILA HESPERA.

*Sphinx hespera*, Fabricius, Syst. Ent. p. 546. n. 33 (1775).

♂, Campbellpore, 18th November, 1885.

## Var. MORPHEUS.

*Sphinx morpheus*, Cramer, Pap. Exot. ii. p. 84, pl. 149. fig. D (1779).

♀, Campbellpore, 18th November, 1885.

The differences between these two varieties were supposed at one time to be characteristic of the sexes; but this is not the case, as both sexes occur with and without the silver spots.

## 97. PROTOPARCE ORIENTALIS.

*Protoparce orientalis*, Butler, Trans. Zool. Soc. vol. x. p. 609. n. 21, pl. xci. figs. 16, 17 (1875).

♀, Campbellpore, August 1885.

## LEUCANIIDÆ.

## 98. LEUCANIA EXTRANEA.

*Leucania extranea*, Guénée, Noct. i. p. 77. n. 104.

♀, Campbellpore.

## 99. LEUCANIA COLLECTA.

*Leucania collecta*, Walker, Cat. Lep. Het. ix. p. 105. n. 63 (1856).

Campbellpore, July 1885.

## CARADRINIDÆ.

## 100. CARADRINA SABULOSA.

*Caradrina sabulosa*, Swinhoe, P. Z. S. 1884, p. 516. n. 23, pl. xlvii. fig. 6.

Campbellpore, 5th, 10th, 28th, and 30th July, 1885.

Seven examples were forwarded by Major Yerbury, exhibiting a considerable amount of variation; as a rule they are much better defined in all their markings than in Col. Swinhoe's figure.



## XYLOPHASIIDÆ.

101. *PRODENIA CARADRINOIDES*.

*Laphygma? caradrinoides*, Walker, Cat. Lep. Het. ix. p. 190. n. 8 (1856).

♀, Campbellpore, 27th July, 1885.

The single specimen sent appears to belong to this species, but has been so much knocked about on the journey from Campbellpore as to be only just recognizable: it is quite unfit to put into the collection.

## NOCTUIDÆ.

102. *AGROTIS AVERSA*.

*Agrotis aversa*, Walker, Cat. Lep. Het. x. p. 345. n. 92 (1856).

*Agrotis certificata*, Walker, l. c. Suppl. vol. ii. p. 697 (1865).

*Caradrina trituration?*, Walker, Cat. Lep. Het. x. p. 295. n. 30 (1856).

♂, Murree, 9th August, 1885.

As indicated by the name given to them, Walker's types of *Caradrina trituration* are so much frayed as to be practically unidentifiable; what is left of them, however, indicates close affinity to, if not identity with, *Agrotis aversa*.

103. *AGROTIS ARISTIFERA*.

*Agrotis aristifera*, Guénée, Noct. i. p. 266. n. 426 (1852).

♂, Campbellpore, 30th July, 1885.

104. *AGROTIS SUFFUSA*.

*Phalæna-Noctua suffusa*, Gmelin, ed. Syst. Nat. i. 5, p. 2541. n. 1028.

♀, Kalabagh, 17th September, 1885.

105. *OCHROPLEURA TRIANGULARIS*.

*Ochropleura triangularis*, Moore, P. Z. S. 1867, p. 55.

Murree, 9th August, 1885.

## ACONTIIDÆ.

106. *BANKIA OPELLA*.

*Acontia opella*, Swinhoe, P. Z. S. 1885, p. 456. n. 68, pl. xxvii. fig. 16.

Campbellpore, 6th July, 1885.

107. *XANTHODES INNOCENS*.

*Xanthodes innocens*, Walker, Cat. Lep. Het. xv. p. 1752 (1858).

Campbellpore, 28th July, 1885.

Nearly allied to *X. graellsii* of Europe, but with the curved longitudinal brown stripe on the primaries narrower and greyer; the primaries themselves are also somewhat paler.

## EURHIPIDÆ.

108. *PENICILLARIA EXCITANS*, sp. n.

Allied to *P. geyeri*; of the same size, form, and general pattern, but the whole of the whity-brown markings of primaries and basal two thirds of secondaries altered to snow-white; the testaceous areas replaced by brick-red and the dull brown by pale ash-grey; the collar snow-white excepting at the base, the prothorax edged with white, the thorax reddish, the abdomen greyish towards the base; the under surface white, with black and grey markings instead of pale brown with darker brown markings. Expanse of wings 42 millim.

Bugnoter, September 19th, 1885.

## TOXOCAMPIDÆ.

109. *PLECOPTERA REFLEXA*.

*Plecoptera reflexa*, Guénée, Noct. ii. p. 431. n. 1303.

*Trigonodes? gammoides*, Walker, Cat. Lep. Het. xv. p. 1833 (1858).

*Poaphila? simplex*, Walker, l. c. p. 1840 (1858).

Campbellpore, 26th and 30th July, 1885.

110. *TOXOCAMPA ORIENTALIS*, sp. n.

Allied to *T. lilacina* of Japan; of the same colours and pattern on the upper surface, but considerably larger and with the fringe of secondaries paler; on the under surface the entire external third excepting the fringe is much darker; the costa of primaries from the middle is ochraceous, and the basal two thirds of the secondaries brownish white, with a distinct black discocellular spot and an arched dusky stripe across the disk. Expanse of wings 47 millim.

Murree, 7th August, 1885.

## POLYDESMIDÆ.

111. *PANDESMATA QUENAVADI*.

*Pandesmata quenavadi*, Guénée, Noct. ii. p. 438. n. 1310.

Campbellpore, 30th June, 6th, 7th, and 25th July, 1885.

The specimen last enumerated is unusually dwarfed and dark, but does not appear to differ in any other respect from ordinary examples; it is a little rubbed, and consequently the black markings are partly obliterated, which may account for its being differently numbered by Major Yerbury.

## HOMOPTERIDÆ.

112. *ALAMIS UMBRINA*.

*Alamis umbrina*, Guénée, Noct. iii. p. 4. n. 1321.

Var. *Alamis albicincta*, Guénée, l. c. n. 1322.

Campbellpore, 29th June and 30th July, 1885.

## 113. HOMOPTERA VILIS.

*Homoptera vilis*, Walker, Cat. Lep. Het., Suppl. iii. p. 889 (1865).

Campbellpore, 27th July, 1885.

The single specimen of this species forwarded by Major Yerbury was much damaged in transit.

## OPHIUSIDÆ.

## 114. ACHÆA MELICERTE.

*Phalæna-Noctua melicerte*, Drury, Ill. Ex. Ent. i. p. 46, pl. 23. fig. 1.

Campbellpore, 27th July, 1885.

Also much damaged.

## 115. OPHIUSA ALBIVITTA.

*Ophiusa albivitta*, Guénée, Noct. iii. p. 271. n. 1707.

Campbellpore, July 1885.

A good deal rubbed.

## 116. GRAMMODES STOLIDA.

*Noctua stolidæ*, Fabricius, Sp. Ins. ii. p. 218. n. 54.

♂, Campbellpore, 23rd July, 1885.

## EUCLIDIIDÆ.

## 117. TRIGONODES HYPPASIA.

*Phalæna-Noctua hyppasia*, Cramer, Pap. Exot. iii. p. 99, pl. 250. fig. E (1782).

*Trigonodes compar*, Walker, Cat. Lep. Het. xiv. p. 1451. n. 9 (1857).

Campbellpore, November 1885.

## HYPENIDÆ.

## 118. HYPENA TATORHINA?

*Hypena tatorhina*, Butler, Ill. Typ. Lep. Het. iii. p. 60, pl. lv. fig. 13 (1879).

♂, Kala Pani, 24th September, 1885.

One worn and broken specimen, apparently of this species.

## 119. RHYNCHINA, sp. n.?

Two examples, both broken and therefore unfit for description.

Murree, 9th August; Bugnoter, 19th September, 1885.

This species somewhat resembles "*Hypena antiqualis*."

## PYRALIDÆ.

## 120. AGLOSSA PINGUINALIS.

*Phalæna-Pyralis pinguinalis*, Linnæus, Fauna Succica, p. 1320.

Murree, 15th August, 1885.

121. *SURATTHA ALBIPENNIS*, sp. n.

Allied to *S. invectalis* of Ceylon, but the primaries of a more uniformly pale sandy-brown tint, the belt beyond the middle being only flecked with black and white like the interno-basal area, the outer border of this belt also less abruptly angulated; the external area grey, irrorated with white and with a marginal series of black-tipped fusiform white spots; secondaries white instead of whity brown; abdomen also paler; under surface paler. Expanse of wings 22 millim.

♂, Campellpore, 30th July, 1885.

The genus *Surattha* was also described by Walker under the names *Pindicitora* and *Calarina*; the types belong to one species only.

122. *PYRALIS ELACHIA*?

*Pyralis elachia*, Butler, Ill. Typ. Lep. Het. iii. p. 70, pl. lviii. fig. 3 (1879).

Campbellpore, July; Murree, August 1885.

Two worn examples belonging apparently to this species; they chiefly differ from the type in their slightly darker secondaries.

123. *PYRALIS INCONGRUA*. (Plate XXXV. fig. 5.)

Allied to *P. glaucinalis* and *P. yokohamæ*; of the same size as the latter, but in pattern much nearer to *P. nannodes*; from the latter it only differs in its superior size and the almost perfectly straight, instead of irregular, whitish stripes across the primaries; from *P. glaucinalis* and *P. yokohamæ* it differs in the much greater width between these stripes in addition to their greater regularity: the colouring in all four species is very similar. Expanse of wings 27 millim.

Kala Pani, 24th September, 1885.

## HERCYNIDÆ.

124. *APORODES MELEAGRISALIS*.

*Herbula meleagrisalis*, Walker, Cat. Lep. Het. xvii. p. 324. n. 11 (1857).

Campbellpore, 7th July, 1885.

## ASOPIIDÆ.

125. *SAMEA YERBURII*, sp. n. (Plate XXXV. fig. 6.)

Allied to *S. magna* of Japan; of the same colours, but with whitish-centred discocellular lunules, the whitish patches quite differently arranged and not forming bands: primaries with two patches—the first small and oblong, in the middle of the cell, the second transverse quinquefid, between the end of the cell and the dusky discal line, the latter unequally bisinuate, not sharply angulated as in *S. magna*, less defined and with a pale (not whitish) external edging; veins whitish towards the outer margin; fringe with a

brown-spotted whitish basal line: secondaries with a small white spot in the cell close to the terminal or discocellular lunule; a large irregular quadrifid patch beyond the cell and bounded by the discal stripe, which is similar in character to that of the primaries, the projecting part of this stripe (its anterior half) being bounded by five white lunules; fringe with a white basal line: body of the same golden-glossed smoky-grey tint as the wings, the abdomen with whitish edges to the segments: wings below paler than above, silvery, the secondaries almost white. Expanse of wings 37 millim.

Murree, 7th and 9th August, 1885.

126. *HYMENIA FASCIALIS*.

*Phalæna-Pyralis fascialis*, Cramer, Pap. Exot. iv. pl. 398. fig. O (1782).

Bugnoter, 19th September, 1875.

BOTIIDÆ.

127. *MECYNIA RUSTICALIS*.

*Pyralis rusticalis*, Hübner, Pyral. p. 26. n. 3, pl. 18. fig. 121.

Campbellpore, 5th July, 1885.

SCOPARIIDÆ.

128. *STENOPTERYX HYBRIDALIS*.

*Pyralis hybridalis*, Hübner, Pyral. p. 29. n. 20, pl. 17. fig. 114.

Murree, 2nd August, 1885.

129. *SCOPULA VINCTALIS*.

*Scopula vinctalis*, Walker, Cat. Lep. Het., Suppl. iv. p. 1476 (1865).

Campbellpore, July 1885.

An unusually dark specimen of this widely distributed species.

130. *DOSARA CÆLATALIS*.

*Dosara cælatalis*, Walker, Cat. Lep. Het. xix. p. 829. n. 1 (1859).

Campbellpore, November 1885.

Does not differ from Ceylonese specimens.

131. *UDEA FOTALIS*.

*Scopula fotalis*, Swinhoe, P. Z. S. 1885, p. 875. n. 165, pl. lvii. fig. 9.

Campbellpore, 30th July, 1885.

CHALCOSIIDÆ.

132. *AGALOPE BASALIS*.

*Agalope basalis*, Walker, Cat. Lep. Het. ii. p. 438. n. 1 (1854).

♂, 8th September, 1885.

"Common in September."—*J. W. Y.*

Major Yerbury sent three males of this species ; it is perfectly constant in all its characters, and therefore readily separable from the two north-eastern forms.

#### ZYGÆNIDÆ.

##### 133. ZYGÆNA CASCHMIRENSIS.

*Zygæna caschmirensis*, Kollar in Hüg. Kaschm. iv. p. 459. n. 1, pl. 19. fig. 6.

Murree, 9th August, 1885.

"Common in September."—J. W. Y.

#### ARCTIIDÆ.

##### 134. THYRGORINA, sp. n. ?

One worn specimen, too much injured for description, but apparently new to science.

Murree, 9th August, 1885.

This species should be common, and, even if not, it is so conspicuous an insect that the only wonder is that it should not exist either in the collections of the British Museum or of Mr. F. Moore ; of course it might have been passed by under the impression that it was some common *Spilosoma* or *Aloa*.

#### LITHOSIIDÆ.

##### 135. DEIOPEIA THYTER.

*Deiopeia thyter*, Butler, Trans. Ent. Soc. London, 1877, p. 361. n. 253.

Campbellpore, 5th July, 1885.

"Common in May, June, and July."—J. W. Y.

#### LIPARIDÆ.

##### 136. ARTAXA ANGULIGERA, sp. n.

Primaries above pale ochreous, crossed beyond the middle by a tolerably broad belt of dark-brown scales crossed by yellow veins, and with a rather acute angle on its outer edge within the second median interspace ; a few scales of the same colour near the base and others in spots on the external border : secondaries much paler than primaries, quite white towards costa : body ochreous ; antennæ white, with grey pectinations ; under surface wholly whitish. Expanse of wings 25 millim.

Murree, 9th August, 1885.

##### 137. ARTAXA SCINTILLANS.

*Somena scintillans*, Walker, Cat. Lep. Het. vii. p. 1734 (1855).

♂ ♀ (in coitû), Murree, 12th August, 1885.

The female obtained by Major Yerbury differs from the male considerably—a most unusual thing in this genus. The colouring and pattern more nearly resemble those of *A. limbata* ; from the latter it principally differs in its smaller size and uniformly paler

tint, the abdomen grey instead of blackish, and the marginal spots of the primaries smaller.

138. *CHÆROTRICHE VITELLINA*.

*Liparis vitellina*, Kollar in Hüg. Kaschm. iv. 2, p. 471. n. 4 (1848).

*Euproctis gamma*, Walker, Cat. Lep. Het. vii. p. 1731 (1855).

*Artaxa princeps*, Walker, l. c. Suppl. ii. p. 331 (1865).

Murree, 7th and 9th August, 1885.

139. *PORTHESIA XANTHORRHÆA*.

*Liparis xanthorrhæa*, Kollar in Hügel's Kaschm. iv. 2, p. 470 (1842).

♂ ♀, Campbellpore, 24th June, 1885.

140. *PORTHETRIA OBFUSCATA*.

♂. *Lymantria obfuscata*, Walker, Cat. Lep. Het., Suppl. ii. p. 367 (1865).

♂ ♀, 5th to 11th August, 1885.

The female (which is a cripple) was sent to me, along with its eggs, some time ago; it nearly resembles the female of *P. japonica* excepting that it is smaller. Some of the eggs were hatched about the beginning of May and, by my advice, were placed upon young hawthorn; upon this and upon oak they have since lived, but their growth has, so far, been very slow; at the present time (June 5th) they are in their second moult and measure 11 millim. in length. Dorsal surface slate-grey, with a central series of seven spots commencing on the fourth segment, the fifth of these spots ochreous, the others red; the spots are connected by a slender longitudinal pale line and are bounded on each side by black spots; the subdorsal line is slender and whitish; the sides and ventral surface ash-grey; a lateral series of testaceous tubercles crowned with radiating bristles and connected by a very slender blackish line; tubercles of the second and two last segments very prominent and terminating in very long bristles; legs testaceous; head dark testaceous, the eyes bounded internally by two large fusiform black spots.

*LASIOCAMPIDÆ.*

141. *TRABALA VISHNOU*.

*Gastropacha vishnou*, Lefebvre, Zool. Journ. iii. p. 207.

♂ ♀, Murree, 3rd September, 1885.

"Cocoons very common all along the hills from Murree to Thundiani, August and beginning of September. The males all came out early in September, the females later; the latter appear to remain on their cocoons, as several were taken thus late in September. Cocoon and chrysalis sent."—*J. W. Y.*

The cocoon of *T. vishnou*, which bears some resemblance to a quaint bearded face, is too well known to be worth redescribing here.

142. *CHILENA SIMILIS* ?

*Chilena similis*, Walker, Cat. Lep. Het. v. p. 1071. n. 1 (1855).

♂ ♀, Campbellpore, from cocoon, July 1885.

The pair forwarded to me are very large for this species, but, so far as can be judged from the much rubbed and frayed specimens, there appears to be no difference of pattern.

143. *MEGASOMA VENUSTUM*.

♀. *Megasoma venustum*, Walker, Cat. Lep. Het. vi. p. 1449. n. 6 (1855).

♀, Campbellpore, 20th July, 1885.

## MUSTILIIDÆ.

144. *MUSTILIA COLUMBARIS*, sp. n. (Plate XXXV. fig. 7.)

Pale sandy greyish brown; primaries crossed by two dark greyish lines, the inner one very irregularly sinuated, commencing in a brown costal streak, the second regular, oblique, from inner margin to apex; a brown patch at second third of costa and one or two diffused spots on outer border; a black spot at end of cell: secondaries with one irregularly angulated line beyond the middle; costal area whitish; external area dusky; a black dot at end of cell: head white: under surface uniform pale sandy brown, reddish towards outer margin, a single straight grey line across the wings. Expanse of wings 61 millim.

Murree, 13th August, 1885.

145. *CALIGULA SIMLA*.

*Saturnia simla*, Westwood, Cat. Orient. Ent. p. 41, pl. 20. fig. 1.

Murree, August 1885.

One specimen is labelled as "from chrysalis said to have come from the snows, Cashmere." All the specimens arrived in a more or less shattered condition.

## NOTODONTIDÆ.

146. *ICHTHYURA CUPREATA*, sp. n.

Brownish or dust-grey; primaries darker than secondaries and varied with irregular bands of pale reddish cupreous; the wings crossed by whitish lines forming in large irregular characters the letters VB (left-hand wing); a submarginal series of unequal dust-grey spots is left between the cupreous bands on the disk; secondaries pale towards the base, the costa white; thorax dark grey-brown: under surface pale and without markings. Expanse of wings 28 millim.

Campbellpore, 26th July, 1885.

## DREPANULIDÆ.

147. *ARGYRIA CINEREA*, sp. n. (Plate XXXV. fig. 8.)

Pale dove-grey; primaries darker in the centre; all the wings



with a large rounded testaceous central patch edged with dark grey and flecked with black, whitish, and metallic silver scales; submarginal and marginal leaden-grey lines, with a series of spots of the same colour between them; under surface wholly greyish white. Expanse of wings 33 millim.

Campbellpore, 5th July, 1885.

Quite unique in the genus.

#### URAPTERYGIDÆ.

##### 148. URAPTERYX YERBURI, sp. n.

Nearest to *U. clara*<sup>1</sup> of the N.E. Himalayas, but differing in the more widely separated and greyer bands across the primaries, the more numerous grey striations on the wings, the paler fringes, the red-centred grey spot in the præcaudal angle of the secondaries, and the narrower tail to these wings; the abdomen is white (as it probably is in fresh specimens of *U. clara*). Expanse of wings 56 millim.

Murree, 2nd October, 1885.

#### ENNOMIDÆ.

##### 149. RUMIA MIMULINA, sp. n.

Nearly allied to *R. cratægaria* of Europe, with almost the same pattern and coloration, but usually larger and always with the chocolate-coloured markings, especially the subapical costal spot of primaries, considerably broader; the form of the so-called "reniform" spot also differs somewhat. Expanse of wings 40-43 millim.

Murree, 8th and 12th September, 1885.

This species so singularly resembles the European insect that until I had examined a considerable number of specimens of the latter, and thus completely satisfied myself that no variety approaching the Indian insect ever occurred in *R. cratægaria*, I was tempted to regard the two specimens sent home by Major Yerbury as sports of the latter species: on looking over Mr. Moore's collection, I found a third example of the Indian species, above which (but separated by a label) was placed, for purposes of comparison, a specimen of the European species.

#### OXYDIIDÆ.

##### 150. PYRINIA? PHÆNICO-TÆNIATA.

*Aspilates phænico-tæniata*, Kollar in Hügel's Kaschm. iv. 2, p. 487 (1842).

Murree, 7th August, 1885.

This species is new to the collection; it corresponds so closely with Kollar's description that I have very little doubt as to the correctness of my identification.

##### 151. HYPERYTHRA PHANTASMA.

*Hyperythra phantasma*, Butler, P. Z. S. 1881, p. 614. n. 62.

Campbellpore, 11th November, 1885.

<sup>1</sup> Ill. Typ. Lep. Het. vi. pl. cxiii. fig. 6.

This species, when fresh, is decidedly greenish, and therefore contrasts strongly with the allied *H. swinhoei*, recently captured specimens of which are decidedly reddish.

#### BOARMIIDÆ.

##### 152. *BOARMIA ITERATA*, sp. n.

Near to *B. repandaria* of Europe, the basal area of the wings more or less suffused with grey, all the markings much more strongly defined excepting the pale submarginal stripe, which is indistinct and less perfectly dentate-sinuate; the first and second black lines on the secondaries are also twice the width apart; the under surface is greyish white instead of sandy buff, and the primaries are strongly clouded with blackish. Expanse of wings 41 to 47 millim.

Murree, 24th and 28th August, 4th September; Kala Pani, 24th September, 1885.

*Boarmia iterata* is a common, though unnamed, Indian species; it is allied to *B. pleniferata*, but more nearly to the European insect.

##### 153. *GNOPHOS? OBTECTARIA*.

*Gnophos obtectaria*, Walker, Cat. Lep. Het., Suppl. v. p. 1597 (1866); Butler, Ill. Typ. Lep. Het. vi. p. 66, pl. cxvi. fig. 8 (1886).

♂, Murree, 8th September, 1885.

This species should be separated from *Gnophos*, as the antennæ of the male are distinctly bipectinated; it may perhaps prove to belong to one of the many allied genera already characterized in this family. Only one worn specimen was sent by Major Yerbury.

##### 154. *GNOPHOS? PERLITA*, sp. n.

Allied to *G. obtectaria*: granite-grey, all the ordinary markings on the upper surface indistinct, centre of the wings slightly paler than the remainder of the surface, so as to give the appearance of a diffused band, this in the primaries is partly bounded by an abbreviated zigzag blackish line, and on the secondaries by a series of blackish dots on the veins; there is also a blackish spot at the end of each discoidal cell; the external border is slightly ash-coloured, with a faintly indicated paler zigzag inner edging, the fringe is traversed at the base and in the middle by slender pale lines, and the abdominal fringe is white: below pure white, the wings with black discocellular spots and a broad blackish external border; fringe spotted with white; legs greyish above. Expanse of wings 48 millim.

Kala Pani, 24th September, 1885.

There is a series of this obscure-looking species in Mr. Moore's collection.

##### 155. *GNOPHOS DISPUNCTATA*.

*Gnophos dispunctata*, Walker, Cat. Lep. Het. xxi. p. 469. n. 28 (1869).

Murree, 4th September, 1885.

"A single specimen, sitting with open wings on a rock."—*J. W. F.*

## 156. GNOPHOS VITREATA.

*Scotosia vitreata*, Moore, P. Z. S. 1867, p. 656.

♂, Kala Pani, 24th September, 1885.

The single specimen obtained is greener than those in Mr. Moore's collection, but does not otherwise differ.

## GEOMETRIDÆ.

## 157. JODIS DETRACTA.

*Geometra detracta*, Walker, Cat. Lep. Het. xxii. p. 521. n. 27 (1861).

Campbellpore, 30th July, 1885.

## 158. THALASSODES OPALINA.

*Thalassodes opalina*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 214. n. 38 (1880); Ill. Typ. Lep. Het. vi. p. 70, pl. cxvii. fig. 9 (1886).

Murree, 6th September, 1885.

## IDÆIDÆ.

159. IDÆA ORNATA (local form *I. deliciosaria*, Wlk.).

*Phalæna ornata*, Scopoli, Ent. Carn. p. 219. n. 545.

Murree, 31st August, 1885.

The markings are a little blacker than in the typical European form.

An example of a second species, of this or an allied genus, was found at Murree on 28th August, but as there is only one much broken example I can do nothing with it; it is numbered 29.

## MACARIIDÆ.

## 160. MACARIA SUFFLATA.

*Macaria sufflata*, Guénée, Phal. ii. p. 88. n. 1059, pl. 17. fig. 8 (1857).

Barracoo, near Rawal Pindee, 9th October, 1885.

New to the Museum collection; the description by M. Guénée is much better than his figure, which is decidedly unsatisfactory. The "*Tephрина incessaria*" of Walker is a species of the same group, as also is the "*Epione brongusaria*" of the same author.

## 161. NADAGARA GRISEA.

*Nadagara grisea*, Butler, P. Z. S. 1883, p. 172. n. 140.

Murree, 7th September, 1885.

## FIDONIIDÆ.

## 162. STERRHA SACRARIA.

*Phalæna-Geometra sacraria*, Linnæus, Syst. Nat. i. 2, p. 863. n. 220.

Murree, 8th, 11th, and 12th August; Campbellpore, 30th October, 1885.

163. *PHYLETIS HERBICOLENS*, var.

*Delocharis herbicolens*, Butler, P. Z. S. 1883, p. 173. n. 141.

♀, Murree, 6th September, 1885.

Differs from the type in its pale greenish-grey, instead of pinky-white tint, with the bands more distinctly green instead of brown. It is allied to *P. silonaria*, and the variation here described seems to be the prevalent type of colouring in the males of this genus.

164. *PHYLETIS INCONSPICUA*, sp. n.

♂. Evidently allied to *P. meonaria*. Brownish grey; the primaries crossed at basal third by an indistinct brown line, beyond the cell by a brown-edged band, and at the outer margin by a border of the same width as the band: secondaries with the costal area and base pale buff, a brown discal line parallel to outer margin and a slender blackish marginal line; all the wings with black discocellular dots; fringes plum-coloured at base and testaceous at the tips: thorax grey, antennæ and abdomen testaceous: wings below pale buff suffused with rose-red, crossed beyond the middle by a darker, slightly arched line; fringes grey at base, pink at tips; a black discocellular dot in all the wings; primaries with greyish discoidal area: body below pale buff tinted with pink. Expanse of wings 32 millim.

Murree, 30th August, 1885.

The relative number of lines across the wings differs wholly from that of *P. meonaria*, but the colouring seems very similar.

*EPIFIDONIA*, gen. nov.

Allied to *Fidonia* (*F. concordaria*<sup>1</sup>); differing in its more slender body, less hairy palpi, more slender and less hairy legs, acute sub-falcate primaries, the much longer discoidal cells in all the wings, and in the less angular discocellulars of the secondaries.

<sup>1</sup> *F. concordaria* is a yellow-winged species similar to those of New Zealand. Mr. Meyrick, whose study of the Geometrina appears to have commenced with a Catalogue of the New-Zealand species, has proposed for some of these yellow-winged species the generic name *Panthea*, a name used five times previously in Zoology. In his opinion the supposed new genus is nearly allied to *Larentia*, whereas the whole structure of the body is totally dissimilar: the form and neururation of the wings bear no near relationship to those of *Larentia*; in the latter genus the wings are delicate, thinly scaled, much elongated, the veins lying close together, the cells prolonged towards the median vein, the second and third median branches and the radial of secondaries equidistant at their origins, whereas in the New-Zealand *Fidonia* the radial is halfway between the median and subcostal veins. These points should be considered in conjunction with the different structure of the antennæ, palpi, legs, and, in fact, whole body, which, however, Mr. Meyrick considers beneath his notice, basing his classification solely upon neururation, which he indeed believes to have been modified to suit the altered shape of the wings; yet, with singular inconsistency, he states that "the shape of the wing, often employed by superficial observers, is not of the least value, being purely specific."

165. *EPIFIDONIA SIGNATA*, sp. n. (Plate XXXV. fig. 9.)

Chocolate-brown; costa and discoidal area of primaries and centre of secondaries more or less suffused with ochraceous, the costal area of the latter wings, excepting at apex, widely bright ochreous; wings striated throughout with black, the primaries crossed in the middle by two well-separated blackish stripes, angulated towards costal margin; an oblique snow-white subcostal spot near apex; secondaries with a double blackish line from centre of abdominal margin to discoidal cell: body greyish: wings below bright ochreous with broad dark-brown tapering apical borders and a number of scattered black striations; primaries with a discal abbreviated band commencing below the white subapical spot; two central black lines; secondaries with an ill-defined central black line; pectus whitish, venter ochraceous. Expanse of wings 29 millim.

Murree, 2nd, 9th, and 28th August, 1885.

## ZERENIDÆ.

166. *ABRAXAS FUSCESCENS*, sp. n. (Plate XXXV. fig. 10.)

Primaries whity brown, speckled and mottled with blackish; base of costa ochreous; two widely separated divergent bands of spots, formed by blackish mottling, limiting the central area; a spot of a similar character on the costa just beyond the middle, an oblique oval spot at the end of the cell, and a spot immediately beyond the outer band at centre of second median interspace: secondaries sericeous creamy white, sparsely speckled with dark grey; a spot at the end of the cell and a slightly sinuous discal series of the same colour: head, collar, and tegulæ ochreous spotted with black, remainder of body cream-coloured with dorsal black spots: primaries below paler than above, the costa slightly ochraceous; body below yellowish cream-coloured, the venter with four series of black spots. Expanse of wings 48 millim.

Kalabagh, 16th September, 1885.

167. *ABRAXAS VIRGINALIS*, sp. n. (Plate XXXV. fig. 11.)

Wings above pure white; base of primaries ochreous, dotted with black and bounded by an irregular series of brownish dots; an imperfect band at basal fourth and the costa mottled with pale silver-grey; an annulus of the same colour closing the cell; two contiguous sinuous series of annular silver-grey spots across the disk, the inner series with black-dotted ochreous centres; an ochreous streak partly connecting the two series between the third median branch and the inner margin; three larger grey spots and a number of scattered annular dots beyond the discal series; six ocelloid marginal spots extending into the fringe: secondaries almost exactly as in *A. pantaria*; body paler than in the latter species: under surface of wings more strongly marked than above, but without the ochreous tinting. Expanse of wings 44 millim.

Murree, 13th August, 1885.

LARENTIIDÆ.<sup>1</sup>

## 168. MELANTHIA RESTITUTA.

*Melanippe restitutata* (sic), Walker, Cat. Lep. Het. xxv. p. 1297 (1862).

Campbellpore, July; Murree, 2nd August, 1885.

The *Melanthia gratulata* of Walker, from Vancouver, is Packard's *Rheumaptera brunneicillata*.

## 169. SCOTOSIA DUBIOSATA.

*Scotosia dubiosata*, Walker, Cat. Lep. Het. xxv. p. 1352. n. 21 (1862).

Murree, 8th September; Bugnoter, 19th September, 1885.

"Not uncommon."—J. W. Y.

## 170. SCOTOSIA VENIMACULATA.

*Scotosia venimaculata*, Moore, P. Z. S. 1867, p. 657.

Thundiani, 24th September, 1885.

The single specimen sent is of a greyish-brown tint, with a pale golden or bronze gloss; it shows no trace of the rosy suffusion commonly seen on the wings of Darjiling specimens; all the markings are, however, identical, and it is possible that the absence of the reddish colouring may be due to fading or to individual variation.

## 171. CIDARIA PERPULCHRA, sp. n.

Allied to *C. aurata* and *C. aliena*; nearest to the former, but differing in the dark-grey instead of copper-brown basal area of the primaries, the much more irregular band following it, owing to the different form of the dark postmedian belt; the latter (which is blackish grey instead of brown) commences transversely instead of obliquely, is deeply bisinuated, and forms an angle at the median vein, it is wider than in *C. aurata* as far as the second median branch, and its anterior edge, instead of being narrowly incised on the lower radial interspace, is cleft so as to form a wide >-shaped incision; the external border is much less rufous and the pale markings upon it are paler and of twice the width; the secondaries are almost white instead of pale grey-brown; the series of silver spots on the under surface of the secondaries is wanting. Expanse of wings 29 millim.

Murree, 8th August, 1885.

This species in coloration more nearly resembles *C. corylata* than either of the two others of the same group.

## 172. CIDARIA JAMEZA?

*Cidaria jameza*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. i. p. 452 (1878); Ill. Typ. Lep. Het. iii. p. 58, pl. lv. fig. 9 (1879).

Murree, 20th August, 1885.

The single worn specimen in the collection is rather larger than Japanese examples, but I can discover no other difference.

<sup>1</sup> The collection contains a *Eupithecia*, but it is too much worn for identification.

173. *CIDARIA ALBIGIRATA*?

*Cidaria albigirata*, Kollar in Hügel's Kaschm. iv. 2, p. 489 (1848).

Murree, 12th August, 1885.

This agrees tolerably closely with Kollar's description, but his statement that it belongs to the neighbourhood of *Cidaria prunata* and *suffumata* is misleading, if this be his species, since it is closely allied to the European *C. picata*, and decidedly more closely than to either of the above-mentioned insects; it occurs also in Afghanistan.

174. *PHIBALAPTERYX*, sp. n.?

A single specimen, much faded, worn, and without any antennæ or palpi, apparently of a new species.

Bugnoter, 19th September, 1885.

## CRAMBIDÆ.

175. *JARTHEZA CHRYSOGRAPHELLA*.

*Chilo chrysographellus*, Kollar in Hügel's Kaschm. ix. p. 494 (1848).

Campbellpore, 30th July, 1885.

176. *APURIMA XANTHOGASTRELLA*.

*Apurima xanthogastrella*, Walker, Cat. Lep. Het. xxvii. p. 194. n. 1 (1863).

Campbellpore, 28th July, 1885.

## TORTRICIDÆ.

177. *CERACE TETRAONIS*, sp. n.

Primaries above black, regularly dotted with pale yellow; costal border crossed by numerous short yellow striæ; a longitudinal sub-costal bright red stripe from base to outer margin: secondaries with the discoidal cell and costal area nearly to apex bright orange ochreous, remainder of the wing black; five black costal spots; an ochreous apical spot; abdominal third of wing spotted all over with ochreous: body blackish, head and collar spotted with yellow, abdomen with ochreous margins to the segments: primaries below without yellow dotting, the red stripe replaced by an ochreous patch filling the discoidal cell and a spot on outer margin; the yellow colouring on the secondaries paler than above, otherwise similar; body below whitish. Expanse of wings 28 millim.

Murree, 28th August, 1885.

Allied to *C. onustana* of Nepal.

## CHOREUTIDÆ.

178. *TEGNA HYBLÆELLA*.

*Tegna hyblæella*, Walker, Cat. Lep. Het., Suppl. v. p. 1810 (1866).

Campbellpore, 20th July, 1885.



J.G. Keulemans del.

Hanhart imp.

PHOENICOPTERUS JAMESI.



## EXPLANATION OF PLATE XXXV.

- Fig. 1. *Azanus uranus*, p. 366.  
 2. *Tarucus extricatus*, p. 366.  
 3. *Spindasis hypargyros*, p. 369.  
 4. *Euchloë lucilla*, p. 376.  
 5. *Pyralis incongrua*, p. 383.  
 6. *Samea yerburii*, p. 383.  
 7. *Mustilia columbaris*, p. 387.  
 8. *Argyria cinerea*, p. 387.  
 9. *Epifidonia signata*, p. 392.  
 10. *Abraxas fuscescens*, p. 392.  
 11. — *virginalis*, p. 392.

9. List of a Collection of Birds from the Province of Tarapacá, Northern Chili. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 25, 1886.]

(Plate XXXVI.)

Mr. H. Berkeley James, F.Z.S., has placed in my hands for determination a collection of bird-skins made for him by Carlos Rahmer, of the National Museum, Santiago, in the province of Tarapacá, formerly in Peru, but now, I believe, annexed to Chili. The collection, which was made in January and February last, contains 150 skins referable to 53 species, amongst which a new Flamingo, as I shall presently point out, is of special interest.

The nearest fauna to Tarapacá that has received much attention is that of the Desert of Atacama just to the south, which was explored in 1853-4 by Dr. R. A. Philippi, of Santiago<sup>1</sup>. Prof. Philippi's list of birds contains 33 species, only 11 or 12 of which are identical with those in the present collection.

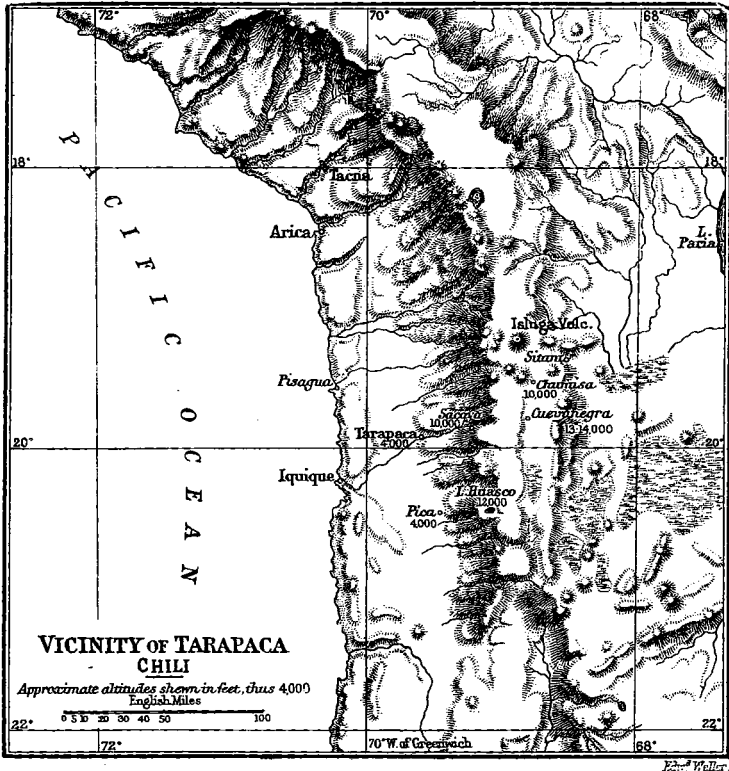
But our leading authority on the Birds of Peru, of which Republic the district of Tarapacá until lately formed part, is Taczanowski's 'Ornithologie du Pérou.' I have, therefore, referred throughout to this most useful work except in the case of the following seven species, which are not included by Taczanowski, and are therefore additions to his avifauna, namely:—*Sycalis aureiventris*, *Upucerthia ruficauda*, *Synallaxis modesta*, *Bolborhynchus orbignesi*, *Phenicopterus jamesi*, *Fulica leucoptera*, and *Ægialitis occidentalis*. Of these seven, one (*Bolborhynchus orbignesi*) was hitherto only known from Bolivia; two, so far as is yet ascertained, are peculiar to Tarapacá (namely *Phenicopterus jamesi* and *Ægialitis occidentalis*), and the remaining four are Chilean species not hitherto recorded so far north.

The species in the present collection from Tarapacá which have not yet been met with in Chili are 20 in number, namely:—*Turdus*

<sup>1</sup> 'Reise durch die Wüste Atacama,' &c. v. Dr. R. A. Philippi: Halle, 1860.

*chiguanco*, *Phrygilus plebeius*, *Chrysomitris atrata*, *Sycalis uropygialis*, *Muscisaxicola albifrons*, *Centrites oreas*, *Cinclodes bifasciatus*, *Bolborhynchus orbignesi*, *Phoenicopterus andinus*, *P. jamesi*, *Metriopelia aymara*, *Chamaepelia cruziana*, *Gymnopenia erythrothorax*, *Gallinula galeata*, *Fulica gigantea*, *F. ardesiaca*, *Vanellus resplendens*, *Aegialitis occidentalis*, *Recurvirostra andina*, and *Tinamotis pentlandi*.

Fig. 1.



The sketch now exhibited (fig. 1) will show most of the different places in which the collection was formed.

#### 1. *TURDUS CHIGUANCO*, d'Orb. et Lafr.

*Turdus chiguanco*, Seebohm, Cat. Birds B. M. v. p. 225; Sel. et Salv. P.Z. S. 1867, p. 984 (Islay).

*Merula chiguanco*, Tacz. Orn. Pér. ii. p. 494.

Sibaya. One ♀: iris brown; feet and beak yellow.

Obtained by Whitely near Islay, Peru, in 1867.

2. *ANTHUS*, sp. inc.

Sacaya. One ♂ : iris brown ; feet brown ; beak dark horn-colour.

A young bird, nearest to *A. furcatus*, d'Orb. et Lafr. (Tacz. Orn. Pér. i. p. 459).

3. *ATTICORA CYANOLEUCA* (Vieill.).

*Atticora cyano-leuca*, Sharpe, Cat. Birds B. M. x. p. 186 ; Tacz. Orn. Pér. i. p. 244.

Huasco. One ♀ : iris brown ; legs brown ; feet black.

4. *PHRYGILUS ATRICEPS* (d'Orb. et Lafr.).

*Emberiza atriceps*, d'Orb. et Lafr. Syn. Av. i. p. 76.

*Phrygilus atriceps*, Tacz. Orn. Pér. iii. p. 34.

Sacaya and Lalcalhuay.

5. *PHRYGILUS UNICOLOR* (d'Orb. et Lafr.).

*Emberiza unicolor*, d'Orb. et Lafr. Syn. Av. i. p. 79.

*Phrygilus unicolor*, Scl. et Salv. Nomencl. p. 31.

*Phrygilus rusticus*, Tacz. Orn. Pér. iii. p. 38.

Huasco. One ♂ : iris dark brown.

6. *PHRYGILUS PLEBEIUS*, Tsch.

*Phrygilus plebeius*, Scl. et Salv. Nomencl. p. 31 ; Tacz. Orn. Pér. iii. p. 39.

Huasco, Sitana, and Lalcalhuay.

7. *PHRYGILUS FRUTICETI* (Kittl.).

