on to the pupils without it showing any signs of discomfort, nor did the animal trouble to use its nictitating membranes. In this respect it had the advantage over the big Felidæ with pupils which contract in a circular manner, since a circular pupil can never contract completely so long as it remains a circle.

I obtained precisely the same contraction with a solution of eserine, whilst atropine or cocaine invariably dilated the pupil to its utmost extent, so that under the influence of these two latter alkaloids all pupils became perfectly circular (fig. 2, p. 483).

In all Mammalia which I have so far examined I have noticed that when atropine is first dropped into the eye a slight contraction invariably precedes the dilatation. This is most noticeable in the Felidæ, as the pupils are so large. In man it may easily be overlooked, owing to the small size of the pupil.

Suddenly alarming a cat has the effect of momentarily dilating the pupil; whilst I have noticed that during sleep the pupil is contracted to an oval, but dilates to its normal condition as soon as the animal wakes.

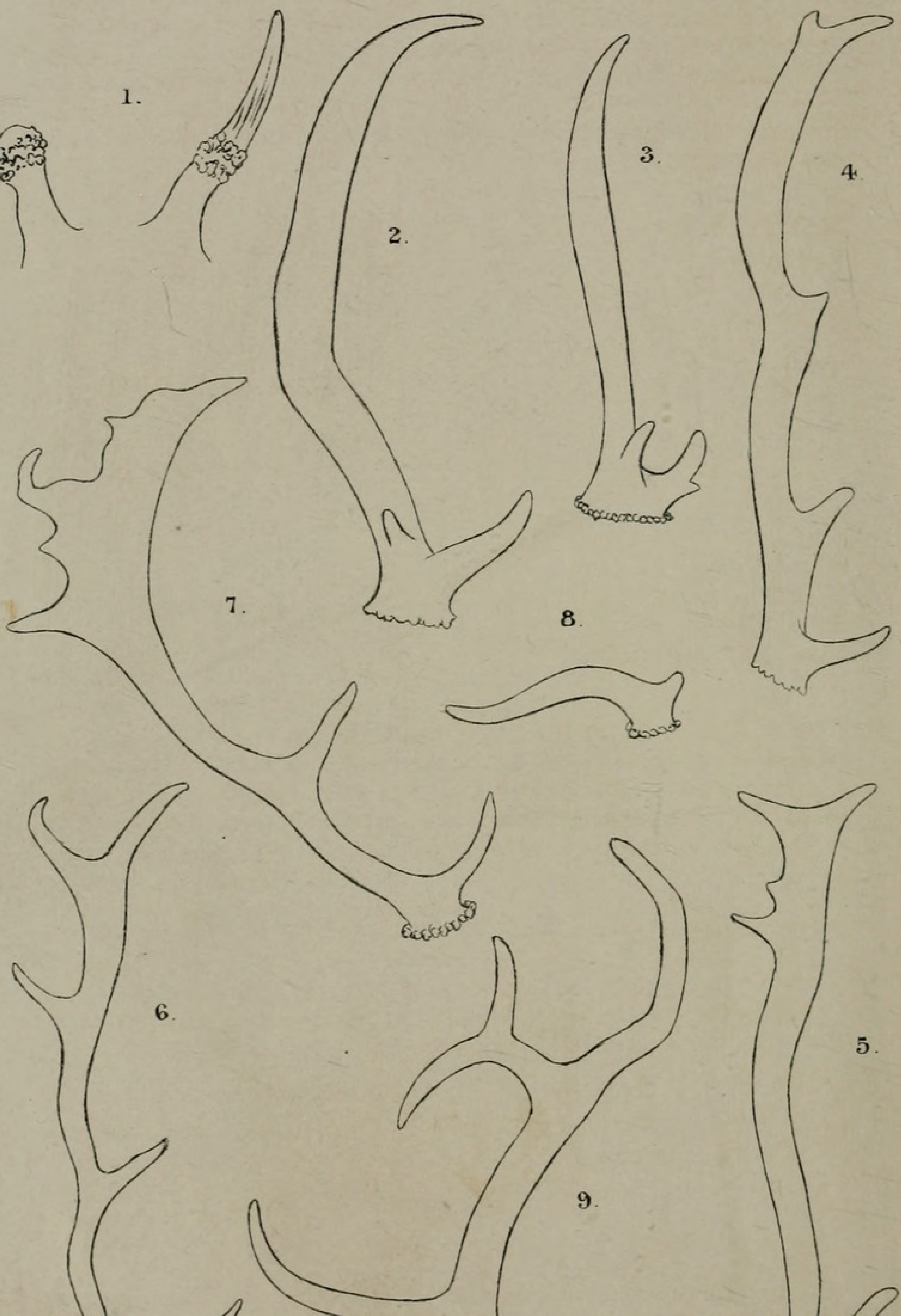
In the Wild Cat, the Geneta, and the Civet I found the pupils to be very large and round, but in bright light they contracted to an oval in the same manner as in the domestic cat. In the Lion, Tiger, Puma, and Leopard, in fact in all the large Felidæ, the pupil is invariably round, and as a rule retains its circular shape when contracting, thus forming a decided contrast to the smaller Felidæ.