*Phrygilus fruticeti*, Scl. et Salv. Nomencl. p. 31 ; Tacz. Orn. Pér. iii. p. 37.

Sibaya. One ♂ : iris dark brown ; feet yellowish.

8. *CHRYSOMITRIS ATRATA* (d'Orb. et Lafr.).

*Chrysomitris atrata*, Scl. et Salv. Nomencl. p. 34 ; Tacz. Orn. Pér. iii. p. 53.

Huasco and Sacaya. Iris very dark brown.

9. *SYCALIS UROPYGIALIS* (d'Orb. et Lafr.).

*Sycalis uropygialis*, Scl. Ibis, 1872, p. 47 ; Tacz. Orn. Pér. iii. p. 58.

Huasco and Sitana. Three examples, ♂ et ♀ : sexes alike.

10. *SYCALIS AUREIVENTRIS*, Ph. et Landb.

*Sycalis aureiventris*, Scl. Ibis, 1872, p. 47, pl. iii.

Chumisa. One ♀ : iris dark brown.

11. *MUSCISAXICOLA ALBIFRONS* (Tsch.).

*Muscisaxicola albifrons*, Tacz. Orn. Pér. ii. p. 209.

Sacaya. One ♀ : iris dark brown ; feet and beak black.

12. *MUSCISAXICOLA RUFIVERTEX*, d'Orb. et Lafr.*Muscisaxicola rufivertex*, Tacz. Orn. Pér. ii. p. 216.

Huasco. ♂ et ♀ : iris bright brown ; bill and feet black.

13. *CENTRITES OREAS*, Scl. et Salv.*Centrites oreas*, Tacz. Orn. Pér. ii. p. 222.

Sacaya. One ♂ : iris very dark brown ; feet and beak black.

14. *GEOSITTA CUNICULARIA* (Vieill.).*Geositta cunicularia juninensis*, Tacz. Orn. Pér. ii. p. 93.

Sacaya and Sitana. ♂ et ♀, alike : iris dark brown ; feet black ; beak horn-colour.

15. *UPUCERTHIA RUFICAUDA* (Meyen).*Ochetorhynchus ruficaudus*, Scl. P. Z. S. 1867, p. 324.*Upucerthia ruficauda*, Scl. et Salv. Nomencl. p. 62 ; iid. P. Z. S. 1879, p. 619.

Lalcalhuay. ♂ : iris brown ; feet and beak black.

16. *CINCLODES BIFASCIATUS*.*Cinclodes bifasciatus*, Scl. P. Z. S. 1858, p. 448 ; Tacz. Orn. Per. ii. p. 3.*Upucerthia atacamensis*, Phil. Reise d. d. Wüste Atacama, p. 161, t. iii.

Chumisa, Sacaya, and Sibaya. Males : iris dark brown ; feet and beak black.

17. *CINCLODES FUSCUS* (Vieill.).*Cinclodes fuscus*, Scl. et Salv. P. Z. S. 1867, p. 985.*Cinclodes rivularis*, Tacz. Orn. Pér. ii. p. 112.

Chumisa, Cueva negra, and Sacaya. Iris brown ; feet black.

18. *LEPTASTHENURA ÆGITHALOIDES* (Kittl.).*Leptasthenura ægithaloides*, Tacz. Orn. Pér. ii. p. 120.

Huasco. Iris dark brown.

19. *SYNALLAXIS MODESTA*, Eyton.*Synallaxis modesta*, Scl. P. Z. S. 1874, p. 23.

Sacaya and Sitana. Two ♂ et ♀ : iris dark brown.

20. *OREOTROCHILUS LEUCOPLEURUS*, Gould.*Oreotrochilus leucopleurus*, Tacz. Orn. Per. ii. p. 278 ; Gould, Mon. Troch. ii. pl. 71.

Chumisa and Lalcalhuay. Two females, with nest and eggs.

The nest consists of an oblong mass of grey and brown wool (apparently Llama's), with a few bits of moss intermixed. It is pointed at the lower extremity. In a shallow open depression are two white pyriform eggs ; they measure about 0·7 by 0·45 inch.

21. *BOLBORHYNCHUS ORBIGNESIUS*.

*Myiopsitta orbignesia*, Bp. Rev. et Mag. de Zool. 1854, p. 151.

*Bolborhynchus orbignesi*, Scl. et Salv. P. Z. S. 1879, p. 635.

*Bolborhynchus d'orbigni*, Finsch, Papag. ii. p. 129.

Lalcalhuay. Males and females: sexes alike; iris dark brown.

These specimens agree with Bolivian skins of this little-known species.

22. *BUTEO ERYTHRONOTUS* (King).

*Buteo erythronotus*, Tacz. Orn. Pér. i. p. 115.

Lalcalhuay. ♀: iris brown; feet yellow.

23. *MILVAGO MEGALOPTERUS* (Meyen).

*Milvago megalopterus*, Tacz. Orn. Pér. i. p. 101.

Sitana. ♂: iris brown; feet yellow.

24. *ARDEA CANDIDISSIMA* (Gm.).

*Ardea candidissima*, Tacz. Orn. Pér. iii. p. 393.

Sitana. ♂: iris yellow; feet black.

25. *PHÆNICOPTERUS ANDINUS*, Philippi.

*Phœnicopterus andinus*, Philippi, Reise d. d. Wüste Atacama, p. 164, tt. iv., v.; Tacz. Orn. Pér. iii. p. 423.

Huasco. Two females, in full plumage. "Iris very dark brown; feet whitish yellow; beak, fore part black, hind part whitish yellow; between the nostrils brick-red; lowest hinder part of lower mandible and a small spot before the eyes violet."

An egg is of a uniform chalky white, with irregular adherent chalky layers, as in some Cormorants' eggs. It measures 3·6 by 2·1 inches, and is only slightly more pointed at the small end.

26. *PHÆNICOPTERUS JAMESI*, sp. nov. (Plate XXXVI.)

*Ph. albus, capite colloque superiore et alis extus roseo indutis; cervicis undique, dorsi superioris et pectoris plumarum apicibus cum scapularibus et secundariis externis elongatis et subalaribus sanguineo-rosaceis; remigibus nigerrimis; subalaribus longis sanguineis; pedibus rubris; rostri basi flava, apice nigra; loris nudis in pelle carneis; digito postico nullo: long. tota circ. 36·0, alæ 16·0, caudæ 6·5, tarsi 8·0.*

*Hab.* in Andibus, prov. Tarapacensis.

*Obs.* A *Ph. andino* cui pedibus tridactylis affinis, forma et pictura rostri, scapularibus et secundariis productis, et pedibus rubris sanè diversus.

An adult male in full dress and a male and female not in full dress of this new species of three-toed Flamingo were obtained by Rahmer at Sitana, at a height of about 12,000 feet, at the foot of the Volcano Tsluga. In a letter announcing this discovery, Mr. Rahmer has proposed to call the species "*jamesi*," a name which I adopt with great pleasure.

There can be no question about the distinctness of this species from *P. andinus*. Besides the differences specified above, the conformation of the bill is of itself sufficient to render *Ph. jamesi* distinct in all ages. As will be seen by the sketches now exhibited (figs. 2

Fig. 2.

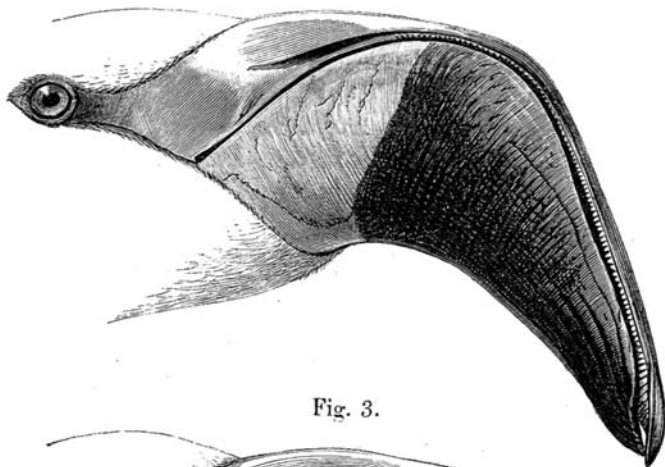


Fig. 3.

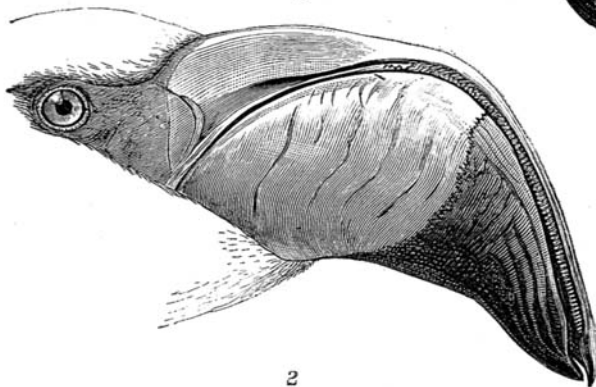
 $\frac{2}{3}$ 

Fig. 2. Bill of *Ph. andinus*.  
Fig. 3. Bill of *Ph. jamesi*.

and 3), the bill is much shorter and smaller in *Ph. jamesi*, the naked space at the lores wider and differently shaped, and the upper mandible is much narrower. The very different disposition of the colours will be likewise seen from the figures. In *P. jamesi* the terminal black portion is much smaller, and is succeeded by an

orange-yellow which occupies the whole basal portion, while the narrow rim at the front, the lores, and the naked skin round the eye are red, in life (according to Rahmer) "carmine." There is besides a red spot terminating the yellow at the front of the upper mandible. In *P. andinus* the black terminal portion is much more extended; this is succeeded by a pale or "whitish yellow" base; and the part between the nostrils is "brick-red." The lower part of the gonys next to the feathering and the narrow naked lores are in the skin of a flesh-colour, in life "violet."

In *P. jamesi* the legs are red, in life "carmine;" in *P. andinus* "whitish yellow."

In *P. jamesi*, as will be seen in the figure (Plate XXXVI.), the external secondaries are elongated into filiform plumes, which extend, when the wing is closed, as much as two inches beyond the primaries, and scapularies are similarly lengthened. Both these sets of plumes are of a bright rosy red. This is also apparent in the two younger specimens of *P. jamesi*, but nothing of the sort appears to take place in *P. andinus*.

## 27. BERNICLA MELANOPTERA (Eyton).

*Bernicla melanoptera*, Tacz. Orn. Pér. iii. p. 467.

Sacaya. One adult and two nestlings: iris dark brown with a white rim; feet carmine.

## 28. ANAS CRISTATA, Gm.

*Anas cristata*, Tacz. Orn. Pér. iii. p. 473.

Sitana, Sacaya, and Huasco. Examples of both sexes: "iris orange." A series of eight eggs are of the usual colour of Ducks' eggs, a pale fulvous white; they measure about 2·6 by 1·7 inch.

## 29. QUERQUEDULA CYANOPTERA (Vieill.).

*Querquedula cyanoptera*, Tacz. Orn. Pér. iii. p. 475.

Sitana and Sacaya. Examples of both sexes: iris orange.

## 30. QUERQUEDULA OXYPTERA (Meyen).

*Querquedula oxyptera*, Scl. et Salv. P. Z. S. 1876, p. 385; Tacz. Orn. Pér. iii. p. 477.

Sitana, Sacaya, Huasco, and Lalcachuay. Males and females: iris dark brown. Ten eggs of this Duck accompany the skins; they are duller and smaller than those of *Anas cristata*, and measure about 2·3 by 1·5 inch.

## 31. QUERQUEDULA PUNA (Tsch.).

*Querquedula puna*, Tacz. Orn. Pér. iii. p. 478; Scl. et Salv. Ex. Orn. pl. xcix.

Sitana and Sacaya. Examples of both sexes: "iris brown."

Five eggs are larger and more pointed than those of *Q. oxyptera* and of a pale fulvous white. They measure about 2·3 by 1·75 inch.

32. *DAFILA SPINICAUDA* (Vieill.).

*Dafila spinicauda*, Tacz. Orn. Pér. iii. p. 481.

Sitana. A pair: "iris brown."

33. *METRIOPELIA MELANOPTERA* (Gm.).

*Metriopelia melanoptera*, Tacz. Orn. Pér. iii. p. 239.

Lalcalhuay. A ♂: "iris dark blue; feet black."

34. *METRIOPELIA AYMARA* (d'Orb.).

*Metriopelia aymara*, Tacz. Orn. Pér. iii. p. 240.

Huasco and Sitana. Examples of both sexes: iris black or very dark brown; feet flesh-coloured.

35. *MELOPELIA MELODA* (Tsch.).

*Melopelia meloda*, Tacz. Orn. Pér. iii. p. 241.

Pica. A single specimen: "iris brown; feet carmine; beak black."

36. *CHAMÆPELIA CRUZIANA* (d'Orb.).

*Chamæpelia cruziana*, Tacz. Orn. Pér. iii. p. 248.

Pica. Examples of both sexes: "iris dark red, with white rim; feet brick-red."

37. *GYMNOPELIA ERYTHROTHORAX* (Meyen).

*Gymnopelia erythrothorax*, Tacz. Orn. Pér. iii. p. 249.

Sibaya. A young male: "iris light blue; feet flesh-colour; naked skin round the eye orange."

38. *GALLINULA GALEATA* (Licht.).

*Gallinula galeata*, Tacz. Orn. Pér. iii. p. 327.

Sitana. A single skin: "iris brown."

39. *FULICA GIGANTEA*, Eyd. et Soul.

*Fulica gigantea*, Tacz. Orn. Pér. iii. p. 329.

Cueva negra near Sacaya. Four examples, all females: "iris red-brown; feet dark brickdust-red; bill red-brown, with the ridge and point white, and a spot on each side yellow."

Two eggs of this species are of the usual character of this group: they are of a pale stone-colour, sparingly spotted and speckled with two shades of reddish grey, and measure about 2·8 by 1·8 inch.

40. *FULICA ARDESIACA*, Tsch.

*Fulica ardesiaca*, Tacz. Orn. Pér. iii. p. 328; Scl. et Salv. Ex. Orn. pl. lvii.

Huasco. Examples of both sexes, alike: "iris brown-red; feet yellowish green; joints and edges of toes greyish; bill with the ridge and borders of mandible white, the point yellowish green, and a spot near nostrils yellow; blaze chocolate."



41. *FULICA LEUCOPTERA*, Vieill.

*Fulica leucoptera*, *Scl. et Salv. Ex. Orn.* p. 119, pl. lx.

*Fulica chloropoides*, *Landb. Wieg. Arch.* 1862, pt. i. p. 218.

*Fulica stricklandi*, *Hartl. J. f. O.* 1853, Extrah. p. 86.

Huasco. One ♀ : "iris red-brown ; feet and bill yellowish green ; ridge of bill white ; spot near nostrils yellow ; spot above the beak chocolate."

42. *VANELLUS RESPLENDENS* (Tsch.).

*Vanellus resplendens*, *Tacz. Orn. Pér.* iii. p. 336.

Sitana and Sacaya. Three males, two females ; sexes alike : iris carmine ; beak and feet carmine ; point of beak black.

Neither Tschudi nor Taczanowski appear to have noted that there is no hind toe in this species.

43. *ÆGIALITIS OCCIDENTALIS*, Cab.

*Ægialitis occidentalis*, *Cab. J. f. O.* 1872, p. 158, et 1885, pl. vi. fig. 1 (head).

Sitana, Huasco, and Cueva negra. Examples of both sexes : "iris brown ; feet black."

Mr. Seebohm has kindly determined these specimens, and sends me the subjoined remarks :—

"Although Cabanis gives no locality, nor mentions the colour of the legs and feet, there can be no doubt that his name refers to this species. He says it is a larger bird than *Æ. nivosus*, but like it has white lores. He also refers to the rusty hind head and neck.

"It appears to be the South-American representative of *Æ. ruficapillus*, which inhabits the coasts of Australia, Tasmania, and occasionally New Zealand."

44. *OREOPHILUS RUFICOLLIS* (Wagl.).

*Oreophilus ruficollis*, *Tacz. Orn. Pér.* iii. p. 347.

Lalcalhuay. One ♂ : iris dark brown ; bill black ; feet carmine.

45. *THINOCORUS ORBIGNYANUS*, Less.

*Thinocorus orbignyanus*, *Tacz. Orn. Pér.* iii. p. 281.

Sacaya. Examples of both sexes : iris brown ; bill horn-colour ; feet yellow.

Three eggs are much pointed, and call to mind those of the *Grallæ* : they are of a shining buffy white, finely speckled with greater and lesser black and blackish specks, and measure about 1·5 by 1·1.

46. *PHEGORNIS MITCHELLI*, Fraser.

*Leptopus mitchelli*, *Fraser, P. Z. S.* 1844, p. 157.

*Phegornis mitchelli*, *Tacz. Orn. Pér.* iii. p. 372.

Sitana. One ♂ : "iris dark brown, almost black ; feet yellowish ; beak black."

A scarce bird, originally described from Chili, where Philippi says it is found on the high Cordillera of the Central Provinces<sup>1</sup>. The same naturalist also obtained it near Rio Frio in the desert of Atacama (Reise d. d. Wüste Atacama, p. 163). Jelski met with it on the Lake of Junin, Central Peru.

47. *RECURVIROSTRA ANDINA*, Ph. et Landb Wieg. Arch. 1863, pt. i. p. 131; Harting, Ibis, 1874, p. 257, pl. ix.

Three examples of this scarce bird from Huasco. "Iris orange with a yellow rim; legs bluish grey; beak black."

48. *TRINGA MACULATA*, Vieill.

*Tringa maculata*, Tacz. Orn. Pér. iii. p. 356.

Huasco. "Iris light brown."

49. *TRINGA BAIRDI* (Coues).

*Tringa bairdi*, Tacz. Orn. Pér. iii. p. 359.

Huasco, Sacaya, and Cueva negra. "Iris dark brown."

50. *GAMBETTA MELANOLEUCA* (Vieill.).

*Totanus melanoleucus*, Tacz. Orn. Per. iii. p. 365.

Sitana.

51. *GAMBETTA FLAVIPES* (Gm.).

*Totanus flavipes*, Tacz. Orn. Pér. iii. p. 367.

Sacaya.

52. *LARUS SERRANUS*, Tsch.

*Larus serranus*, Tacz. Orn. Pér. iii. p. 452.

Huasco, Sitani, and Cueva negra. Examples of both sexes: "iris dark brown; bill and feet dark brown-red."

53. *TINAMOTIS PENTLANDI*, Vig.

*Tinamotis pentlandi*, Tacz. Orn. Pér. iii. p. 310.

Huasco. One ♂: "iris chocolate; legs whitish greenish; feet black."

<sup>1</sup> "Cat. Av. Chilenas," in Anales de la Univers. de Chile, tom. xxxi. p. 272.

10. Note on the Presence of a Columella (Epipterygoid) in the Skull of *Ichthyosaurus*. By A. SMITH WOODWARD, F.G.S., of the British Museum (Natural History). (Communicated by Professor FLOWER, LL.D., F.R.S., President.)

[Received June 3, 1886.]

In the skulls of fossil Reptiles and Amphibia it so rarely happens that the bones on the inner side of the temporal fossa, and those between the orbits, are well exposed to view, that even in some of the most familiar genera very little has yet been ascertained regarding the special characters of any of these ossifications. In so conspicuous a form as *Ichthyosaurus*, for example, there appears to be no published reference to these structures beyond the brief statements of Profs. Huxley, Cope, and Sir Richard Owen, and even these do not afford any very definite information. Prof. Huxley determined<sup>1</sup> the presence of a distinct pro-otic, and the doubtful absence of ali- and orbito-sphenoids; Prof. Cope gives<sup>2</sup> a diagrammatic outline of the "columella"; while Sir Richard Owen appears to have been less successful in his researches, having met with nothing but unsatisfactory indications of small "alisphenoids" (? pro-otics), and especially remarking that there is "no trace or sign of the Lacertian columellar bone"<sup>3</sup>.

In making the latter statement, the distinguished palæontologist just mentioned evidently overlooked Prof. Cope's previous researches upon the osteology of the Ichthyosaurian skull; and having lately discovered that there is no foundation for the assertion in the British Museum specimens, that formed the basis of Sir Richard Owen's monograph, I venture to offer a few remarks upon the subject, by way of pointing out the mistake. A detailed description of the interesting bone in question may also be acceptable, since Prof. Cope's materials appear to have been less complete and satisfactory than those now afforded by the fossils from the English Jurassic.

The first specimen of interest in this connection is a small slab of Lias from Lyme Regis, exhibiting a number of dislocated cranial bones, which Mr. William Davies long ago recognized as belonging to *Ichthyosaurus*, but which do not appear, hitherto, to have been submitted to so careful a study as their admirable state of preservation renders desirable. In the middle of the fossil, the basioccipital, basisphenoid, and presphenoid are arranged in irregular series, with their upper aspect exposed; in front are the remains of the supra-occipital and parietals; and on either side are scattered a number of

<sup>1</sup> T. H. Huxley, 'Anatomy of Vertebrated Animals,' 1871, p. 211.

<sup>2</sup> E. D. Cope, "On the Cranium of the Ichthyopterygia," Proc. Amer. Assoc. Adv. Sci. vol. xix. (1870), pp. 200-203. (For this reference I am indebted to the kindness of Mr. J. W. Hulke, F.R.S.)

<sup>3</sup> R. Owen, "Fossil Reptilia of the Liassic Formations.—III." (Mon. Pal. Soc. 1881), p. 96; also, 'History of British Fossil Reptiles,' vol. iii. (1884), p. 54.

other cranial elements in a more or less well-preserved state. Among the latter are two long bones with expanded extremities, lying lengthwise, one on either side of the basi- and presphenoids; and the form and situation of these elements, considered in connection with the evidence of other specimens presently to be noticed, can leave no doubt that they are the homologues of the columella (epipterygoid, Parker) found in Lacertilia, Rhynchocephalia, Anomodontia, Dinosauria<sup>1</sup>, and Chelonina. The bone on the right shows a side view, while that on the left is seen either from behind or before, and although both are fractured to a certain extent, their boundaries are readily distinguishable.

The right columella is 0.045 metre in total length, and is shown of the natural size in fig. 1<sup>2</sup> (p. 407). The upper end exhibits a triangular expansion, which, before fracture, must have measured about 0.016 metre in greatest breadth; and the long terminal upper border thus produced has a gently arched contour. Immediately below the expanded portion the bone becomes much constricted, having a diameter of only 0.003 metre, and at the distance of 0.019 metre from the lower extremity it commences again to widen, but here in an unsymmetrical manner. From the upper expansion downwards the anterior edge is nearly straight, but at the point just mentioned the hinder edge rapidly curves backwards, until the bone attains a maximum breadth of 0.012 metre, when the border once more descends almost vertically for some distance, and finally curves to the front. The lower end, however, has evidently been much crushed, like the remainder of the bone, and perhaps does not give an exact idea of its original shape.

The left columella, presenting only an anterior (or hinder) view, does not add any further details to the foregoing description; but this side of the fossil is of especial interest, since, as pointed out to me by Mr. G. B. Howes, there appears to be some indication of a downwardly-directed process of the parietal to meet the columella, such as exists in the living *Cyclodus*<sup>3</sup>. There is no indication of the fusion of the upper end of the bone with the parietal (or ? "squamosal"), such as Prof. Cope describes (*l. c.* p. 204) in the American form.

In a skeleton of *Ichthyosaurus* from the collection of the late Prof. Tennant (No. R 44 of the B.M. Register), the postorbital and adjoining bones are so far removed and displaced as to permit an admirable view of the lower end of the right columella, which is uncrushed, and still in contact with the pterygoid immediately behind the orbit. This is shown of the natural size in fig. 2. Its front edge is almost vertical, but curves slightly forwards near the lower termination, and there is a sharp anterior outer ridge along the whole length of the bone. The expanded portion exhibits a

<sup>1</sup> See O. C. Marsh, "Restoration of *Brontosaurus*," Amer. Journ. Sci. (3) vol. xxvi. p. 83; "On the Diplodocidæ," *ibid.* (3) xxvii. p. 163; "The Order Theropoda," *tom. cit.* p. 332.

<sup>2</sup> The drawings have been made by Mr. W. H. Hill.

<sup>3</sup> T. H. Huxley, 'Anatomy of Vertebrated Animals,' p. 189, fig. 69.

long inferior border, decidedly marked off from a short posterior border, but the precise nature of its original articulation is unfortunately not apparent. The pterygoid seems to have slipped somewhat from its natural position.

Fig. 1.



Fig. 2.

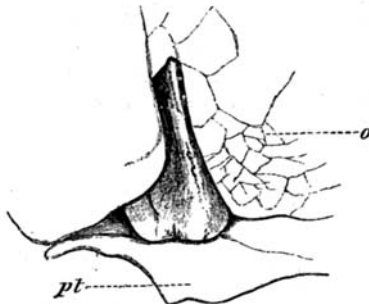


Fig. 3.



Fig. 4.



Fig. 1. Right columella of *Ichthyosaurus*, much crushed; inner side view. [B.M., No. 2000. 40 \*.]

Fig. 2. Lower portion of right columella of *Ichthyosaurus*; outer side view: *pt*, pterygoid; *o*, crushed bones in orbit. [B.M., No. R 44.]

Fig. 3. Lower portion of left columella of *Ichthyosaurus intermedius*; inner side view. [B.M., No. 2000. 15.]

Fig. 4. Left columella of *Hatteria punctata*; outer side view: *pt*, pterygoid; *qu*, quadrate.

The fragmentary skull of *Ichthyosaurus*<sup>1</sup> figured by Hawkins in his 'Book of the Great Sea-Dragons,' pl. 19. fig. 1, also exhibits the lower two thirds of the left columella, and this is interesting as

<sup>1</sup> This specimen has been identified with *I. intermedius*, Conyb., by Sir Richard Owen, and bears his MS. label.

displaying an uncrushed inner view: the bone, however, though well shown in Mr. O'Neill's drawing, is not specially marked, and it is therefore advisable to append a separate sketch, such as is given in the woodcut, fig. 3 (p. 407). The general outline is similar to that of the examples already described, but the additional characters of the inner aspect are well worthy of note. In the constricted portion of the bone, the shaft is compressed to form a sharp ridge, which terminates in an abrupt prominence at the point where the lower expansion commences, and beneath this the broad surface is divided into two distinct, apparently articular, facettes. The upper and hinder division (*a*) is slightly hollowed and somewhat triangular in shape; while the lower facette (*b*) is more elongated, and is separated from the first in its anterior portion by being more deeply impressed in the bone.

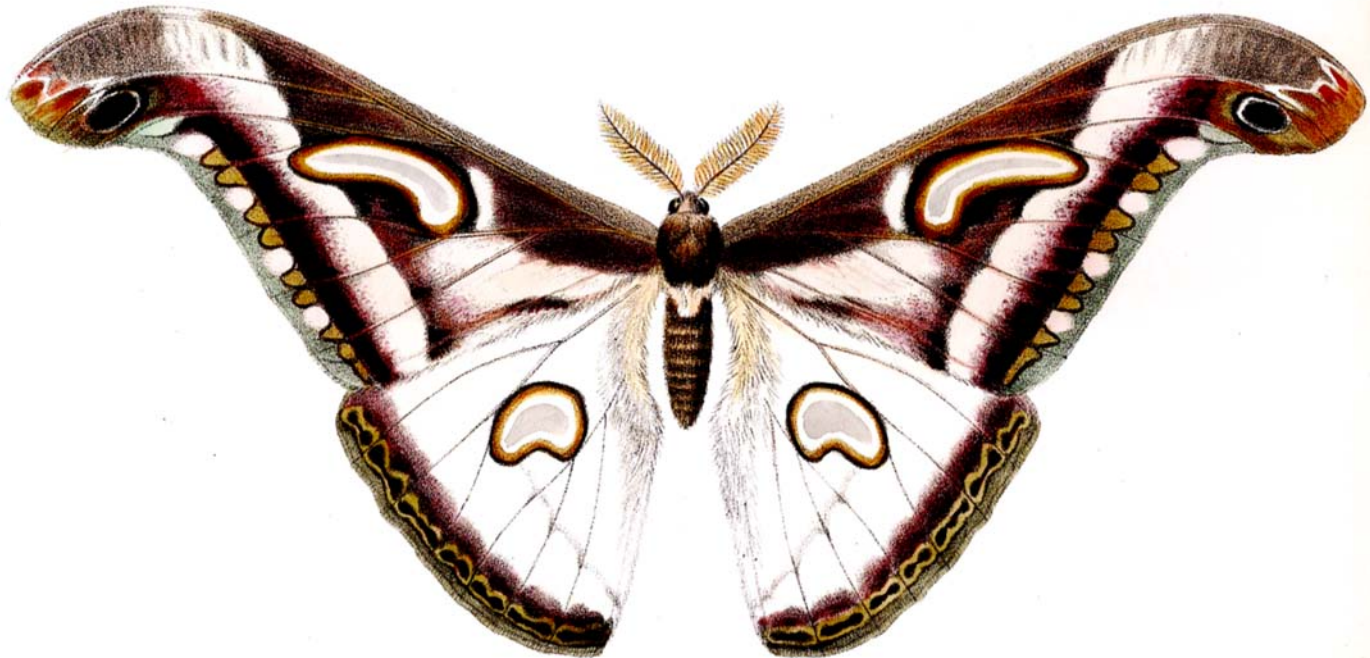
Among the crushed cranial bones, immediately behind the sclerotic plates, in another specimen of *Ichthyosaurus* in the National Collection the columella is also distinctly visible; but this does not supply any additional facts of importance.

On comparing the bone under consideration with its homologue among recent Reptiles, none is found to exhibit a more striking similarity than that of *Hatteria* (fig. 4, p. 407). As Dr. Günther has pointed out<sup>1</sup>, the columella in this genus is particularly remarkable for the great expansion of its extremities; and it is also peculiar from the fact that the lower end articulates not only with the pterygoid, but also with an inward extension of the quadrate. Moreover, so far as can be ascertained from a complete skull, the columella appears to show some signs of contracting this articulation by an overlapping of the two bones in a vertical plane; and the upper end is connected with cartilage, and not directly in contact with the parietal above.

Unfortunately at present it is only possible to compare the *form* of the element in each of these types. In none of the fossil Ichthyosaurs I have examined are the precise relations of the bone very distinct. As already stated, however, the first fossil is remarkably suggestive of a direct articulation of the upper end of the columella with a downward process of the parietal; and the originals of figs. 2 and 3 exhibit so close a resemblance to the corresponding parts in *Hatteria*, that there is also strong evidence of the lower articulation being double. But it ought to be remarked that in *Ichthyosaurus* no inwardly directed extension of the quadrate has hitherto been observed<sup>2</sup>, and the discovery of more satisfactory specimens must yet be awaited before it is possible to arrive at any definite conclusion.

<sup>1</sup> A. Günther, "Contribution to the Anatomy of *Hatteria* (*Rhynchocephalus*, Owen)," Phil. Trans. 1867, p. 599, pl. xxvi. figs. 3, 4.

<sup>2</sup> H. G. Seeley, "Similitudes of the Bones in the Enaliosauria," Journ. Linn. Soc. (Zoology) vol. xii. (1876), p. 309.



W. Purkiss lith.

Hanhart imp.

*ATTACUS ALBIDUS.*

11. Descriptions of some new Species of Heterocera from Tropical Africa. By HERBERT DRUCE, F.L.S., F.R.G.S., F.Z.S.

[Received June 16, 1886.]

(Plates XXXVII. & XXXVIII.)

SATURNIIDÆ.

*ATTACUS ALBIDUS*, sp. n. (Plate XXXVII. fig. 1.)

♂. The primaries very similar to *A. ploetzi*, but the white band is closer to the outer margin, four round white spots between the apex and the anal angle. Secondaries pure white excepting the outer margin, which is narrowly bordered with reddish brown, with black and fawn-coloured lunular markings as in *A. ploetzi*; the vitreous spot long, narrowly edged with black, bordered on the inner side with yellow. The underside the same as above. Head and thorax reddish brown, a wide white band at the base of the thorax, the abdomen brown banded with white; antennæ and legs pale yellowish brown. The female the same as the male, but slightly more reddish in colour, and with all the vitreous spots considerably larger. Expanse, ♂ 7 inches, ♀  $6\frac{1}{2}$  inches.

*Hab.* West Africa, Cameroon Mountains. Mus. Druce.

This very fine species comes into the group containing *A. vacuna*, Westw., *A. ploetzi*, Weymer, from both of which it is at once distinguished by the pure white secondaries.

*ANTHERÆA DOLABELLA*, sp. n. (Plate XXXVIII. fig. 2, ♂.)

♂. Primaries chrome-yellow, crossed by three irregular black bands, beyond which, along the outer margin, are a series of dusky patches, the base of the wing shaded with pink. Secondaries bright pink, broadly bordered with chrome-yellow, from the apex to the anal angle with several indistinct dusky black patches; nearest the anal angle a wide black band, dividing the two colours, crossing from near the apex to the inner margin; a large round deep yellow ocellus with a wide black border, on the outer edge of the black is a ring of bluish-fawn colour; in the centre of the ocellus is a very small vitreous spot. Head and thorax and upperside of abdomen bright pink, the underside of abdomen chrome-yellow banded with black; tegulæ chrome-yellow; antennæ black; legs black and yellow. Expanse  $4\frac{1}{2}$  inches.

*Hab.* East Central Africa. Mus. Druce.

This very beautiful species is quite unlike any other known to me.

*BUNÆA PYGELA*, n. sp. (Plate XXXVIII. fig. 1, ♂.)

♂. Primaries uniform pale pinkish brown, darkest along the costal margin; the outer and inner margin narrowly edged with pink; underside as above, but shaded with dark yellow from the base to about the middle; a small black spot at the end of the



cell. Secondaries dark orange-yellow, bordered from the apex to the anal angle and thence along the inner margin to the base with bright pink; a large central round fawn-coloured ocellus broadly edged with black. The underside uniform pale pinkish brown. Head and thorax orange-yellow; collar and underside of the thorax pure white; a wide pink band at the base of the thorax. Abdomen, upperside orange-yellow, underside pale pinkish brown; the anus pink; antennæ brown, deeply pectinated; legs pale brown. Expanse  $3\frac{1}{2}$  inches.

*Hab.* East Africa, Matebele Country. Mus. Druce.

This species is allied to *B. pygmæa*, Maassen, from which it is at once distinguished by not having the black band across the primaries and the absence of the white dot at the end of the cell, and difference in the colour of the antennæ.

#### LASIOCAMPIDÆ.

##### STIBOLEPIS SYLVIA, sp. n.

Primaries silvery white, brownish black along the costal margin, the apex, and outer margin; the veins from the cell to the outer margin dusky. Secondaries silvery white, with the apex and outer margin narrowly edged with brownish black; the veins a short way up from the margin dusky. Underside as above, excepting that the primaries have less black at the apex. Head and thorax yellowish white. Abdomen dark yellow; antennæ black; legs yellow. Expanse  $2\frac{1}{2}$  inches.

*Hab.* West Africa, Cameroons (*Thompson*). Mus. Druce.

This beautiful species is allied to *Stibolepis nivea*, Butler, from which it is at once distinguished by its smaller size and entire absence of the black marginal band of that species.

##### CHRYSOPOLOMA ROSEA, sp. n. (Plate XXXVIII. fig. 3.)

Primaries fawn-colour, shaded with pink along the inner margin, crossed beyond the middle by a row of brownish-red spots. Secondaries pale yellow, the fringe pinkish. The head, thorax, and abdomen pale yellowish-fawn colour; legs brownish black; antennæ black. Expanse  $1\frac{3}{4}$  inch.

*Hab.* East Africa, Delagoa Bay. Mus. Druce.

This pretty little species is allied to *Chrysopoloma obtusa*, Walker, also from East Africa.

##### CHRYSOPOLOMA CITRINA, sp. n. (Plate XXXVIII. fig. 4.)

Primaries pale yellow, crossed about the middle, from the costal to the inner margin, by a band of very small brown spots, beyond which is a second band, extending from the apex to the inner margin; the second band is very much wider, and near the inner margin it has several whitish spots; a submarginal row of minute dots extending from the apex to the anal angle. Secondaries pale yellow, with a central and submarginal row of small brown spots. The fringe of both primaries and secondaries pale yellow; the underside



1



2a.



2b.



1a.



2.

uniform pale yellow. Head, thorax, and abdomen yellow; legs yellow, banded with brown. Expanse  $1\frac{3}{4}$  inch.

*Hab.* West Africa, Old Calabar. Mus. Druce.

In form this species resembles *C. rudis*, Walker, but in colour and markings it is very distinct.

**LECHENOPTERYX FULVIA, sp. n.**

Primaries pinkish brown, crossed near the outer margin from near the apex to the inner margin by a black line, bordered on the inner side with yellow; a small white dot edged with black at the end of the cell; secondaries pinkish brown, with the same coloured line extending from the apex to the inner margin close to the anal angle. Underside much paler than above, and the black lines not edged with yellow. Head, thorax, and abdomen pinkish brown; antennæ brown; legs darker brown. Expanse  $1\frac{3}{4}$  inch.

*Hab.* East Africa; Zanzibar. Magila (*Craven*). Mus. Druce.

EXPLANATION OF THE PLATES.

PLATE XXXVII.

Fig. 1. *Attacus albidus*, sp. n., ♂, p. 409.

PLATE XXXVIII.

Fig. 1. *Bunæa pygela*, sp. n., ♂, p. 409.

2. *Antheræa dolabella*, sp. n., ♂, p. 409.

3. *Chrysopoloma rosea*, sp. n., p. 410.

4. — *citrina*, sp. n., p. 410.

12. First Report on Additions to the Batrachian Collection in the Natural-History Museum. By G. A. BOULENGER.

[Received June 28, 1886.]

(Plate XXXIX.)

The following is a list of all the species of Batrachians added to the National Collection since the publication of the last edition of the Catalogue (1882). To such names as are not mentioned in that work, reference to the original description is appended; an asterisk indicates that the type specimen is in the collection. The list is followed by the descriptions of a few new species.

ECAUDATA.

- \*1. *Ceratobatrachus guentheri*, Blgr. P. Z. S. 1884, p. 212.—Solomon Islands (*Guppy*).
- \*2. *Rana bufoniformis*, Blgr. l. c. p. 210.—Solomons (*Guppy*).
- \*3. *Rana sternosignata*, Murray, Ann. N. H. (5) 1885, xvi. p. 120. —Sind (*Murray*).
- \*4. *Rana guppyi*, Blgr. l. c. p. 211.—Solomons (*Guppy*).
- \*5. *Rana opisthodon*, Blgr. l. c. p. 211.—Solomons (*Guppy*).
- 6. *Rana septentrionalis*, Baird.—Canada (*Lataste*).

- \*7. *Rana forreri*, Blgr. Ann. N. H. (5) 1883, xi. p. 343.—Presidio, W. Mexico (*Forrer*).
- \*8. *Rana mucronemis*, Blgr. P. Z. S. 1885, p. 22.—Brusa (*v. Maltzan*).
- 9. *Rana iberica*, Blgr.—Serra de Gerez, Portugal (*Gadow*).
- 10. *Rana latastii*, Blgr.—Various localities in North Italy (*Camerano and de Betta*).
- \*11. *Rana martensi*, Blgr., *infra*.—Yedo (*v. Martens*).
- \*12. *Rana pustulosa*, Blgr. Ann. N. H. (5) 1883, xi. p. 343.—Ventanas, W. Mexico (*Forrer*).
- 13. *Rana nicobariensis*, Stol.—Nias (*Sandemann*).
- \*14. *Rana masonii*, Blgr. Ann. N. H. (5) 1884, xiii. p. 397.—Batavia (*Mason*).
- \*15. *Rana macropus*, Blgr., *infra*.—Loo Choo Islands (*Carpenter*).
- 16. *Rana ulcerosa*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- 17. *Rana granulata*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- 18. *Rana buergeri*, Schleg.—Japan (*Anderson*).
- 19. *Rhacophorus dispar*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- \*20. *Rhacophorus lateralis*, Blgr. Ann. N. H. (5) 1883, xii. p. 162.—Malabar (*Beddome*).
- \*21. *Ixalus asper*, Blgr., *infra*.—Larut, Perak (*Wray*).
- \*22. *Cornufer guppyi*, Blgr. P. Z. S. 1884, p. 211.—Solomons (*Guppy*).
- \*23. *Cornufer solomonis*, Blgr. l. c. p. 212.—Solomons (*Guppy*).
- \*24. *Rappia burtonii*, Blgr. Ann. N. H. (5) 1883, xii. p. 163.—Gold Coast (*Burton and Cameron*).
- 25. *Nyctixalus margaritifer*, Blgr. Ann. N. H. (5) 1882, x. p. 35.—Willis Mountains, Java (*v. Huegel*).
- \*26. *Prostherapis femoralis*, Blgr. P. Z. S. 1883, p. 635.—Yurimaguas (*Hahnel*).
- 27. *Mantella ebenawi*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- \*28. *Dendrobates reticulatus*, Blgr. l. c. p. 635.—Yurimaguas (*Hahnel*).
- \*29. *Dendrobates fantasticus*, Blgr. l. c. p. 636.—Yurimaguas (*Hahnel*).
- \*30. *Dendrobates hahnelii*, Blgr. l. c. p. 636.—Yurimaguas (*Hahnel*).
- \*31. *Hypopachus oxyrrhinus*, Blgr. Ann. N. H. (5) 1883, xii. p. 344.—Presidio (*Forrer*).
- \*32. *Microhyla fissipes*, Blgr. Ann. N. H. (5) 1884, xiii. p. 397.—Taiwanfoo, Formosa.
- 33. *Rhombophryne testudo*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- 34. *Cophyla phyllodactyla*, Bttg.—Nossi Bé (*Senckenberg Mus.*).
- 35. *Pseudis mantidactyla*, Cope.—Rio Grande do Sul (*v. Ihering*). Montevideo (*Paris Mus.*). R. de la Plata (*Gairdner*).
- \*36. *Phyllobates trilineatus*, Blgr. P. Z. S. 1883, p. 636.—Yurimaguas (*Hahnel*).
- 37. *Hylodes brocchii*, Blgr. in Brocchi, Miss. Sc. Mex., Batr. p. 60.—Vera Paz (*Salvin*).
- 38. *Hylodes augusti*, Brocchi.—Ventanas (*Forrer*).