June 19, 1894.

Dr. A. GÜNTHER, F.R.S., Vice-President, in the Chair.

Mr. Sclater laid on the table the skin of a Monkey of the genus *Cercopithecus*, which had been deposited in the Society's Gardens by Mr. Wall, of 4 Lansdowne Place, Russell Square, on the 5th of March, 1894, and had died shortly afterwards. He pointed out that this Monkey unquestionably belonged to the local form which he had spoken of in his paper on the *Cercopitheci* (P. Z. S. 1893, p. 255) as *Cercopithecus diana ignitus*, and which differed from the ordinary Diana Monkey in its bright chestnut thighs, shorter beard, and other smaller particulars. Mr. Sclater had lately seen a mounted specimen in the Berlin Museum, apparently also referable to this form of *C. diana*.

Mr. Sclater also exhibited the typical specimen of *Cercopithecus grayi*, Fraser, formerly in the Knowsley Collection, and now belonging to the Free Public and Derby Museum, Liverpool (*cf.* P. Z. S. 1893, p. 256), which had been kindly sent to him for examination by Mr. Henry O. Forbes, Director of that Museum. Mr. Sclater pointed out that there could be no doubt that this



G. H. Fowler del. J. Smit lith.

Mintern Bros. imp.

HORNS OF FALLOW DEER.

species, which in his paper on *Cercopithecus* he had placed in the appendix as unknown to him, was the same as *C. erxlebeni* of Pucheran (*op. cit.* p. 254). Therefore, if the strict law of priority were followed, Fraser's name would be adopted for this species; but, as it was doubtful whether Fraser's name (Cat. Knowsley Coll. p. 8), though in print, had ever been published, Mr. Sclater did not propose to use it.

Mr. H. Scherren, F.Z.S., exhibited the nest of an Amphipodous Crustacean (*Amphithoe littorina*), and made the following remarks :

"The Amphipods in the bottle are probably *Amphithoe littorina* of Spence Bate. They were taken at Jersey on May 14th, and have lived ever since in the bottle in which they are now exhibited. The nests and runs are at the bottom of the bottle. I have had the opportunity, which Mr. Spence Bate did not enjoy, of watching the nests made. The Amphipod gathered sand-grains and vegetable débris with its antennæ, till the material was within reach of its gnathopods. The material was then applied to the mouth, probably in order to cover it with some adhesive secretive, and then pressed down by the feet to the structure, the creature lying on its side the while. There are tubes in the floating weed constructed probably by this species. An individual now in the possession of Mr. Pocock, of the British Museum (Natural History), made such a tube in the course of one night."

Prof. Ray Lankester, F.R.S., read a paper on the external characters which distinguish the two Dipnoid fishes *Lepidosiren* and *Protopterus*, and pointed out that there could be no doubt that these two forms should be referred to distinct genera.

This memoir will be printed in the Society's 'Transactions.'

The following papers were read:—

1. Notes on some Specimens of Antlers of the Fallow Deer, showing Continuous Variation, and the Effects of Total or Partial Castration. By G. Herbert Fowler, B.A., Ph.D., Assistant-Professor of Zoology, University College, London.

[Received May 18, 1894.]

(Plate XXXIV.)

By the kindness of my friend Mr. J. A. Wallace of Loch Ryan, N.B., I am enabled to exhibit to the Society an interesting pair of antlers of the Fallow Deer, put up by a 'rig,' or buck castrated on one side. I have not been able to trace any description of specimens of this species which show the effects of partial castration on secondary sexual characters, although the point is of considerable interest; but dogmatic and contradictory statements on the matter are plentiful enough. When searching for similar specimens at the College of Surgeons and the British Museum, I found apparently undescribed specimens illustrating other points; and I venture to submit these incomplete notes to the Society, chiefly in the hope of directing the attention of gentlemen who have herds of Fallow Deer to abnormalities in the antlers, especially with reference to the condition of the generative organs.

The earliest account of experiments on the subject which I have been able to find is contained in the Introduction to an Essay entitled 'The Oeconomy of Nature in Acute and Chronical Diseases of the Glands,' by Richard Russell, M.D., F.R.S. (London 1755, 8vo; there is also a Latin edition of the same date).—Exper. i. A " very young deer " was castrated, which never put up any horns. —Exper. ii. A young deer "some months older" was castrated; he had " one little velvet bud instead of a horn on one side, and an irregular velvet horn, about six inches long, on the other side; both were cartilaginous; and the longest had not stability enough to keep it straight, as in the Pricket Deer, but inclined horizontally." —Exper. iii. A deer, " somewhat older than the second," was castrated, " but not cut clean, as they term it. The event was this : he had two most irregular horns that never cast their velvet; and the left testicle and spermatics being least spoiled, the left horn was (for that reason probably) one third longer than the right." From the velvet hung " soft pensile glands."—Exper. iv. Two old bucks were castrated at the end of February; their horns dropped off on the 21st March, or about five weeks too soon. " These horns were renewed next year, and were longer than the bucks of the same age, but the palms or collateral branches were less and shorter; and neither the velvet of the horns nor the horns themselves were cast ever afterwards." A postscript states that a year afterwards these horns had diminished—in the one case to stumps three or four inches in length; in the other case, the one horn was about half wasted, the other not so much so, " possibly because this buck might not be cut so clean as the former."

In the Osteological Museum of the Royal College of Surgeons is a series of antlers and frontlets, illustrating the experiments [1] made by Sir Philip Egerton for Sir Richard Owen upon the effect of various degrees of castration on the antlers of Fallow Deer. The specimens are recorded in the Museum Catalogue of 1853, and this record is repeated in the present Catalogue; it is unfortunately silent on many points of importance. The conclusions of Owen on this matter constitute the most authoritative statement with which I have been able to meet, and supersede the older statements of Redi ('Experimenta circa Res diversas Naturales,' Amstelodami, 1675, 12mo), which have been copied into

[1] The only experiments on Fallow Deer, except Russell's, of which I have found record.

many later books. Owen's views are as follows :—" If a Fallow-buck, with antlers, be castrated, they are shed earlier than usual [1], and by a more active absorbent process, which leaves an irregular concavity at the base [1]; the antlers that are subsequently developed are small, seldom branched [2], retain the 'velvet' longer than usual [2], and become thickened by irregular tuberculate masses of bone. If a young buck be castrated before it has 'put up' antlers, it does, afterwards, in some cases develop them, but of reduced size and abnormal shape, retaining them with their formative covering longer than usual [3]. Occasionally, though rarely, they are shed and renewed ; but such shed antlers of a 'heavier' or castrate deer are characterized by the excavation of their base" [4] (Comp. Anat. Phys. Vert. 1868, vol. iii. p. 631). A footnote to this passage states that Sir Philip Egerton's experiments yielded "in the main" these results, and I have given references above to the specimens, of which the Catalogue-record confirms the statements of Owen.

Since, so far as I know, none of these specimens have been figured, and some of them are not included by the passage quoted above, I append a brief description of the series, and outlines of the more interesting specimens, by the kind permission of the Council of the College of Surgeons.

R. Coll. Surg., Ost. Ser.

1555. Castrated at birth. The skull exhibits slender frontal processes, about two inches in length, resembling those of a Giraffe. They are stated to have been covered during life by a hairy skin rather than true velvet. Texture, hard and bony.

1556. Castrated at birth (fig. 1). The frontlet shows somewhat similar Giraffe-like frontal processes, of more cancellous texture. They have a distinct, though slight, burr, and measure respectively two and four inches.

1563. "One of a pair that were put up by a castrated buck and retained." This is a dag still attached to the frontal bone, six inches in length, covered by coarse irregular exostoses.

1569. A similar specimen to the former two, but with longer processes covered by very coarse exostoses. The specimen was figured in Knight's 'English Cyclopædia of Natural History,' i. 844 (1854), art. Cervidæ, as "the horns of a Fallow Deer that were not shed at the usual time in consequence of the castration of the animal."

All these specimens exhibit a single short stem or "dag," such as is first put up by a buck, and all are still attached to the frontal bones.

1566. No statement of age at castration. The frontlet carries antlers which show a rudimentary brow-tyne; both it and the beam are very short, and are covered by huge exostoses. They are stated to have been retained long after the usual time for shedding.

This differs from the previous specimens only in showing signs of a brow-tyne. It is possible that all these specimens were castrated at birth, and that the antlers of this type are not shed

[1] R. C. S. Osteol. specimen 1560.
[2] R. C. S. Osteol. specimen 1565.
[3] R. C. S. Osteol. specimens 1555, 1556.
[4] R. C. S. Osteol. specimens *passim*.

at all; this appears also to have been Owen's opinion. They are more or less cancellous above the burr.