- \*39. *Hylodes vertebralis*, Blgr., *infra*.—Intac, Ecuador (*Buckley*).
- \*40. *Paludicola gracilis*, Blgr. Ann. N. H. (5) 1883, xi. p. 17.—Rio Grande do Sul (*v. Ihering*). Uruguay.
- 41. *Paludicola falcipes*, Hens.—R. Grande do Sul (*v. Ihering*).
- 42. *Paludicola olfersii*, Martens, Nomencl. Rept. Mus. Berol. p. 40.—Brazil (*Berlin Museum*).
- \*43. *Leptodactylus discodactylus*, Blgr. P. Z. S. 1883, p. 637.—Yurimaguas (*Hahnel*).
- 44. *Leptodactylus gracilis*, D. & B.—Rio Grande do Sul (*v. Ihering*).
- \*45. *Leptodactylus rhodomystax*, Blgr. l. c. p. 637.—Yurimaguas (*Hahnel*).
- \*46. *Leptodactylus diptyx*, Bttg. Zeitschr. f. Naturw. 1885, lviii. p. 244.—Paraguay.
- \*47. *Limnodynastes olivaceus*, De Vis, Proc. Linn. Soc. N. S. W. 1884, ix. p. 66.—Queensland (*Ling Roth*).
- 48. *Eupemphix nattereri*, Stdchr.—Paraguay.
- 49. *Bufo mexicanus*, Brocchi.—Ciudad (*Forrer*).
- \*50. *Bufo andersonii*, Blgr. Ann. N. H. (5) 1883, xii. p. 163.—Ajmere and Muscat (*Blanford*). Tatta, Sind.
- \*51. *Bufo formosus*, Blgr. P. Z. S. 1883, p. 140.—Yokohama ('*Challenger*').
- 52. *Bufo punctatus*, B. & G.—La Paz, Cal. (*Smithson. Inst.*).
- 53. *Hyla nasica*, Cope.—Rio Grande do Sul (*v. Ihering*). Soriano, Uruguay (*Havers*). Paraguay.
- \*54. *Hyla glandulosa*, Blgr. Ann. N. H. (5) xii. 1883, p. 164.—Guatemala (*Godman*).
- \*55. *Hyla macrops*, Blgr. l. c. p. 164.—Treasury Island, Solomons (*Guppy*).
- 56. *Hyla thesaurensis*, Ptrs.—Treasury Island (*Guppy*).
- 57. *Hyla stoufferi*, Cope.—Guatemala (*Godman*).
- \*58. *Pternohyla fodiens*, Blgr. Ann. N. H. (5) 1882, x. p. 326.—Presidio (*Forrer*).
- \*59. *Phyllomedusa iheringii*, Blgr. Ann. N. H. (5) 1885, xvi. p. 88.—Rio Grande do Sul (*v. Ihering*).
- \*60. *Phyllomedusa perlata*, Blgr. P. Z. S. 1883, p. 638.—Yurimaguas (*Hahnel*).
- \*61. *Triprion spatulatus*, Gthr. Ann. N. H. (5) 1882, x. p. 279.—Presidio (*Forrer*).
- 62. *Scaphiopus couchii*, Baird.—Presidio (*Forrer*).
- \*63. *Megalophrys longipes*, Blgr. P. Z. S. 1885, p. 850.—Perak (*Wray*).

## CAUDATA.

- \*1. *Hynobius lichenatus*, Blgr. Ann. N. H. (5) 1883, xii. p. 165.—Awomori, Japan (*Lewis*).
- \*2. *Geomolge fischeri*, Blgr., *infra*.—Manchuria (*Fischer*).
- 3. *Plethodon croceator*, Cope.—San Diego, Cal. (*Forrer*).
- \*4. *Spelerpes peruvianus*, Blgr. Ann. N. H. (5) 1883, xii. p. 165.—Moyobamba, Peru (*Roff*).

## APODA.

- \*1. *Epicrionops bicolor*, Blgr. Ann. N. H. (5) 1883, xi. p. 202.—Intac, Ecuador (*Buckley*).
- \*2. *Cœcilia buckleyi*, Blgr. Ann. N. H. (5) 1884, xiii. p. 398.—Intac (*Buckley*).
3. *Dermophis thomensis*, Bocage.—S. Thomé (*Berlin Mus.*).
- \*4. *Cryptosophs multiplicatus*, Blgr. Ann. N. H. (5) 1883, xii. p. 166.—Seychelles (*Günther*).
5. *Gymnopsis unicolor*, A. Dum.—Cayenne (*Bavay*).
- \*6. *Scolecormorphus kirkii*, Blgr. Ann. N. H. (5) 1883, xi. p. 48.—Near Lake Tanganyika (*Kirk*).
7. *Chthonerpeton indistinctum*, R. & L.—Porto Alegre (*Berlin Mus.*).

## RANA MARTENSI, sp. n.

Allied to *R. temporaria*. Vomerine teeth in two rather oblique oval groups, extending posteriorly beyond the line of the choanæ. Head about as long as broad, very similar to that of *R. agilis*; nostril equally distant from the eye and the end of the snout; interorbital space narrower than the upper eyelids; tympanum rather large, its diameter equalling about two thirds that of the eye, from which it is separated by a space equal to about half its diameter. The first finger extends beyond the second. The tibio-tarsal articulation reaches the eye or the nostril; tibia shorter than the fore limb. Inner metatarsal tubercle rather strong, blunt, oval; outer tubercle absent, or scarcely marked; subarticular tubercles of fingers and toes moderate; toes two-thirds webbed. Skin smooth; lateral fold rather narrow, moderately prominent. Coloration very similar to that of *R. agilis*, save that the whitish streak bordering the temporal spot inferiorly does not extend forwards beyond the eye. Male with internal vocal sacs.

Yedo; several specimens (4410, 4411) in the Berlin Museum, one of which was obtained for the British Museum. Collected by Dr. E. von Martens (*cf.* Preuss. Exped. n. Ost-Asien, Zool. i. p. 111).

## RANA MACROPUS.

*Ixalus japonicus*, Hallow. Proc. Ac. Philad. 1860, p. 501.

Vomerine teeth in two rather indistinct oblique series between the choanæ, widely separated in the middle. Snout obtuse, as long as the diameter of the orbit; nostril nearer the end of the snout than the eye; canthus rostralis well marked, curved; loreal region concave; eye large; interorbital space narrower than the upper eyelid; tympanum very distinct, measuring not quite half the diameter of the eye. Fingers moderate, slightly depressed, first shorter than second; toes moderate, three-fourths webbed; tips of fingers and toes dilated into well-developed disks, which are much smaller than the tympanum; subarticular tubercles moderate; a single, oval, inner metatarsal tubercle; no tarsal fold. When the fore limb is stretched

forwards, the femoro-tibial articulation reaches the shoulder and the tibio-tarsal far beyond the end of the snout; tibia as long as the fore limb. Upper surfaces with small warts intermixed with elongate fold-like ones, which form an  $\Lambda$ -shaped figure on the scapular region; a strong fold from eye to shoulder. Dark brown above, with darker marblings and regular cross bars on the limbs; lips with a series of dark brown spots; lower surfaces white.

From snout to vent 34 millim.

A single (half-grown?) specimen was obtained at Oho Sima, Loo Choo Islands, and presented to the Museum by Lieut. Alfred Carpenter, R.N., of H.M.S. 'Magpie.'

*IXALUS ASPER*, sp. n. (Plate XXXIX. fig. 1.)

Snout rounded, as long as the diameter of the orbit; canthus rostralis very feebly marked; loreal region concave; nostril nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum very distinct, nearly as large as the eye. Fingers free, toes three-fourths webbed; disks well developed; subarticular tubercles weak; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches nearly the tip of the snout. Upper parts rough with small conical warts; belly granular, throat perfectly smooth. Blackish above and below; the warts of the upper surfaces appearing as white dots; belly marbled with white; flanks, lower surface of limbs, and hinder side of thighs with irregular white network. Male without vocal sac.

From snout to vent 35 millim.

Two specimens, male and female, presented by L. Wray, Esq.; caught breeding in the water on Hill Garden, Larut, Perak, at an altitude of 3300 feet.

*HYLODES VERTEBRALIS*, sp. n.

Tongue oval, entire. Vomerine teeth in two oblique groups considerably behind the choanæ. Snout rounded or subacuminate, as long as the greatest orbital diameter; canthus rostralis distinct; nostril nearer the tip of the snout than the eye; fronto-parietals a little concave, their edges slightly prominent, their width equalling once and one third that of the upper eyelid; tympanum distinct, two fifths the diameter of the eye. Fingers moderate, first shorter than second; toes moderate, quite free, fringed; disks quite as large as the tympanum; subarticular tubercles moderate; two metatarsal tubercles. The tibio-tarsal articulation reaches the eye. Back smooth, sides with small warts; belly granular. Blackish brown above; one specimen with a whitish vertebral band; lower surfaces yellow, brown-speckled; groin and sides of thighs with dark-brown network.

From snout to vent 38 millim.

Two female specimens, from Intac, Ecuador; collected by Mr. Buckley.

Distinguished from *H. buckleyi* by a less stout habit, larger digital expansions, and narrower fronto-parietals.

## GEOMOLGE, g. n.

Tongue large, subcircular, free on the sides. Palatine teeth in two arched, slightly angular series, separated by a narrow interspace. Toes five. Tail cylindrical at the base, compressed at the end.

Intermediate between *Onychodactylus* and *Ranidens* in the palatine dentition; distinguished, besides, from the former by the absence of claws, from the latter by the shape of the tail, which indicates a land animal.

## GEOMOLGE FISCHERI, sp. n. (Plate XXXIX. fig. 2.)

Physiognomy that of *Onychodactylus japonicus*. Head small, longer than broad, broader than the neck; snout rounded; eyes large, prominent; no labial lobes. Body cylindrical, four and a half or five times the length of the head. Limbs in every respect similar to those of *Onychodactylus japonicus*, save the absence of claws; the male likewise with tibio-tarsal dilatation. Tail longer than head and body, cylindrical in its anterior half, becoming gradually compressed and keeled towards the end, which is obtusely pointed. Anal opening subcruciform, as in *Onychodactylus*. Skin smooth; fourteen or fifteen costal grooves; paratoids and gular fold as in *Onychodactylus*. Brown above, with blackish variegations, most crowded on the sides, which also bear some whitish spots; lower surfaces brownish white.

	♂.	♀.
	millim.	millim.
Total length .....	163	— <sup>1</sup>
From snout to vent .....	70	80
Head .....	12	14
Width of head .....	9½	10
Fore limb .....	17	20
Hind limb .....	22	22
Tail .....	93	— <sup>1</sup>

Two specimens from Chaborowska, on the River Ussuri, Manchuria, collected by Hr. Dörries, of Hamburg; they were obtained for the British Museum through Dr. J. G. Fischer, in honour of whom the new species is named.

## EXPLANATION OF PLATE XXXIX.

Fig. 1. *Ixalus asper*, upper view.

1 a. ———, lower view.

2. *Geomolge fischeri*, ♂.

2 a. ———, side view of head.

2 b. ———, open mouth.

<sup>1</sup> Tail injured.



November 16, 1886.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, September, and October, 1886:—

The total number of registered additions to the Society's Menagerie during the month of June was 226, of which 24 were by birth, 129 by presentation, 52 by purchase, and 21 were received on deposit. The total number of departures during the same period by death and removals was 120.

The following are of special interest:—

1. A Glaucous Macaw (*Ara glauca*), purchased of the Zoological Gardens, Antwerp, June 3rd.

Of this near ally of Lear's Macaw<sup>1</sup> we have not previously possessed a living specimen. The present species is of nearly the same size and general coloration as *A. leari*, but is at once distinguishable by the glaucous blue of the body.

2. Two young Tcheli Monkeys (*Macacus tcheliensis*), presented by Dr. S. W. Bushell, C.M.Z.S., of Pekin, June 17th, obtained from the mountains near the "Jung-ling," or Eastern Mausoleum of the reigning dynasty of China, which is situated some 70 miles east of Pekin. The animals are covered with a thick fur, which fits them to endure the bitterly cold winter of this part of Northern China, where the thermometer frequently goes below zero of Fahrenheit. We are also indebted to Dr. Bushell for former examples of this Monkey.

3. A Bald Ouakari (*Brachyurus calvus*), ♂, purchased 12th June, of a dealer in Liverpool, new to the Society's collection.

Of the curious Monkeys of the genus *Brachyurus*, on which our late Prosector, Mr. Forbes, wrote an excellent paper in 1880 (see P. Z. S. 1880, p. 627), we have already had specimens of *B. melanocephalus* and *B. rubicundus*, and we have now for the first time an example of the perhaps still more curious *B. calvus*, which, according to Castlenau, is confined to the forests on the north bank of the Amazons, between the rivers Putumayo and Japurá.

The registered additions to the Society's Menagerie during the month of July were 166 in number; of these 82 were acquired by presentation, 44 by purchase, 33 by birth, and 6 were received on deposit. One young Pheasant, received during the month, was bred from some eggs laid in the Society's Gardens and sent into the country to be hatched. The total number of departures during the same period by death and removals was 105.

Among the additions may be specially noticed two rare American Parrots—a Lear's Macaw (*Ara leari*) and a Lineolated Parrakeet (*Bolborhynchus lineolatus*), acquired by purchase.

<sup>1</sup> See P. Z. S. 1879, p. 551

The total number of registered additions to the Society's Menagerie during the month of August was 98; of these 50 were acquired by presentation, 14 by purchase, 15 by birth, 6 were received on deposit, and 5 in exchange. Eight Elliot's Pheasants, received during the month, were bred from some eggs laid in the Society's Gardens and sent into the country to be hatched. The total number of departures during the same period by death and removals was 104.

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The total number of registered additions to the Society's Menagerie during the month of September was 80; of these 42 were acquired by presentation, 4 by purchase, 2 by exchange, 19 were bred in the Gardens, and 13 were received on deposit. The total number of departures during the same period by death and removals was 84.

The following are of special interest:—

A Spot-ringed Snake (*Liophis pœcilogyrus*) from Brazil, presented by Edgell Hunt, Esq., September 9th, new to the collection.

Two Elegant Galidias (*Galidia elegans*) from Madagascar, presented by Burt C. Müller, Esq., September 16th.

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The total number of registered additions to the Society's Menagerie during the month of October was 77, of which 11 were by birth, 45 by presentation, 5 by purchase, 6 by exchange, and 10 were received on deposit. The total number of departures during the same period by death and removals was 112.

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An extract was read from a letter addressed to the President by Dr. Emin Bey, dated Wadilai, Eastern Equatorial Africa, Jan. 1st, 1886.

After speaking of the skull of a Chimpanzee and of some skins and skeletons of other Mammals and Birds obtained in Monbottu, which he proposed to send to the Society, Dr. Emin Bey continued as follows:—

"It may be interesting for you to hear that an anthropoid Ape exists in Uganda and Unyoro. I cannot say whether it is identical with the Monbottu Chimpanzee or not. While staying in these countries the negroes told me much about this animal, and in a MS. map which I forwarded to Dr. Petermann I fixed its northern limit at 2° N. lat. Now I hear that this Ape is frequent in the thick forests near Ugóma, and I hasten to beg my friend King Kabrega for some specimens."

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A letter was read addressed to the Secretary by Dr. Chr. Lütken, of Copenhagen, F.M.Z.S.

Referring to Mr. O. Thomas's statement (P. Z. S. 1886, p. 78) that *Chiropodomys penicillatus* was a rare animal in Museums and that its distribution was not certainly known, Dr. Lütken announced

that the Museum of Copenhagen had received in 1878 a specimen of this mammal in spirit from Buitenzorg, Java, forwarded by the late Mr. Köbke, Danish Consul at Batavia, and that he has been informed by Mr. H. Winge that several specimens of it from the same locality were in the Museo Civico of Genoa.

A letter was read from Dr. A. B. Meyer, C.M.Z.S., communicating the following remarks by Mr. K. G. Henke on a specimen of a hybrid Grouse, in the Dresden Museum, referred to by Dr. Collett in a previous communication :—

“Dr. Collett has declared (*suprà*, p. 225, note) a hybrid which I have figured, ‘*Zeitschrift für die gesammte Ornithologie*,’ 1885, p. 47, pl. iii., ‘to be clearly only a partial albino of *Tetrao tetrix* fem.,’ but without giving his reasons for this opinion.

“I will not discuss the question now, whether *Tetrao tetrix* or *Lagopus albus* was the father of this specimen, as it is treated and refigured, not as a single example of its kind, but together with others, similar and varying, in Dr. Meyer’s forthcoming work ‘*Unser Auer-, Birk- und Rackelwild*,’ which will be illustrated by 15 coloured folio plates. I only wish to remark here, that Dr. Collett’s view of the said specimen does not appear to be correct, as supposing it really were a partial albino, a strong partial melanism would still be present, to account for the many black patches and markings, of which there is no trace in the female *Tetrao tetrix*—a coincidence which no one will admit, and which never has been observed. Besides, the albino of *Tetrao tetrix*, fem., has no such regular markings as the specimen in question.

“I therefore cannot agree with Dr. Collett, but am convinced that he is mistaken in declaring the Dresden specimen to be a partial albino.”

Prof. Flower exhibited a specimen of an Armadillo, now belonging to the Museum of the Scarborough Philosophical Society, but the origin of which unfortunately appeared to be unknown. It was evidently a member of the genus *Tatusia*, and closely allied to the common *T. novemcincta* or *T. peba*, from which it differed mainly in having the whole of the carapace covered with a thick coating of light brown, fine, but rather stiff hair, about an inch and a half in length. The same kind of hair grew on the cheeks, the proximal portion of the limbs, and (though less abundantly and shorter) on the whole under surface of the body. The cephalic shield, the snout, the hands and feet, and the tail (except quite at the base) were bare. The covering of the hair of the back and sides was so thick as completely to conceal the carapace, except near the antero-inferior margin of the scapular region; but the usual scutes and bands were seen to be present on separating the hair, which only grew from the intervals between them. The length of the head was  $3\frac{3}{4}$ , of the body  $8\frac{1}{2}$ , and of the tail  $8\frac{1}{2}$  inches. Unfortunately nearly the whole of the skull had been removed, but some of the anterior teeth which remained in the jaws were of very small size and appeared to indicate that the animal was young.

There was little doubt of the specific identity of the specimen with that belonging to the Vienna Museum, described by Fitzinger under the name of *Cryptophractus pilosus*<sup>1</sup>, and also with two specimens from Guyaquil in the Lima Museum, described and figured by Burmeister as *Præopus hirsutus*<sup>2</sup>, if, as was probably the case, the smaller size of the present specimen could be attributed to its not being full-grown. So far as Prof. Flower knew, these were the only published indications of the existence of this somewhat remarkable species, or at all events very distinct variety, of Armadillo, of which no specimen existed in our National collection.

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Prof. Bell exhibited and made remarks upon an object (apparently of the nature of an amulet) supposed to have been made from some portion of the skin of a mammal. It had been obtained from the natives at Moreton Bay, and sent to Kew, being supposed to be of vegetable origin.

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Mr. Seeböhm exhibited a skin of the Lesser White-fronted Goose, *Anser albifrons minutus* (*Anser erythropus*, Linn. Syst. Nat. i. p. 197), which had been shot on the 16th of September last near Holy Island, on the coast of Northumberland, by Mr. Alfred Crawhall Chapman, of Sunderland. It was the first recorded example of the small form of the White-fronted Goose which had been obtained on the coasts of our islands, and it was especially interesting as being a young bird in first plumage. It proved to be a female on dissection, and bore a remarkable resemblance to the young in first plumage of the dark-bellied or typical form of the Brent Goose, *Anser brenta*; but its much greater expanse of wing (4 feet) and its large legs and feet, which were yellow-ochre in colour when first shot, precluded the possibility of confounding it with that species. Its very small bill, quite as small as that of the Brent Goose, showed it to be a small example of the small form of the White-fronted Goose, but in so young a bird the white forehead had not yet appeared.

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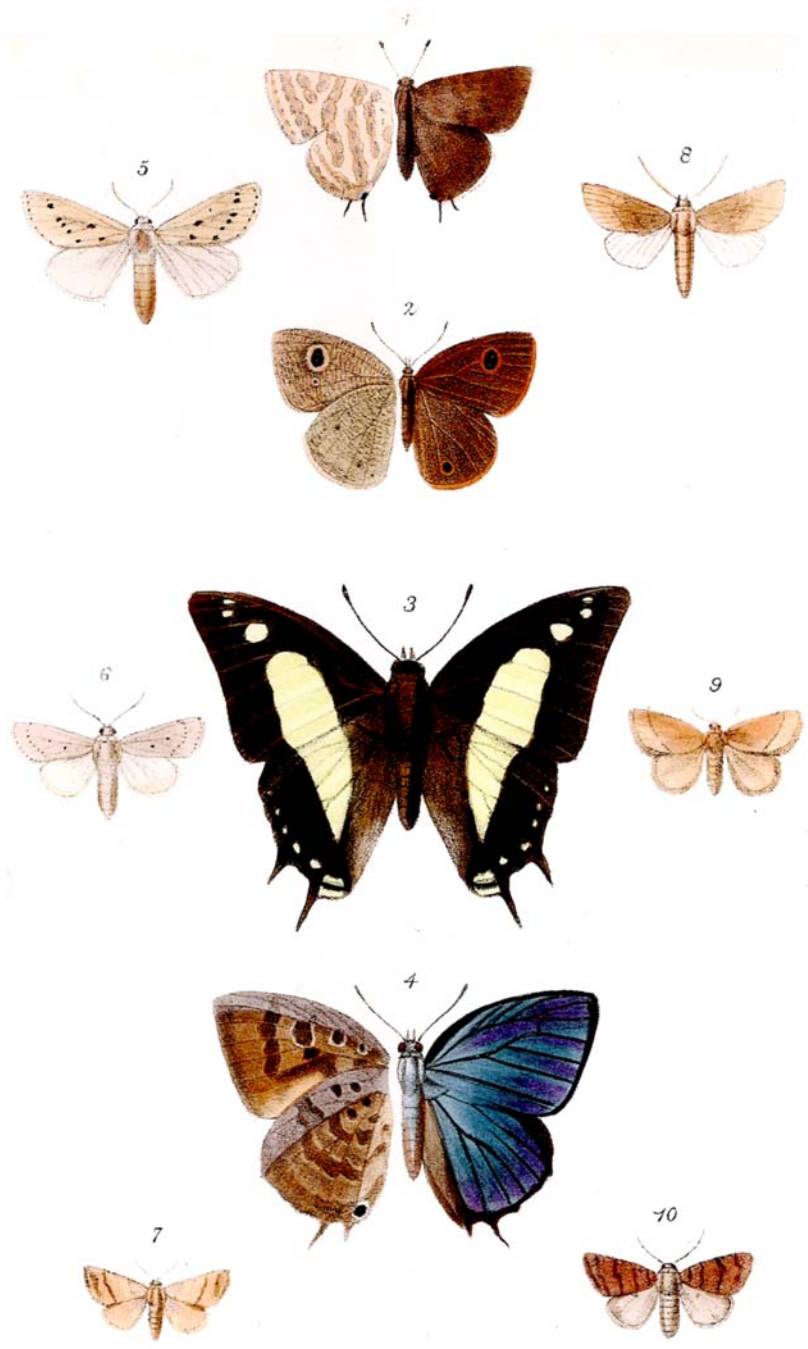
Mr. W. T. Blanford exhibited a stuffed skin, the first perfect specimen he had seen, of *Paradoxurus jerdoni*, described and figured in the Society's Proceedings for 1885 (pp. 613, 802, pl. xlix.). For this specimen, which was killed at Kāteri (Kartary) on the Nilgiri hills, Mr. Blanford was indebted to Mr. G. F. Hampson, of Dunsandle, Ootacamund, who had identified the species from the description, and had confirmed the suggestion already made by Mr. Blanford, l. c. p. 613, that this species inhabits the Nilgiri hills as well as the Animalé range.

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The following papers were read :—

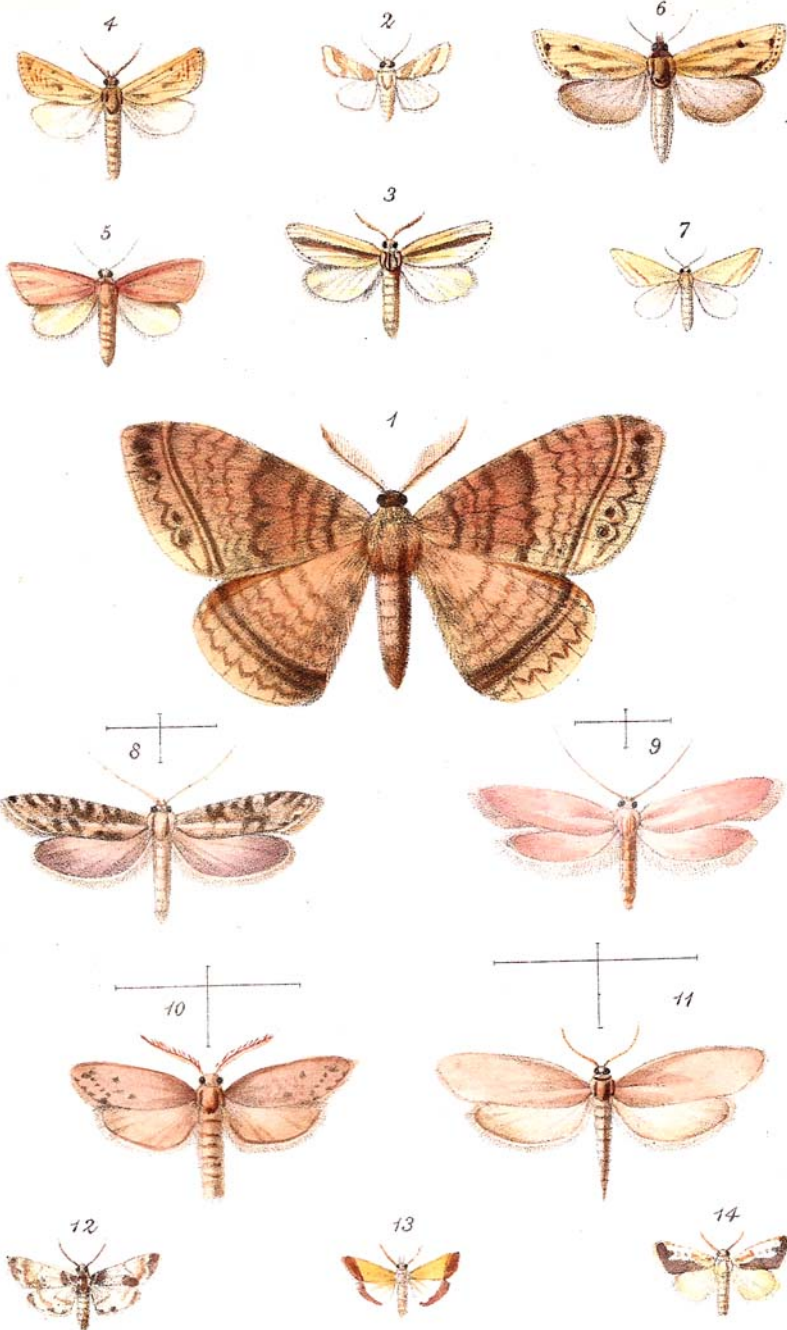
<sup>1</sup> Tageblatt, Nr. 32; Versamml. deutsch. Naturf. u. Aerzte, 1856, Nr. 6, S. 123. I am only acquainted with this reference through Fitzinger's subsequent paper, "Die natürliche Familie der Gürtelthiere (Dasypoder)," in Sitz. der k. Akad. der Wissensch., Band lxi. 1 Abth. (1871).

<sup>2</sup> Abhandl. naturf. Gesell. Halle, B. vi. p. 147 (1861).



W. Purkiss del.

Hanhart imp.



W. Purkiss del.

Hanhart imp.

1. On the Lepidoptera of Mhow, in Central India.  
By Colonel C. SWINHOE, F.L.S., F.Z.S.

[Received June 3, 1886.]

(Plates XL. & XLI.)

I collected Lepidoptera at Mhow from September 1881 until August 1882, with the assistance of a trained native, whose captures were daily recorded. My military duties kept me well employed, and as I also collected birds and took notes on them during the whole of this period, the results of which have since appeared in 'The Ibis,' I had not much time to give to the study of Lepidoptera; and therefore this paper only professes to contain a list of Lepidoptera taken in Mhow and its immediate neighbourhood for a year, with the addition of a few taken by my subordinates at the sub-stations of Neemuch and Assirghur.

I am indebted to Lord Walsingham for working out the specimens of Tortricidæ and Tineina.

Types of all the new species mentioned in this paper have been presented by me, as usual, to the British Museum.

I. RHOPALOCERA.

N Y M P H A L I D Æ.

E U P L Œ I N Æ.

1. TIRUMALA LIMNIACE.

*Pap. limniace*, Cramer, Pap. Exot. i. pl. 59. f. D, E (1775).

Common from September to July.

2. SALATURA GENUTIA.

*Pap. genutia*, Cramer, Pap. Exot. iii. pl. 206. f. C, D (1779).

Common from September to July.

3. LIMNAS CHRYSIPPUS.

*Pap. chrysippus*, Linn. Syst. Nat. p. 471 (1758).

Common everywhere from September to March.

4. LIMNAS ALCIPPOIDES.

*Limnas alcippoides*, Moore, P. Z. S. 1883, p. 238, pl. 31. f. 1.

I took one example of this variety at Mhow in June 1882, and one at Panghur near Neemuch in November 1884.

5. CRASTIA CORE.

*Pap. core*, Cramer, Pap. Exot. iii. pl. 266. f. E, F (1780).

March and June. Very plentiful in March; only one example taken in June.

## SATYRINÆ.

## 6. MELANITIS LEDA.

*Pap. leda*, Linn. Syst. Nat. i. 2, p. 773 (1767).

June, July; September and October.

## 7. MELANITIS ISMENE.

*Pap. ismene*, Cramer, Pap. Exot. i. pl. 26. f. A, B (1775).

Common during the cold weather from the latter end of October to the beginning of March. I took, however, one example in June 1882.

## 8. CALYSISME PERSEUS.

*Pap. perseus*, Fabr. Syst. Ent. p. 488 (1775).

October and April. Only one example taken in the latter month; it was fairly common in October 1881.

## 9. CALYSISME DRUSIA.

*Pap. drusia*, Cramer, Pap. Exot. i. pl. 84. f. C, D (1779).

I found one example of this variety of *C. mineus*, Linn., in a collection of Butterflies taken at Mhow in 1881 by Major Yerbury, R.A. It is smaller and paler than the types in the British Museum, but is otherwise identical.

Cramer's type came from China, but I have typical examples in my collection from the Kangra valley and from Darjiling.

## 10. YPETHIMA INICA.

*Ypthima inica*, Hewitson, Trans. Ent. Soc. ser. 3, vol. ii. p. 285 (1865).

Mhow, December; Depalpore, November.

This is said to be an African insect, but the examples taken as above are identical with Hewitson's type.

## 11. YPETHIMA ALKIBIE, n. sp.

Upperside dark brown, with the ocelli as in *Y. inica*, but the general coloration is darker and brighter. Underside pale whitish brown, thickly covered with short delicate pale reddish-brown strigæ, which are uniformly disposed, but paler on the costa and margins of the fore wings in most specimens, and both wings with a marginal brown line and submarginal brown, slightly sinuated fascia; the ocelli as in *Y. inica*, but one or other of the three minute ocelli on the hind wings is often more or less obsolete. Hind wings with three pale reddish-brown speckled zigzag bands, and can easily be distinguished from *Y. inica* because the inner discal band curves outwardly, whereas in the type of *Y. inica* this band curves inwards.

Expanse of wings  $1\frac{1}{10}$ – $1\frac{2}{10}$  inch.

Mhow, November to March, very plentiful; Depalpore, January and February.



12. *YPTHIMA MAHRATTA*.

*Ypthima mahratia*, Moore, Journ. As. Soc. Bengal, vol. iii. pt. 2, no. i. p. 1 (1884).

Mhow, July and November; Neemuch, September to November.

13. *YPTHIMA ALEMOLA*.

*Ypthima alemola*, Swinhoe, P. Z. S. 1885, p. 127.

April to July.

14. *YPTHIMA DÆDALEA*, n. sp.

Allied to *Y. ariaspæ*, Moore.

Upperside dark brown, with the ocelli as in *Y. inica*, the one on the hind wing being minute, but with a clear ring of yellow round it. Underside pale grey, marginal lines brown; both wings covered with short brown strigæ, uniformly disposed, with a submarginal whitish fascia, bordered on the outer side by an incomplete brown, slightly zigzag line; pupils of the ocelli pale blue, metallic; fore wing with one subapical large ocellus, bi-pupilled: hind wing with three light distinct ocelli—one large (slightly smaller than the one on the fore wing), subapical, placed well inside the wing, almost in the disk, and with its upper part overlapping the second subcostal nervule; one a little smaller, in the interspace between the second and third median nervules; and a third, the smallest, is duplex at the anal angle; these ocelli are very curious: commencing with the largest one near the apex of the fore wings, they are gradually smaller, and the three first are in a perfectly straight line, the minute duplex one at the anal angle being at an obtuse angle inwards; all the ocelli have broad uniform yellow rings with brown borders, and the duplicate ocellus at the anal angle is distinctly divided with yellow, but not cut between by the brown ring, which borders the outer yellow only, making it a complete duplex ocellus.

Expanse of wings  $1\frac{2}{10}$  inch.

Mhow, June 1882.

15. *YPTHIMA RARA*.

*Ypthima rara*, Butler, P. Z. S. 1883, p. 145, pl. xxiv. f. 1.

May to November, very plentiful; Neemuch, November.

16. *YPTHIMA COMPLEXIVA*, n. sp. (Plate XL. fig. 2, ♀.)

Shape, colour, and markings above identical with *Y. rara*. The underside is, however, quite different, colour pale greyish, covered with dark chocolate-brown strigæ, and with an indistinct incomplete submarginal zigzag line, more distinct in parts of the hind wings: fore wings with a large subapical ocellus, bi-pupilled, with a deep yellow ring, bordered with brown, pupils bright blue metallic, and with another smaller blind ocellus just below it, also with a yellow ring round it: hind wings with three black, very minute spots where the ocelli should be placed, as in *Y. inica*.

Expanse of wings  $1\frac{5}{10}$  inch.

Depalpore, November.

## 17. LETHE NEELGHERRIENSIS.

*Satyrus (Cyllo) neelgherriensis*, Guérin, Delessert's Voy. dans l'Inde, pt. ii, p. 74, pl. 21. f. 1, 1 a (1843).

March, April, and May.

## ACRÆINÆ.

## 18. TELCHINIA VIOLE.

*Pap. violæ*, Fabr. Syst. Ent. p. 460 (1775).

Mhow, September (*Yerbury*).

## NYMPHALINÆ.

## 19. ATELLA PHALANTA.

*Pap. phalanta*, Drury, Ill. Ex. Ent. i. pl. 21. f. 1, 2 (1773).

Common, September to July.

## 20. PYRAMEIS CARDUI.

*Pap. cardui*, Linn. Faun. Suec. p. 276 (1761).

Common from September to December.

## 21. JUNONIA LEMONIAS.

*Pap. lemonias*, Linn. Mus. Ulr. p. 277 (1764).

Common from September to July.

## 22. JUNONIA HIERTE.

*Pap. hierte*, Fabr. Ent. Syst. Suppl. p. 424 (1798).

Common from September to July.

## 23. JUNONIA ORYTHIA.

*Pap. orythia*, Linn. Mus. Ulr. p. 278 (1764).

Common from September to July.

## 24. JUNONIA ASTERIE.

*Pap. asterie*, Linn. Syst. Nat. i. 2, p. 769 (1767).

Common from September to November.

## 25. JUNONIA ALMANA.

*Pap. almana*, Linn. Mus. Ulr. p. 272 (1764).

October, January, and March.

## 26. HYPANIS POLINICE.

*Pap. polinice*, Cram. Pap. Exot. iv. pl. 375. f. G, H (1782).

October to December.

## 27. HYPANIS SIMPLEX.

*Hypanis simplex*, Butler, P. Z. S. 1883, p. 146, pl. 24. f. 8.

Mhow, June, July, and October; Depalpore, January; Assirghur, September.

28. *HYPOLIMNAS BOLINA*.*Pap. bolina*, Linn. Mus. Ulr. p. 295 (1764).

Mhow, July. Neemuch, November; Assirghur, October.

29. *HYPOLIMNAS AVIA*.*Pap. avia*, Fab. Ent. Syst. iii. 1, p. 111 (1793).

Mhow, September and October; Neemuch, September to November, in great plenty.

This is merely the large form of the preceding.

30. *HYPOLIMNAS MISIPPUS*.*Pap. misippus*, Linn. Mus. Ulr. p. 264 (1764).

September to February.

The females all mimic *L. chrysippus*.31. *NEPTIS EURYMENE*.*Neptis eurymene*, Butler, P. Z. S. 1883, p. 145, pl. 24. f. 5.

February to April.

32. *SYMPHÆDRA NAIS*.*Pap. nais*, Forst. Nov. Spec. Ins. p. 73 (1771).*Pap. thyelia*, Fabr. Ent. Syst. iii. 1, p. 142 (1793).

Common from October to July.

33. *CHARAXES FABIVS*.*Pap. fabius*, Fabr. Spec. Ins. ii. p. 12 (1781).

June and October.

34. *CHARAXES AGRARIUS*, n. sp. (Plate XL. fig. 3, ♂.)

Allied to *C. athamus*, Drury, and *C. hamasta*, Moore. Smaller than either; nearest to the latter, but differs in having both wings with the discal transverse band one-fourth narrower in width, the subapical spot on the fore wing is small, whereas in *C. hamasta* this spot is a lengthened square, and in the male there are two smaller upper apical spots. On the hind wing the submarginal white spots are prominent, but there is no outer marginal row of ochreous lunules.

Expanse of wings  $2\frac{3}{10}$ – $2\frac{6}{10}$  inches.

Mhow, October; Assirghur, October.

## LYCÆNIDÆ.

35. *POLYOMMATUS BÆTICUS*.*Pap. bæticus*, Linn. Syst. Nat. ii. p. 789 (1766).

September to February.

36. *CATOCHRYSOPS STRABO*.*Hesperia strabo*, Fabr. Ent. Syst. iii. 1, p. 287 (1793).*Lyc. kandarpa*, Horsf. Cat. Lep. E. I. C. vol. i. p. 82 (1829).

Common from September to July.

## 37. CATOCHRYSOPS CNEJUS.

*Hesperia cnejus*, Fabr. Ent. Syst. v. Suppl. p. 430 (1798).

July to October.

## 38. CATOCHRYSOPS PATALA.

*Lycæna patala*, Kollar, Hüg. Kaschm. iv. 2, p. 418 (1848).

October to February. Very plentiful in October.

## 39. CATOCHRYSOPS HAPALINA.

*Catochrysops hapalina*, Butler, P. Z. S. 1883, p. 148, pl. 24. f. 2, 3.

December and January.

## 40. CATOCHRYSOPS ELLA.

*Catochrysops ella*, Butler, P. Z. S. 1881, p. 606.

September to November.

## 41. JAMIDES BOCHUS.

*Pap. bochus*, Cramer, Pap. Exot. iv. pl. 391. f. C, D (1782).

September to November.

## 42. ZIZERA MAHA.

*Lycæna maha*, Kollar, Hüg. Kaschm. iv. 2, p. 422 (1848).

Mhow, April, May, and June; Manpore, June.

## 43. ZIZERA CHANDALA.

*Polyommatus chandala*, Moore, P. Z. S. 1865, p. 504, pl. 31. f. 5.

November, February, April, and May.

Mr. Moore, in P. Z. S. 1882, p. 245, has put this species as a synonym to the preceding one. This I think is a mistake. He had, if I recollect rightly, only two examples, both males, in his collection. They were quite common at Mhow; and I found no difficulty in recognizing them, they are much paler blue than *Z. maha*. The females are the same colour as the males, instead of brown like *Z. maha*, and the underside in both sexes has very faint spots on the hind wings, each spot having a whitish ring round it.

## 44. ZIZERA KARSANDRA.

*Polyommatus karsandra*, Moore, P. Z. S. 1865, p. 505, pl. 31. f. 7.

October to May.

This insect is very variable in colour; the type is brown. Irrespective of sex, the colour varies from blue to dark brown. I have many examples from Quetta, Metazai, Sukkur, Karachi, the Punjab, Central India, the Deccan, and also from Aden, of many shades of colour, quite impossible to separate.

45. *ZIZERA DICRETA*.

*Zizera dicreta*, Butler, P. Z. S. 1883, p. 150.

October to May.

46. *ZIZERA PYGMÆA*.

*Lycæna pygmæa*, Snellen, Tijds. voor Ent. xix. pl. 7. f. 3 (1876).

September to December.

47. *ZIZERA SANGRA*.

*Polyommatus sangra*, Moore, P. Z. S. 1857, p. 772, pl. 41. f. 8.

*Lycæna indica*, Murray, Trans. Ent. Soc. 1874, p. 525.

October to February.

Varies much in size in different localities. I have four definite uniform sizes taken in four different parts of India; some are slightly paler than others, but otherwise all are identical. The uniform manner in which almost all the different Indian species of *Zizera* are marked on the wings below is very curious. *Z. pygmæa* has markings peculiar to itself, but all the others mentioned in this paper have the spots below arranged in almost exactly the same manner, *Z. sangra* differing from the others merely in the absence of the spot inside the cell.

48. *NACADUBA ARDATES*.

*Lycæna ardates*, Moore, P. Z. S. 1874, p. 574, pl. 67. f. 1.

November.

49. *EVERES PARRHASIUS*.

*Hesperia parrhasius*, Fabr. Ent. Syst. iii. 1, p. 289 (1793).

February and March.

50. *CHILADES PUTLI*.

*Lycæna putli*, Kollar, Hüg. Kaschm. iv. 2, p. 422 (1848).

September to December.

51. *CHILADES VARUNANA*.

*Polyommatus varunana*, Moore, P. Z. S. 1865, p. 772, pl. 41. f. 6.

May, September, October, November, and December.

52. *CHILADES LAIUS*.

*Pap. laius*, Cram. Pap. Exot. iv. pl. 319. f. D, E (1782).

November and December.

53. *TARUCUS PLINIUS*.