There is, however, a more complex type of antler formed after simple castration. Of the four specimens in the College of Surgeons which illustrate this type, the age at which castration was performed is implied in only one case; but it is probable, from a comparison of this specimen (1565) and its group with specimens recorded as having been castrated *at birth* (1555, 1556) and their group, that these next four are from deer castrated fairly late in life, after they had put up horns.

In three of these four specimens there has made its appearance between brow- and tray-tynes, a third tyne, which, I suggest with some diffidence, may be regarded as a bay-tyne. In an Elaphine deer this bay-tyne lies a little above the brow, often somewhat towards the outer side of the beam; and this is the position of the third tyne in these abnormal antlers.

1561. No statement of age at castration. The outline here given (fig. 2) is of the right antler from the outer side; it consists of a heavy beam, a brow-tyne, and a smaller extra tyne above it. Measurements: burr to tip, along the curve, 16 in.; brow-tyne 3 in.; extra tyne 1 in. The left antler was 1½ in. longer, and devoid of the extra tyne.

1565. "The antlers of a castrated buck eight years old." "They were developed after castration, and were retained two years before the animal was killed." Presumably therefore the buck was castrated at the age of six years. A remarkable feature of these antlers, which are still on a frontlet, is their very unequal development. The left might pass for the antler of a "sore," or buck in its fourth year; it has a well-developed brow- and tray-tynes, and two points on the palm. The right antler, on the other hand (fig. 3), strongly resembles the preceding specimen (1561); it has a strong thickened beam, a short bifurcating brow-tyne, and the little extra tyne which may perhaps represent a bay-tyne. On the inner side, at the level of this lesser tyne, is a minute wart. Measurements: burr to tip, along the curve, 15½ in.; brow-tyne 2½ in.; extra tyne 1¾ in. It is possible, judging from two heads shortly to be described (1567 and Mr. Wallace's specimen), that the castration in this case was less completely effected on the left side than on the right.

1562. No statement of the age at castration. The single antler (fig. 4) exhibits three tynes and a beam with two points, but little palm. Measurements: burr to tip, along the curve, 19½ in.; fork of brow to fork of extra tyne 3 in.; fork of extra tyne to fork of tray, 4 in.; brow-tyne projects 2½ in., extra tyne 1¼ in., tray-tyne 0½ in.

1564. No statement of age at castration. The single antler (fig. 5) exhibits a well-developed brow-tyne, and a palm with four points, but no tray-tyne. Measurements: burr to tip, along the curve, 15½ in.

Of these four specimens, of which one certainly, the rest probably, were castrated after they had put up horns, all had been shed except the specimen which had been killed (1565); that is to say, the horns of castrated bucks can be shed; the burr is always excavated below, instead of being convex or flat.

1560. The buck which carried these antlers was castrated in August (probably in its fourth year); by that date the antlers were already "burnished," *i.e.* the skin or velvet had been rubbed off from them, and the antler was incapable of further development. They were shed in the following October, instead of May. In this specimen therefore the effect of castration was to hasten the shedding or "mewing." Unfortunately the antler put up in the next year is not recorded. The antlers are of course normal.

1558 and 1559. Antlers in the fifth and sixth year of a buck "from which the testes, but not the spermatic cords, had been removed soon after it was born." I do not understand this statement, since the spermatic cords are never "removed" in castration, but at most their lower ends. It may perhaps mean that the testis was simply cut away from the epididymis; in this case I cannot help fancying that some part of the testis must have escaped the operation, for the antlers are perfectly normal. They were formed and shed annually; but they are slightly smaller, were retained longer, and retained their velvet longer than those of entire bucks. The specimens, as they stand with their present label, are in direct contradiction to all the other specimens of this series, and are probably an example of the same result as the next specimen (1557).

1557. Antler of a specimen from which the half of each testicle had been removed soon after birth (fig. 6). The general development of the antler is normal, but much slighter than in the entire buck; as the palm is narrow, the three points appear unusually long. The antler was shed after the fourth year. Measurements: burr to tip, along the curve, 18¾ in.

The remaining specimen of this collection has the same history as that of Mr. Wallace.

1567. Cranium and antlers of a buck, "from which the left testis had been removed, showing a corresponding arrest of development of the left antler." "The velvet was retained longer than usual on both antlers." The right antler (fig. 7) is that of a full-grown buck, showing not more than the usual individual variation in the points. The left one (fig. 8) is very short, carries a rudimentary brow-tyne, and is curved backwards over the parietals. Measurements: right antler, burr to tip, along the curve, 20½ in.; left antler, same measurement, 5½ in.

Mr. Wallace's specimen (fig. 9) is stated also to be from a "rig," or half-gelding. The right antler is slightly developed, but shows a very great abnormality; it has brow- and tray-tynes and three points, of which the lowest is further inwards towards the middle line than is usual except in old heads. The left antler has a well-developed brow, a bifurcating (? tray-) tyne, and a thin beam. Measurements: left antler, burr to tip along the curve 11½ in.; brow 5 in.; tray to bifurcation 2¼ in., its forks 3¼ in., 2¾ in. respectively: right antler 14 in. The tradition of the head is to the effect that in this case the right testis, *i. e.* that of the side *opposite* to the abnormal antler, was removed.

Summary of the foregoing specimens :—

1. *Complete castration at birth* may result in the formation of simple dags (1555, 1556). Three other specimens (1563, 1569, 1566) resemble these, but the age at castration is not stated.
2. *Castration late in life* is recorded of only one specimen (1565). There is great asymmetry in the antlers [1], the one being of a

[1] It is of course not always easy to castrate an adult completely, and a small portion of testis may have been left on this side (*cf.* 1567, and Mr. Wallace's specimen and Russell's Exper. iii.). But even if castration have been completely effected, the presence of spermatozoa in greater quantity in one epididymis or vas deferens may be sufficient to affect that side; I am informed that in horses gelded late in life (*e.g.* funeral horses, in which the operation is deferred in order to obtain the crest) the temper is as bad as or worse than in a stallion, until they have been put to a mare—an observation which shows the marked effect of the mere presence of spermatozoa in the vas deferens upon the organism.

normal type, but of a grade characteristic of bucks much younger than this specimen, the other is profoundly modified. Other modified specimens, which appear to me likely to have the same history, are 1561, 1562, 1564.

3. *Antlers of castrated deer can be shed* (? if castrated at birth). This is shown by 1561, 1562, 1564; if castrated after the horns for the year are "burnished," the animal may shed them prematurely (1560); antlers put up after castration may be retained for at least two years (1565). When shed the burr is concave below, not flat or convex (*passim*).
4. *Partial castration soon after birth* may result in a comparatively feeble but normal development of the antlers (1557)[1].
5. *Castration on one side* may result in the nearly normal development of one antler, and the abnormality and reduction of the other (1567, and Mr. Wallace's specimen). This reduction may occur on the castrated side of the animal (1567), but is *traditionally* stated in the second specimen to be of the opposite side to castration.

There remain two doubtful specimens, the one (1558 and 1559 *supra*) with the rather incomprehensible label; the other (1568) a fine head of eight points, which is said to have been castrated; the catalogue is, however, uncertain on this point.

Very interesting in the light of the specimens gelded on one side are the observations of Collyns ('Notes on the Chase of the Wild Red Deer,' London, 1862, 8vo):—"Not unfrequently I have found deer killed by the hounds with horns deformed, or wanting. I used to attribute this to injuries done to the horns during their growth by fighting or otherwise; but from frequent investigations and dissections I have come to the conclusion that the appearances have generally been due to the shot or slug of the poacher injuring the deer in the testicle before his horns are shed, or during the growth of the new horn." He figures a pair of antlers of a specimen killed by the Devon and Somerset hounds; one of these was abortive, the other fairly well developed; there were shot-wounds in the testis of the *same* side as the defective horn.

At the Natural History Museum at South Kensington is an interesting series of abnormal antlers of *Cervus dama* from the New Forest, to which Mr. Oldfield Thomas has kindly called my attention (50.2.5.1 to 46). While there is no history as to the generative organs of these specimens, I have personally little doubt, after comparison with the R. C. S. specimens, that in the bulk of cases the abnormality is due to disease, removal, or incomplete development of the generative organs[2]. Apart from

[1] This appears to be commonly practised in some parks (Shirley, 'Some Account of English Deer Parks,' London, 1867, 8vo, p. 241) and among the Lapps (Caton, 'Antelope and Deer of America,' Boston, 1881, 8vo).

[2] A belief exists that an injury of almost any kind will affect the development of the antler; this may be illustrated by two specimens in the Roy. Coll. Surg.

this, however, which is pure speculation, a few notes on them seem to be justified from the standpoint of the increasing interest in Variation.

They fall into three chief groups :—

i. Antlers in which the abnormality or arrest is approximately symmetrical on both sides.