*Hesperia plinius*, Fabr. Ent. Syst. iii. 1, p. 284 (1793).

September to July.

54. *TARUCUS NARA*.

*Lycæna nara*, Kollar, Hüg. Kaschm. iv. 2, p. 421 (1848).

September to July.

55. *TARUCUS THEOPHRASTUS*.*Hesperia theophrastus*, Fabr. Ent. Syst. iii. 1, p. 281 (1793).

September to July.

56. *AZANUS UBALDUS*.*Papilio ubaldus*, Cramer, Pap. Exot. iv. pl. 390. f. L, M (1782).

January, April, and May.

57. *AZANUS ZENA*.*Lycæna zena*, Moore, P. Z. S. 1865, p. 505, pl. 31. f. 9.

September, October, and November.

58. *APHNÆUS ELIMA*.*Aphnæus elima*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 51 (1877).

March.

59. *APHNÆUS ICTIS*.*Aphnæus ictis*, Hewitson, Ill. D. L. p. 61, pl. 25. f. 8, 9 (1865).

November to July.

60. *APHNÆUS BRACTEATUS*.*Aphnæus bracteatus*, Butler, P. Z. S. 1883, p. 147, pl. 24. f. 10, 11.

October to June.

61. *APHNÆUS ÆSTIVUS*, n. sp. (Plate XL. fig. 1.)

Upperside pale reddish grey, with the bands on the underside showing faintly through the wings; marginal line brown, fringe silvery white: hind wings with two brown spots on the anal angle on a slightly reddish ground. Underside pale yellowish cream-colour, bands pale reddish brown with metallic marks: fore wings with two short bands before the middle which do not go below the cell; a median band broken in the middle, followed by a costal spot like a figure of 8, followed by two more larger spots, one touching the costa and the other below it like a figure of 8 broken off in the middle; then a submarginal and a marginal band, marginal line dark brown: hind wing with an inner median and discal band, and with a submarginal and marginal band like those on the fore wings; marginal line brown, and some brown marks on the abdominal margin. All the bands on both wings are margined with dark brown on both sides, and have a peculiar zigzag appearance in consequence of the zigzag formation of their borders.

Expanse of wings  $1\frac{4}{10}$  inch.

Mhow, May.

62. *VIRACHOLA ISOCRATES*.*Hesperia isocrates*, Fabr. Ent. Syst. iii. 1, p. 266 (1793).

February, April, and November.

63. *BASPA MELAMPUS*.

*Pap. melampus*, Cram. Pap. Exot. iv. pl. 362. f. G, H (1782).  
September to June.

64. *NILASERA APELLA*, n. sp. (Plate XL. fig. 4, ♂.)

Allied to *N. amantes*, Hewitson.

Upside of a brighter and paler blue, but similar to *A. amantes* in the deep costal band on the fore wings of the male, which is absent in the female, and in the far deeper costal band of the hind wings and marginal band of both wings. The underside is, however, quite different, the ground-colour being of a uniform pale brownish grey with an ochreous tinge, this tinge showing quite distinctly on the brown portions of the fore wings, the costal portion and much of the hind wing being silvery grey. Fore wings with one small spot in the cell near the base, and a larger one also within the cell, a little forward of its centre, the upper portions of both touching the sub-costal vein; another spot, square and larger at the end of the cell, and a smaller one below this in the angle of the first median interspace, and below this is a spot elongated into a band running along the interspace for more than half its length below the first median branch, and half filling up that portion of the interno-median interspace; there is also a discal row of six confluent spots from the costa, commencing with a small one and getting gradually larger and ending on the first median branch at the end of the band; all the spots brown, surrounded with yellowish white, the white borders being clearest round the two spots in the cell and the two outside it. Hind wing with four or five brown spots near the base, a central whirl of spots of the same colour, disconnected, and irregular like a zigzag band, a discal whorl of similar spots but paler, and the space on each side filled in with other bands of spots so pale as to be only here and there visible. Margins of both wings brown, diffused inwardly; a black spot at the anal angle, and a white silvery streak on the margin running from this spot to the first median branch, and clouded with dark brown atoms. Tails black, tips white.

Expanse of wings  $2\frac{1}{6}$  inches.

Mhow, March.

65. *TAJURIA JEHANA*.

*Tajuria jehana*, Moore, P. Z. S. 1883, p. 529, pl. 49. f. 7.  
September.

## PAPILIONIDÆ.

## PIERINÆ.

66. *TERIAS LÆTA*.

*Terias læta*, Boisduval, Sp. Gén. i. p. 174 (1836).  
September to July. The commonest Butterfly in Mhow.

63. *BASPA MELAMPUS*.

*Pap. melampus*, Cram. Pap. Exot. iv. pl. 362. f. G, H (1782).  
September to June.

64. *NILASERA APELLA*, n. sp. (Plate XL. fig. 4, ♂.)

Allied to *N. amantes*, Hewitson.

Upside of a brighter and paler blue, but similar to *A. amantes* in the deep costal band on the fore wings of the male, which is absent in the female, and in the far deeper costal band of the hind wings and marginal band of both wings. The underside is, however, quite different, the ground-colour being of a uniform pale brownish grey with an ochreous tinge, this tinge showing quite distinctly on the brown portions of the fore wings, the costal portion and much of the hind wing being silvery grey. Fore wings with one small spot in the cell near the base, and a larger one also within the cell, a little forward of its centre, the upper portions of both touching the sub-costal vein; another spot, square and larger at the end of the cell, and a smaller one below this in the angle of the first median interspace, and below this is a spot elongated into a band running along the interspace for more than half its length below the first median branch, and half filling up that portion of the interno-median interspace; there is also a discal row of six confluent spots from the costa, commencing with a small one and getting gradually larger and ending on the first median branch at the end of the band; all the spots brown, surrounded with yellowish white, the white borders being clearest round the two spots in the cell and the two outside it. Hind wing with four or five brown spots near the base, a central whirl of spots of the same colour, disconnected, and irregular like a zigzag band, a discal whorl of similar spots but paler, and the space on each side filled in with other bands of spots so pale as to be only here and there visible. Margins of both wings brown, diffused inwardly; a black spot at the anal angle, and a white silvery streak on the margin running from this spot to the first median branch, and clouded with dark brown atoms. Tails black, tips white.

Expanse of wings  $2\frac{1}{8}$  inches.

Mhow, March.

65. *TAJURIA JEHANA*.

*Tajuria jehana*, Moore, P. Z. S. 1883, p. 529, pl. 49. f. 7.  
September.

## PAPILIONIDÆ.

## PIERINÆ.

66. *TERIAS LÆTA*.

*Terias læta*, Boisduval, Sp. Gén. i. p. 174 (1836).  
September to July. The commonest Butterfly in Mhow.



67. **TERIAS DRONA.**  
*Terias drona*, Horsfield, Cat. Lep. E. I. C. p. 137, pl. 1. f. 13 (1829).  
September, October, and November.
68. **TERIAS VENATA.**  
*Terias venata*, Moore, Cat. Lep. E. I. C. i. p. 65, pl. 2. f. 2 (1857).  
June, July, September, and October.
69. **TERIAS RUBELLA.**  
*Terias rubella*, Wall. Trans. Ent. Soc. ser. 3, vol. iv. p. 323 (1867).  
October to April. In great numbers.
70. **TERIAS HECABE.**  
*Pap. hecabe*, Linn. Mus. Ulr. p. 249 (1764).  
February, July, and September.
71. **TERIAS HECABEOIDES.**  
*Terias hecabeoides*, Mén. Cat. Mus. Petr., Lép. i. p. 85, pl. 2. f. 2 (1855).  
September, October, and November.
72. **TERIAS ÆSIOPE.**  
*Terias æsiopæ*, Mén. Cat. Mus. Petr., Lép. i. p. 85, pl. 2. f. 3 (1855).  
October.
73. **TERIAS EXCAVATA.**  
*Terias excavata*, Moore, P. Z. S. 1882, p. 252.  
September to December. Very plentiful in December.
74. **TERIAS PURREEA.**  
*Terias purreea*, Moore, P. Z. S. 1882, p. 252.  
November to May.
75. **TERIAS ASPHODELUS.**  
*Terias asphodelus*, Butler, P. Z. S. 1883, p. 151, pl. 24. f. 13.  
December to April.
76. **TERIAS NARCISSUS.**  
*Terias narcissus*, Butler, P. Z. S. 1883, p. 151.  
December to February.
77. **BELENOIS MESENTINA.**  
*Pap. mesentina*, Cramer, Pap. Exot. iii. pl. 270. f. A, B (1782).  
Common all the year round.  
This is a very variable species; some of the males are deep yellow

on the secondaries below, and many of both sexes vary much in the depth of the markings above, they also vary much in size. I have a female from Neemuch with the apical portion entirely black, and both males and females identical with and not separable from a pair in my collection taken by Major Yerbury *in copula* at Haithalkim in Arabia, and identical with Walker's type in the British Museum of *B. lordaca* from Damascus. Mr. Butler (P. Z. S. 1884, p. 492) says the males sent him by Major Yerbury from Huswah and Haithalkim are smaller than the Damascus type; but I have males both large and small from these localities, and a pair from the Punjab quite as large as the Damascus insect, the male being a typical *B. lordaca* and the female only slightly paler in its marginal black borders.

78. HUPHINA PHRYNE.

*Papilio phryne*, Fabr. Syst. Ent. p. 473 (1775).

September, October, and November.

79. HUPHINA ZEUXIPPE.

*Pap. zeuxippe*, Cram. Pap. Exot. iv. pl. 362. f. E, F (1782).

April, May, and June.

80. HUPHINA CASSIDA.

*Pap. Danaus cassida*, Fabr. Ent. Syst. Suppl. p. 427. n. 595, 596 (1798).

November to May.

81. GANORIS RAPÆ.

*Papilio rapæ*, Linn. Faun. Suec. p. 270 (1761).

I took a worn female of this species in a garden at Mhow on the 6th of June, 1882, which I have still in my collection; it is out of place in this list, but as I took it there myself I record it; its chrysalis might have come from England with somebody's baggage.

82. APPIAS LIBYTHEA.

*Pap. libythea*, Fabr. Syst. Ent. p. 471 (1775).

June.

83. APPIAS ARES.

*Appias ares*, Swinhoe, P. Z. S. 1885, p. 138.

January.

84. DELIAS EUCHARIS.

*Pap. eucharis*, Drury, Ill. Exot. Ent. ii. pl. 10. f. 5, 6 (1773).

Common from September to July.

85. NEPHERONIA GAEA.

*Nepheronia gaea*, Felder, Reise Nov., Lep. ii. p. 130 (1865).

February and April.

## 86. CATOPSILIA PYRANTHE.

*Pap. pyranthe*, Linn. Mus. Ulr. p. 245 (1764).

Common all the year round.

## 87. CATOPSILIA PHILIPPINA.

*Pap. philippina*, Cram. Pap. Exot. iv. pl. 361. f. C, D (1782).

September to April.

## 88. CATOPSILIA CROCALE.

*Pap. crocale*, Cram. Pap. Exot. i. pl. 55. f. C, D (1779).

July.

## 89. CATOPSILIA CATILLA.

*Pap. catilla*, Cram. Pap. Exot. iii. pl. 229. f. D, E (1782).

Common from September to April.

## 90. IXIAS MERIDIONALIS.

*Ixias meridionalis*, Swinhoe, P. Z. S. 1885, p. 140, pl. 9. f. 5, ♀.

May to August.

## 91. IXIAS DEPALPURA.

*Ixias depalpura*, Butler, P. Z. S. 1883, p. 153, pl. 24. f. 6, 7.

Depalpore lakes, November, December, and January.

## 92. IXIAS KAUSALA.

*Ixias kausala*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 49 (1877).

Depalpore lakes, November, December, and January.

Very plentiful. All the females taken were albinos; the type female in Mr. Moore's collection is primrose-coloured, and I have a primrose female taken with a male (identical with Mr. Moore's type) in the Western Jumna canal.

## 93. TERACOLUS PERNOTATUS.

*Teracolus pernotatus*, Butler, P. Z. S. 1876, p. 159, pl. 7. f. 1.

Mhow, September; Neemuch, September.

## 94. TERACOLUS BIMBURA.

*Teracolus bimbura*, Butler, P. Z. S. 1876, p. 161, pl. 7. f. 3, 4.

January.

This *Teracolus* (which was originally named from specimens taken at Bimbur in Cashmir) is the most widely spread of all the genus. I have it from many parts of India.

## PAPILIONINÆ.

## 95. OPHEIDES ERITHONIUS.

*Pap. erithonius*, Cram. Pap. Exot. iii. pl. 232. f. A, B (1782).

Common from September to March.

## 96. LAERTIAS PAMMON.

*Pap. pammon*, Linn. Mus. Utr. p. 189 (1764).

♀. *Pap. polytes*, Linn. Mus. Utr. p. 186 (1764).

Common from September to March. The females taken were all of *M. diphilus* form.

## 97. MENELAIDES DIPHILUS.

*Pap. diphilus*, Esper, Ausl. Schmett. pl. 40 B. f. 1 (1785-98).

Common from September to March.

## HESPERIDÆ.

## 98. PYRGUS GALBA.

*Hesperia galba*, Fabr. Ent. Syst. iii. 1, p. 352 (1793).

July, October, and December.

## 99. PLESIONEURA INDRANI.

*Plesioneura indrani*, Moore, P. Z. S. 1865, p. 789.

September.

## 100. TELICOTA AUGIAS.

*Pap. augias*, Linn. Syst. Nat. i. 2, p. 794 (1767).

Common from September to July.

## 101. PADRAONA MÆSA.

*Pamphila mæsa*, Moore, P. Z. S. 1865, p. 509, pl. 30. f. 9.

February to May.

## 102. PARNARA BEVANI.

*Hesperia bevani*, Moore, P. Z. S. 1878, p. 688.

July.

## 103. CHAPRA AGNA.

*Hesperia agna*, Moore, P. Z. S. 1865, p. 791.

July.

## 104. CHAPRA MATHIAS.

*Hesperia mathias*, Fabr. Ent. Syst. Suppl. p. 433 (1798).

December to April.

## 105. SUASTUS GREMIUS.

*Hesperia gremius*, Fabr., Butler, Cat. Fabr. Lep. B. M. p. 271, pl. 3. f. 7, ♀.

*Hesperia divodasa*, Moore, Cat. Lep. Mus. E. I. C. i. p. 255.

Mhow, May, November, and December, scarce; Depalpole, January, one taken; Neemuch, September to November, common.

## 106. ISOTEINON NILGIRIANA.

*Isotheinon nilgiriana*, Moore, P. Z. S. 1883, p. 533.

March.

## 107. TARACTOCERA SAGARA.

*Pamphila sagara*, Moore, P. Z. S. 1865, p. 792.

April to July.

## 108. ISMENE ALEXIS.

*Papilio alexis*, Fabr. Syst. Ent. p. 533 (1775).

July.

## 109. BADAMIA EXCLAMATIONIS.

*Pap. exclamatonis*, Fabr. Syst. Ent. p. 530 (1775).

♀. *Pap. ladon*, Cramer, Pap. Exot. iii. pl. 284. f. C (1782).

June and July.

## II. HETEROCERA.

## SPHINGIDÆ.

## 1. CEPHONODES HYLAS.

*Sphinx hylas*, Linn. Mantissa, i. p. 539 (1771).

September and December.

## 2. MACROGLOSSA GYRANS.

*Macroglossa gyrans*, Walker, Cat. Lep. Het. viii. 91 (1856).

July, September, and November. Common in September and in great plenty in November.

## 3. MACROGLOSSA BELIS.

*Sphinx belis*, Cram. Pap. Exot. i. p. 147, pl. 94. f. C (1779).

June, September, and November. In great plenty in November.

## 4. LOPHURA HYAS.

*Lophura hyas*, Walker, viii. 107 (1856).

November.

## 5. CHÆROCAMPA ALECTO.

*Sphinx alecto*, Linn. Mus. Lud. Ulr. p. 357 (1764).

March and September.

## 6. CHÆROCAMPA THYELIA.

*Sphinx thyelia*, Linn. Mus. Lud. Ulr. p. 360 (1764).

Common from September to November.

## 7. CHÆROCAMPA CELERIO.

*Sphinx celerio*, Linn. Syst. Nat. i. 2, p. 800 (1766).

Common from September to December.

## 8. CHÆROCAMPA OLDENLANDIÆ.

*Sphinx oldenlandiæ*, Fabr. Sp. Ins. ii. p. 148 (1781).

July and September.

## 9. DEILEPHILA LIVORNICA.

*Sphinx livornica*, Esper, Ausl. Schmett. ii. pp. 87, 196, pl. 8. f. 4 (1785).

June.

## 10. DAPHNIS NERII.

*Sphinx nerii*, Linn. Syst. Nat. i. 2, p. 798 (1766).

September, October, and November.

## 11. POLYPTICHUS DENTATUS.

*Sphinx dentata*, Cram. Pap. Exot. ii. p. 42, pl. 125. f. G (1779).

October.

## 12. LEUCOPHLEBIA BICOLOR.

*Leucophlebia bicolor*, Butler, P. Z. S. 1875, p. 16, pl. 2. f. 5.

June and July.

## 13. BASIANA CERVINA.

*Basiana cervina*, Walker, viii. 237 (1856).

August (*Forsayeth*).

## 14.ACHERONTIA STYX.

*Acherontia styx*, Westwood, Cab. Orient. Ent. p. 88, pl. 42. f. 3 (1847).

September.

## 15.ACHERONTIA MORTA.

*Acherontia morta*, Hübner, Verz. bek. Schmett. p. 140 (1816).

February and September.

## 16. PROTOPARCE ORIENTALIS.

*Protoparce orientalis*, Butler, Tr. Z. S. 1877, vol. ix. part 10, p. 609.

June, July, and September.

## 17. NEPHELE HESPERA.

*Sphinx hespera*, Fabr. Syst. Ent. p. 546 (1775).

Common from September to June. Very plentiful in November.

Hawk-Moths were in extraordinary abundance in September 1881 in Mhow. A large thorny tree in my garden remained in full blossom for the greater part of that month, and I spent many evenings sitting under it watching these moths. About half an hour before sunset a few *Cephonodes hylas* would come, to be followed in a short time by *Macroglossa belis* and *M. gyrans*; then would fly by with a rush a single *Nephele hespera*. He would circle round and fly away, and a minute afterwards thousands of these insects would take possession of the tree. The solitary one always came first, apparently to see that all was safe, then flew away and a multitude of

them would come, and the *Macroglossa* and *Cephonodes* would disappear. In about half an hour the *Nephele* would vanish as suddenly as they came, just about the time it was getting dark; and from then till nine or ten o'clock *Chærocampa thyelia*, *C. celerio*, *Daphnis nerii*, and *Protoparce orientalis* would be hovering about the flowers, and by ten o'clock the tree would be deserted, and it would remain deserted until just before daybreak, when it always again had a crowd of visitors. They invariably came and went in the same order. I never found any on the tree during the middle of the night.

#### SYNTOMIDÆ.

##### 18. ERESSA CONFINIS.

*Syntomis confinis*, Walker, vii. 1592 (1856).

April and October.

I never saw this insect on the wing; I usually found them lying dead in the early morning in the verandah of my house.

##### 19. SYNTOMIS CYSSEA.

*Sphinx cyseus*, Cramer, Pap. Exot. iv. 124, pl. 355. f. B.

January to March; June, September, and November.

Flying in swarms over the flowering poppy-fields in February.

#### AGARISTIDÆ.

##### 20. EUSEMIA AFFLICTA.

*Eusemia afflicta*, Butler, Ent. M. M. xii. p. 118 (1875).

June.

#### LITHOSIIDÆ.

##### 21. ARGINA CRIBRARIA.

*Argina cribraria*, Clerck, Icones, pl. 54. f. 4.

September and October.

##### 22. ARGINA NOTATA.

*Argina notata*, Butler, Trans. Ent. Soc. 1877, part iv. Dec. p. 365. n. 270.

September.

##### 23. ARGINA ASTREA.

*Phalæna astrea*, Drury, Ill. Exot. Ins. ii. pl. vi. f. 3.

September, October, and November.

##### 24. DEIOPEIA PULCHELLA.

*Tinea pulchella*, Linn. Syst. Nat. i. 2, p. 884. no. 349.

September to March.

##### 25. DEIOPEIA LOTRIX.

*Phalæna lotrix*, Cramer, Pap. Exot. ii. 20, pl. 109. f. E.

September to March.

26. *ÆMENE TENEBROSA*.

*Æmene tenebrosa*, Moore, P. Z. S. 1878, p. 34.

May and June.

27. *LACIDES FICUS*.

*Noctua ficus*, Fabr. Ent. Syst. iii. p. 27. no. 62.

September and October.

## ARCTIIDÆ.

28. *ALOPE RICINI*.

*Bombyx ricini*, Fabr. Ent. Syst. iii. 1, p. 473 (1793).

*Alope ocellifera*, Walker, iii. 620 (1856).

August (*Forsayeth*).

29. *CREATONOTUS INTERRUPTUS*.

*Phalæna interrupta*, Linn. Syst. Nat. Phal. 116.

September.

30. *MICROSEMYRA PALLIDA*.

*Microsemyra pallida*, Butler, P. Z. S. 1883, p. 155.

October.

31. *ALOA PUNCTISTRIGA*.

*Spilosoma punctistriga*, Walker, iii. 676 (1855).

June and September.

32. *ALOA EMITTENS*.

*Creatonotus emittens*, Walker, iii. 638 (1855).

June.

33. *ALOA SANGUINOLENTA*.

*Bombyx sanguinolenta*, Fabr. Ent. Syst. iii. 1, p. 473 (1793).

September (*Forsayeth*).

## LIPARIDÆ.

34. *PERINA BASALIS*.

*Perina basalis*, Walker, iv. 966 (1855).

September and October.

35. *CHARNIDAS TESTACEA*.

*Cynia testacea*, Waker, iii. 683 (1855).

October, December, and March.

36. *EUPROCTIS LUNATA*.

*Euproctis lunata*, Walker, iv. 837 (1855).

September.

Both sexes vary much in colour from deep chrome-yellow to pure creamy white.



37. *PORTHESIA MARGINALIS.**Euproctis marginalis*, Walker, vii. 1731 (1865).

June, September, and November.

38. *ENOME DETERSA.**Lymantria detera*, Walker, xxxii. 365 (1865).

September to February.

39. *ENOME INCERTA.**Lymantria incerta*, Walker, iv. 880 (1855).

September, December, and February.

40. *LYMANTRIA OBSOLETA.**Lymantria obsoleta*, Walker, iv. 880 (1855).

September, November, December, and April.

41. *OLENE FUSIFORMIS.**Nioda fusiformis*, Walker, v. 1070 (1855).September (*Forsayeth*).42. *PSALIS SECURIS.**Psalis securis*, Hübner, Samml. exot. Schmiett. iii. 9, 146. f. 291, 292.August (*Forsayeth*).43. *CHILENA STRIGULA.**Lasiocampa strigula*, Walker, xxxii. 563 (1865).September (*Forsayeth*).

## NOTODONTIDÆ.

44. *CETOLA DENTATA.**Cetola dentata*, Walker, v. 1016 (1855).

July and September.

45. *ANTHEUA DISCALIS.**Antheua discalis*, Walker, iii. 767 (1855).Mhow (*Ferbury*).46. *BIRETA GALBANA*, n. sp. (Plate XL. fig. 5.)

♂ ♀. Thorax, fore wings, and antennæ yellowish cream-colour; head reddish brown, a stripe of the same colour down the centre of the thorax. Fore wings sparsely irrorated with black atoms, except in the centre, where they cluster together, forming a slight shade; three rows of black dots—first just before the middle, consisting of two dots, one on the median vein, and the other close to the hinder margin; the second discal, one on each nervule; the third marginal, minute but very distinct, one on the extremity of each nervule. Hind wings and abdomen pure white; underside pure white.

The spots on the female are generally smaller than those on the male.

Expanse of wings  $1\frac{3}{10}$  inch.

June and July.

47. *DABARITA ICTERICA*, n. sp. (Plate XL. fig. 8.)

Head, thorax, antennæ, and fore wings pale reddish yellow, top of head and collar whitish; fore wings with two outwardly oblique, thin, yellowish, slightly sinuous lines, rather close together, the first just before the middle, the second beyond the middle; the basal half of the wing the darkest, caused by numerous latitudinal brick-dust coloured minute regular lines or strigulæ, diffuse and terminating between the two lines. Abdomen pale dirty straw-colour; hind wings white, semidiaphanous; underside white, shining.

Expanse of wings  $1\frac{1}{10}$  inch.

June.

48. *ICHTHYURA RESTITURA*.

*Ichthyura restituta*, Walker, xxxii. 433 (1865).

October.

49. *ORÆSIA EMARGINATA*.

*Noctua emarginata*, Fabr. Ent. Syst. iii. 2, p. 240.

October.

LIMACODIDÆ.

50. *MIRESA ALBIPUNCTA*.

*Nyssia albipuncta*, Herr.-Schäff. Lep. Exot. Sp. Ser. i. f. 179.

October.

51. *CANDYBA PUNCTATA*.

*Candyba punctata*, Walker, vii. 1761 (1856).

*Belgoræa subnotata*, Walker, xxxii. 497 (1865).

June.

Walker's type of *C. punctata* is said to have come from Central Brazil, but the types of the above two species are identical.

52. *NATADA BASALIS*.

*Natada basalis*, Walker, v. 1110 (1855).

June and July.

53. *PARASA LEPIDA*.

*Phalæna-Noctua lepida*, Cram. Pap. Exot. ii. p. 50, pl. 130. f. E (1779).

September.

54. *APHENDALA TRIPARTITA*.

*Aphendala tripartita*, Moore, Trans. Ent. Soc. 1884, p. 376.

June and July.

55. *SUSICA COSMIANA*, n. sp. (Plate XL. fig. 9, ♀.)

Allied to *S. fraterna*, Moore. ♂ pale reddish ochreous; ♀ greyish ochreous, covered with silvery minute speckles, with the head and collar whitish. ♂ ♀ with a minute spot at end of cell, more than two thirds of the wing from the base suffused with reddish, bounded by a reddish line curving outwardly from the costa near the apex, stopping short before the outer third of the hinder margin. Hind wings paler, reddish grey in the ♂, greyish ochreous in the ♀. Underside in both sexes pale shining reddish ochreous.

Expanse of wings  $\frac{9}{16}$  inch.

October to February.

## BOMBYCIDÆ.

56. *TRILOCHA VARIANS*.

*Naprepa varians*, Walker, v. 1153 (1855).

October and December.

## LASIOCAMPIDÆ.

57. *TARAGAMA GANESA*.

♂. *Bombyx ganesa*, Lefebvre, Zool. Journ. iii. p. 211 (1827).

♀. *Bombyx siva*, Lefebvre, l. c. p. 210.

August (*Yerbury*).

58. *TRISULA VARIEGATA*.

*Trisula variegata*, Moore, Cat. Lep. E.I. C. ii. p. 420 pl. 12 a. f. 1 (1858-9).

September.

59. *TRABALA VISHNU*.

♀. *Gastropacha vishnu*, Lefebvre, Zool. Journ. iii. p. 207 (1827).

♂. *Amydona prasina*, Walker, vi. 1417 (1855).

September (*Forsayeth*).

60. *LEBEDA BUDDHA*.

♂. *Bombyx buddha*, Lefebvre, Zool. Journ. iii. p. 209 (1827).

♀. *Bombyx brahma*, Lefebvre, l. c. p. 208.

August (*Forsayeth*).

61. *EUPTEROTE IGNAVUS*, n. sp. (Plate XLI. fig. 1, ♂.)

Allied to *E. mutans*, Walker.

Male of a soft yellowish-fawn colour, the internal bands being much more deeply bent inwards towards the costa than in *E. mutans*; the insect is also much smaller and of altogether a different colour; the bands on the hind wings are very distinct and, except at the base, are identical with those on the fore wings, which is not the case with *E. mutans*. Antennæ, head, thorax, and all the bands and markings rufous-brown; marginal border of both wings outside the outer double straight band much paler than the rest of the wings.

Basal third of the hind wings clothed with long pale hairs. Underside clear greyish yellow, with the bands and marks as above but paler.

*Female* of a uniform rufous-brown, coloured somewhat similarly to ♂ *E. undata*, Blanchard. Bands dark rufous-brown, placed as in the male but much straighter, less toothed and hardly at all bent in towards the costa, and the brown spots outside the outer straight band of the fore wings are wanting in the female; antennæ, head, and body dark rufous-brown. Underside pale rufous; markings as above but much paler.

Expanse of wings, ♂  $3\frac{5}{10}$ , ♀ 4 inches.

June.

#### DREPANULIDÆ.

##### 62. ARGYRIS EXTRUSATA.

*Ephyra extrusata*, Walker, xxii. 637 (1861).

October.

#### SATURNIIDÆ.

##### 63. ANTHERÆA NEBULOSA.

*Antheræa nebulosa*, Hutton, Journ. As. Soc. Bengal, 1869, p. 16.

Common in the jungles below Assirghur from August to October.

#### COSSIDÆ.

##### 64. PHRAGMATÆCIA MINOR.

*Phragmatæcia minor*, Moore, Desc. Lep. Col. Atkinson, part i. p. 87.

June.

##### 65. BRACHYLIA ACRONYCTOIDES.

*Brachylia acronyctoides*, Moore, P. Z. S. 1879, p. 411, pl. 34. f. 4.

June.

#### NOCTUES.

#### LEUCANIDÆ.

##### 66. LEUCANIA EXTRANEA.

*Leucania extranea*, Guénée, Noct. i. 77, 104.

April.

##### 67. LEUCANIA AUREOLA.

*Leucania aureola*, Walker, ix. 108.

September, in great numbers for about a fortnight.

##### 68. LEUCANIA INFERENS.

*Leucania inferens*, Walker, ix. 105.

Mr. Butler identified some Moths I sent him in 1882, taken in September 1881, as this species. I therefore enter it in this list, but I have no Mhow examples in my collection now, neither have I any note in my diary of Lepidoptera of having taken this insect in Mhow.

69. *LEUCANIA BYSSINA*, n. sp. (Plate XL. fig. 6.)

Antennæ, head, thorax, and fore wings pale greyish white, very slightly tinged with ochreous. Fore wings shining, irrorated with black atoms, a black spot at the end of the cell, another before the middle in the interno-median area, a discal row of black points curving outwardly, deeply bent in towards the costa, and a marginal row of black points. Fringe long, same colour as the wing. Abdomen, hind wings above, and the entire surface below pure shining white.

Expanse of wings  $1-1\frac{1}{10}$  inch.

June.

70. *AXYLIA FURTIVA*.

*Axylia furtiva*, Swinhoe, P. Z. S. 1885, p. 448.

September.

## HELIOTHIDÆ.

71. *ALARIA LANCEOLATA*.

*Alaria lanceolata*, Walker, xxxiii. 767.

September.

72. *PRADATTA BIVITTA*.

*Leucania bivitta*, Walker, ix. 108.

September. The above two species were together in great numbers in September 1881 for about a week.

73. *PRADATTA BEATRIX*. (Plate XLI. fig. 5.)

*Pradatta beatrix*, Moore, P. Z. S. 1881, p. 365.

Antennæ, head, thorax, and fore wings bright rosy pink. Fore wings with a cream-coloured stripe from base to outer margin, passing through the whole length of the cell. Abdomen and hind wings silvery white, the latter in some specimens stained here and there with rosy. Underside silvery white, brownish towards the basal centre of the fore wings, and stained with rosy grey here and there on both wings.

Expanse of wings 1 inch.

September.

74. *HELIOTHIS ARMIGERA*.

*Noctua armigera*, Hübner, Noct. pl. 79. f. 370.

October, November, and December.

75. *HELIOTHIS RUBESCENS*.

*Thalophila rubescens*, Walker, xv. 1681.

December.

76. *HELIOTHIS PELTIGERA*.

*Noctua peltigera*, Wien. Verz. 89. 2.

June and December.

77. *HELIOTHIS SUCCINEA*.

*Heliothis succinea*, Moore, P. Z. S. 1881, p. 362.  
November.

78. *ADISURA LEUCANOIDES*.

*Adisura leucanoides*, Moore, P. Z. S. 1881, p. 368.  
October.

79. *ANTHÆCIA SWINHOEI*.

*Anthæcia swinhoei*, Butler, P. Z. S. 1883, p. 162.  
Assirghur, October.

## GLOTTULIDÆ.

80. *GLOTTULA DOMINICA*.

*Phalæna-Noctua dominica*, Cram. Pap. Exot. iv. p. 238, pl. 399.  
f. H.  
August (*Forsayeth*).

## CYMATOPHORIDÆ.

81. *RISOBA OBSTRUCTA*.

*Risoba obstructa*, Moore, P. Z. S. 1881, p. 328.  
July.

## APAMIIDÆ.

82. *PRODENIA RETINA*.

*Neuria retina*, Frivaldsky, Herr.-Schäff. Eur. Schmett. ii. 292,  
Noct. pl. 29. f. 145.  
October.

83. *LAPHYGMA EXIGUA*.

*Noctua exigua*, Hübner, Samml. Eur. Schmett., Noct. f. 362.  
February and March.

84. *ILATTIA CEPHUSALIS*.

*Ilattia cephusalis*, Walker, xvi. 209.  
September and October.

85. *MAMESTRA DOLOROSA*.

*Mamestra dolorosa*, Walker, xxxii. 667.  
October and November.

86. *PERIGIA SERVA*.

*Celaena serva*, Walker, xv. 1689.  
October.

87. *PERIGIA CENTRALIS*.

*Perigia centralis*, Walker, xi. 734.  
June.

## NOCTUIDÆ.

## 88. AGROTIS SEGETUM.

*Phalæna-Noctua segetum*, Gmel. ed. Syst. Nat. i. 5, p. 2539. 1018.  
January to April.

## 89. AGROTIS SUFFUSA.

*Phalæna-Noctua suffusa*, Gmel. ed. Syst. Nat. i. 5, p. 2541. 1028.  
February.

## 90. AGROTIS ARISTIFERA.

*Agrotis aristifera*, Guénée, Noct. i. 266. 426.  
April, June, November, and December.

## 91. AGROTIS LASSA, n. sp.

Allied to *A. repulsa*. Antennæ, head, thorax, and fore wings dark brownish fawn-colour. Fore wings of the male very narrow; fore wings of both sexes with some brown marks, like strigulæ here and there; on the male the usual stigmata are not visible; on the female the orbicular is represented by a black ring, and the claviform and reniform are both visible, but obscure and black; and the latter is like a small smudged figure of 8. Hind wings white, semi-hyaline, with the costa and outer border tinged with fawn-colour. Abdomen grey, with the segments marked out with some white hairs. Underside paler, with the thorax, abdomen, and fore and hind wings streaked with silvery-white speckles.

Expanse of wings  $1\frac{1}{2}$  inch.

March and April.

## HADENIDÆ.

## 92. RADINACRA VARIANA, n. sp. (Plate XL. fig. 10.)

Antennæ, head, thorax, and fore wings brownish fawn-colour. Fore wings with the lines sinuous, dark brown, one subbasal extending only halfway down from the costa, another before the middle, and one submarginal; all these complete and bending slightly outwardly; three yellowish dots on the costa near the apex; the third line runs through the reniform stigma, which is hardly visible, the orbicular is indicated by a faint white spot. Abdomen greyish brown. Hind wings and underside pale brownish grey. Both wings above and below shining, almost gilded.

Expanse of wings 1 inch.

September.

## XYLOPHASIDÆ.

## 93. SPODOPTERA CILIUM.

*Spodoptera cilium*, Guénée, Noct. i. 156. 249.  
March and October.

## 94. SPODOPTERA INFECTA.

*Prodenia infecta*, Walker, ix. 196.  
October.

## ERASTRIIDÆ.

## 95. LEPTOSIA QUINARIA.

*Leptosia quinaria*, Moore, P. Z. S. 1881, p. 371.  
April.

## ACONTIIDÆ.

## 96. ACONTIA SIGNIFERA.

*Acontia signifera*, Walker, xii. 793.  
September.

## 97. ACONTIA NIGRIPALPIS.

*Acontia nigripalpis*, Walker, xxxv. 1965.  
Assirghur, October.

## 98. ACONTIA BADIA, n. sp.

Of a uniform pale reddish fawn-colour. Fore wing with whitish lines, thin, sinuous—one antemedian, one postmedian, one submarginal, and one marginal; a dark brown central band, stopping short of the costa, and expanding outwardly towards the apex, in some specimens overlapping the second line, in others having this line as its outer border for some distance upwards from the hinder margin; the inner border of this band is upright, bent inwardly on the centre and well defined, and within this band is a deep black reniform mark, and another black mark beyond. Hind wings slightly darker towards the border, and rather more grey-coloured than the ground-colour of the fore wings. Underside: fore wings greyish brown, with the costa and hinder margin broadly pinkish yellow; hind wings pale ochreous grey.

Expanse of wings  $\frac{8}{10}$  inch.

October.

## 99. ACONTIA CROCATA.

*Acontia crocata*, Guénée, Noct. ii. 218. 989.  
October.

## 100. ACONTIA INDA.

*Acontia inda*, Felder, Reise Nov. iv. pl. 108. fig. 23.  
June.

## 101. ACONTIA QUADRIPARTITA.

*Acontia quadripartita*, Walker, xxxiii. 786.  
June.

## 102. ACONTIA EXCISA.

*Acontia excisa*, Walker, MS., Swinhoe, P. Z. S. 1885, p. 455.  
September.

## 103. PHOTHEDES VEPRECUA.

*Phothedes veprecula*, Swinhoe, P. Z. S. 1885, p. 456.  
June, September, and October.



104. *PHOTHEDES FRAUSA*, n. sp.

Yellowish cream-colour. Fore wings diffused with pinkish, costa broadly grey; an indistinct silvery sinuous inner line, which in some specimens is disconnected and in some is wanting; a similar outward line from the outer two thirds of the hinder margin up to the apex; this line in many specimens runs in a brownish-grey shade, and there are streaks and marks of this colour on the costa, on the hinder margin towards the base, and marginal marks; fringe also of same colour. Hind wings in some examples slightly grey towards the outer border, in others pure pale yellowish cream-colour, paler than the ground-colour of the fore wings. Underside of the same colour but paler, more whitish, shining, and quite unmarked.

Expanse of wings  $\frac{7}{10}$  inch.

July.

Quite common for a few days. A somewhat variable-looking insect, because the colours and markings are much stronger in some than in others, the ground-colour in some females being almost pure pinkish.

105. *HICCODA HERBARIA*, n. sp.

Upperside, body, and wings white. Fore wings sparsely irrorated with reddish-brown dots and atoms, some marks of the same colour on the costa and outer margin, a sinuous line within a diffused band, from the outer two thirds of the hinder margin to the apex; a square blackish large spot in the disk within this band; fringe white, marked with black marks. Hind wings with the outer half shaded with pale reddish brown; fringe pure white. Underside whitish, shaded with grey, darkest on the costa. Palpi black, last joint very minute and pure white; fore tarsi black with white bands.

Expanse of wings  $\frac{6}{10}$  inch.

June and July.

106. *TARACHE NIVOSA*, n. sp. (Plate XLI. fig. 14.)

Head and thorax snow-white; antennæ and thorax reddish grey, the latter marked with pure white within the segments, may be altogether white in freshly emerged specimens. Fore wings reddish slate-colour, in some specimens pale brown-pink, a deep snow-white band extending along four fifths of the costa, filling nearly the whole basal area with the dark colour of the wings, forming an elbow upwards in the centre part of the band; a reddish indistinct line crossing the band at the basal third, just before the elbow, a spot at the base within the band, also the orbicular and reniform spots all of the general colour of the wing, clear and distinct; the dark part of the wing has white marks showing through here and there, and a brownish elbow parallel with the stigmata, giving the appearance of three spots in a longitudinal row; marginal marks white; fringe white. Hind wings in some specimens white with greyish borders, in others of a uniform pale slaty grey; fringe white. Underside pale grey, unmarked.

Expanse of wings  $\frac{8}{10}$  inch.

June and September.

A well-marked and pretty little insect.

#### ANTHOPHILIDÆ.

##### 107. THALPOCHARES ROSEANA.

*Thalpochares roseana*, Moore, P. Z. S. 1881, p. 370.

April and May.

##### 108. THALPOCHARES RIVULA.

*Thalpochares rivula*, Moore, Desc. Lep. col. Atkinson, ii. p. 140 (1882).

March.

##### 109. AGROPHILA SULPHURALIS.

*Phalæna-Pyralis sulphuralis*, Bergestr. Ins. Suec. i. 16.

October.

##### 110. ANTHOPHILA INNUBILA, n. sp.

Upperside of a uniform shining cream-colour, the fore wings rather darker than the hind wings, and tinged with ochreous, especially on the costa. Fore wings sparsely covered with silvery-white freckles, and with a whitish line which extends upwards from the centre of the hinder margin towards the apex and then angles inwards, meeting the costa at the outer two thirds; there is also a faint indication of a similar inner line parallel to this just inside the middle. Eyes black; antennæ ochreous. Underside paler than the upperside, shining, unmarked.

Expanse of wings  $\frac{8}{10}$  inch.

June.

##### 111. EUBLEMMA AMABILIS.

*Eublemma amabilis*, Moore, Lep. Ceylon, iii. p. 54.

June.

#### PLUSIIDÆ.

##### 112. PLUSIA VERTICILLATA.

*Plusia verticillata*, Guénée, Noct. ii. 344. 1168.

September.

##### 113. PLUSIA EXTRAHENS.

*Plusia extrahens*, Walker, xii. 929.

June and October.

##### 114. PLUSIA CIRCUMFLEXA.

*Phalæna-Noctua circumflexa*, Linn. Syst. Nat. 128.

April.

115. *PLUSIA ORICHALCEA*.*Noctua orichalcea*, Fabr. Sp. Ins. ii. 227. 92.October (*Forsayeth*).

## HYBLÆIDÆ.

116. *HYBLÆA PUERA*.*Phalæna-Noctua puera*, Cram. Pap. Exot. ii. 10, pl. 103. f. D, E.Mhow (*Ferbury*).

## GONOPTERIDÆ.

117. *COSMOPHILA XANTHINDYMA*.♂. *Cosmophila xanthindyma*, Boisd. Faun. Ent. Mad. Bourb. et Maur., Lép. p. 94, pl. 13. f. 7 (1833).♀. *Cosmophila indica*, Guénée, Noct. ii. 396. 1256 (1852).