Specimens	
36.[1], 29., 35., 24., 26., 39.	Belong to the same type as the first group of the College of Surgeons; they form short dags, often overgrown by exostoses, cancellous in structure, white in colour, and are probably covered by skin throughout life.
23., 42.	Are compact rough dags, obviously burnished, growing backwards and downwards. This curious direction is taken in several specimens of the next group (*cf.* Roy. Coll. Surg. 1567).
34., 11., 12., 19., 27., 3., 22., 16., 41.	These specimens increase in size and complexity, in something like the order given. Beginning with no. 34, which exhibits a pair of simple burnished dags, measuring R. $4\frac{1}{2}$ in., L. $7\frac{1}{2}$ in. in length, we reach, not by regular steps, but with increase in size corresponding on the whole to increase in complexity, to no. 41, which has brow, tray, and two points, and is $13\frac{1}{2}$ in. in length.

ii. Antlers of which the one is fairly developed and of more or less normal growth, the other arrested at a lower grade and frequently of abnormal form.

These specimens are sufficiently interesting from the point of view of "Continuous Variation" to justify more detail than has been given of the previous group. The following Table exhibits the relations of the shorter antler; the lengths are given in inches. No tray-tyne occurs in any specimen.

The specimens are approximately arranged in the Table (p. 492) according to their *general* development, together with that of the corresponding antler; not according to total length, brow, or points. Still there is a fairly regular agreement among these, and the

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Pathological Series:—No. 1730 is the head of a Red Deer with the R. antler less developed than the L., and 1731 the L. tarsal, &c., bones of the same specimen, evidently severely broken during life, and covered by spongy new bone; "it is *supposed* that the injury to the leg was the cause of the defective growth of the antler." No. 1732 is a left antler of imperfect development, "*probably* in consequence of an injury to the right elbow-joint." I have italicized two words in the citations from the Catalogue: fractures of the limbs are not uncommon in deer, and, apparently, abnormality of the antler is not uncommon; it is natural therefore that they should occasionally coincide in the same animal. These two cases relate to the *opposite* side. On the other hand, Scrope and Whitaker both cite cases in which a wound, not apparently in the testis, produced abnormality in the antler of the *same* side. This is merely one instance of many which show how necessary is a renewed study of the whole question.

[1] The full reference numbers are 50.2.5.36, 50.2.5.29, &c., of the Osteological series of Mammalia.

List of Specimens of Abnormal Antlers of Fallow Deer.

Specimen.	Antler.	Length including burr.	Brow.	Points.	Remarks.
50.2.5.28	R	0	0	0	Represented by a mere roughness on the frontal bone.
33 *a*	R	1	0	0	
31	L	$1\frac{1}{4}$	0	0	
Label, no number.	L	$1\frac{1}{2}$	0	0	
18	R	$2\frac{1}{2}$	0	0	Curved outwards at tip.
9	R	3	0	0	Curved forwards at tip.
15	L	$3\frac{1}{2}$	0	0	Curved backwards and inwards.
8	R	$6\frac{1}{2}$	0	0	Curved backwards, outwards, forwards, inwards; crosier-like.
33 *b*	L	5	Minute ridge.	0	Curved backwards, downwards, outwards.
25	L	4	$\frac{3}{4}$	0	
32	R	10	Ridge.	0	Curved outwards, upwards, inwards.
2	L	12	Wart.	0	Several warts besides the one in the position of the brow.
10	R	16	0	0	Curved backwards, outwards, upwards.
4	R	$15\frac{1}{2}$	Wart.	2	
5	L	$15\frac{1}{2}$	0	3	

Note.—Specimen no. 1 exhibited on the right antler an anterior tyne $4\frac{1}{2}$ in. long, and a posterior $1\frac{1}{2}$ in. long; there was no burr (the only case that I have so far met with). As it was doubtful whether the smaller tyne was to be regarded as a beam or as an extra tyne, I have not included it in the Table.

specimens form a fairly continuous series considering their small number.

The continuity of the variation is equally completely shown in the case of the brow-tyne :—

50.2.5.33, L.—a ridge.	50.2.5.19, L.—$1\frac{1}{4}$ in.
33, R.—$\frac{1}{8}$ in.	22, R.—$1\frac{1}{2}$ in.
2, L.—$\frac{1}{4}$ in.	25, R.—$1\frac{3}{4}$ in.
22, L.—$\frac{3}{8}$ in.	27, R.—$2\frac{1}{4}$ in.
45, L.—$\frac{1}{2}$ in.	31, R.—$2\frac{1}{2}$ in.
25, L.—$\frac{5}{8}$ in.	10, L.—3 in.
10, R.—1 in.	41, R.—$3\frac{3}{4}$ in.

I have not taken it beyond $3\frac{3}{4}$ in., as it is then within the ordinary age-size limits of the normal antler.