July, September, and October; in great numbers in September.

## POLYDESMIDÆ.

118. *PANDESMATA QUENAVADI*.*Pandesmata quenavadi*, Guénée, Noct. ii. 438. 1310.

May, July, and September.

119. *POLYDESMATA BOARMOIDES*.*Polydesmata boarmoides*, Guénée, Noct. ii. 441. 1314.

June.

120. *POLYDESMATA BREVIPALPIS*.*Alamis brevipalpis*, Walker, xiii. 1051.

June and July.

121. *BAMRA ACRONYCTOIDES*.*Bamra acronyctoides*, Moore, Desc. Lep. col. Atkinson, ii. p. 160 (1882).Mhow (*Ferbury*).

## HOMOPTERIDÆ.

122. *HOMOPTERA VETUSTA*.*Homoptera vetusta*, Walker, xxxiii. 875.

June, July, and October.

123. *ALAMIS UMBRINA*.*Alamis umbrina*, Guénée, Noct. iii. 4. 132.

July and October.

124. *ALAMIS CONTINUA*.*Alamis continua*, Walker, xxxiii. 877.September (*Forsayeth*).

125. *GIRPA FRATERNA*.

*Girpa fraterna*, Moore, Lep. Ceylon, iii. p. 94 (1884).  
September and October.

126. *GIRPA INANGULATA*.

*Hulodes inangulata*, Guénée, Noct. iii. 210. 1612.  
*Remigia optativa*, Walker, xiv. 1510.  
*Remigia optatura*, Walker, xv. 1848.  
September and October.

## HYPOGRAMMIDÆ.

127. *SELEPA CELTIS*.

*Selepa celtis*, Moore, Cat. Lep. E. I. C. ii. p. 353, pl. ix. a. f. 9.  
October (*Forsayeth*).

128. *SELEPA OCCULTA*.

*Selepa occulta*, Swinhoe, P. Z. S. 1885, p. 461.  
June.

129. *SELEPA CURVIFERELLA*.

*Subrita* ? *curviferella*, Walker, xxxv. 1745.  
September (*Forsayeth*).

## CATEPHIDÆ.

130. *ERYGIA APICALIS*.

*Erygia apicalis*, Guénée, Noct. iii. 50. 1381.  
November.

131. *BRIARDA BOLINOIDES*.

*Briarda bolinoides*, Walker, xv. 1802.  
July.

132. *ANOPHIA OLIVESCENS*.

*Anophia olivescens*, Guénée, Noct. iii. 48. 1379.  
June.

## OMMATOPHORIDÆ.

133. *PATULA MACROPS*.

*Phalæna-Noctua macrops*, Linn. Syst. Nat. ii. 225.  
June and September.

134. *ENTOMOGRAMMA TORSA*.

*Entomogramma torsa*, Guénée, Noct. iii. 204. 1605.  
October.

135. *HOMÆA CLATHRUM*.

*Homæa clathrum*, Walker, xiv. 1334.  
July.

## HYPOPYRIDÆ.

## 136. SPIRAMIA HELICINA.

*Speiredonia helicina*, Hübner, Samml. exot. Schmett. iii. 14. 219.  
f. 437, 438.

March, June, July, and September.

## OPHIDERIDÆ.

## 137. ARGADESA MATERNA.

*Phalæna-Noctua materna*, Linn. Syst. Nat. ii. 840. 17.  
July.

## 138. OTHREIS FULLONICA.

*Phalæna-Noctua fullonica*, Linn. Syst. Nat. ii. 812. 16.  
July.

## OPHIUSIDÆ.

## 139. OPHIODES SEPARANS.

*Ophiodes separans*, Walker, xiv. 1357.  
September (*Forsayeth*).

## 140. OPHIODES TRIPHÆNOIDES.

*Ophiodes triphænoides*, Walker, xiv. 1358.  
Mhow (*Yerbury*).

## 141. SPHINGOMORPHA CHLOREA.

*Phalæna chlorea*, Cram. Pap. Exot. ii. p. 12, pl. 104. f. C.  
September and November.

## 142. ACHÆA MELICERTE.

*Phalæna-Noctua melicerte*, Drury, Ins. i. p. 46, pl. 23. f. 1.  
July to November.

## 143. ERCHEIA DIVERSIPENNIS.

*Ercheia diversipennis*, Walker, xiii. 1108.  
September (*Forsayeth*).

## 144. OPHIUSA ALBIVITTA.

*Ophiusa albivitta*, Guénée, Noct. iii. 271. 1707.  
July.

## 145. OPHIUSA JOVIANA.

*Phalæna-Noctua joviana*, Cram. Pap. Exot. iv. p. 237, pl. 399.  
f. B.  
Depalpore, November.

## 146. OPHIUSA ARCTOTÆNIA.

*Ophiusa arctotænia*, Guénée, Noct. iii. p. 272 (1852).  
Mhow (*Yerbury*).

## 147. GRAMMODES AMMONIA.

*Phalæna ammonia*, Cram. Pap. Exot. iii. p. 98, pl. 250. f. D.

July and September.

## EUCLIDIIDÆ.

## 148. TRIGONODES HIPPIASIA.

*Phalæna-Noctua hippasia*, Cram. Pap. Exot. iii. p. 99, pl. 250. f. E.

September, October, and November.

## 149. ACANTHOLIPES AFFINIS.

*Docela affinis*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 225 (1880).

Mhow, October ; Assirghur, October.

## 150. ACANTHOLIPES ACERVALIS, n. sp.

♂. Cream-colour, sparsely irrorated with brown atoms ; head and collar pure white. Fore wings with a black dot in the cell and one or two in a line beyond it, a short grey longitudinal streak from the end of the cell to the outer border, some short grey streaks on the border, made by the interspaces near the border being nearly filled up with grey color, a black dot near the external angle (this is not present in all specimens) ; hinder margin grey. Hind wings ochreous grey towards the outer border. Underside white, fore wings suffused with purplish grey, darkest along the costa. Mhow, October.

## 150A. ANTHOPHILA PULCHRA, n. sp.

♀. Allied to *A. purpurina*. Cream-colour ; head and collar pure white. Fore wings with the costa and outer half suffused with purplish grey, gradually darkening towards the outer border, where there is a white streak running from the apex halfway down the outer margin, and then making a short streak inwards. Hind wings dark grey. Underside similar to the male, the purple on the fore wings rather darker.

Expanse of wings  $\frac{9}{10}$  inch.

Mhow, November.

## REMIGIIDÆ.

## 151. REMIGIA FRUGALIS.

*Noctua frugalis*, Fabr. Ent. Syst. iii. 2. 138.

Common from July to December.

## 152. REMIGIA ARCHESIA.

*Phalæna-Noctua archesia*, Cram. Pap. Exot. iii. p. 145, pl. 273. f. F, G.

July, September, and October.

## POAPHILIDÆ.

## 153. POAPHILA HAMIFERA.

*Poaphila hamifera*, Walker, xxxiii. 992.

July.

## THERMESIIDÆ.

## 154. AZAZIA RUBRICANS.

*Ophiusa rubricans*, Boisd. Faun. Léop. Mad. p. 106. 11, pl. 16. f. 1. September.

## 155. MESTLETA BACCALIX, n. sp. (Plate XL. fig. 7.)

Pale pinkish cream-colour. Fore wings irrorated with pinkish-brown atoms; with four equidistant parallel whitish oblique lines—subbasal, antemedian, median, and postmedian; each line nearly straight from hinder margin till near the costa, where it abruptly bends inwards to the costa; each line margined with pinkish brown on its inner side; outer border darker than the rest of the wing, with a whitish subapical line running inwards from the costa for a short distance; fringe pinkish brown with white tips. Hind wings paler than the fore wings, pale pinkish brown towards the outer margin; fringe pinkish grey, with white tips. Underside whitish; legs marked with pinkish brown; body dark brown-pink; fore wings suffused with pinkish brown towards the apex; fringe of both wings as on the upperside.

Expanse of wings  $\frac{8}{10}$  inch.

December.

## FOCILLIDÆ.

## 156. HINGULA UNICOLORIS, n. sp.

Dark brown; antennæ articulated with white, tips of the palpi white; head white on the inside of the eyes; wings saturated with pinkish; fore wings with some black marks on the costa, a black streak at the end of the cell; both wings with black points on the outer margin, and with two irregular, very indistinct black lines across the wings difficult to distinguish. Underside slightly paler than the upperside, in one specimen quite unmarked, in another with faint traces of outer and submarginal lines.

Expanse of wings 1 inch.

February and September.

## PLATYDIDÆ.

## 157. EPISPARIS SIGNATA.

*Episparis signata*, Walker, xxxiii. 1032.

July.

## HYPENIDÆ.

## 158. RHYNCHINA PERVULGALIS.

*Rhynchina pervulgalis*, Swinhoe, P. Z. S. 1885, p. 471, pl. 28. f. 5.

May and September.

## 159. RHYNCHINA XYLINA, n. sp.

Palpi, head, and collar white, speckled with grey, the palpi in

some specimens mostly grey; antennæ grey, articulated with white, ciliated in the male, filiform in the female; thorax and fore wings dark grey speckled with white; an antemedian upright sinuous double white line, a median, outwardly oblique, sinuous double white line sharply bent inwards to the costa, round the reniform stigma, which is white and prominent; there is also an orbicular spot of the same colour, smaller and less prominent, some white marks on the costa near the apex, and a submarginal and a marginal brown line with white points. Hind wings and underside pale grey, unmarked; abdomen grey with white segmental lines; male with a prominent grey anal tuft.

This little insect varies much in the shade of its general coloration, some specimens being reddish grey, and in many the white predominates.

Expanse of wings  $\frac{5}{16}$ – $\frac{6}{16}$  inch.

June and July; common in the cotton-fields.

#### 160. *HYPENA ABDUCALIS*.

*Hypena abducalis*, Walker, xvi. 67.

Common in July.

This species is very variable; some are strongly marked like the type, others have merely a whitish curved line on the fore wings from the tip to the base, with a few streaks, and the general colour of the wing is pale and quite different to the type.

### HERMINIIDÆ.

#### 161. *NODARIA EXTERNALIS*.

*Nodaria externalis*, Guénée, Delt. et Pyral. 64. 78.

October.

#### 162. *APPHADANA MISERA*.

*Apphadana misera*, Butler, P. Z. S. 1883, p. 166.

Mhow, October; Assirghur, October.

#### 163. *SPADIX VEGETUS*.

*Spadix vegetus*, Swinhoe, P. Z. S. 1885, p. 475, pl. 28. f. 14.

June and September.

#### 164. *BYTURNA DIGRAMMA*.

*Bocana digramma*, Walker, xxxiv. 1170.

September and October.

#### 165. *LABANDA PAMPHOSALIS*.

*Bocana pamphosalis*, Walker, xix. 887.

October.



## GEOMETRIDES.

## ENNOMIIDÆ.

166. *HYPERYTHRA SWINHOOI*.

*Hyperythra swinhooi*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 223 (1880).

Mhow, February ; Ajnot, November.

167. *CHIZALA DECIPIENS*.

*Chizala decipiens*, Walker, xx. 263.

March.

## BOARMIIDÆ.

168. *HYPOCHROMA DISPENSATA*.

*Hypochroma dispensata*, Walker, xxi. 435.

March.

169. *BOARMIA CORNARIA*.

*Boarmia cornaria*, Guénée, Phal. i. 254. 390.

February and October.

170. *PETELIA MEDARDARIA*.

*Petelia medardaria*, Herr.-Schäff. Exot. Schm. pl. 94. f. 534.

July.

## AMPHIDASIDÆ.

171. *BUZURA PANTERINARIA*.

*Amphidasis panterinaria*, Bremer und Grey, Beitr. zur Schmett.-Fauna des nördlichen China's, p. 21. 107.

June.

## GEOMETRIDÆ.

172. *NEMORIA CARNIFRONS*.

*Nemoria carnifrons*, Butler, P. Z. S. 1883, p. 169.

September and October.

173. *NEMORIA FREQUENS*.

*Nemoria frequens*, Butler, P. Z. S. 1881, p. 616.

Mhow, March, April, and November ; Ajnot, November.

174. *TIMANDRA DIATOMARIA*.

*Timandra diatomaria*, Walker, xxvi. 1616.

September, October, and November.

## EPHYRIDÆ.

175. *EPHYRA CLEORARIA*.

*Acidalia cleoraria*, Walker, xxiii. 792.

Mhow, February to June, also in October ; Depalpore, November and December.

176. *EPHYRA INEXACTA*.*Epione inexacta*, Walker, xxvi. 1497.

October.

## IDÆIDÆ.

177. *IDÆA ADDICTARIA*.*Acidalia addictaria*, Walker, xxii. 749.

October.

178. *IDÆA PATULARIA*.*Acidalia patularia*, Walker, xxxv. 1633.

Delapore, November.

179. *IDÆA REMOTATA*.*Acidalia remotata*, Walker, xxii. 748.

Depalpore, November.

180. *IDÆA ABSCONDITARIA*.*Acidalia absconditaria*, Walker, xxiii. 757.

October, November, and December.

181. *IDÆA WALKERI*.*Idea walkeri*, Butler, P. Z. S. 1883, p. 170.*Acidalia extimaria*, Walker, xxiii. 794.

October and January.

182. *IDÆA NEGATARIA*.*Acidalia negataria*, Walker, xxiii. 751.

Mhow, December; Depalpore, November.

183. *IDÆA CHOTARIA*.*Idea chotaria*, Swinhoe, P. Z. S. 1885, p. 858, pl. 57. f. 14.

April and June.

184. *HYRIA BILINEATA*.*Hyria bilineata*, Butler, P. Z. S. 1883, p. 170.

Assirghur, October.

## CABERIDÆ.

185. *STEGANIA UVIDULA*.*Stegania uvidula*, Swinhoe, P. Z. S. 1885, p. 860.

July.

## MACARIIDÆ.

186. *MACARIA ELEONORA*.*Phalæna eleonora*, Cram. Pap. Exot. iii. p. 172, pl. 288. f. E, F, G.

July.

187. *MACARIA HEBESATA*.*Macaria hebesata*, Walker, xxiii. 931.

September.

188. *MACARIA ZEBRINA*.*Tephрина zebrina*, Butler, P. Z. S. 1883, p. 171.

March, April, and May.

189. *MACARIA ARENARIA*.*Tephрина arenaria*, Swinhoe, P. Z. S. 1884, p. 527, pl. 48. f. 13.

December.

190. *MACARIA LITHINA*.*Tiphrina lithina*, Butler, P. Z. S. 1883, p. 171.

March and October.

I believe these to be females of *M. zebrina*, though at first sight they do not look like it, having no median bands; but I have never taken a male, and the female of the allied species, *M. strenuata*, Walker, is often also without bands and is hardly distinguishable from *M. lithina*.

191. *MACARIA PEREMPTARIA*.*Macaria peremptaria*, Walker, xxiii. 929.

October.

192. *MACARIA GRANITALIS*.*Tephрина granitalis*, Butler, P. Z. S. 1883, p. 171.

September.

## FIDONIIDÆ.

193. *STERRHA SACRARIA*.*Phalæna-Geometra sacraria*, Linn. Syst. Nat. i. 2, p. 863. 220.

February, May, and June.

194. *STERRHA PAULULA*, n. sp. (Plate XLI. fig. 7.)

White; eyes black; thorax and fore wings irrorated with ochreous atoms; fore wings with a reddish-ochreous dot at the end of the cell, and with two oblique outer lines of the same colour close together, from the outer two thirds of the hinder margin, where they are separate, opening out in their centre and meeting at the apex; abdomen and hind wings pure white. Underside white; fore wings pale ochreous towards the costa.

Expanse of wings  $\frac{8}{10}$  inch.

May.

## LARENTIIDÆ.

195. *LYCAUGES DEMISSUS*, n. sp.

Eyes black; top of head pure white; antennæ, body, and wings cream-colour, both wings irrorated with brown atoms, which are

densely packed in places, forming bands along the costa and on all the borders of both wings. Fore wings with an oblique central band of the same colour (also irrorated with darker atoms) from the centre of the hinder margin to the apex; a row of brown dots between this band and the outer margin, the dots being connected together with a line of pale atoms; a brown dot at the end of the cell and sometimes one or two more in a row inwards; fringe white, densely irrorated with brown atoms, making it clearly interlined. Hind wings with a brown dot at the end of the cell, with a central band of the same colour as that in the fore wings, the band being curved inwardly to the costa; an outward row of dots connected together by brownish atoms, and a marginal row of dots; fringe as in fore wings; in some specimens the outer line of atoms in both wings is double, with the dot on the inside line. Underside like the upperside, but darker and duller.

Expanse of wings  $\frac{9}{10}$  inch.

February to June; common.

196. NADAGARA GRISEA.

*Nadagara grisea*, Butler, P. Z. S. 1883, p. 172.

May.

#### PYRALES.

##### PYRALIDÆ.

197. PYRALIS LUCILLALIS.

*Pyralis lucillalis*, Walker, xvii. 268.

April and September.

198. PYRALIS UBERALIS.

*Pyralis uberalis*, Swinhoe, P. Z. S. 1884, p. 523, pl. 48. f. 10.

May.

199. CLEDEOBIA HYPOTIALIS.

*Cledeobia hypotialis*, Swinhoe, P. Z. S. 1885, p. 866.

June, September, and October; in great plenty in June.

##### ENNYCHIIDÆ.

200. PYRAUSTA STULTALIS.

*Botys stultalis*, Walker, xviii. 669.

June and September.

201. RHODARIA JUNCTURALIS.

*Rhodaria juncturalis*, Walker, xxxiv. 1283.

September.

##### ASOPIIDÆ.

202. HYMENIA FASCIALIS.

*Phalæna-Pyralis fascialis*, Cram. Pap. Exot. iv. p. 236, pl. 398. f. O.

June, July, and September.

203. *COPTOBASIS OPISALIS*.*Desmia opisalis*, Walker, xvii. 346.

July and September.

204. *COPTOBASIS ÆNEALIS*.*Coptobasis ænealis*, Swinhoe, P. Z. S. 1885, p. 867.

July.

205. *SAMEA INSCITALIS*.*Ædiodes inscitalis*, Walker, xxxiv. 1297.

September.

206. *LEUCINODES AUXIALIS*, n. sp. (Plate XLI. fig. 12.)

Head and thorax reddish brown, covered with white marks; abdomen pure pearl-white, with pale reddish-brown bands in the last four segments. Fore wings pure pearl-white, with a broad reddish-brown band at the base, and another on the outer border, diffused inwardly, and filling up the outer third of the wing; a white line at the base, and another submarginal, both sinuous, and showing distinctly on the brown bands, which are also covered with white marks as on the thorax; there are also some pale reddish marks on the costa in the central portion of the wing. Hind wings white, semihyaline, with a discal waved line and an interrupted marginal band diffused inwardly; both pale reddish brown; fringe of both wings white. Underside white, with the bands and marks pale, showing through the wings.

Expanse of wings  $\frac{7}{10}$ — $\frac{8}{10}$  inch.

April.

## HYDROCAMPIDÆ.

207. *PARAPONYX AFFINIALIS*.*Paraponyx affinialis*, Guénée, Delt. et Pyral. 270. 259.

October, November, January, March, April, and June; very plentiful.

## HERCYNIDÆ.

208. *HERBULA MELEAGRISALIS*.*Herbula meleagrisalis*, Walker, xvii. 324.

April.

## SPILOMELIDÆ.

209. *SALBIA PERSPICUALIS*.*Zebronia perspicualis*, Walker, xxxiv. 1347.

October.

210. *ZEBRONIA AUROLINEATUS*.*Zebronia aurolineatus*, Walker, xvii. 478.

Assirghur, October.

211. *ZEBRONIA GRAPHICALIS*, n. sp.

Allied to *Z. obrinusalis*, Walker.

Ochreous; fore wings with a black dot at the end of the cell and three black dots on the costa—one basal, one before and another beyond the middle, exactly as in *Z. aurolinealis* and *Z. plutusalis*. Both fore and hind wings crossed by five dark ochreous, slightly sinuous bands; marginal line dark ochreous; fringe long, with pale tips. Underside paler; wings unmarked, except a deep black spot at the end of the cell of the fore wings; all the legs with black knees; fore tarsi with three black bands.

Expanse of wings  $\frac{9}{10}$ —1 inch.

February, March, and July.

## MARGARODIDÆ.

212. *Pygospila tyresalis*.

*Phalæna-Pyralis tyres*, Pap. Exot. iii. p. 124, pl. 263. f. C.

*Pygospila tyresalis*, Guénée, Delt. et Pyral. 312. 340.

Mhow (*Yerbury*).

213. *Phakellura indica*.

*Eudiotis indica*, Saunders, Zool. ix. 3070.

September, October, and November.

214. *Glyphodes fessalis*, n. sp. (Plate XLI. fig. 13.)

Palpi unusually long, much longer than the breadth of the head; antennæ, palpi, head, thorax, and abdomen pure white; a reddish band on each side of the collar, joining a similar band on the costa of the fore wings; outer border of fore wings with a band of the same colour—in some specimens purplish, margined inwardly with a brown line. Hind wings white, semihyaline, with an outer border slightly paler than that on the fore wings, and which becomes gradually attenuated to the anal angle; fringe of both wings white. Underside white, shining, with the bands faintly showing through.

Expanse of wings  $\frac{6}{10}$  inch.

April and May.

215. *Euclasta defamatalis*.

*Ilurgia defamatalis*, Walker, xviii. 544.

November.

## BOTIDIDÆ.

216. *Botys aurea*.

*Botys aurea*, Butler, Ill. Typ. Lep. Het. iii. p. 76, pl. 59. f. 11 (1879).

October.

217. *Botys incoloralis*.

*Botys incoloralis*, Guénée, Delt. et Pyral. 332. 369.

October.

218. *BOTYS OBSTRUSALIS*.*Botys obstrusalis*, Walker, xviii. 663.

July, September, October, and November.

219. *BOTYS NEOCLESALIS*.*Botys neoclesalis*, Walker, xviii. 635.

June.

220. *BOTYS MOLUSALIS*.*Botys molusalis*, Walker, xix. 1409.August (*Forsayeth*).221. *EBULEA CATALAUNALIS*.*Botys catalaunalis*, Duponchel, Lép. de France, viii. p. 330.  
pl. 232. f. 8.

September, October, and November.

222. *SCOPULA DAMASTESALIS*.*Scopula damastesalis*, Walker, xix. 1013.

July and September.

223. *SCOPULA VINCTALIS*.*Scopula vinctalis*, Walker, xxxiv. 1476.

July.

224. *SCOPULA STRENUALIS*.*Botys strenualis*, Walker, xxxiv. 1409.August (*Forsayeth*).

## STENIIDÆ.

225. *DIASEMIA GEOMETRALIS*.*Lepyrodes geometralis*, Guénée, Delt. et Pyral. 278. 271.

Assirghur, October.

## PHYCIDÆ.

226. *NEPHOPTERYX SUFFUSCALIS*, n. sp.

Cinereous brown; whitish, shining, beneath; palpi stout, pubescent, curving upwards, not rising higher than the vertex, third joint lanceolate, short, not one third of the length of the second; antennæ rather stout, brown marked with white; top of head whitish; palpi, thorax, and fore wings cinereous brown, some silvery-white atoms on thorax and on the fore wings near the base; reniform stigma represented by a whitish spot; four sinuous incomplete black lines across the fore wings—basal, antemedian, postmedian, and submarginal; marginal points black; fringe long, greyish brown; hind wings pale whitish cinereous.

Expanse of wings  $\frac{5}{10}$  inch.

March and April.

## 227. HOMÆOSOMA GRATELLA.

*Homæosoma gratella*, Walker, xxvii. 26.

February and April.

## CRAMBIDÆ.

## 228. SCHÆNOBIUS BISIGNATUS.

*Schænobius bisignatus*, Zeller, MS. (col. B.M.), P. Z. S. 1885, p. 878.

June and July.

## 229. CHILO AURIFUSELLUS.

*Crambus aurifusellus*, Walker, xxxv. 1756.

June and July.

## 230. CHILO INTERRUPELLUS.

*Chilo interruptellus*, Moore, P. Z. S. 1872, p. 581, pl. 34. f. 5.

June.

## 231. CHILO ORTELLUS, n. sp. (Plate XLI. fig. 3.)

White; palpi fawn-colour, porrect, about as long as the breadth of the head, second joint with large white tufts above, third acutely conical, as long as the second; antennæ white, stout, pectinated in the male, branches reddish, short; top of head pure white; thorax grey, with a black central stripe and a white band on each side; abdomen pure white. Wings white; fore wings with the upper portions suffused with yellowish-fawn colour, and with a broad black longitudinal central stripe from base to outer margin, attenuated at both ends; marginal points black, and a few black atoms distributed over the surface of the wing; hind wings pure white, unmarked. Underside white, with the stripe and marginal points on the fore wings showing through the wings, and in the male with the costal portions and outer border of the fore wings and costa of hind wings suffused with dirty reddish grey.

Expanse of wings, ♂  $1\frac{2}{10}$ , ♀  $1\frac{4}{10}$  inch.

June and July.

## 232. CHARLTONA KALA.

*Charltona kala*, Swinhoe, P. Z. S. 1885, p. 879, pl. 57. f. 4, ♂.

June and July.

## 233. JARTHEZA CHRYSOGRAPHELLA.

*Chilo chrysographella*, Kollar, Hügel's Kasch. p. 494 (1848).

February to April, June and October.

## 234. JARTHEZA CASSIMELLA, n. sp. (Plate XLI. fig. 4 ♂, fig. 6 ♀.)

Allied to *J. xylinella*.

Pale yellowish fawn-colour; labial palpi porrect, stout, longer than



the breadth of the head, last joint minute; maxillary palpi half the length of the labial palpi. Antennæ of the male pectinated, branches very short; of the female filiform, with short bristles, colour grey. Top of head and thorax chestnut-brown, latter with a white band on each side; abdomen grey, with white segmental lines.

Fore wings yellowish fawn-colour, with two dark brown, diffuse, incomplete longitudinal stripes, one running a short distance out of the centre of the cell towards the outer border, the other from the base on the submedian vein for about two thirds of the length of the wing, each stripe containing a glistening silver-white streak; a sub-marginal narrow semidentate brown band and black lunular small spots on the veins close to, but not touching, the outer margin; fringe grey, with a brown line in its centre. Hind wings smoky grey, unmarked; fringe white. Underside whitish, shining; fore wings suffused with grey; legs fawn-colour, brown on their inner sides; tarsi with brown bands.

Expanse of wings, ♂  $1\frac{2}{10}$ , ♀  $1\frac{5}{10}$  inch.

June and July; common.

#### 235. CRAMBUS PARTELLUS.

*Crambus partellus*, Swinhoe, P. Z. S. 1885, p. 879.

October.

#### 236. CRAMBUS MULTIVAGELLUS, n. sp.

White; antennæ thin; labial palpi slender, as long as the breadth of the head; maxillary palpi one third of the length of the labial palpi; abdomen extending a little beyond the hind wings; fore wings acute, rather narrow, outer border oblique, costa slightly convex; wings and body above and below pure white, shining, unmarked.

Expanse of wings  $\frac{9}{10}$  inch.

June, July, and September.

#### 237. UROLA INCLARALIS.

*Crambus inclaralis*, Walker, xxxvii. 166.

June and July.

#### 238. EROMENE BELLA.

*Eromene bella*, Hübner, Tin. f. 69.

April and June.

#### 239. SURATTHA INVECTALIS.

*Surattha invectalis*, Walker, xxvii. 76.

June.

#### 240. HYPOTIA ALLALIS, n. sp. (Plate XLI. fig. 2.)

White; fore wings with the costal line and basal third very pale reddish cinereous, an oblique broad pale reddish-brown band beyond

the middle, on the inner margin of which is the reniform stigma, brownish, rather large, lunular; marginal line reddish brown, this line runs round the apex on to the costa and round the hinder angle a little way on the hinder margin; some faint, very pale, reddish marks on the outer third of the wing. Hind wings white, marginal line reddish brown; fringe on both wings interlined—white, pale reddish brown, and white. Antennæ, palpi, and body pure white; a thin brown band on the abdomen near the base, in some specimens like a fine line. Underside white, with the costal portion of the fore wings suffused with reddish.

Expanse of wings  $\frac{7}{10}$  inch.

Mhow, June.

#### NYCTEOLIDÆ.

##### 241. *EARIAS FRONDOSANA*.

*Earias frondosana*, Walker, xxvii. 204.

Assirghur, October.

##### 242. *EARIAS TRISTRIGOSA*.

*Earias tristrigosa*, Butler, P. Z. S. 1881, p. 614.

April.

##### 243. *EARIAS SPEIPLENA*.

*Aphusia speiplena*, Walker, xii. 770.

October and December.

#### TORTRICIDÆ.

##### 244. *PHYCODES HIRUNDINICORNIS*.

*Phycodes hirundinicornis*, Guénée, Noct. ii. 389. 1249.

*Tegna hyblælla*, Walker, xxxv. 1810.

April and September.

##### 245. *DICHRORAMPHA SUBSEQUANA*.

*Tortrix subsequana*, Haworth; Stephens; Wood, fig. 1021.

June and October.

#### TINEIDÆ.

##### 246. *ALAVONA BARBARELLA*.

*Alavona barbarella*, Walker, xxviii. 515.

May and June, in great numbers.

##### 247. *ALAVONA COSSUSELLA*.

*Alavona cossusella*, Walker, xxxv. 1816.

June and July, in great numbers in the former month.

248. *ALAVONA INDECORELLA* ?

*Alavona indecorella*, Walker, xxviii. 515.

June.

Four male specimens, all more or less rubbed; they are in size and appearance more like Walker's type of the above than of any other insect in this genus, but they cannot safely be determined as identical with this species.

249. *ALAVONA MINOR*, Walsingham, n. sp. (Plate XLI. figs. 10, 11, ♂ ♀.)

Palpi dull ochreous, shaded with brownish beneath; head ochreous; antennæ cinereous; thorax brownish. Fore wings pale whitish fawn, shaded at the base of the costal margin with brownish, a series of brown spots around the apical and outer portions of the costal margins; between these and the end of the cell, in brightly marked specimens, is a second series of similar spots parallel to the apical margin, but turning outward to the anal angle at their lower end; a brownish spot is situated at the upper angle of the cell, another on the outer third of the fold. The markings in this species appear to be frequently almost obsolete, but the marginal spots are nearly always distinguishable. Hind wings slightly paler than the fore wings; abdomen tinged with brownish. Male, expanse 24 millim.

The female has no markings, so far as can be judged from a single specimen in poor condition, but is much smaller than the female of *Alavona cossusella*, Walker. Female, expanse 26 millim.

June and July, common.

250. *TINEA SUBOCHRACELLA*, Walsingham, n. sp. (Plate XLI. fig. 9.)

Head tufted, bright yellowish ochreous; labial palpi ochreous, faintly tinged with greyish, short and drooping, not thickly clothed; maxillary palpi as long as the labials. Fore wings shining ochreous, faintly tinged at the base of the costa and about the fringes and apex of the wings with purplish grey. Hind wings greyish ochreous, with a slight coppery tinge; abdomen and legs pale ochreous.

Expanse 13 millim.

April.

A single specimen, received from the Rev. J. H. Hocking, from Dharmasala, by Lord Walsingham, measures 15 millim. in the expanse of the fore wings.

Two others of my Mhow specimens Lord Walsingham says are apparently not distinct from this species, although one of them is slightly larger in size (expanse 17 millim.), and is almost entirely devoid of the greyish tinge of the fore wings.

The insect has much the appearance of *Myrmecocela ochraceella*, Tgstr., but differs in the form of the labial palpi.

## 251. HAPSIFERA DEVIELLA.

*Drosica deviella*, Walker, xxviii. 520.

January, June, and July.

## 252. SETOMORPHA TINEOIDES, Walsingham, n. sp. (Plate XLI. fig. 8.)

Palpi pale greyish above, tinged with fuscous beneath; antennæ greyish fuscous; thorax and fore wings spotted and mottled with ill-defined patches of brownish fuscous scales, these are very numerous across the middle of the wing and form a series of spots around the costal, apical, and a portion of dorsal margins. Hind wings greyish, with a faint purplish tinge; abdomen greyish fuscous.

Expanse of wings 14 millim.

April, May, and June.

## CRYPTOLECHIIDÆ.

## 253. DEPRESSARIA SWINHOEI.

*Depressaria swinhoei*, Butler, P. Z. S. 1883, p. 174.

October.

## EXPLANATION OF THE PLATES.

## PLATE XL.

- Fig. 1. *Aphnæus æstivus*, n. sp., p. 428.  
 2. *Ypthima complexiva*, ♀, n. sp., p. 423.  
 3. *Charaxes agrarius*, ♂, n. sp., p. 425.  
 4. *Nilasera apella*, ♂, n. sp., p. 429.  
 5. *Bireta galbana*, n. sp., p. 433.  
 6. *Leucania byssina*, n. sp., p. 442.  
 7. *Mestleta baccalix*, n. sp., p. 452.  
 8. *Dabarita icterica*, n. sp., p. 439.  
 9. *Susica cosmiana*, ♀, n. sp., p. 440.  
 10. *Radinacra variana*, n. sp., p. 444.

## PLATE XLI.

- Fig. 1. *Eupterote ignavus*, ♂, n. sp., p. 440.  
 2. *Hypotia allalis*, n. sp., p. 462.  
 3. *Chilo ortellus*, ♂, n. sp., p. 461.  
 4. *Jartheza cassimella*, ♂, n. sp., p. 461.  
 5. *Pradatta beatrix*, n. sp., p. 442.  
 6. *Jartheza cassimella*, ♀, p. 461.  
 7. *Sterrha paulula*, n. sp., p. 456.  
 8. *Setomorpha tineoides*, n. sp., p. 465.  
 9. *Tinea subochraceella*, n. sp., p. 464.  
 10. *Alavona minor*, ♂, n. sp., p. 464.  
 11. ———, ♀, p. 464.  
 12. *Leucinodes auxialis*, n. sp., p. 458.  
 13. *Glyphodes fessalis*, n. sp., p. 459.  
 14. *Tarache nivosa*, n. sp., p. 446.

2. Contributions to the Anatomy of *Geococcyx californianus*.

By R. W. SHUFELDT, C.M.Z.S.

[Received June 28, 1886.]

(Plates XLII.—XLV.)

The investigations I am enabled to record in the present paper have been made possible through the kindness of Mr. W. F. Peacock, of Marysville, California.

This gentleman on the 23rd of July, 1885, came into possession of a fine male *Geococcyx*, which had been captured for him alive by a man who had run the specimen down on horseback. Mr. Peacock, having been informed by me that I only desired the skeleton of the species, killed and eviscerated it, and filled the abdominal cavity with powdered charcoal and pyroligneous acid, which preparation brought it safely into my hands after three days' travel during the most sultry weather.

Upon receiving it I at once consigned it to a vessel containing strong alcohol; so that, at this date (May 1886), the specimen is before me in excellent condition.

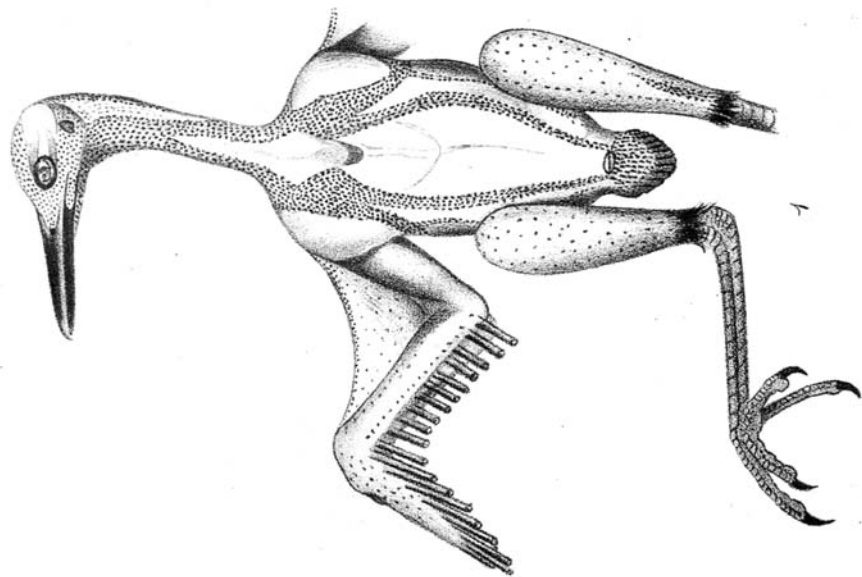
Owing to the fact, however, that it has been eviscerated, I am unable upon the present occasion to say anything about those organs which are situated in the thorax and abdomen, and will confine myself principally to examinations of the muscles of the limbs, the carotids, the trachea (if it be not injured), and the pterylosis.

It will be remembered by those who are familiar with my work that I have already published a full account of the skeleton of *Geococcyx* elsewhere<sup>1</sup>, and to that paper the present memoir may be considered a second instalment.

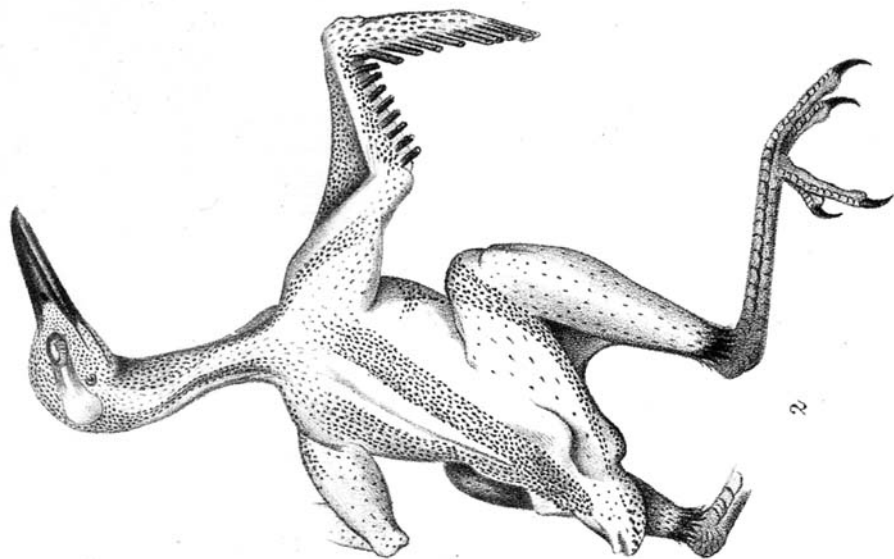
Just now I am far removed by many thousand miles from the libraries and museums, and in a country where such American forms as might with profit be compared with our present subject do not occur. I have by me, however, an excellent field library, consisting of many of the standard anatomical works, including the collected "Scientific Papers" of Garrod and Forbes. Neither of the last-named anatomists have anything to say about our Ground-Cuckoo, and I am inclined to think that neither of those untiring workers in avian morphology ever came into possession of such material. Further, so far as my memory serves me, no one has yet paid any special attention to the structure of *Geococcyx californianus*. This being the case, I have reason to hope that my present contributions will not come amiss.

Garrod's investigations upon the anatomy of the Cuculidæ demonstrated the fact that both of the carotid arteries are present in these birds (Coll. Scientif. Papers, p. 169). His statement to this effect is based upon his having examined the following species:—

<sup>1</sup> Journ. of Anat. and Physiology, Lond. vol. xx. pt. 2, Jan. 1886, pp. 244–266, pls. vii., viii., and ix.

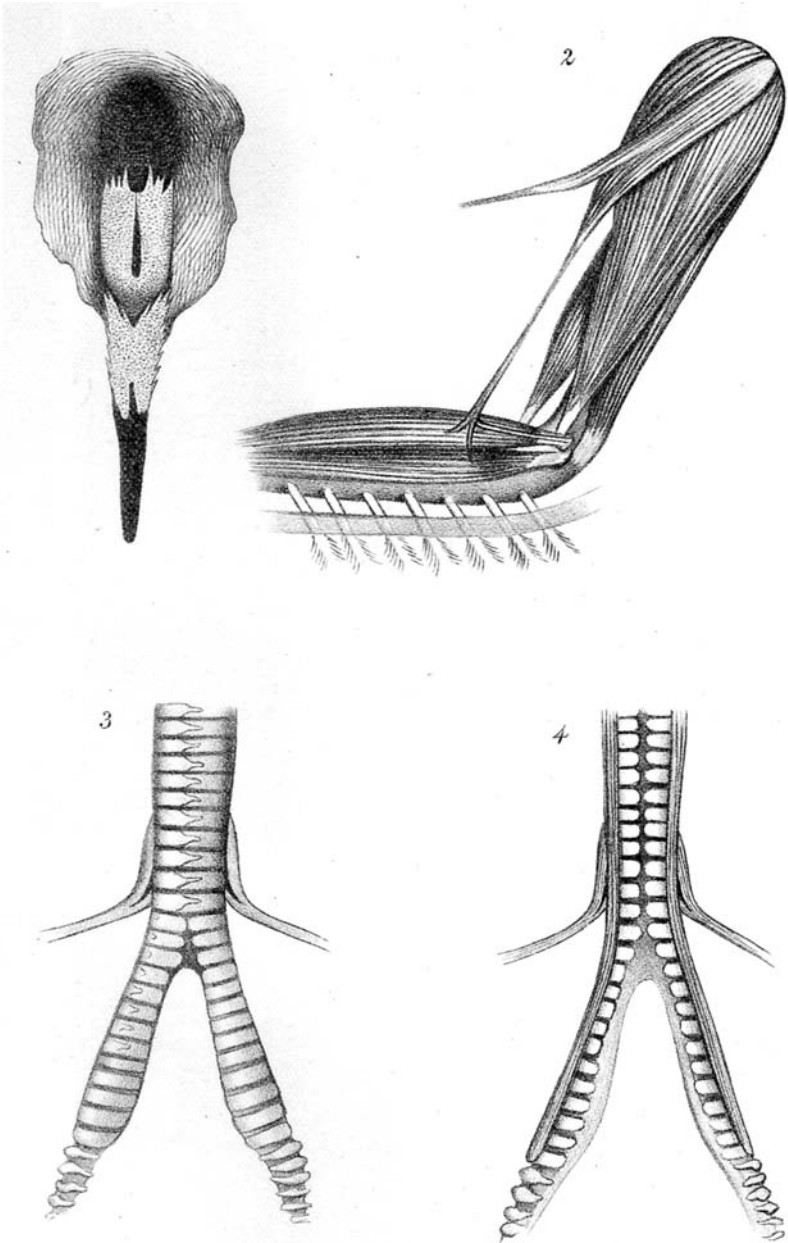


J. Smit lith.

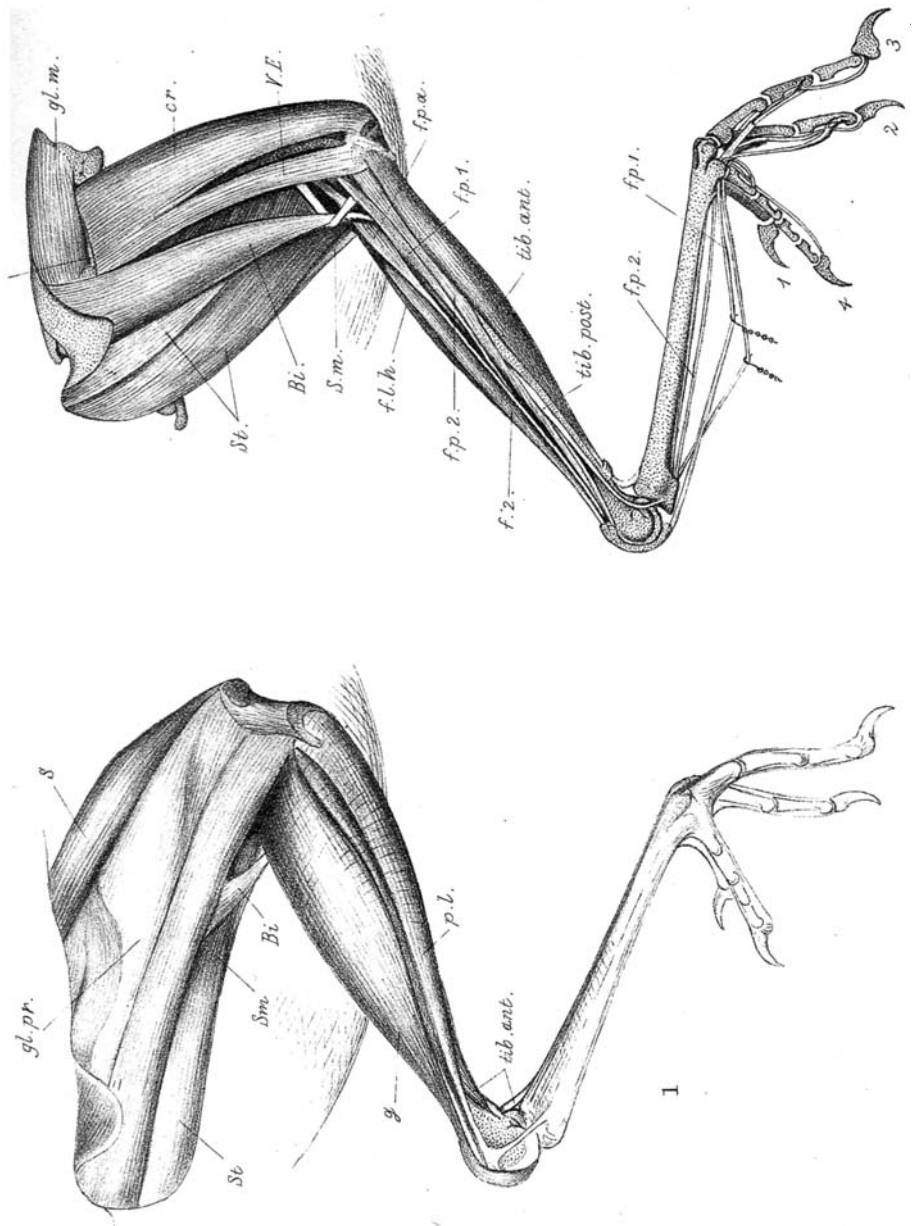


Hanhart imp.

ANATOMY OF GEOCOCCYX CALIFORNIANUS.



gl. min.

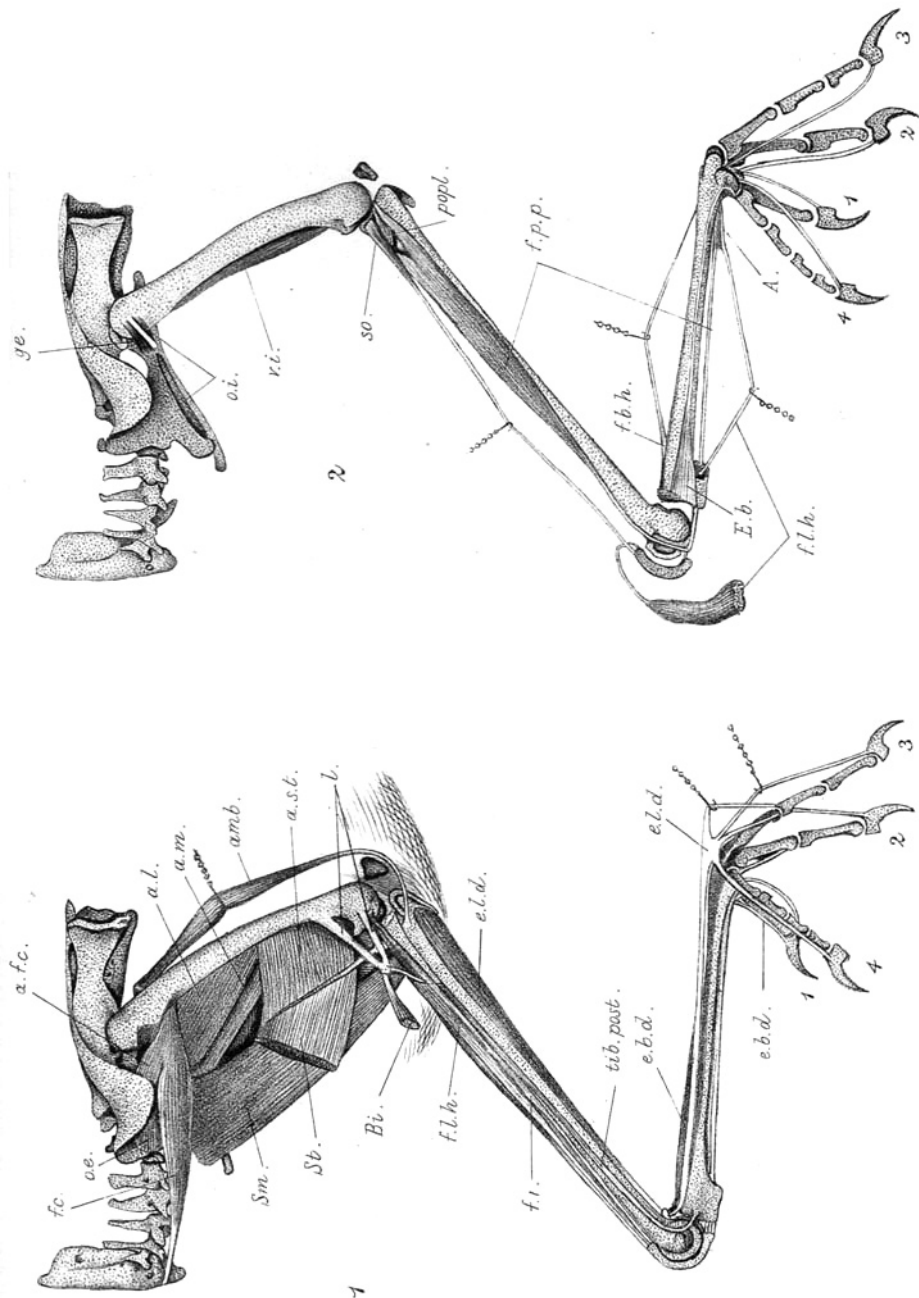


J. Smit lith.

ANATOMY OF GEOCOCCYX CALIFORNIANUS.

Hanhart imp.





*Cuculus canorus*,  
*Cacomantis sepulchralis*,  
*Chrysococcyx* sp.,  
*Centropus senegalensis*,  
*Guira piririgua*,  
*Phœnicophaes* sp.

The same authority finds the accessory femoro-caudal muscle present in :—

*Centropus senegalensis*,  
*Centropus phasianus*,  
*Guira piririgua*,  
*Phœnicophaes* sp.,

and absent in the following species :—

*Cuculus canorus*,  
*Chrysococcyx* sp.,  
*Cacomantis sepulchralis*.

Of this latter peculiarity Mr. Garrod said, " Amongst the Cuculidæ, the Ground-Cuckoos (*Centropus*, *Guira*, *Phœnicophaes*) differ from *Cuculus* and its allies in having the accessory femoro-caudal developed, whilst it is absent in the latter, their respective formulæ being AB. XY., and A. XY. This peculiarity, when added to those in the pterylosis, justifies the division of the family into two subfamilies, which may be termed the Centropodinæ and the Cuculinæ " (*loc. cit.* p. 210).

According to this author, the ambiens muscle also being present in the Cuculidæ it throws this group into the subclass named by him the Homalognatæ; and Mr. Garrod brings forward his very interesting researches upon the plantar tendons in birds to still further support his classification of this particular group. The arrangement of these tendons I will again refer to further on.

Cuculidæ have the cæca also present and possess a nude oil-gland.

To briefly recapitulate, then, the above and a few other structural characters of this group brought to light by this talented investigator, we find that the Cuculidæ are homalognatous birds with two carotids; with the sciatic artery the main one in the leg (except *Centropus*); Cicouine, as regards the presence of the expansor secundariorum muscle (see Garrod's Coll. Scientif. Papers, pp. 323-29); and finally, as I say, have a nude oil-gland and the cæca.

Forbes examined specimens of *Geococcyx affinis*, and showed some interesting points in regard to the bursa Fabricii, which in the Cuculidæ he says " presents a very characteristic shape, the peduncle being long and thin, and the extremity club-shaped, giving the whole somewhat the appearance of a shortened and clumsy antenna of a butterfly. It disappears completely in adult birds " (Forbes's Coll. Scientif. Papers, p. 11). This author, on the page of the work quoted, presents us with a figure of the cloaca and bursa of *Geococcyx affinis*.

At the present time, the American Ornithologists' Union place the Cuckoos of this country in an order *Coccyges*, having three sub-orders, the *Cuculi*, the *Trogones*, and the *Aleyones*, our genus *Geococcyx* falling into the first under the subfamily *Coccyginæ*, there being one other associated with it, the genus *Coccyzus*.

Not long ago I showed some of the peculiarities of the coloration and extent of the naked skin-tracts upon the head of this bird<sup>1</sup>; I regret to say, however, that I have not at hand an account of the pterylosis of the *Cuculidæ*, so on the present occasion I must content myself with an accurate description of that feature in *Geococcyx californianus*, and leave the comparisons to be made by others who may be more fortunate in this respect.

#### *Of the Pterylosis of Geococcyx.*

So carefully have I drawn the two views of our subject, which are presented in Plate XLII., showing the pterylæ and their exact limits and extent, that a few words will suffice to complete the description. It will be seen that the "capital area" is quite complete, being broken only by the naked and coloured skin-tracts about the eye and on the back of the head. These latter vermilion-tinted skin areas are divided in the median line behind by a very narrow pteryla, which is directly continuous with the posterior middle strip of an equal width, and which terminates at the root of the neck, where it is somewhat abruptly lost in a central, sparsely scattered tract, just anterior to the spinal pterylosis. This posterior cervical strip is continuous above with the capital area. Upon the anterior cervical region we find the tract quite broad above, where it is continuous with the feather-tracts of the gular space; but as we proceed down the front of the neck this tract bifurcates at about halfway between the trunk and the throat, each separate strip thus formed being extended on either side to a point opposite a clavicular head, where it merges into the "ventral" and "humeral tracts."

A "humeral tract" is but faintly marked in our Ground-Cuckoo; and it is seen to pass, on the posterior aspect of the brachium, from the shoulder toward the elbow, but is gradually lost before it arrives at the latter point (Plate XLII. fig. 1).

The "ventral tracts" are very broad anteriorly, and are bounded mesially by curved lines, which overlie the clavicular limbs. These tracts, on either side, also bifurcate as we proceed in the direction of the abdomen. The outer strip grows gradually narrower, and makes a graceful curve round under the arm-pit, below which it abruptly terminates. The mesial strip formed by the bifurcation of the ventral tract is long and narrow, being gently convex outwards for its entire length. The distal extremities of these strips become extremely slender as they converge towards the vent, around which they pass to merge with each other behind this opening, and with the feather-tract covering the underside of the coccygeal protuberance (Plate XLII. fig. 2).

<sup>1</sup> *Ibis*, 1885, pp. 286-288, pl. vii.

The spinal pterylosis is represented by two broad, longitudinal tracts well separated from each other in the middle line by a naked-skin area overlying the vertebral column. These spinal pteryloses gradually converge towards each other as they approach the pelvic region, over which they merge into one feather-space, which becomes pointed behind and terminates just in front of the nude oil-gland.

The upperside of the coccygeal protuberance is also sparsely feathered, being divided from a more generously covered area below by the line of horizontally arranged pits for the quill-butts of the rectrices of the tail. An exceedingly narrow tract, on either side, springs from the posterior margin of the outer bifurcation of the ventral tract just below the arm-pit, to run longitudinally down the side, in front of the thigh, to become lost before it arrives at the margin of the vent. This strip seems to be composed simply of a double row of feathers, and might appropriately be termed the *lateral tract*.

The patagium of the arm is very thinly feathered anteriorly, while its dorsal aspect is quite completely covered; the remainder of the pterylosis of the pectoral limb presents us with nothing of a peculiar nature. The posterior marginal boundary of this "alar tract" is, as usual, terminated by the row of quill-butts of the primary feathers of the wing.

Passing now to the crural region, we find a posterior limb but sparsely feathered, while a conspicuous "femoral tract" extends obliquely across the dorsal aspect of the thigh, and rapidly narrowing, runs along the pubic line, finally merging into the "caudal tract."

*Geococcyx* shows its best-marked *apteria* in front, in the mesial space between the inner strips of the ventral tracts, and laterally to the outer side of the spinal pterylosis, where, indeed, for a considerable space no feathers may be said to occur at all. A well-marked dorso-longitudinal naked area is also to be seen. In this Ground-Cuckoo we notice a membrane, stretching between the thigh and leg, which corresponds to the patagial fold of the pectoral limb, and fully as well-developed.

Before closing this part of our subject it is of interest to observe the general form of *Geococcyx*, which, now that its feathers have been removed, can be studied to the best advantage. It will be seen how perfectly its figure has come to assume a shape best adapted to the peculiar requirements of the bird. Its pelvic limbs are large, muscular, and consequently powerful, while the pectoral ones are decidedly less so, though by no means weak or inefficient. The body-form of this prince of avian racers is what almost might be called "clipper built," so admirably fashioned is it to the needs and ends of a rapid running bird of the size of our subject.

With these few remarks upon the external organization and appearance of *Geococcyx* we will now close this part of our discussion, and pass to the consideration of some of the features presented in the structure of the remainder of its economy.

*On the Mode of Insertion of the Patagial Muscles  
of the Pectoral Limb.*

Having considerable faith in the value in classification of the arrangement of the insertional extremities of the tendon of the *tensor patagii brevis* muscle, and the forms of the patagial muscles generally, as *single characters*, it was with no little interest that I carefully removed with my scalpel the integuments over this region, for the first time in my experience in *Geococcyx*. The late Mr. Garrod's excellent work in this direction is now familiar to all ornithologists; but on this occasion I refrained from consulting any of the accurate drawings he has left us illustrating these parts in many groups of birds until I had actually completed my dissection, and my drawing of it, which is shown in Plate XLIII. fig. 2. I then opened his "Collected Scientific Papers" and proceeded to compare my figure with his numerous illustrations of the same dissection among other birds.

Being familiar with the arrangement of this tendon in a great many North-American birds from my own labours, I was confident that the condition of things in *Geococcyx californianus* was a marked departure from anything I had previously met; nor did I expect to find anything in Garrod's illustrations that would prove to be exactly like it. But in this last hope I was very agreeably disappointed, for I find that it corresponds almost exactly with the state of affairs found by this talented anatomist to be present in certain Galbulidæ. To satisfy one's self of this fact it is but necessary to compare my figure with the Jacamar dissected by Mr. Garrod, as shown in his work (plate 23. fig. 1, tendon of *tensor patagii brevis* in *Urogalba paradisea*), and the striking resemblance will be at once appreciated. He has simply cleared his tendon more completely of its investing fascia than I have, and still further separated its several slips; while in my figure of *Geococcyx* the tendon is shown as it presents itself immediately after turning back the integuments, or, in other words, exactly *in situ*. The liberty taken by Mr. Garrod to still further show these slips and their exact insertions is perfectly permissible, and often resorted to for the purpose named.

It will be seen that after the tendon of the *tensor patagii brevis* arrives over the proximal third of the belly of the *extensor metacarpi radialis longior* muscle in *Geococcyx* it trifurcates, one slip passing downwards to become inserted immediately below and on the outer aspect of the *extensor carpi ulnaris* muscle; the shortest slip at once attaches itself to the *extensor metacarpi radialis longior*, while the longest division of all passes with the last-named muscle to become inserted with it upon the outer condyle of the humerus.

As for the muscular portion of these patagial muscles above in this Ground-Cuckoo, I have represented them with the arm turned somewhat differently than the position Mr. Garrod was wont to give it. It will be seen, however, that the bulk of this muscular portion in *Geococcyx*, as in *Urogalba*, belongs to the *tensor patagii brevis* muscle.

It is still further interesting to compare the arrangement of these tendons in *Geococcyx* with the similar structures as they were found to exist by Mr. Garrod in *Upupa epops* and *Cuculus canorus*, both of which are figured upon the same plate alluded to above. We at once observe that our subject differs considerably in these particulars not only from the Hoopoe, but still more from the Cuckoo. Indeed, so far as *Upupa* is concerned, it simply lacks the long slip going to the humeral condyle in order to make the arrangement of the insertional extremities of the *tensor patagii brevis* agree with the corresponding arrangement as found in my specimen of *Geococcyx*.

So far as this one character is concerned, then, it points to the fact that a certain affinity exists connecting our *Geococcyx* with the *Galbulidæ*.

Fig. 1.

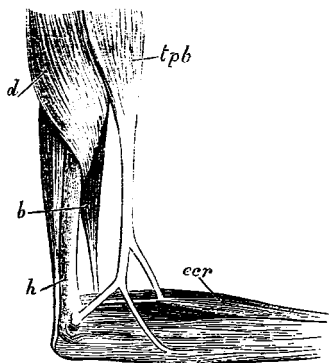


Fig. 2.

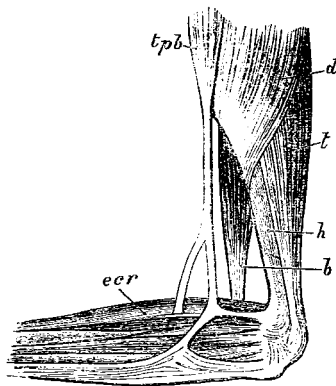


Fig. 1. Muscles at the outer side of the elbow of the right wing of *Caprimulgus europæus*.

Fig. 2. The same of the left wing of *Steatornis*. (Both figures after Garrod.) *tpb*, tensor patagii brevis; *ecr*, extensor carpi radialis (extensor metacarpi radialis longior of the present writer); *b*, biceps; *d*, deltoid; *t*, triceps; *h*, humerus.

Further, the marked difference in this particular between *Geococcyx* and *Cuculus canorus* is not to be overlooked.

Now, strange to say, there is still another (and what we must believe to be a widely separated) group of birds that possesses an arrangement of the insertional extremity of the *tensor patagii brevis* very much as we find it in our present subject. These are no others than the *Caprimulgi*.

I reproduce (figs. 1 & 2) Prof. Garrod's figures of these parts in *Steatornis* and *Caprimulgus europæus*, the better to show this similarity. It will be seen in these Caprimulagine birds, however, that the lowest slip merges with the fascia to the outer side of the ulna, while in my specimen of *Geococcyx* it goes to the *extensor carpi ulnaris* muscle.

Garrod pointed out another character of some value, which he

discovered during his dissections of the arms of birds; this was the presence or absence of the *expansor secundariorum* muscle (Coll. Sci. Papers, p. 323). As this delicate muscle and its tendon is well developed in the Storks, he, for convenience sake, termed it the Ciconine character. He found the Cuculidæ to be Ciconine birds so far as this structure was concerned, but I find after a very careful search in both pectoral limbs of my specimen of *Geococcyx* that this character is missing in it. This, then, constitutes another difference between *Geococcyx* and the Cuculidæ.

#### *Of the Pectoral Muscles.*

All three of the pectoral muscles are present in this bird, and all conspicuously developed, although the *pectoralis tertius* is considerably larger in comparison than is usually the case. Their muscular fibres are remarkable for their fine texture and compactness, both of which qualities, added to their pale colour, lend to these structures a very delicate appearance.

Nothing of a peculiar nature seems to distinguish either the *pectoralis major* or *secundus*, as they both arise and are inserted in a manner common to the majority of the class.

On the other hand, the *pectoralis tertius*, although inserted as we usually find it in birds, has no sternal origin, but arises from the externo-anterior aspect of the sternal extremity of the coracoid, as well as from the side of the shaft of the same bone.

Recent dissections of mine, performed upon various species of the Corvidæ, go to show that in them this muscle has quite an extensive origin upon the sternum, and its bulk sinks into insignificance when compared with the size of the great pectoral as it exists in all of the species of this latter group which I have examined.

#### *On the Myology of the Pelvic Limb in Geococcyx.*

Quite recently I have completed a very extensive chapter on the muscles of birds, and the MS. of this piece of work, with the nearly one hundred woodcuts that illustrate it, are at hand at the present writing. So with the bird now before us I will, without further explanation, adopt the myological nomenclature which I have proposed in my MS., without discussion of such points as wherein I may differ in homologies or terms with other authorities. Such differences, and I trust they may be few and well sustained, must be left for decision until such time as the work referred to appears in type.

It is my aim here to enter quite extensively into the description of the muscles of the pelvic limb of *Geococcyx*, as they offer us many points of interest.

We find the *sartorius* muscle (Plate XLIV. fig. 1, *S*) powerfully developed in *Geococcyx*, as are the majority of the muscles of the thigh in this bird. It arises, semitendinous, from the crest of the neural spine of the last vertebra of the dorsal region of the spine, from the summit of the anterior portion of the crista of the sacrum, and from the adjacent surface of the superior aspect of the ilium on the cor-

responding side. The fibres, forming an oblong and rather thick muscle, pass downwards and backwards to the region in front of the knee. Here it becomes inserted by a special slip of fascia that is thrown off and merges with the general fascia surrounding the knee-joint; and, secondly, by a more carneous insertion into the inner half of the superior rim of the cnemial crest of the tibia and the continuous inner margin of the summit of that bone.

The *sartorius* bounds anteriorly the superficial group of muscles of the thigh; consequently its anterior border is free. Its posterior border above unites quite intimately with the overlapping *gluteus primus* muscle; while this border below is sharp and free, although here, too, the *gluteus* also overlaps it, and a delicate connective tissue binds them together.

The *gluteus primus* (Plate XLIV. fig. 1, *gl.pr*) constitutes that great and rather complex muscle which makes up the central fleshy portion of the outer aspect of the thigh. It arises by a strong fascia from the summit of the coossified neural spines of the anterior sacral vertebræ, and by carneous fibres from the outer rim and under surface of the whorl-like, overarching portion of the ilium behind; and finally from the contiguous portion of the pelvis over the antitrochanter, between these anterior and posterior origins. In front the muscle consists first of a strong layer of semitendinous fascia, which closely overlies the *gluteus medius* muscle beneath it, and overlaps the *sartorius* anteriorly. The posterior origin and mid-division become rapidly carneous and more massive as we proceed in the direction of the caudal extremity of the body. So that, where we find it arising from beneath the overarching part of the ilium behind, the muscle fills about one fourth of the convexity there formed, the *semitendinosus* filling the remainder of this curious cavity. The fibres of the strong, semitendinous, muscular sheet springing from these several origins, or rather along this continuous line of origin, now pass, converging as they do so, towards the anterior aspect of the knee-joint. The semitendinous portion anteriorly becomes fleshy as it arrives along the outer pelvic margin, with which it is quite intimately connected. The hinder division of the muscle remains thick and carneous until it comes to the knee-joint. Here all the fibres again become tendinous and fascia-like, and, uniting with a similar structure contributed by the *extensor femoris* lying beneath it, the combined sheath thus formed surrounding the well-developed patella, closely invests the front and sides of the knee-joint, and is finally inserted all round the anterior and externo-lateral borders of the summit of the tibia.

The most superficial muscles of the leg are the *gastrocnemius* and the *peroneus longus*.

As we would naturally expect, the *gastrocnemius* muscle (Plate XLIV. fig. 1, *g*) in *Geococcyx* is wonderfully well-developed. All three of its heads are strongly defined, and the fleshy belly of the muscle is massive and thick.

Its *external head* arises, curiously enough, by two perfectly distinct tendinous slips. One of these, a strong, flat tendon, comes off from



the outer surface of the external condyle of the femur, while the second slip, also strong but somewhat more rounded, arises from the back of the external femoral condyle, just above the trochlear surface. Between these two tendons of the external head of the *gastrocnemius* we find the loop for the *biceps* and the tendon of that muscle itself, the loop being quite intimately attached to the free edge of the outer tendon. Below the loop, these tendons merge with each other and terminate in the commencing fibres that compose the external head of the *gastrocnemius* proper.

The *internal head* of the *gastrocnemius*, or what is really the middle head in birds, is quite median in position, and is represented merely by a long, narrow, muscular slip that arises by a delicate, though strong, cord-like, tendon from the middle of the intercondyloid notch of the femur.

The *tibial head* of the muscle under consideration is massive in its dimensions when compared with the divisions of origin of the *gastrocnemius* already described. It arises fleshy from an extensive surface on the inner aspect of the head of the tibia as high up as the marginal boundary of its summit; and from the muscular fascia surrounding certain of the deep thigh-muscles, which are inserted into the distal end of the femur, and consequently are adjacent to the posterior aspect of the head of the tibia.

At a point about opposite the junction of the upper and middle third of the shaft of the tibia the internal and tibial heads of the *gastrocnemius* merge with each other, while between their free edges above passes the exceedingly delicate tendon of the *semimembranosus* muscle.

All of the fibres of this complicated origin of the *gastrocnemius* muscle now converge and pass directly down the back of the leg of the bird. They also merge with each other in such a manner that, were we to examine the muscle at about the middle third of the leg, we would find it composed of two well-defined bellies, rather thin, nearly of equal size, united somewhat firmly by an intervening fascia, and each being convex on their superficial aspect and the reverse on their under sides, which concavity accurately moulds itself to the deeper layer of muscles of the leg, which the *gastrocnemius* completely covers.

At the lower fourth of the tibial shaft the fibres terminate in a broad, flat, and glistening tendon, which passes flat-wise over the shallow and longitudinal groove of the *tibial cartilage*, at which point the tendon is considerably thickened. Next, crossing the tibio-tarsal joint, it becomes internally attached to the hinder surface of the hypotarsus of the métatarsal bone, below which protuberance it finally merges into the deeper layer of the podothecal sheath confining the flexor tendons.

The *peroneus longus* (Plate XLIV. fig. 1, *p.l*) arises from the entire free margin of the cnemial crest in front of the head of the tibia, and by somewhat specialized, though delicate, tendons, one each from the apices of the pro- and ectocnemial processes of the same part of the bone. These latter tendons pass down on the under surface

of the muscle, which latter must be cut across and reflected in order to discover them. From this origin the *peroneus longus* as a rather thick, concavo-convex muscle passes down in front of the leg, its outer edge dipping down for attachment between the *tibialis anticus* muscle, which it almost completely covers, and the flexors to its outer side; its inner edge is free and thin, and overlaps the gastrocnemius.

Low down on the outer side of the tibial shaft the fibres of the *peroneus longus* have converged to terminate in a small narrow tendon. This tendon, just above the condyles of the tibia, bifurcates, the short slip of the bifurcation going to the fascia covering the block of cartilage (which I have termed the tibial cartilage) at the back of the tibio-tarsal joint for attachment, while the longer slip passes across the articulation to the bundle of tendons at the back of the tarso-metatarsus to merge with one of the special flexors.

Removing this superficial layer of muscles of the pelvic limb and turning our attention once more to the thigh, the following ones are presented to our view for examination:—

The *gluteus medius* muscle (Plate XLIV. fig. 2, *gl.m*) is found to be strong and tendinous. It, as in all of the birds that I have examined, fills the concavity of the preacetabular portion of the pelvis, and here in *Geococcyx* extends laterally much beyond the bone, as this bird has a very narrow pelvis anteriorly, while it demands the use of a powerful set of gluteal muscles.

The *gluteus medius* arises by a strong, flat tendon from the superior surface of the outer moiety of the anterior iliac margin, by a dense fascia from the entire line bounding the preacetabular concavity, and finally by fleshy fibres from the upperside of the ilium itself. The fibres of the roundish muscle thus formed converge as they pass to the caput femoris, and, just before arriving at the bone, they terminate in a dense flat tendon, which, passing over a bursa, is inserted at a point on the antero-external aspect of the femoral trochanter.

The *gluteus minimus* (Plate XLIV. fig. 2, *gl.min*) is a very much smaller muscle than the *gluteus medius*, and is found immediately beneath it to its outer side. In form it is oblong, and fully three times as long as wide. It arises from the outer superior surface of the fore part of the ilium, and passing obliquely downwards and backwards as a flat narrow band of fibres, it becomes inserted by semitendinous ones on the outer aspect of the upper third of the femur, just below the trochanter. This muscle may also ride over a small bursa, just before it arrives at its insertion.

The *extensor femoris* is readily divisible at its lower half into two parts, the bulkier anterior one representing the *cruræus* (Plate XLIV. fig. 2, *cr*), and the posterior division the *vastus externus* (Plate XLIV. fig. 2, *V.E*).

As a whole, this powerful extensor of the leg upon the thigh arises from the antero-external aspect of nearly the entire length of the shaft of the femur, and from a portion of the trochanter at its summit. At about its lower fourth it terminates in a broad tendinous expansion, which, as has already been described, is amply reinforced by other insertional portions of the superficial muscles of the thigh.

The *patella* is found encased in front in this great tendinous sheath of the knee-joint, and below the apex of this sesamoid we find the enveloped track of the tendon of the *ambiens* muscles, as it passes round in front of the femoro-tibial articulation. The combined tendon of the *extensor femoris* is finally inserted into the cnemial crest of the tibial and the lateral boundaries of the summit of that bone. Some of the superficial muscles on the outer side of the leg are so extended as to take a certain amount of their origin from this great tendinous expansion.

In Plate XLIV. fig. 2 I have very thoroughly divided these two subdivisions of the *extensor femoris*, in order to show their relative size, as well as their relation to each other and the surrounding structures.

The *biceps flexor cruris* (Plate XLIV. fig. 1; fig. 2, *Bi*) arises by carneous fibres upon quite an extensive portion of the under surface of the over-curved part of the ilium behind the acetabulum, and by a long tendinous slip which comes off from the free anterior margin of this part of the ilium. The fibres converge as they pass downwards, and unite to form a somewhat flattened muscle. Opposite the head of the tibia, the biceps terminates in a round tendon, of cord-like dimensions, which passes through a special loop to make its way between some of the muscles at the back of the leg, to become inserted on the tubercle intended for it on the outer side of the superior moiety of the shaft of the fibula. The loop of the *biceps* (Plate XLV. fig. 1, *l*) is flat and fashioned like a delicate tendinous ribbon. Its upper end arises from the side of the shaft of the femur above the external condyle, while the lower end comes off from this protuberance just below the insertion of the outer slip of the external head of the *gastrocnemius* muscle. A branch of the sciatic nerve also passes through this loop in company with the tendon of the *biceps*.

The *semitendinosus* (Plate XLIV. figs. 1, 2, *St*; Plate XLV. fig. 1, *St*) is a marvellously well-developed muscle in this form, as is also its accessory head. Its origin fills about three fourths of the nether cavity formed by the posterior overarching portion of the ilium, under which it arises.

Posteriorly, the fibres forming its free margin are so arranged as to create a rounded border; the lower end of its arc terminating about opposite the post-pubis of the pelvis. From this origin the fibres of the *semitendinosus* pass downwards and forwards as a great, though somewhat compressed muscle. When within rather more than a centimetre's length of the shaft of the femur, they terminate in an oblique tendinous raphe, which latter forms the bounding-line between this muscle and the next.

The *accessory semitendinosus* (Plate XLV. fig. 1, *a.s.t*) is composed of coarser fibres than the muscle just described. It springs from a longitudinal line occupying the distal half of the shaft of the femur, and from the upper surface of the hinder aspect of the external condyle of that bone. The fibres pass backwards and a little upwards to become inserted into the tendinous raphe just alluded to.

The lower extremity of this tendinous raphe terminates, in *Geococcyx*, in a thin, flat, and delicate tendon, which continues down-

wards and forwards to the inner surface of the head of the tibia, where it becomes inserted, the point of insertion being found above that of the *semimembranosus* muscle, the insertional tendon of which overlaps it.

The *semimembranosus* (Plate XLIV. figs. 1, 2; Plate XLV. fig. 1, *Sm*) in *Geococcyx*, though thoroughly developed, is rather a slender and thin muscle, markedly so when we compare it with the massive *semitendinosus* which overlies it.

It arises from the outer surface of the ischium, for its posterior two thirds, on a line situated a few millimetres above the lower free edge of that element of the pelvis. The fibres gradually converge as they pass downwards and forwards, to terminate in a very delicate and thin ribbon-like tendon, which, passing between the broad tibial head of the *gastrocnemius* and the proximal extremity of the shaft of the tibia, becomes finally thereupon inserted on its internal surface. The hinder margin of the *semimembranosus* is free, while its border anteriorly is juxtaposed to the posterior edge of the adductors.

In the bird before us the *ambiens* muscle (Plate XLV. fig. 1, *amb*) is conspicuously developed.

It arises from the apex of the prominent prepubic spine of the pelvis, and the fibres passing directly down to the inner side of the femur, and parallel with that bone, form a strong fusiform muscle. As it approaches the patella it terminates in a small flattened tendon, which, piercing the fascial envelop of the knee-joint below the inferior apex of that sesamoid, passes round the joint, to become finally lost to the outer side and opposite the summit of the tibia, where some of its tendinous fibres merge with the fibres of origin of the *flexor perforatus digitorum*, or, at least, with one of its divisions.

The *ambiens* is overlaid by the *sartorius* muscle, and in the figure is brought into view only through the aid of a small dissecting-hook and chain, which pull it forwards in order that it may be better seen.

The *femoro-caudal* muscle and the *accessory femoro-caudal* are both present and fully developed.

The *femoro-caudal* (Plate XLV. fig. 1, *f.c*) arises, tendinous, from the lower posterior border of the pygostyle. It soon becomes fleshy and as a narrow, muscular ribbon passes through the tissues overlying the lateral group of caudal muscles proper. Opposite the posterior border of the pelvis it expands to form a prettily-shaped and compressed spindle, closely covering the *obturator externus* muscle and the side of that bone. As it nears the femur it again contracts, receives the fibres of its accessory head, and is finally inserted upon the femoral shaft, at the posterior aspect of its proximal third.

The *accessory femoro-caudal* (Plate XLV. fig. 1, *a.f.c*) arises beneath the overarching part of the postacetabular portion of the ilium, just behind the acetabulum and beyond. Its fibres pass obliquely downwards and forwards to join with those of the *femoro-caudal*, and to become inserted with them into the upper part of the femur as already described.

The *obturator externus* (Plate XLV. fig. 1, *o.e*) arises from the outer surface of the ischium above the "obturator space," the

muscle being thin and closely pressed to the pelvis. The fibres converge as they near the femur and terminate in a strong, flat tendon which becomes inserted on the outer aspect of the trochanter of that bone, which insertion is slightly overlapped by the tendon of the *gluteus medius* muscle.

The *adductors* arise from the infero-external margin of the ischium, between the anterior edge of the *semimembranosus* and the obturator foramen.

The *adductor longus* (Plate XLV. fig. 1, *a.l*) is the more anterior of the two and consequently arises the higher on the pelvis, and comes off in front of the *adductor magnus*, which it largely overlaps. Its fibres pass obliquely to the posterior aspect of the shaft of the femur, down which they become inserted as far as its middle, along the *linea aspera*, a line which is well marked in our subject.

The *adductor magnus* (Plate XLV. fig. 1, *a.m*), like the one just described, is also a broad ribbon-like muscle, arising from the ischium between the *semimembranosus* and a middle point on the underside of the *adductor longus*, close up to its semitendinous origin. Anteriorly its margin is free, while posteriorly it is juxtaposed to the anterior border of the *semimembranosus*. Passing parallel with those of the other adductor, its fibres are inserted into the distal moiety of the *linea aspera* of the femoral shaft, down to the intercondyloid notch of that bone, where this muscle makes a very substantial insertion.

Removing all the muscles of the thigh thus far described, we find that in this region we have the following ones remaining. They are shown in my drawing (Plate XLV. fig. 2), together with a few as yet undescribed muscles of the leg.

A very important muscle is the *obturator internus* (Plate XLV. fig. 2, *o.i*), and in *Geococcyx* it exists as we find it in the majority of the class. Prof. Garrod laid some stress on the point whether this muscle arose from a triangular or an oval area. Here it arises from a decidedly oval one, and as usual this is from the mesial surfaces of the ischium and the post-pubic element of the pelvis. Its tendon emerges from the obturator foramen, and overlapping the *gemellus* muscle, passes to the outer aspect of the upper part of the trochanter of the femur, where it is inserted.

The *gemellus* (Plate XLV. fig. 2, *ge*) is a short, thick, carneous muscle, which arises about the outer rim of the obturator foramen of the pelvis. Its fibres passing obliquely upwards and forwards are inserted with the tendon of the *obturator internus* muscle on the trochanter of the femur. This bird also has a few of the fibres of its *gemellus* muscle inserted into the tendon of the *obturator externus* muscle, at least I found this to be the case in the specimen before me.

We find the *vastus internus* (Plate XLV. fig. 2, *v.i*) to be a strong, fusiform muscle, that is only fully discovered after we have removed the *ambiens* and the *adductors*. It lies on the postero-internal aspect of the shaft of the femur, arising from the *linea aspera* nearly as high up as the head of that bone, and increasing in bulk as it descends, still making attachment to the *linea aspera*, it only becomes free just above the condyles. At this point it terminates in a flat tendon, which, crossing the articulation of the knee, becomes inserted into the

front part of the inner marginal rim of the summit of the tibia. This muscle constitutes a powerful auxillary to the action of the *extensor femoris*, and it appears to be quite a constant one in the class Aves.

The description of the *vastus internus* completes our account of the musculature of the thigh. A brief recapitulation of them shows us that *Geococcyx* possesses in this region all of the muscles that we usually find there in birds.

The entire group including the *ambiens*, the *femoro-caudal*, the *accessory femoro-caudal*, the *semitendinosus*, the *accessory semitendinosus*, and the *semimembranosus*, so ably introduced into taxonomy by Garrod, are all present and wonderfully well developed. Then we have all three *glutei* represented, with an ample *extensor femoris*, and its auxiliary the *vastus internus*, a handsome *biceps flexor cruris*, with its interesting pulley at the back of the knee. Next, the two *obturator*s and the *gemellus*; and finally two powerful *adductors*, the *magnus* and *longus*.

We may now once more direct our attention to the leg, and investigate the muscles there found in its second layer.

First among these stands the *tibialis anticus* (Plate XLIV. figs. 1, 2, *tib.ant*). This interesting muscle arises, as most commonly among birds, by two very distinct heads. The under and at the same time the smaller one of these comes off by a tendon from a little pit that is found on the anterior aspect of the external condyle of the femur; the second or larger portion of the muscle completely covers over the first, except of course its tendon, which extends further up. This latter head arises from a line extending all round within the cnemial crest and the pro- and ectocnemial ridges of the tibia. The fibres of the two heads extend directly down in front of the tibial shaft, at the lower third of which they gradually merge with each other, and finally terminate in a strong tendon, which, passing through the oblique fibrous loop, or bridge rather, at the front and lower end of the tibia, pass across the tibio-tarsal joint, to become inserted on the anterior surface of the upper third of the tarso-metatarsus bone, just below its head.

The *soleus* (Plate XLV. fig. 2, *so*), found at the back of the leg, is another well-developed muscle of this layer in *Geococcyx californianus*. It arises from behind the tibia, on its inner side, and just below the marginal rim of its summit. The fibres at once form a little flat muscle, rather longer in shape than the fish from which it derives its name, and soon terminate at the lower or tail-end in a tendon. This tendon, long and narrow, passes directly down the postero-internal aspect of the leg to become inserted into the dense fascia covering the tibial cartilage at its supero-internal angle.

Great care and patience are necessary in the study of the arrangement and distribution of the tendons of the flexors and extensors in the leg and foot of a bird, and to this rule *Geococcyx* by no means forms any exception.

In describing these I will present them in the order that they most conveniently came under my hand after the removal of the muscles alluded to in the foregoing paragraphs.

After we have cut away the *tibialis anticus*, we find another, and only one other, muscle occupying the anterior aspect of the tibia. This is the *extensor longus digitorum*.

The *extensor longus digitorum* (Plate XLV. fig. 1, *e.l.d*) arises from the anterior aspect of the in-half of the tibial shaft as high up as the *tibialis anticus* muscle, which covers it; it also arises from a tense fascia which comes off from the lower free edge of the pronemial crest of the tibia; and finally from a longitudinal line extending obliquely down the front of the shaft of the tibia to its lower third. This obliquity finally brings the tendon in which the *extensor longus digitorum* terminates to the middle line.

Just above the condyles of the tibia, it here passes through the little bony bridge; emerging from which it crosses the ankle-joint in front, then passes down the anterior aspect of the tarso-metatarsus bone, overlying the short extensor. At the upper end of this last-named bone, and over the ankle-joint, this tendon is firmly bound down by a fibrous fascia. In some birds we know a special bony span exists for it on the upper part of the tarso-metatarsus, as in certain Owls. When the tendon of this muscle arrives at the anterior aspect of the trochleæ of the distal end of the tarso-metatarsus, it expands and bifurcates. The tendinous expansion becomes more or less attached to the underlying tissues, while each bifurcation passes one over the second, and the other over the third toe, for their entire lengths, to become inserted into the upper points of their ungual phalanges.