A similar if less perfect continuity of variation could be demonstrated for the length and thickness of the beam and tray-tyne, but enough has been said to demonstrate its existence in antlers of the Fallow Deer.

It is not probable that the continuity of the series is appreciably attributable to the increasing age of the specimens, although it is not possible to prove this ; at least, the condition of the bones and the sutures does not point in that direction. The age at death was probably determined by the suitability of the deer for venison, as the antlers are all on the frontals ; none of these B. M. specimens had been shed.

iii. Antlers exhibiting extra tynes, &c.

43. One antler still attached to a portion of the frontal bone. The burr is very thick (5 in. circumference) ; the antler above it is also very thick ($1\frac{3}{4}$ in. high) and carries 3 tynes ($1\frac{1}{2}$, 2, and 3 in. in length).
37. Frontlet with both antlers. L. antler : from the burr spring 3 tynes $5\frac{1}{4}$, $6\frac{1}{4}$, and 12 in. long. From the relative position of the three tynes, and from a deep groove between the two larger, which cuts right through the burr, these two may represent a split beam.—R. antler : brow, tray, and a palm with 6 points.
40. Right antler on frontal. From the burr spring almost at once four tynes—one in the position of a brow-tyne ($6\frac{1}{2}$ in. long), one in the position of a bay-tyne (10 in.), a bifurcating tyne presumably representing the beam ($13\frac{1}{2}$ in.), and lastly a tyne which springs posteriorly and grows downwards and outwards.
20. Frontlet with both antlers. R. antler has a curved beam ($7\frac{3}{4}$ in.) ; and, growing on the usual process of the frontal bone, a small tyne with a separate burr (3 in.), apparently representing the brow-tyne. L. antler has brow-tyne and beam (14 in.) only.

Here, again, we have apparently steps in a continuous series of variations ; from the little warts of B. M. specimen no. 2 (see Table), through the Roy. Coll. Surg. specimen 1561, and through B. M. 43, we reach B. M. 37[1]. I have seen no steps leading up to B. M. 20, except the deep groove interrupting the burr in B. M. 37. A continuation of such a groove in a half-circle would cut off a tyne

[1] The occurrence of extra beams (? tynes) in the Roebuck is recorded by Bateson in 'Materials for the Study of Variation,' London, 1894, 8vo (p. 286, fig. 75).

with a separate burr[1]; but it must be remembered that, so far, I have only been able to handle a few specimens, and there is room for surprise that on these few such continuity should be shown.

The remaining specimens of this British Museum series are not of immediate interest, but are recorded here for the sake of completeness.

14. Heavy antlers, broken across below the tray-tyne, apparently after full growth but before burnishing. A tyne had grown outwards from one of them at the fractured surface[2].
44. A single antler of the character of R. C. S. specimen 1567 (fig. 8), with a slight brow-tyne, and a bifurcating tyne a little above this.
45. A similar specimen to 44, but with only a brow-tyne.
46. A single antler of stunted growth, with a brow and three points.

In conclusion, I have but to express my thanks to Sir William Flower, Prof. Charles Stewart, and Mr. Oldfield Thomas, for the facilities granted to me in the examination of specimens, and to Mr. J. E. Harting for help with the literature of the subject; and my hopes that the incomplete character of these notes may induce Fellows of the Society, who own a herd of Fallow Deer or have influence with their owners, to arrange a series of systematic observations on the abnormalities of antlers.

EXPLANATION OF PLATE XXXIV.

Fig. 1. R. C. S. Osteol. Cat., 1556.
2. R. C. S. Osteol. Cat., 1561: right antler from outer side.
3. R. C. S. Osteol. Cat., 1565: right antler from outer side.
4. R. C. S. Osteol. Cat., 1562: left antler from inner side.
5. R. C. S. Osteol. Cat., 1564: right antler from outer side.
6. R. C. S. Osteol. Cat., 1557: left antler from inner side.
7. R. C. S. Osteol. Cat., 1567: right antler from outer side.
8. R. C. S. Osteol. Cat., 1567: left antler from inner side.
9. Specimen in the possession of J. A. Wallace, Esq.: left antler from outer side.