Now from the side of the tendon that goes to the third toe another slip is differentiated off in a very peculiar manner, owing to the reversion of the toe in question. For it not only passes over the top length for insertion of this fourth digit, as in the case of the others, but its slip also splits off to make a separate insertion at the extremity of the basal phalanx of the third digit. I have had the opportunity of dissecting three feet, with the view of studying this point, and I find it to obtain in all of them.

The *extensor brevis digitorum* (Plate XLV. fig. 1, *e.b.d*). This is a muscle I find that, in common with many other authors, I have described in my MSS. as the *extensor hallucis brevis*, from the fact that its tendon goes to the hallux alone. But here, so extraordinary is its development, that no such term would be either adequate or appropriate.

Even here the short extensor of the hallux has a certain amount of individualization, though it is not fully differentiated from the other part of this *extensor brevis*. It, however, is not attached more than halfway down the anterior aspect of the shaft of the tarso-metatarsus, at which point it terminates in a delicate thread-like tendon; this passes directly over the upper border of the accessory metatarsal, and along the top of the basal joint of the hallux, to become inserted in the usual manner in the base of the claw-joint. Now the remainder of the *extensor brevis digitorum* is attached down the shaft of the tarso-metatarsus, as far as the distal trochleæ; the outer portion of it developing a tendon about halfway down, which is concealed by the carneous fibres which overlie it.

This tendon passes round beneath the trochlea for the fourth toe and is really inserted on the *underside of the basal joint* of this digit at its proximal extremity; so that in the case of this toe it seems as though it would act almost as a *flexor*. With the second and third toes, however, the carneous fibres of the muscle under consideration are continued all the way to the trochleæ, where they terminate, in either case, in a strong, flat tendon, which passing over the joint is inserted *on the upperside* of the proximal extremity of the basal joint. Here, of course, the muscle acts (in the case of the second and third toes) as an auxiliary to the long extensor.

Not a little room is here open to us for speculation as to how the tendon of this short extensor in the case of this fourth toe exactly came to assume its present point for insertion, as the digit gradually and finally became permanently reversed. Indeed, the high development of this short extensor in *Geococcyx* over the vast majority of the class is, too, an interesting fact; and did the reversion of the digit precede or follow the muscular development? No doubt the completeness of the latter, and its perfection for an avian type, has come about as a demand on the part of the habits of the bird itself and its marvellous fleetness of foot.

The *tibialis posticus* (Plate XLV. fig. 1, *tib. post*) is a very slender muscle in *Geococcyx*, but closely resembles the same muscle as I have found it in all other birds which I have examined for their myology. My reasons for terming it the *tibialis posticus* are fully given in my MSS. and will appear in due time. It seems to be one of the *peronei* of the senior Edwards.

As in a number of the Passeres, we find it here to arise from the antero-lateral aspect of the shaft of the fibula below the tubercle for the insertion of the *biceps flexor cruris*, from the interosseous membrane between the leg-bones, from the contiguous surface of the shaft of the tibia, and, finally, from the fascia separating it from the deep flexors of the leg. The fibres pass directly down the outer side of the tibia as a long, slender, fusiform muscle. At the lower fourth of the shaft of this bone they terminate in a small tendon, which, passing in front of the external malleolus, crosses the ankle-joint to become inserted into the supero-external rim of the summit of the tarso-metatarsus.

The *flexor perforatus indicis secundus pedis* (Plate XLIV. fig. 2, *f.p.*) is even a better developed muscle than I found it to be among typical Corvidæ, some of which I have recently dissected, and it is fully as well individualized.

It arises from the fascia at the outer side of the knee-joint, and from the contiguous surface of the external condyle of the femur. Here it receives the anastomosing fibres of the extremity of the tendon of the *ambiens*.

The muscle is fusiform in shape and accurately moulded on the flexor it covers at its side. Its tendon in descending the leg is thin and ribbon-like. At the ankle it passes through the tibial cartilage, and crossing the joint goes through, with the second tier of tendons, the cartilaginous cap on the back of the hypotarsus of the tarso-metatarsus. Passing down behind this latter bone, and



through the annular ligament in the sole of the foot, it proceeds to the underside of the second toe, beneath the second phalanx of which it expands to form a tubular sheath for the passage of the deep flexor, while at the same time it becomes attached to the side of this joint of the toe in question.

The carneous portion of this muscle in the leg is to the *outer* side of the loop for the *biceps flexor cruris*, and, owing to the fact that it varies in form and size in different birds, it is as well to bear this in mind.

The *flexor perforatus medius secundus pedis* (Plate XLIV. fig. 2, *f.p.*), as in all of the birds I have examined, is one of the best developed perforated tendons at the back of the leg. Its fascia of origin merges with the enveloping fascia about the knee-joint, while it also arises by a strong tendon, common to it and the *flexor perforatus indicis secundus pedis*, from the external aspect of the outer condyle of the femur.

Finally, it is attached more or less by carneous fibres down the shafts of the leg-bones to a point below their middle, or rather the middle of the leg. Below this the muscle terminates in a strong tendon, which, taking an oblique course through the tibial cartilage, passes as usual over the ankle-joint, through the hypotarsus, and down the back of the tarso-metatarsus.

In the foot it perforates the more superficial flexor of the basal phalanx of the outermost of the two anterior toes, then the turn bifurcates over the prebasal joint to allow the deep flexor to pass through, these bifurcations becoming the insertions of this muscle, and they are attached to the sides of the shaft of the second joint of the toe alluded to, or the external one of the two in front.

The *flexor perforatus annularis primus pedis* (Plate XLIV. fig. 2, *f.p.a*) in this bird seems to have acquired a more central position on the back of the leg than in many others that I have dissected, and, moreover, its tendon, as will be seen from the figure, is quite superficial.

It arises from between the condyles of the femur by a slight semitendinous slip, and from the side of the *flexor longus hallucis*. The muscle itself is somewhat of a fusiform outline and rather flat; it lies to the *inner* side of the loop for the *biceps*. About one third the way down the back of the leg it terminates in a small though very long tendon, which, passing quite superficially through the tibial cartilage and over the ankle-joint and hypotarsus, runs in common with the other flexors down the back of the tarso-metatarsus, turns to the rear in the sole of the foot to become inserted on the underside of the distal end of the basal phalanx of the reversed digit. In the specimen before me this insertion is to the outer side of the deep flexor, and the tendon is not slit for its passage. Nothing could be more engaging than the examination of these *reversed* tendons in the sole of the foot of this Ground-Cuckoo, for the greatest nicety in accommodation has been accomplished as they have gradually come to assume their present position. No doubt some of the departures observed from the more common arrangement of them are due to the reversion of the digit in question.

Strong, fibrous bands are so disposed in this plantar region as to

admirably hold the several groups of flexor tendons in place, and at the same time they act as pulleys for their guidance and afford correct application of the force intended to flex the toes.

The *flexor longus hallucis* (Plate XLIV. figs. 2, *f.l.h.*; Plate XLV. figs. 1, 2, *f.l.h.*) has two separate heads, the one coming off from the outer side of the external condyle of the femur, and the other, far more fleshy, arising from the posterior aspect of the same bone between the condyles. Above this muscle is overlapped by the more superficial flexors, while in turn it has beneath it the *flexor perforans digitorum profundus*. About halfway down the leg it gives way to a strong tendon, which, passing deep in the tibial cartilage, crosses the ankle-joint to pass through the outer canal of the osseous portion of the hypotarsus of the tarso-metatarsus. Down the back of the shaft of this latter bone the tendon exhibits a disposition to develop an osseous rod in its continuity, but this does not actually occur in my specimen. It lies in this region just above the tendon of the deep flexor, and, immediately above the sole, makes a fibrous connection with it of some extent. This fibrous "vinculum" is in no way oblique as it is described by Garrod for many birds, but passes directly from one tendon to the other for about 8 millimetres, and were it not known that it as a rule passes obliquely from the *flexor longus hallucis*, it would be quite impossible here to designate which tendon was responsible for the connection.

In the foot the long tendon of the *hallux* passes in the usual way to become inserted on the tubercle at the underside of the proximal end of the ungual phalanx.

As its name indicates, our next muscle, the *flexor perforatus indicis primus pedis* (Plate XLV. fig. 1, *f<sub>1</sub>*), has its tendon attached to the nether side of the basal phalanx of the index digit, and consequently aids in bending that toe.

Above, as a flat, long muscle, it comes off by a thin tendon from the external surface of the outer femoral condyle, arising with the *flexor perforatus medius secundus pedis*.

We also have in *Geococcyx* an unusually large *flexor perforatus medius primus pedis* (Plate XLIV. fig. 2, *f<sub>2</sub>*), which here arises by two slips, an outer tendinous one, from the external condyle of the femur, which has a common origin with other muscles there arising and is intimately connected with the dense fascia about the front of the knee-joint; while the second slip arises from between the femoral condyles, in common with other flexors that come off from that point. The two heads are quite independent, but merge with each other before they terminate in their common tendon at the lower third of the tibial shaft.

It passes through the tibial cartilage, overlaid by, but in close company with, the far more diminutive and narrower tendon of the *flexor perforatus annularis primus pedis*.

When it arrives under the basal phalanx of the median toe, the outer one of the anterior pair, it bifurcates to allow the other two flexor tendons to pass, while the slips thus formed become attached to the sides of the shaft of this joint close to its distal head.

It will at once be seen that *Geococcyx californianus*, in common with the vast majority of birds, has no special tendon devoted to the flexing of the *second* or prebasal phalanx of the *fourth* toe (here the reversed one). Provision is made for this in various ways in different birds. Here, in the subject before us, a special slip is thrown off for attachment from the deep flexor tendon as it passes over the prebasal joint in question, which slip virtually fulfils the function of a *flexor perforatus annularis secundus pedis*, did such a muscle with an independent tendon exist.

The *flexor perforans digitorum profundus* (Plate XLV. fig. 2, *f.p.p.*). This muscle is deep to all the flexors, and is situated directly on the posterior aspect of the tibia and fibula. It arises by two heads, one from the upper part of the tibia immediately below the overhanging rim of its summit, and the other, smaller, from the back of the head of the fibula. In the Corvidæ there is a well-developed third head, which comes off from above the fibular notch of the outer condyle of the femur, and in these birds, too, there is no fibular head to this muscle, but two tibial ones instead. *Geococcyx* agrees however, with most birds in having this muscle attached nearly the whole length of the posterior aspect of the shaft of the tibia by lightly attached carneous fibres.

About a centimetre about the tibial cartilage it terminates in a strong subcompressed tendon, which, passing *beneath* the cartilage referred to, crosses the ankle-joint in front of all the other flexor tendons, and then passes through the inner of the two longitudinal perforations of the hypotarsal apophysis of the tarso-metatarsus. Down the posterior aspect of the shaft of this bone the tendon still maintains its anterior position and exhibits a predisposition to ossify. But this does not actually take place in the specimen before me. Above the distal trochleæ, it makes the fibrous connection with the tendon of the *flexor longus hallucis* already described. This band is shown in the figure. Once within the limits of the post-trochlear space, the tendon of this muscle behaves in a manner common to most birds—that is, it quadrifurcates, and each branch takes a course close up to the joints on their plantar aspects, and running through the slits in the perforated tendons pass in each case to the ends of the toes, where they become attached or inserted upon the infero-proximal tubercles of the unequal phalanges. The one passing along under the fourth digit sends up a slip which is attached to the underside of the shaft of the prebasal joint, thus making good the deficiency here of what is represented in the other toes by an independent tendon.

The tibial head of this muscle at its origin is directly covered by the *soleus*, while in the aperture existing between the two heads we can discern the *popliteus*.

These flexor muscles, and others on both the front and rear of this limb, are moulded upon each other in a manner that can only be justly appreciated by a personal examination. In some the connections are quite feeble, the intervening tissue being easily separable, while in others the intimacy is very close, and great care is

demanded on the part of the investigator to see that the separation is made along the proper divisions.

I am convinced from my studies that a greater difference is to be found among the various muscles of birds than we have ever accredited them with, and this fact leads me to believe that the day will come when these differences can be called into play in taxonomy with excellent effect. Perhaps if the myology of the leg is examined as carefully as Prof. Garrod examined the muscles of the thigh in this class, fully as many interesting and valuable distinctions will come to light.

The *popliteus* (Plate XLV. fig. 2, *popl*) is quite well developed in *Geococcyx*, where it is seen to arise from an oblique line on the back of the tibial shaft below the head of the bone, and the fibres converging to pass upwards and outwards are inserted by a short tendon into the corresponding aspect of the head of the fibular, close to the superior fibres of insertion of the *flexor perforans digitorum profundus*. When engaged upon my dissections of the *Corvidæ*, recently I ascertained that this muscle was absent at least in the American forms of the group. This was also the case with the two peculiar muscles next to be described.

The *flexor brevis hallucis* (Plate XLV. fig. 2, *f.b.h*) is an exceedingly interesting little muscle, and one that it has not been my good fortune to have seen in birds before, as I have just said, nor can I find at hand any description of it for this class by any previous anatomist.

It arises from the side and the lower margin of the inner aspect of the hypotarsus of the tarso-metatarsus, and from some of the shaft of this bone immediately below. The fibres converge to terminate in a small tendon, which, passing down the postero-internal aspect of the shaft, goes to the inner side of the basal joint of the hallux, about which it winds to finally become inserted on its underside, at the proximal extremity of this joint, just a little beyond its articulation with the tarso-metatarsal trochlea.

Thus it will be seen that this little muscle is entirely devoted to assist in flexing the hallux. Its mesial fibres meet those of the muscle next to be described, down the mid-longitudinal line of the shaft of the bone which gives it origin.

Equally engaging with the last is another still smaller muscle, the *extensor brevis annularis* (Plate XLV. fig. 2, *E.b*), on the opposite side of the same bone. Here we find its origin is much the same as for the *flexor brevis hallucis*, coming off from the external aspect of the hypotarsus and the shaft below. It soon terminates in an extremely delicate little tendon, which, passing directly down to the fourth or reversed toe, becomes inserted on the supero-inner aspect of the basal phalanx of this digit.

By its contraction it will act as a direct extensor of this toe, a requirement no doubt made necessary through the feeble manner in which this digit is now served by the slip which goes to it from the common extensor of these phalanges.

This tendon of the short extensor gets its leverage by the fascia which circularly binds down all the tendons of the flexors and

extensors, just above the sole on the one side, and which passes above the distal trochleæ on the other.

As we pass the muscles we have described for this limb in review, it will at once be recognized that the list is unusually complete. All the ordinary muscles of the thigh are present as found in birds, and all highly developed. In the leg marked specialization and organization are everywhere evident, while exceptional muscles are here, too, fully represented.

This complexity by no means diminishes as we proceed towards the foot, for the arrangement of the tendons as they course down the tarso-metatarsus and the special musculature of this division of the limb is manifestly indicative of high organization.

Finally, we have the complex insertional extremities of the intricate system above laid before us in the foot; and the most exquisite examples of adaptation, compactness, and final requirements are to be seen throughout the structure on every hand.

#### *Notes on the Arterial System.*

Fortunately the evisceration that had been performed upon my specimen before it came into my hands has not injured the heart and great vessels. So by a careful dissection I am enabled to state that there are two carotids in *Geococcyx californianus*, and that their arrangement and the method of their branching at the base of the heart is normal. In other words, the bird in this respect is to be included with the *Aves bicarotidinæ normales*, as defined by Garrod.

I would remark, however, that the carotids come off from the innominates at points considerably further removed from the heart than that anatomist depicts them in his diagram of this condition. The branching is the same, however, and no doubt Mr. Garrod's figures were intended to illustrate this point above all others, to which end they serve an excellent purpose.

Turning to the arterial system in the pelvic limb, I find that the main artery of the leg is the *sciatic*. This agrees with the vast majority of birds, and, so far as I am aware, it is only in *Centropus phasianus* among the Cuculidæ that the rare condition of the femoral artery being the main one obtains.

#### *Of the Bursa Fabricii.*

As I said at the beginning of this memoir, Forbes has already called our attention to the peculiarity of form of this structure in the young of *Geococcyx affinis* (P. Z. S. 1877, p. 312), and says that it completely disappears in the adult. I can verify this statement so far as the specimen before me is concerned, for in it this bursa is not present, while the region otherwise is characterized as we find it in the adults of the *Centropodina*.

#### *The Trachea.* (Plate XLIII. figs. 3 and 4.)

For the entire length of this subcylindrical tube, the osseous rings which compose it fail to meet in the longitudinal median line posteriorly.

The interval thus formed, which is not very great, is occupied by a thin membrane which is continuous with the *internal tympaniform membrane* of the lower larynx. As to shape, the trachea diminishes in calibre gradually from above downwards, and nowhere in its continuity does it present any enlargements or dilatations.

This does not apply exactly to the bronchial bifurcations, for each one of them shows a disposition to swell just before arriving at the contracted parts of these tubes, where they impinge upon the lung-tissue.

We may reckon either of these bifurcations as being partially surrounded by 13 *semirings*. Of course in this bird, as I say, the entire trachea may be regarded as having only semirings, but had the usual number of these united behind, there would still have remained the 13 semirings to each bronchial tube. An osseous *pessulus* is not present in *Geococcyx*, and the *internal tympaniform membrane* is quite extensive. There does not even seem to be any thickening of this membrane in our subject where this bony little bridge is located in those birds where it exists.

As to its myology, the lower larynx is exceedingly simple in arrangement and meagrely supplied. Viewing the inferior part of the trachea and the bronchial tubes from in front, we can see but one pair of muscles, and these are the delicate *sterno-tracheales*. They are attached on either side to the last five tracheal rings (fig. 3, Plate XLIII.); the insertion seemingly consisting of two slips, the inferior one being attached to the lowermost of the five rings. These muscular slips soon merge with each other; and the muscle itself stretches across in the usual manner, for attachment to the inner surface of the costal process of the sternum.

From a near view we discover another pair of muscles; these are the *tracheo-laterales* (fig. 4, Plate XLIII.). They here extend the whole length of the tracheal tube, on its postero-lateral aspect, rather than fairly on its sides, as in the majority of birds. On either side they are carried down clear to the last bronchial semiring for attachment, *i. e.* not reckoning the aforesaid few semideveloped rings which we find at the terminal extremities of these bronchial bifurcations.

This position of the *tracheo-lateralis* muscle is just the reverse of what Garrod found in such a bird as *Opisthocomus* (Scientif. Mem., p. 466, fig. 1); for, according to this authority, these muscles may be seen in the Hoatzin on an anterior view, and, moreover, in it they pass down *in front* of the *sterno-trachealis*.

Garrod made many excellent examinations of the thoracic extremity of the trachea in the Gallinæ, and among the representatives of this group an extraordinary variety of forms of this part of the bird's economy was discovered (P. Z. S. 1879, p. 354). As the paper I refer to is profusely illustrated by drawings of the gallinaceous trachea, I have been enabled to compare them with the corresponding parts as I found them to exist in *Geococcyx*. But of all the types given, I fail to find a single one that in any way resembles the subject before us.

This is the less to be looked for, however, when we come to

consider how greatly the Gallinæ differ among themselves in this part of their structure. So whatever affinities *Geococcyx* may have with this group, it is not evident in the form assumed by its trachea nor in the musculature of the lower larynx.

#### *Of the Tongue.*

My memoir upon the skeleton of this bird contains an illustration of the hyoid arches as they are found in it (Journ. of Anat., Jan. 1886, pl. viii. fig. 8), and here it will be of interest to show the form of the tongue itself.

It will be seen from the figure of this organ (Plate XLIII. fig. 1) that its tip is rounded, and that its anterior moiety is ensheathed in a horny theca of a jet-black colour; the posterior half, however, is soft and fleshy, with its lateral margins fringed with delicate fleshy spines of a pure white colour and directed backwards.

From above downwards it is somewhat compressed, while its form as a whole is that of an isosceles triangle the base of which is rather less than one third of a side, and which exhibits a deep angular notch.

The lateral margins of the superior larynx are smooth and sharp, while its hinder edge supports a spine-like fringe, very similar to the one found on the borders of the posterior moiety of the tongue. Immediately back of this we observe the large and capacious entrance to the gullet, a feature which I have also included in my illustration of the parts under consideration.

The delicate, backward-extending limbs of the hyoidean apparatus curve up but very slightly behind the cranium in this Ground-Cuckoo.

#### *Of the Ossiculum lacrymo-palatinum.*

Careful search was made for this ossicle in my specimen of *Geococcyx*, both orbits being included in the examination, but I am confident that no such bone is found in it. This bonelet was first described by Brandt, and is best seen in certain Albatrosses, and I have elsewhere described its location and appearance in *Diomedea brachyura*.

According to Forbes, "it also occurs in forms so different from these as the Musophagidæ, many Cuculidæ, *Chunga* and *Cariama*, as well as in some Laridæ and Alcidae, so that its presence is obviously of no particular taxonomic value" (Coll. Mem. p. 415).

It was this account of its occurrence in certain Cuculidæ that incited me to search for it in our present subject, but, as I have said, it does not possess it.

In birds where it exists it is represented, when thoroughly ossified, by a delicate styliform bar connecting the descending limb of the lacrymal bone with the upper surface of the palatine.

#### *Conclusions.*

By the aid of the researches of Garrod and Forbes into the

structure of the Cuculidæ and allied forms, together with the facts brought to light in the present article, we can arrange in a tabular form a number of the anatomical similarities and differences existing among *Geococcyx californianus* and the groups with which it is more or less nearly related; so that we may gain some idea as to its probable position in the system, at least as correctly as our present knowledge of its morphology seems to indicate.

The group or types compared.	Amiens.	Fem.-caud.	Acc. f.-c.	Semitend.	Acc. semit.	Exp. second.	Carotids.	Obt. int.	Cæca.	Oil-gland.	Tendon of tensor patagii brevis, &c.
<i>Geococcyx californianus</i> .	+	+	+	+	+	—	2 norm.	Oval.	?	Not tufted.	Differs from <i>Cuculus</i> .
Cuculidæ .....	+	+	±	+	+	peculiar.	2	Triang.	+	Not tufted.	Lacks the humeral slip.
<i>Opisthocomus</i>	+	+	+	+	+	?	2	Triang.	+	Tufted.	
Gallinæ .....	+	±	+	+	+	+	2	Triang.	+	Tufted.	
Corvidæ .....	—	+	—	+	+	—	{ right — left +	{ Oval.	+	Not tufted.	

As I have already said, in the opinion of the American Ornithologists' Union, so far as it is expressed in their published Code and Check-List, the genera *Geococcyx* and *Coccyzus* are contained in the one and same subfamily COCCYGINÆ. Now a careful examination of the structure of the subject of this memoir undoubtedly demonstrates, beyond cavil, that its anatomical characters are essentially very different from the corresponding ones as we find them in the true Cuckoos. Taking into consideration the weight which we are obliged to attach to important morphological differences in Aves, I can only remark here that these differences are certainly super-generic; in other words, they clearly point to the correctness of Garrod's suggestions, who proposed that the Cuculidæ should form two SUBFAMILIES, the *Centropodinæ* and the *Cuculinæ*—the first to contain the Ground-Cuckoos, and the latter the true Cuckoos. The studies of the structure of the forms in question demonstrate that this change in classification is a sound one and should be adopted.

The classification of the family of North-American Cuckoos would then be :—

### Family CUCULIDÆ.

#### Subfamily CROTAPHAGINÆ. (Anis.)

#### Genus CROTAPHAGA.

Species : *C. ani*.

*C. sulcirostris*.



## Subfamily CENTROPODINÆ. (Ground-Cuckoos.)

Genus *GEOCOCCYX*.Species : *G. californianus*.

## Subfamily CUCULINÆ. (True Cuckoos.)

Genus *COCCYZUS*.Species : *C. minor*.*C. americanus*.*C. erythrophthalmus*.

It is hardly necessary to add, from what we know of the osteology of these subfamilies, that this classification will be strongly supported by a comparison of that part of the anatomy of the several forms.

## EXPLANATION OF THE PLATES.

## PLATE XLII.

- Fig. 1. Pterylosis of *Geococcyx californianus*, ventral aspect.  
2. " " " dorsal aspect.

## PLATE XLIII.

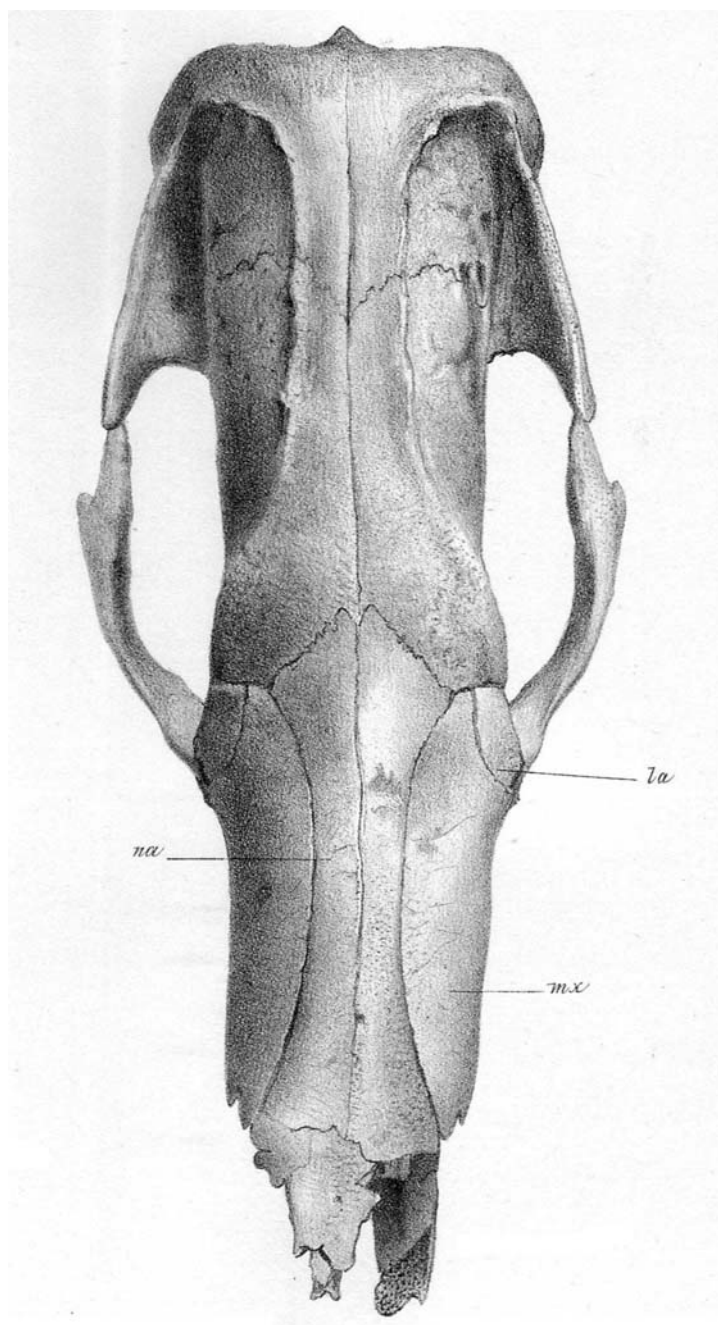
- Fig. 1. Tongue, upper larynx, and entrance to œsophagus of *Geococcyx californianus*, seen from above. (Life-size, and drawn by the author from the specimen.)  
2. Mode of insertion of patagial muscles.  
3. Lower larynx, dorsal aspect.  
4. Lower larynx, ventral aspect.

## PLATE XLIV.

Lettering of this and following Plate.

*gl.pr*, gluteus primus; *gl.m*, gluteus medius; *gl.min*, gluteus minimus; *St*, semitendinosus; *a.st*, accessory semitendinosus; *Cr*, cruræus; *V.E*, vastus externus; *v.i*, vastus internus; *Bi*, biceps flexor cruris; *l*, tendinous loop of biceps; *amb*, ambiens; *Sm*, semimembranosus; *S*, sartorius; *a.l*, adductor longus; *a.m*, adductor magnus; *f.c*, femoro-caudal; *a.f.c*, accessory femoro-caudal; *o.e*, obturator externus; *o.i*, obturator internus; *ge*, gemellus; *p.l*, peroneus longus; *tib.ant*, tibialis anticus; *tib.post*, tibialis posticus; *g*, gastrocnemius; *so*, soleus; *popl*, popliteus; *e.l.d*, extensor longus digitorum; *f.p<sub>1</sub>*, flexor perforatus indicis secundus pedis; *f.p<sub>2</sub>*, flexor perforatus medius secundus pedis; *f<sub>1</sub>*, flexor perforatus indicis primus pedis; *f<sub>2</sub>*, flexor perforatus medius primus pedis; *f.l.h*, flexor longus hallucis; *f.b.h*, flexor brevis hallucis; *f.p.a*, flexor perforatus annularis primus pedis; *f.p.p*, flexor perforans digitorum profundus; *E.b*, extensor brevis annularis; *e.b.d*, extensor brevis digitorum.

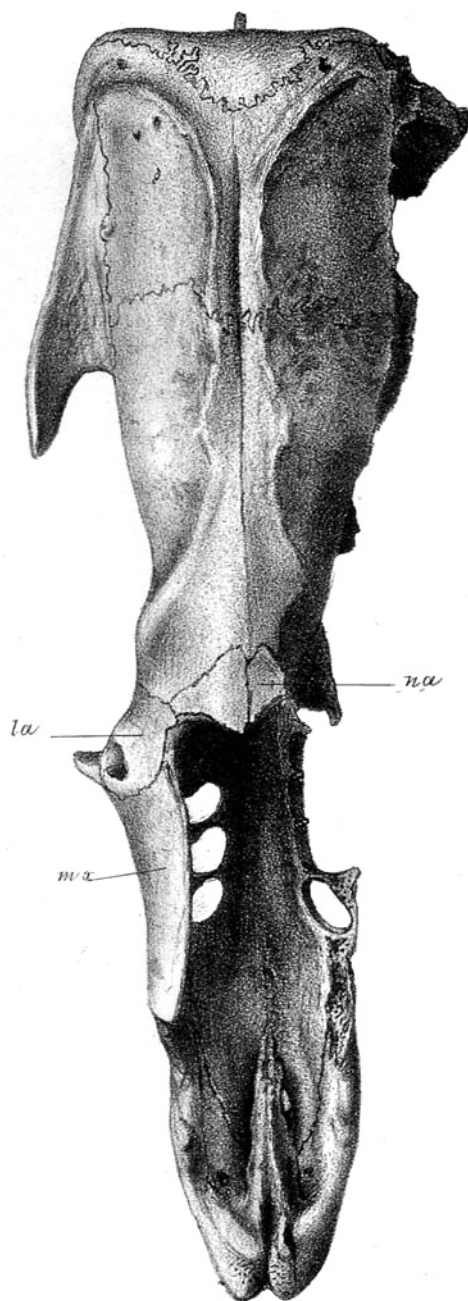
- Fig. 1. The outer aspect of the right pelvic limb of *Geococcyx californianus*; the integuments have been removed, and the drawing is designed to show the superficial muscles of the part. Life size, by the author from his own dissections.  
2. Outer view of the right pelvic limb of *Geococcyx californianus*, the superficial muscles removed and the next layer being exposed. Life size, by the author from his own dissections. The limb is drawn in a different position from what it is in fig. 1, which will account for the shortening of some of the muscles and their change of form.



J. Smit lith.

Hatch imp.

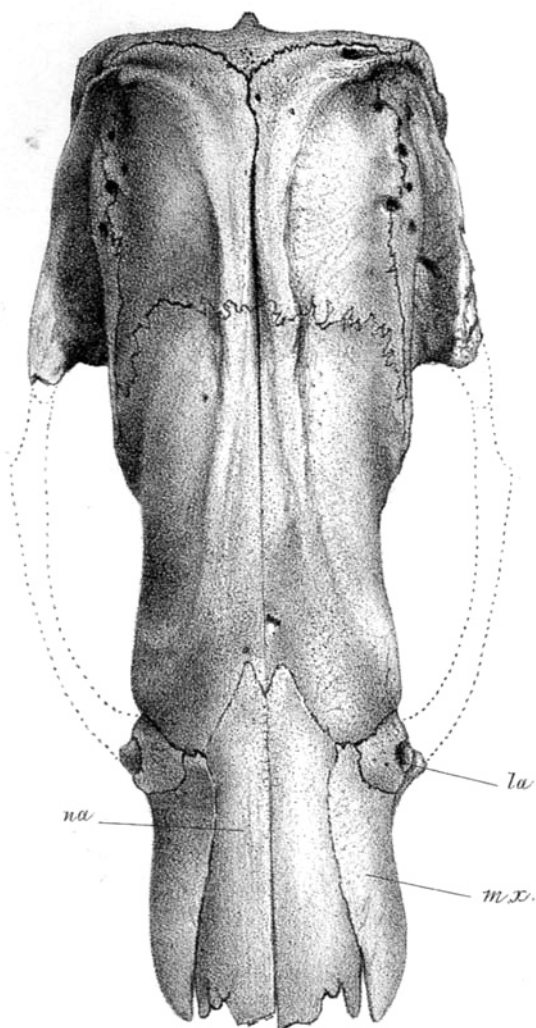
SCELIDOTHERIUM LEPTOCEPHALUM.



J. Smit lith.

Hanhart imp.

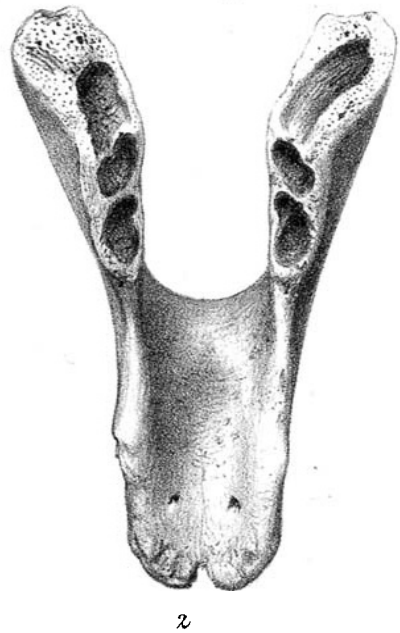
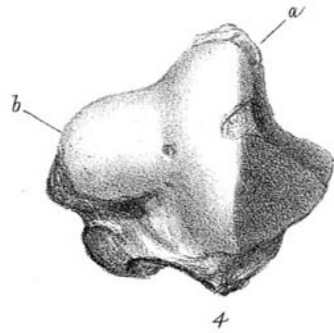
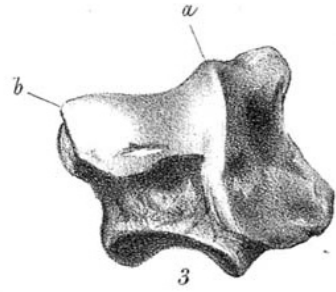
SCELIDOTHERIUM BRAVARDI.



J. Smit lith.

Hanhart imp.

SCELIDOTHERIUM CHILIENSE.



J. Smit lith.

Hanhart imp.

- |   |                |                |
|---|----------------|----------------|
| 1 | SCOLIDOTHERIUM | BRAVARDI.      |
| 2 | "              | CHILIENSE.     |
| 3 | "              | LEPTOCEPHALUM. |
| 4 | "              | BRAVARDI.      |

## PLATE XLV.

Fig. 1. Outer aspect of the right pelvic limb of *Geococcyx californianus* showing the third layer of deep muscles, with a dissecting-chain pulling the *ambiens* into view. Life size, by the author from his own dissections.

2. Outer aspect of pelvis and right pelvic limb of *Geococcyx californianus*. Designed to show the deep muscles of the region, and the bones have been slightly rotated from their normal positions in order to bring them into view. *a.* Vinculum between deep flexor and flexor *longus hallucis*. Drawn by the author from his own dissections.

### 3. Description of three Species of *Scelidotherium*.

By R. LYDEKKER, B.A., F.G.S., F.Z.S., &c.

[Received September 20, 1886.]

(Plates XLVI.-XLIX.)

In the 'Zoology of the Voyage of the Beagle,' published in 1840, Prof. Sir Richard Owen founded the genus *Scelidotherium* on the evidence of a considerable portion of the skeleton of a large megatherioid Edentate found by Darwin in the Pleistocene of Bahia Blanca, in Patagonia, and applied the specific name of *leptocephalum*. In the following year and in 1842, Lund published in the volumes of the Copenhagen Academy descriptions and figures of more or less imperfect remains of various allied animals from the Brazilian caves, all of which were eventually referred either to Owen's genus or to the new genus *Platyonyx*, no less than seven new specific names being applied to these specimens. In 1850 the late Prof. P. Gervais published, in the results of Castelnau's Voyage ('Mammifères fossiles de l'Amérique méridionale'), a description and figure of a skull from Buenos Ayres which he referred to the type species of *Scelidotherium*, and also of a second one from Tarija in Bolivia, which he did not name specifically but thought might be a new species. In 1857 Sir Richard Owen published a second memoir in the 'Philosophical Transactions,' in which he described and figured two skulls brought over in 1854 by Bravard from the Pleistocene of the Argentine Republic, both of which he referred to the type species. An important notice of the group was contributed by Dr. H. Burmeister, of Buenos Ayres, in his 'Description Physique de la République Argentine'<sup>1</sup> (1879), where he described a skeleton which he likewise referred to the type species, and also gave reasons for adopting Lund's genus *Platyonyx* for some of the allied forms. In 1880 Messrs. H. Gervais and Ameghino, in a memoir published under the title of 'Mammifères fossiles de l'Amérique méridionale,' gave a synopsis of all the previously named species of *Scelidotherium* and *Platyonyx*, and applied the new specific name of *S. tarijense* to the above-mentioned skull from Bolivia, figured by P. Gervais; and also founded a second

<sup>1</sup> Vol. i. part iii. pp. 322-345, pl. xiv. There is no copy of the Atlas in any of the London libraries.

new species, for which they proposed the name of *S. capellini*, on the evidence of a lower jaw from the Pleistocene of Buenos Ayres. In 1881 Dr. Burmeister published in the Monatsb. k. preuss. Ak. Wiss. (pp. 374–380) a description with figures of the manus, pes, and knee-joint of a skeleton of *Scelidotherrum* from the Pleistocene of the Argentine Republic, which was referred to *S. leptocephalum*. In 1885 Dr. Fischer<sup>1</sup> described a skeleton lately acquired by the Paris Museum of Natural History, which he refers to *S. leptocephalum*; while in 1886 Señor Ameghino<sup>2</sup> has applied the new name of *Scelidotherrum? bellulum* to a single tooth from Parana. Finally it may be observed that the so-called *Scelidotherrum ankilosopum*, Bravard<sup>3</sup>, is the same as *Myiodon (Grypotherrum) darwini*, Owen. Other memoirs of minor import, which need not be quoted here, have also been published.

It will be seen from the above that no less than eleven specific names have been applied to animals of this group; six of which are included by Messrs. Gervais and Ameghino, in the memoir cited, in *Scelidotherrum*, while four are referred to *Platyonyx*, the eleventh being of later date. Among the seven included under the former genus, there is no difficulty in regard to accepting the typical *S. leptocephalum* and *S. tarijense*; *S. capellini*, however, as being founded on a specimen which has not yet been figured, must be regarded merely as a nominal species; while *S. minutum*, Lund, is apparently founded upon immature specimens, and *S. bellulum* upon a single unfigured tooth. With regard to *S. bucklandi* and *S. oweni* of Lund, the type specimens are so imperfect that they do not appear to me to afford characters of sufficient importance to enable other specimens to be identified with them; and I have therefore been compelled to ignore these names when considering the affinities of the specimens described below. Of the four so-called species ranged by Messrs. Gervais and Ameghino under *Platyonyx*, the only one that can be regarded as satisfactory is *P. brongniarti*, which is founded on a nearly complete skull. *P. cuvieri* is founded on a fragment of a mandible which does not afford more satisfactory characters than the one on which *S. bucklandi* is founded; while *P. blainvillei* and *P. agassizi* have been named on still more unsatisfactory evidence, and must certainly therefore be regarded as not of more than nominal value.

The object of the present communication is, first, to show that one of the specimens figured by Sir Richard Owen in the memoir in the 'Philosophical Transactions,' already cited, does not belong to *S. leptocephalum*, which also leads to the conclusion that the specimen described by Dr. Burmeister in his second memoir under the same name is likewise distinct; and, secondly, to describe a skull belonging to a series of specimens, from the Pleistocene of Chili, recently acquired by the British Museum. In the course of this paper it will be shown that there appears no reason for the retention

<sup>1</sup> Comptes Rendus, vol. ci. p. 1291 (1885).

<sup>2</sup> Bol. Ac. Nac. Cordoba, vol. ix. p. 184 (1886).

<sup>3</sup> In P. Gervais's 'Zool. et Pal. Générales,' sér. i. p. 132 (1867–69).

of the so-called genus *Platyonyx*, which is either founded on a misidentification, or on characters which cannot be regarded as of more than specific value.

With these few words of introduction, the descriptive portion of the memoir may be commenced.

#### SCOLIDOTHERIUM LEPTOCEPHALUM, Owen.

The type species is represented in English collections by the imperfect type skeleton from Patagonia preserved in the Museum of the Royal College of Surgeons, and by two imperfect skeletons collected by Bravard in the Argentine Republic and preserved in the British Museum. The skull from the latter country, figured by P. Gervais in the 'Mammifères fossiles de l'Amérique méridionale' (Castelnau's Voyage), pl. xi. fig. 1, apparently also belongs to this species.

The type cranium is considerably damaged, but the two British-Museum crania (Nos. 37308 and 32995), taken together, exhibit nearly all the important features; the second of these specimens is figured from the lateral aspect by Sir R. Owen in the 'Philosophical Transactions' for 1857, pl. viii. fig. 1. In Plate XLVI. of the present memoir I have figured the former specimen, the occiput being restored from No. 32995. In the figured specimen the greater portion of the nasals is preserved, and its more important characters are as follows:—

The facial profile is strongly curved, and presents a well-marked frontal protuberance behind the orbit; the cranium is of moderate width, and the nasals of great relative length, being when complete at least equal to one half the total length of the frontal aspect of the cranium. In correlation with the elongated nasals the facial portion of the maxilla is lengthened, and a large portion of it appears on the frontal aspect. The lachrymal is not very prominent, and the aperture of its canal looks directly outwards. The anterior border of the zygomatic process of the maxilla is inclined backwards; the fronto-parietal ridges are widely separated, and the interdental portion of the palate is not excessively narrow.

The mandible associated with the figured cranium has an elongated symphysis, the portion in advance of the teeth being nearly twice the length of the whole dental series, and the superior border of the anterior portion of the ramus nearly straight.

The more important measurements of the figured skull are as follows:—

Length of broken nasals . . . . .	0·270
Length of facial part of maxilla . . . . .	0·170
Width of the two occipital condyles . . . . .	0·108
Length from condyle to last tooth . . . . .	0·242
Length of dental series . . . . .	0·113
Length of mandibular symphysis . . . . .	0·156
Interval between hinder border of sym-	
physis and last tooth . . . . .	0·350
Interval between do. and first tooth . . . . .	0·050



The only other part of the skeleton to which I wish to call attention is the astragalus, and I have accordingly figured the type specimen in Plate XLIX, fig. 3. It will be seen from this figure that the external trochlear ridge for articulation with the tibia is not prominent, and scarcely projects above the level of the internal tuberosity. The astragalus (B.M. No. 37476) associated with the cranium No. 37308 exhibits precisely similar features, although it is of somewhat larger dimensions. This type of astragalus is very widely different from that of *Megatherium* (in which the external trochlear ridge is extremely prominent), and apparently indicates that the eversion of the foot was not so great as in that genus.

SCELIDOTHERIUM BRAVARDI, n. sp.

This species is founded on an imperfect skeleton in the British Museum, brought by Bravard from the Argentine Republic, which presents features clearly showing that it cannot belong to the type species, to which it has hitherto been referred. The cranium (B.M. No. 37626), which lacks the whole of the dentition and the greater portion of the nasals, has been figured by Sir R. Owen in the 'Philosophical Transactions' for 1857, pl. viii. fig. 2, from the palatal aspect<sup>1</sup>, and referred to the type species; an upper view is given in Plate XLVII. of the present memoir. It is extremely unfortunate that the nasals are wanting; but from the structure of the adjacent bones it can be shown that these bones were certainly much shorter than in *S. leptocephalum*, since in the first place the superior border of the facial portion of the maxilla forms a much shorter curve than in the latter, while if the nasals were of the same length as in that species they would have projected far in advance of the premaxillæ. That the nasals were of a shorter type is also evident from a comparison of the figure with that of *S. chilense* (Plate XLVIII.), when it will be seen that the facial portion of the maxilla is not dissimilar in the two species. The whole cranium is, moreover, relatively narrower than in *S. leptocephalum*, and the frontal profile is quite straight; while only a narrow moiety of the facial portion of the maxilla appears on the frontal aspect; and the lachrymal is characterized by its extreme prominence, and the partially upward direction of the aperture of its canal. The anterior border of the zygomatic process of the maxilla is nearly vertical, while the fronto-parietal ridges are closely approximated, and the interdental portion of the palate (as is well shown in Sir R. Owen's figure) is of excessive narrowness. It will also be seen from the following table of dimensions that while the width of the occipital condyles is smaller than in *S. leptocephalum*, the interval between the condyles and the last tooth is considerably greater, which indicates a great difference in the relative proportions of the two crania. The premaxillæ are well developed.

In the mandible<sup>2</sup> associated with the cranium, while the length of

<sup>1</sup> The teeth have been introduced on one side in this figure.

<sup>2</sup> This specimen is figured by Owen, *op. cit.* pl. viii. figs. 4, 5, with the teeth restored; and apparently in pl. ix. figs. 2, 3, the specimen represented in fig. 2 being erroneously described as belonging to the upper jaw.

the symphysis is greater than in *S. leptcephalum*, the interval between the hinder border of the symphysis and the first tooth is very considerably less. The superior border of that portion of the mandible in advance of the teeth is moreover inclined strongly upwards.

The following dimensions may be compared with those of *S. leptcephalum*:—

Length of facial part of maxilla (about) . . . . .	0·135
Width of the two occipital condyles . . . . .	0·095
Length from condyle to last tooth . . . . .	0·258
Length of upper dental series . . . . .	0·105
Length of mandibular symphysis . . . . .	0·175
Interval between hinder border of symphysis and last tooth . . . . .	0·350
Interval between do. and first tooth . . . . .	0·032

I will now direct attention to the astragalus. Unfortunately the one specimen of this bone, associated with the cranium, is imperfect, although sufficient remains to show that it differs from the corresponding bone of the type species by the great prominence of the external trochlear ridge, which projects far above the level of the internal tuberosity. In Plate XLIX. fig. 4, there is represented an astragalus from a cavern in Brazil, which, although of larger size than Bravard's specimen, agrees precisely in structure, and either belongs to a male of the present form or to an allied species; and I think a comparison of this figure with that of the astragalus of *S. leptcephalum* will leave no doubt as to the specific distinctness of the two forms. This astragalus agrees precisely with the corresponding bone of a hind foot belonging to a perfect skeleton figured by Dr. Burmeister in the Monatsb. k. preuss. Ak. Wiss. for 1881, plate facing p. 380, fig. 2, and referred (on the authority of Sir R. Owen's figure of the cranium of the present form) to a large male of *S. leptcephalum*. A tibia from Brazil, associated with the figured astragalus, presents a structure of its distal surface modified to accord with this peculiar articulation, which is different from that of the tibia of *S. leptcephalum*; and there are equally well-marked differences in some of the other bones of the present form to which I shall allude on another occasion.

Whether or no the larger bones mentioned above belong to male individuals of the same species as the cranium, I think sufficient evidence has been adduced to show that both the form to which the latter and that to which the former belonged are specifically distinct from *S. leptcephalum*.

Confining, however, attention to Bravard's specimen, it is quite evident that this form is distinct both from *S. tarijense* (in which the mandible is of quite a different type) and *S. (Platyonyx) brongniarti* (in which the nasals are very short and the premaxillæ aborted); and since it appears impossible to identify it with either of the ill-defined Brazilian forms mentioned above to which specific names have been assigned, I propose that it should be known as

*S. bravardi*. Should, however, any of my fellow workers be able to identify it with either of such forms, I shall be only too happy to relegate this name to the rank of a synonym.

The structure of the astragalus of *S. bravardi* (as Dr. Burmeister remarks in his description of the larger form which I provisionally associate) approximates very strongly to that of *Megatherium*, although wanting the articular cup for the navicular; and it is therefore probable that the hind foot of this species was more everted than in *S. leptocephalum*. The shorter nasals of the present species also diverge less widely from the *Megatherium* type than do those of the last-named species, and this character is still more developed in the following form.

SCOLIDOTHERIUM CHILIENSE, n. sp.

The form to which I propose to apply the above name is represented by a series of specimens purchased during the present year by the British Museum, from a gentleman residing at Lima, which were obtained from the Pleistocene of Tamarugal, in the district of Tarapaca in Chili<sup>1</sup>. The specimens comprise three more or less imperfect crania, the anterior portion of a mandible, and a considerable number of vertebræ and limb-bones. All that I have to say in regard to the limb-bones is, that the astragalus is intermediate in structure between that of *S. leptocephalum* and that of *S. bravardi*, and that the humerus has a well-defined entepicondylar foramen.

The least imperfect of the three crania is represented in Plate XLVIII., and shows nearly the whole of the nasals. The most striking feature of this cranium is the extreme shortness and breadth of the latter bones—their length not exceeding one third of the total length of the cranium—while the mandibular symphysis is also equally short, as will be seen by the following measurements. That this form is totally distinct from *S. leptocephalum* is self-evident. It appears more nearly allied to *S. bravardi*, with which it agrees in the prominence of the lachrymal, the narrowness of that portion of the maxilla appearing on the frontal aspect, the straight facial profile, and the narrowness of the interdental portion of the palate; but differs by its greater width, by the still shorter facial portion, by the probable abortion (as will be shown below) of the premaxillæ, and by the shorter anterior portion and symphysis of the mandible. The mandible is quite unlike that of *S. tarijense*<sup>2</sup>, in which the symphyseal part is bent upwards very suddenly, nearly the whole of it being above the level of the dental alveoli. The nasals of that species are also much longer than those of the present form.

With the skull of the so-called *Platyonyx brongniarti* from Brazil, figured by Lund in the K. Danske Vid. Selsk. Skr. vol. ix. pl. xxviii., the present specimens agree very closely in general characters; but in addition to being of superior size, the cranium is relatively narrower, and lacks the marked expansion behind the nasals, while

<sup>1</sup> See map, *suprà*, p. 396.

<sup>2</sup> I refer to this species a left mandibular ramus from Brazil in the British Museum (No. 18649 a).

the nasals themselves are more pointed posteriorly and wider anteriorly, the width of the anterior expansion being greater than that at the frontal expansion, while the reverse condition obtains in *S. brongniarti*. The resemblance between the two crania is, however, sufficiently close to render it probable that the two forms were closely allied, and that the premaxillæ of the present form were similarly aborted. The dimensions of the present form are as follows :—

Length of the facial portion of maxilla.....	0.122
Width of the two occipital condyles .....	0.099
Length from condyles to last tooth .....	0.238
Length of upper dental series.....	0.093
Length of mandibular symphysis .....	0.124
Interval between hinder border of symphysis and first tooth .....	0.012

Since the present form is decidedly distinct from all the species mentioned above, and since I cannot identify it with either of the other ill-defined forms referred to *Scolidotherium* and *Platyonyx*, I can only adopt the course followed in the case of the preceding species; and I accordingly propose to designate this form as *Scolidotherium chiliense*, since I shall immediately show that the genus *Platyonyx* ought to be merged in *Scolidotherium*.

*Platyonyx* is stated by Lund (and his view is followed by Dr. Burmeister<sup>1</sup>) to be distinguished from *Scolidotherium* by the absence of an entepicondylar foramen to the humerus, and by the more flattened phalangeals; while, according to Messrs. H. Gervais and Ameghino<sup>2</sup>, the crochet of the last lower tooth is more prominent. Sir R. Owen<sup>3</sup>, who unites the two genera, is of opinion that the limb-bones referred by Lund to *Platyonyx* really belong to *Glyptodon*. I have no means of deciding which of these two views is correct; but the close general resemblance in the structure of the nasals of *Scolidotherium chiliense* to those of the so-called *Platyonyx brongniarti* leads me to conclude that whether the humerus of the latter was, or was not, provided with an entepicondylar foramen, the species is not entitled to generic distinction from *Scolidotherium*, the alleged differences in the structure of the phalangeals and of the last lower tooth being characters which are certainly not more than specific ones.

Taking the three species, *S. leptcephalum*, *S. bravardi*, and *S. chiliense* together, it will be seen that they form a sequence as here placed in regard to the length of the nasals—*S. chiliense* (together with *S. brongniarti*) being the least, and *S. leptcephalum* the most removed from the type of cranium obtaining in *Megatherium*.

#### *Affinities of the Genus.*

In conclusion, I may observe that *Scolidotherium* appears to be a

<sup>1</sup> Monatsb. k. preuss. Ak. Wiss. 1881, pp. 374–380.

<sup>2</sup> 'Mammifères fossiles de l'Amérique méridionale,' p. 151 (1880).

<sup>3</sup> Memoir on the *Mylodon*, p. 170, note.

genus occupying in some respects an intermediate position between *Megatherium* and *Myiodon*, but also showing evidence of a still more widely extended affinity. The dentition is decidedly nearest to that of *Myiodon*, while the hind foot approximates to that of *Megatherium*. The crania of species like *S. chilense* and *S. bravardi* are those least removed from the *Megatherium* type, and it is these species which come nearest to that genus in the structure of the astragalus. All those forms in which the pes is known exhibit the anchylosis of the first and second phalangeals of the third digit, and the large claw of the same, which are such characteristic features of the type genus of the family. The peculiar *Myiodon darwini* (generically separated by Reinhardt under the name of *Grypotherium*) is the form by which *Scolidotherium* is connected by cranial characters with *Myiodon*; and the connection is so close that it becomes somewhat difficult to give a clear differential diagnosis. In its extremely elongated facial region and peculiar astragalus, *S. leptcephalum* is the species departing most widely from the *Megatherium* type, and it is probable, from the structure of the last-named bone, that in this animal the pes was not everted as it is in *Megatherium*. In both its peculiar features *S. leptcephalum* makes such a very marked approach to the *Myrmecophagidæ*, that it is quite easy to imagine how that family may have taken origin from some member of the *Megatheriidae*; while the remarkable resemblance in dental characters existing between those members of the genus *Myiodon* which have been separated by some writers under the names of *Pseudolestodon* and *Lestodon* and the *Bradypodidæ* suggests that the modern arboreal Sloths may also originally have sprung from some early member of the same great family of Ground-Sloths.

## EXPLANATION OF THE PLATES.

## PLATE XLVI.

*Scolidotherium leptcephalum*, Owen. Frontal aspect of the cranium; from the Argentine Republic. British Museum, No. 37308. The occiput has been restored from another specimen.  $\frac{1}{2}$ . *la*, lachrymal; *na*, nasal; *mx*, maxilla.

## PLATE XLVII.

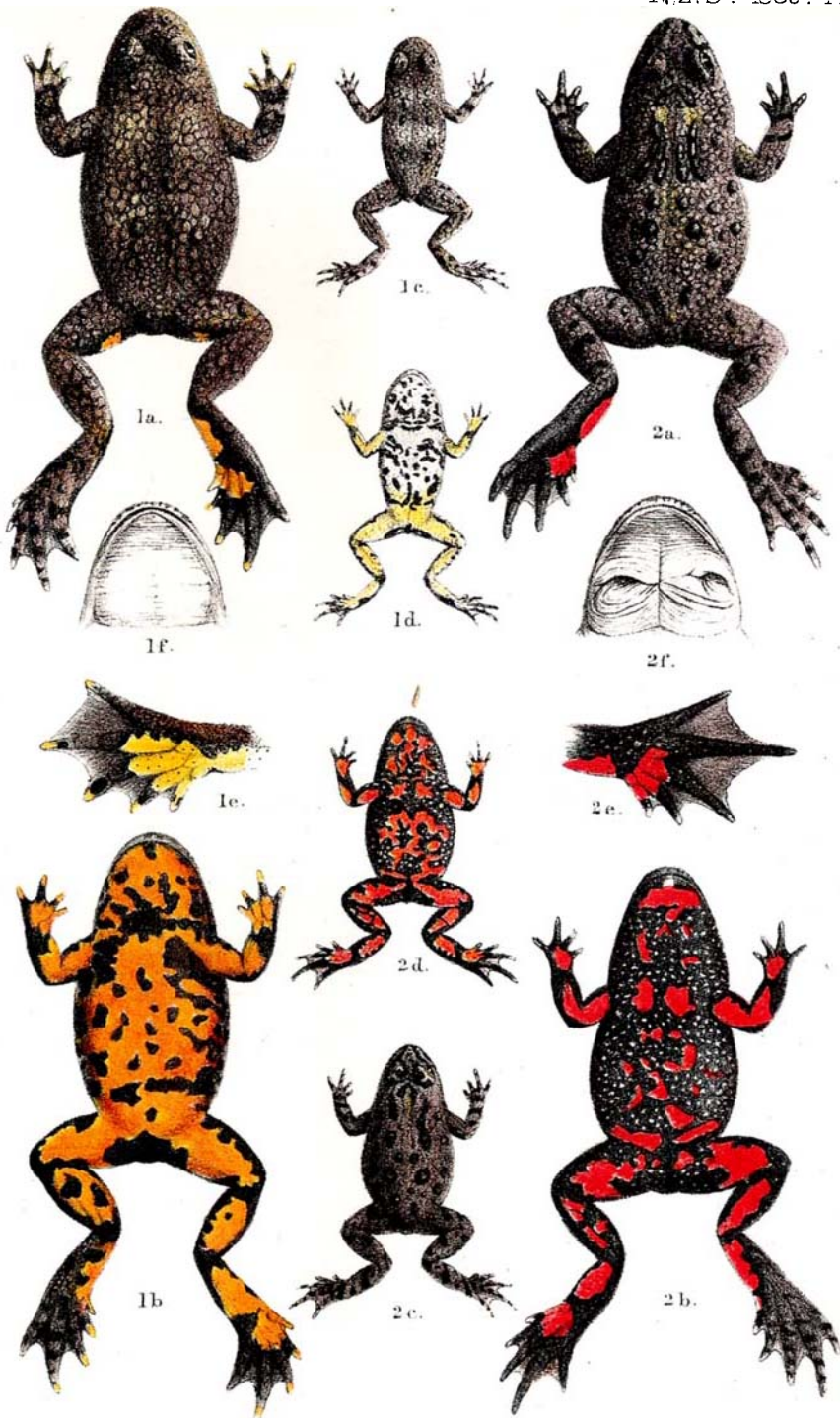
*Scolidotherium bravardi*, Lydekker. Frontal aspect of the imperfect cranium; from the Argentine Republic. British Museum, No. 37626.  $\frac{1}{3}$ . Letters as in Plate XLVI.

## PLATE XLVIII.

*Scolidotherium chilense*, Lydekker. Frontal aspect of the cranium. British Museum, No. M. 2819.  $\frac{1}{3}$ . Letters as in Plate XLVI.

## PLATE XLIX.

- Fig. 1. *Scolidotherium bravardi*, Lydekker. The mandible associated with the cranium figured in Plate XLVII. British Museum, No. 37649.  $\frac{1}{4}$ .  
 2. *Scolidotherium chilense*, Lydekker. The anterior part of the mandible; from Chili. British Museum, No. M. 2821.  $\frac{1}{2}$ .  
 3. *Scolidotherium leptcephalum*, Owen. The left astragalus; from Patagonia. Mus. Roy. Coll. Surgeons, No. 3520.  $\frac{1}{3}$ . *a*, external trochlear ridge for tibia; *b*, internal tuberosity.  
 4. (?) *Scolidotherium bravardi*, Lydekker. The left astragalus; from Brazil. British Museum, No. 18620  $\frac{1}{2}$ .  $\frac{1}{3}$ . Letters as in fig. 3.



F. H. Franzen, del et lith.

Mintern Bros. Chicago. Imp.

1. BOMBINATOR BOMBINUS.  
2. BOMBINATOR IGNEUS.

4. On two European Species of *Bombinator*.

By G. A. BOULENGER, F.Z.S.

[Received September 28, 1886.]

(Plate L.)

Two distinct forms of *Bombinator* occur in Germany. The fact has been known to me for many years, having, when a boy, been struck by the very different appearance of specimens obtained by me at Dresden as compared with the familiar form from Belgium and the Rhine. But it was only during a recent journey to Germany that I was enabled, by examining a larger material, to form a decisive opinion that the two forms are entitled to rank as species.

German authors, so far as can be gathered from their publications, have never seized upon the distinction, although individual variations have caused a var. *brevipes* (Blasius), Koch, to be established. Possibly Fitzinger was the first to separate the two forms correctly by distinguishing a *Bombinator pachypus*, from the mountains of Italy, from the true *B. igneus* of Laurenti. However, perhaps through misrepresentation of Fitzinger's views, nothing but confusion was added by Bonaparte, who, as is well known, introduced that author's MS. name into nomenclature<sup>1</sup>. The result of my search into the synonymy of *Bombinator* is that Linnæus's name *Rana bombina* and Laurenti's *Bufo igneus* apply respectively to the two species now under consideration. The words of Linnæus (Faun. Suec. 2nd ed. p. 101, 1761), "*abdomine luteo nigro maculato*," and those of Laurenti (Syn. Rept. p. 29, 1768) "*infra albido-cærulescens, punctatus maculis late miniatis*," seem to settle the point; and if, as I have reason to believe, the paler-bellied Frog occurs in Sweden and the brighter one in Austria, "*in paludibus Danubialibus*," it is settled beyond doubt. Although Rösel, as præ-Linnean and polynomialist, has no claim in matters of nomenclature, it is well to say that his, the first scientific account of *Bombinator* refers to the form which I now name *B. bombinus*. It must also be added that *B. pachypus* and *B. brevipes* are undoubtedly to be regarded as synonyms of *B. bombinus*, and that the sacrum and coccyx figured by Gené (Syn. Rept. Sard.) as that of *B. igneus*, and which has lately been the subject of some discussion, is clearly that of a *Pelobates*.

I may now pass on to the distinctive characters of the two species.

## 1. BOMBINATOR BOMBINUS, L. (Plate L. fig. 1.)

Habit stouter, snout rather shorter, digits thicker, warts stronger and more crowded than in *B. igneus*. The length of the leg or crus equals or exceeds the distance between the inner metatarsal tubercle and the extremity of the fourth toe. Male with black nuptial excrescences under the second and third toes, sometimes also

<sup>1</sup> Bonaparte's figure was evidently not executed from life, and therefore no importance is to be attached to the coloration attributed to his *B. pachypus*.

under the fourth; without gular pouches, the submaxillary (mylohyoid) muscle being undivided. Upper surfaces without or with very indistinct dark spots. Young with a pair of roundish light spots or a light transverse band between the shoulders and another on the middle of the body; these spots often more or less easily distinguishable in the adult. Lower surfaces varying from sulphur-yellow to orange, with irregular blackish or bluish-grey spots or marblings; the yellow colour usually predominates, and the blackish markings may even be entirely absent. Tips of fingers and toes yellow. Young very pale yellow inferiorly, with bluish-grey spots.

*Hab.* I have myself collected this species in Belgium, where it is very abundant in the province of Namur, and occurs also near Tournay and Liège, in France near Bordeaux, in Rhenish Prussia, and in the Tyrol near Salzburg, where it is found in great abundance. I have at present before me living specimens from near Frankfort on the Main, kindly given to me by Dr. Boettger. Mr. W. Wolterstorff writes to me from Halle that this species is, in Germany, restricted to more hilly districts; he obtained it at Tiefenort, near Eisenach, near Weismau and Muggendorf, between Bamberg and Baireuth, and round the Starberger See, near Munich. I have examined spirit-specimens from the following localities:—Hanover (Brit. Mus.), Goslar, Harz (Brit. and Berlin Mus.), Geneva (Brussels Mus.), Hungary (Brussels Mus.), Brostenii, Moldavia (Brussels Mus.), and Dalmatia (Brussels Mus.). For several specimens from San Romedio, S. Tyrol, and Marcellise, prov. Verona, I am indebted to the kindness of M. de Betta, and for two from Florence to Prof. Giglioli.

## 2. BOMBINATOR IGNEUS, Laur. (Plate L. fig. 2.)

The length of the leg is less than the distance between the inner metatarsal tubercle and the extremity of the fourth toe. No nuptial excrescences on the toes. In the male, the submaxillary muscle is divided into an anterior and a posterior portion, with a pouch on each side between the two; this vocal pouch does not communicate with the mouth through any opening, but the skin of the floor of the mouth is loose and plicate, and capable of distention during the inflation of the sides of the throat. Greyish or olive above, with distinct symmetrical blackish or bottle-green spots; sometimes the whole or part of the upper surfaces washed with green; usually a pair of pale green roundish spots between the shoulders. Lower surfaces bluish black with white dots and bright orange or vermilion insular spots; tips of fingers and toes black. Young coloured like the adult.

*Hab.* This species is common near Berlin, whence I obtained numerous specimens during a recent stay in that city. I also got it at Dresden, and I received some years ago specimens from Brostenii, Moldavia, together with *B. bombinus*; these specimens are in the Brussels Museum, where I have recently compared them with the Berlin examples. Dr. Boettger received it from near Bitterfeld. Mr. Wolterstorff, who was so kind as to send me specimens from



Magdeburg, informs me that it is only found in the plain and never occurs in company with *B. bombinus*, which, however, may inhabit the same districts, but only at a certain altitude, as is, for instance, the case in Thuringia.

## Dimensions.

	<i>B. bombinus.</i>		<i>B. igneus.</i>	
	♂. millim.	♀. millim.	♂. millim.	♀. millim.
From snout to vent . .	46	46	46	42
Head . . . . .	14	14	14	13
Width of head . . . . .	15	15	15	13
Fore limb . . . . .	23	20	21	20
Hind limb . . . . .	55	51	52	48
Tibia . . . . .	16	15	14	13
Foot, from inner meta- tarsal tubercle . . . .	15	14	16	15.5

## EXPLANATION OF PLATE L.

Fig. 1. *Bombinator bombinus*.

2. — *igneus*.

- a. Adult female, upper view.
- b. Adult female, lower view.
- c. Young, upper view.
- d. Young, lower view.
- e. Breeding male, lower view of foot.
- f. Breeding male, musculature of the throat.

## 5. Additional Notes upon the Anatomy of the *Trochili*, *Caprimulgi*, and *Cypselidæ*. By R. W. SHUFELDT, M.D. &c.

[Received July 9, 1886.]

To the meeting of this Society on December 1, 1885\*, I communicated a paper on the "Comparative Osteology of the Trochilidæ, Caprimulgidæ, and Cypselidæ," wherein I ventured to bring forward certain anatomical facts in support of Professor Huxley's expressed opinions upon the probable relations of the Humming-birds, Swallows, Swifts, and Nightjars (P. Z. S. 1867, p. 415).

Although it does not in any way alter the general comparisons I made in my first contribution to this subject, nor my conclusions, yet I find an unfortunate error has crept into the drawings of one of the Plates in the paper in question (plate lxi. fig. 3). How this happened it would be impossible for me to say at the present time, but the humerus of *Trochilus alexandri* in this figure is the *right* one, and *not* the left as stated in the text. It is quite possible that the extraordinary position of the pneumatic foramen in this bone, taken in connection with its diminutive size, or confusing the pair after the skeleton had been disarticulated for the purpose of studying the details, may have had something to do with the mistake.

\* See P. Z. S. 1885, p. 886.

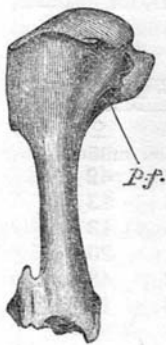


Fig. 1.

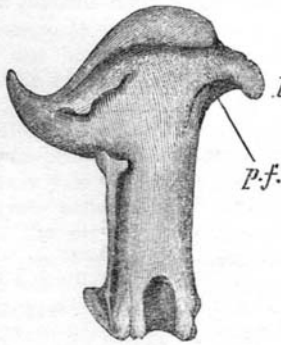


Fig. 3.

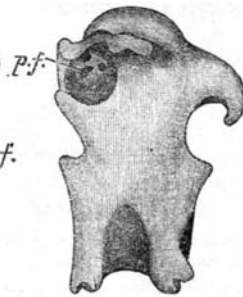


Fig. 5.

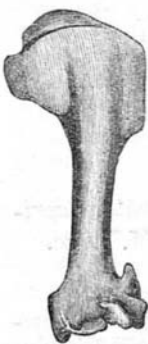


Fig. 2.

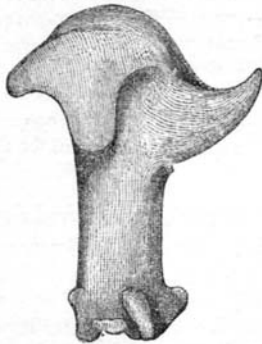


Fig. 4.



Fig. 6.

Fig. 1. Anconal aspect of left humerus of *Tachycineta thalassina*.  $\times 3$ .

Fig. 2. Palmar aspect of the bone shown in fig. 1.  $\times 3$ .

Fig. 3. Anconal aspect of the left humerus of *Micropus melanoleucus*.  $\times 4$ .  
(This was the *Panyptila saxatilis* of my first paper, but I have now adopted the nomenclature of the A. O. U. for this White-throated Rock-Swift.)

Fig. 4. Palmar aspect of the bone shown in fig. 3.  $\times 4$ .

Fig. 5. Anconal aspect of the left humerus of *Trochilus alexandri*.  $\times 8$ .

Fig. 6. Palmar aspect of the bone shown in fig. 5.  $\times 8$ .

By "anconal" I mean that side of the bone which is next to the body of the bird, and the reverse of this is the "palmar" aspect. All these figures are drawn from the specimens by the author, and *p.f.* calls attention to the *pneumatic foramen*.

Be this as it may, the oversight has been kindly pointed out to me by Mr. F. A. Lucas, the osteologist of the United States National Museum, and it devolves upon me to set the matter right.

The only changes it demands in the text of my article is, that on p. 908, in describing the humerus of *Trochilus*, the sentence reading "but the radial crest is represented by a strong and gracefully curved hook" should state, instead of the "radial crest," the *ulnar tuberosity*. Again, in the description of this figure on p. 915, it should say the *right* humerus instead of the left; and here as elsewhere in the paper take into consideration the changes that result therefrom.

Now as a correct comparison of these bones is of such high importance, and as I fully intend to carry my comparisons of the structure of these groups still further, I have redrawn, increasing in size and presenting two views, the humeri of the forms under discussion, and offer these drawings here as illustrations to the present article.

From an examination of figures 1 and 2, it must be evident, to any one familiar with the ordinary form of the avian humerus, that in the Swallow the bone departs to some extent from the more common shape it wears among the Passeres. The principal departure, however, consists in a marked *shortening of the shaft*, and perhaps a comparatively more conspicuous radial crest. The bone is likewise *non-pneumatic*. This also we find to be the case in the Swift, where, too, the radial crest is drawn out into an upturned hook, and the ulnar tuberosity is simply drawn out further and consequently more hook-like.

Now turning to the Humming-bird (figs. 5 and 6), we find a humerus that, so far as my knowledge extends, has not its counterpart among living birds. In the first place, the extraordinary position of its pneumatic fossa, *being on the radial side of the bone*, is an exception to every general definition of a bird's humerus that the writer has ever met with. Of the peculiar method of insertion of the pectoralis major muscle in this bird I shall have something to say in a future contribution. As will be seen from the figures, the ulnar tuberosity is a prominent decurved process, and one of the most striking features of this curiously twisted bone. It would be superfluous on my part to point out in the figures the manifest differences existing between the humerus of this Hummer and the Swift; they are even greater than I thought them to be, before I made the oversight above quoted. In addition to its general form, the humerus is highly pneumatic in *Trochilus*, which, as I have said, is not the case among the Cypselidæ, these latter agreeing with the Swallows in this particular in having non-pneumatic humeri.

6. On two Species of Antelopes from Somali-Land. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received September 20, 1886.]

(Plate LI.)

In Mr. E. Lort Phillips's "Notes on the Antelopes of Somali-Land" (P. Z. S. 1885, p. 930) is mentioned a Gazelle under the name of "Flabby-nosed Gazelle," the single specimen of which, in determining Mr. Lort Phillips's species, I reserved for future examination.

I was in hopes of being able to have the bones removed from the head of the single specimen obtained, in order to ascertain whether there is not some peculiarity in the frontal and nasal bones to accompany the extraordinary development of the nose in this animal. Not having been able to obtain the necessary facilities for this purpose (which, seeing that the specimen is unique and has been excellently mounted, was not much to be wondered at), I will content myself with again exhibiting the head of this remarkable Antelope (Plate LI.), and remarking that I think there can be no question of its belonging to an undescribed species, which I propose to call *Gazella naso*. *Gazella naso*, as its name implies, is sufficiently distinguishable from all other known members of the genus by having the extremity of the snout above the nasal openings developed into a large flabby wrinkled mass, which is scantily covered by short hairs of a grey colour. Above this elevated mass the face is crossed by a broad black bar. Above that again the centre of the forehead and space between the horns is covered by dense fur of a chestnut-red colour. This chestnut-red forehead is bordered on each side by two broad white longitudinal stripes, which extend from the base of the horns down to the nostrils. This longitudinal stripe is again bordered above the eye on the inside to below the eye on the outside by an indistinct blackish stripe. The tear-pits below the eye seem to be particularly large and well developed. The rest of the fur of the head and neck is of the sandy colour usual in most species of this genus. The ears, which are long and rather narrow, are of a greyish colour. In the size and shape of its horns *G. naso* does not differ materially from other species of the group allied to *G. dorcas*. The length of the horns in the present specimen, from the base to the tip, is about  $9\frac{1}{2}$  inches; the breadth of the skull between the eyes is 1.7 inch; the length from the occiput to the end of the nose about 8 inches; the length of the ear is 6 inches.

As regards the *Neotragus*, of which specimens were obtained by Mr. Phillips and were likewise left undetermined in the same communication (see P. Z. S. 1885, p. 932), I have now compared the skull and the skin brought by Mr. Phillips with specimens in the British Museum. As regards the skin there is such variation in the coloration of the fur of *Neotragus* that I do not think much reliance can be placed on the somewhat abnormal appearance of this



F. Smeat 1886.

Hanhart imp.

GAZELLA NASO

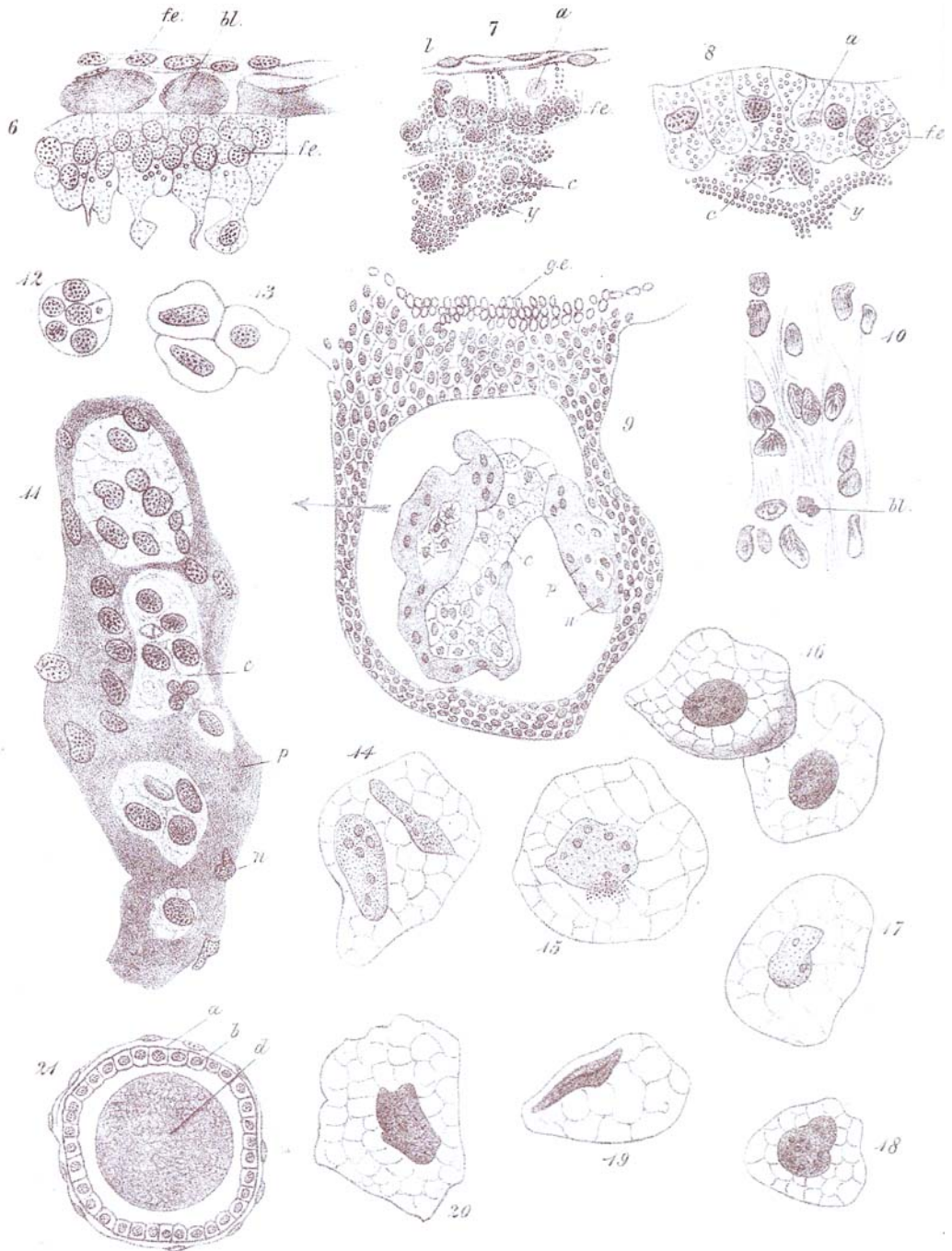


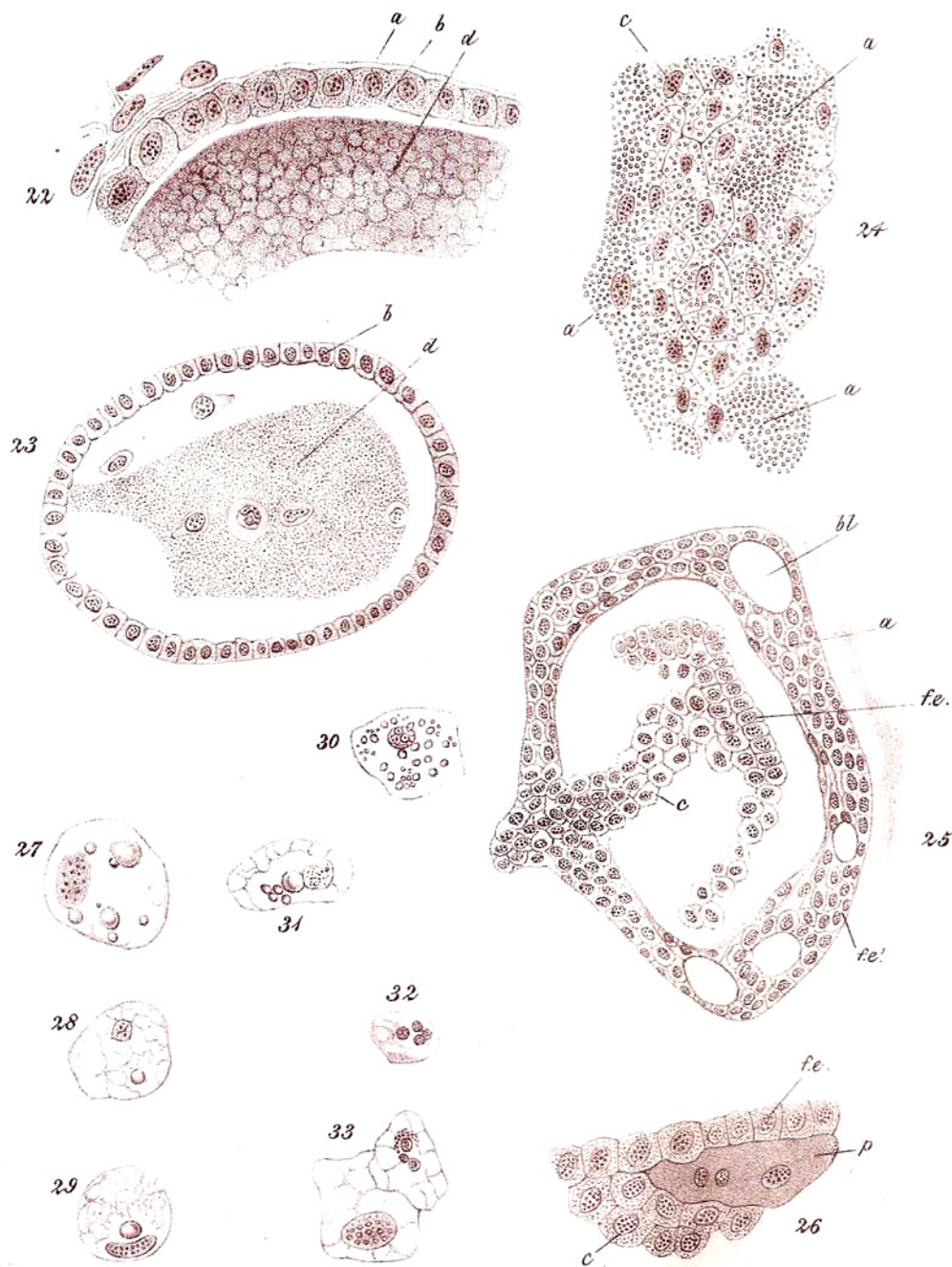
F.E.B. del. J. Smit lith.

Hanhart imp.

STRUCTURE OF OVUM IN THE DIPNOI.









example, which is nearly paralleled by other specimens in the National Collection. The skull, however, is characterized by the excessive reduction of the nasal bones, which is carried to a much greater extreme than in the typical specimen of *Neotragus kirkii*, Günther (P. Z. S. 1880, p. 20). There are also other points of difference when the skulls are compared together.

But as *Neotragus kirkii* is from nearly the same country, I think it would be hardly justifiable to name a second *Neotragus* from Somali-Land without a better series of materials to base it upon. I will therefore content myself with calling attention to their divergencies, and, as Mr. Phillips has empowered me so to do, with depositing his specimens in the British Museum to await further inquiries.

From the discoveries made by Mr. Hagenbeck's collector, Herr Menges<sup>1</sup>, and Messrs. James and Lort Phillips, it is quite evident that there is yet much interesting work to be done among the Mammalia in Somali-Land, and I trust that we shall soon receive additional specimens and further information concerning this interesting animal.

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December 7, 1886.

Prof. Flower, LL.D., V.P.R.S., President, in the Chair.

Prof. Bell exhibited and made some remarks on a specimen of *Tænia rana*, the smallest known human parasite, which had lately been obtained for the Museum of King's College.

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The following papers were read:—

1. Observations on the Development and Structure of the Ovum in the Dipnoi. By FRANK E. BEDDARD, M.A., F.R.S.E., Prosecutor to the Society, and Lecturer on Biology at Guy's Hospital.

[Received December 3, 1886.]

(Plates LII.—LIV.)

The present paper is the continuation of a research into the structure of the ovary in *Protopterus*, the main results of which have already appeared in the last number of the 'Proceedings.' Besides being able to give a more complete account of the ovarian ova in *Protopterus*, I am also able to supplement this account with some few notes respecting the structures to be observed in the ovary of *Ceratodus*. The opportunity of studying *Ceratodus* I owe to the kindness of Prof. Lankester and Prof. G. B. Howes. The material was taken

<sup>1</sup> Cf. Sclater, P. Z. S. 1884, p. 538; Noack, Zool. Gart. xxvi. p. 172 et xxvii. p. 39; Kohl, Ann. d. k. k. naturhist. Hofmuseums, i. p. 75 (1886).