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[1] It is of course possible to regard the small tyne of B. M. specimen 20 as a separate beam with its own burr, but its direction and position with regard to the other tyne distinctly indicate that it is really a separate brow-tyne, and not an instance of reduplication. Of this reduplication, however, an example is afforded by specimen 382 of the Roy. Coll. Surg. Teratological Series. This is a calvarium of the Axis Deer, with brow-tyne and a broken beam on the R. side: on the L. side the usual process of the frontal bone (1) carries a burr, from which spring a brow-tyne (8 in. from burr to tip; only 1 in. shorter than that of the other side) and three little tynes about $1\frac{1}{2}$ in. in the clear; one of these bifurcates slightly, and they surround the spot from which the beam should spring; (2) below this burr it grows outwards and downwards, at an angle to the horizon of about 45°, and carries another burr, a thick brow-tyne, and beam of 6 in. in length. Here, therefore, are two distinct antlers, carried on different points of an elongated and bent process of the frontal bone. The first one is in the usual position with respect to the head; the second lies parallel to the long axis of the head, with tyne and beam in the same line, and therefore, as regards the curvature of the brow-tyne, is not an optical reflection of even a normal antler.

[2] Collyns (*op. cit.*) records that from the stump of the sawn-off antler of a Red Deer a dag was put up after four years.

2. On the Perforated Flexor Muscles in some Birds.

By P. Chalmers Mitchell, M.A., F.Z.S.

[Received May 30, 1894.]

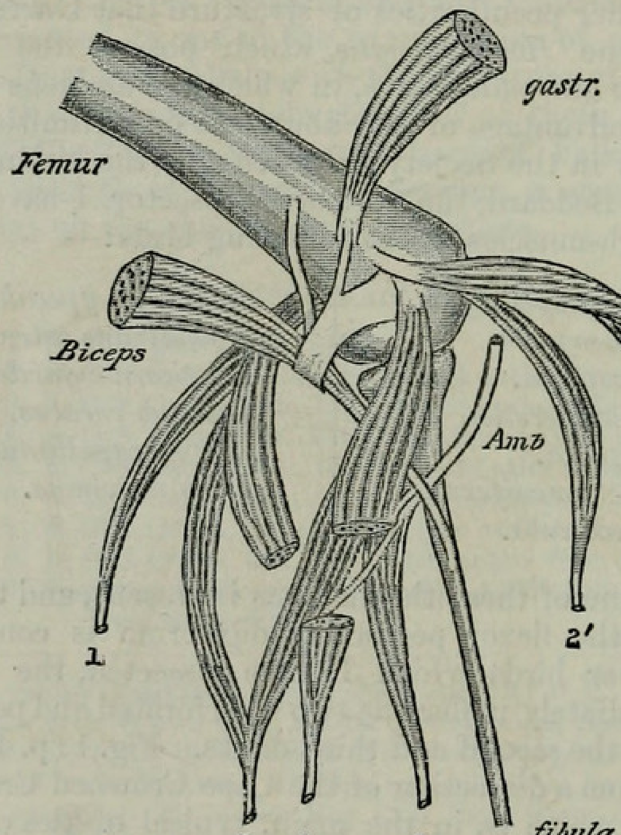
However opinions may differ as to the value of muscles in classification, few would dispute that the *ambiens* muscle of birds, in the peculiarity and isolation of its position and course, and in the constancy of its relations, is an anatomical character difficult to overlook in classification. The ambiens, as all anatomists know from the researches of Garrod, is a slender muscle which, after origin from a spine or ridge immediately in front of, or below, the acetabulum, runs along the inner side of the thigh to end in a thin tendon which usually crosses the knee and joins the *flexor perforatus digitorum*. Its presence and absence are associated with so many other peculiarities of structure that Garrod divided all birds into the *Homalogonatæ*, which possess the muscle in question, and the *Anomalogonatæ*, in which the ambiens is absent.

While taking advantage of the abundant opportunities afforded by the laboratory in the Society's Gardens, by the kindness of my friend Mr. F. E. Beddard, the Society's Prosector, I have dissected the leg- and thigh-muscles in the following birds:—

Balearica chrysopelargus.
Haliaëtus leucogaster.
Psophia leucoptera.
Thaumalea amherstiæ.
Fulica leucoptera.
Leptoptilus crumeniferus.
Palamedea cornuta.
Aramides ypecaha.
Hæmatopus ostralegus.
Nycticorax gardeni.
Eclectus roratus.
Corvus capellanus.
Bubo maximus.

In the first nine of these the ambiens is present, and the relation of its tendon to the flexor perforatus digitorum is constant. In these, as in other birds which I have dissected, the perforated flexors lie immediately under the two "perforated and perforating" flexors, those of the second and third digits. Fig. 1 (p. 496), which I have drawn from a dissection of the Cape Crowned Crane, shows an arrangement which is, in the main, typical of the other eight birds. Distally, the three tendons pass respectively to the second, third, and fourth toes. These tendons arise from a mass of muscle innervated by that branch of the ischiadic nerve that also supplies the middle head of the gastrocnemius muscle. The mass of muscle has three distinct origins—an inner head, which arises from the intercondylar notch very close to, and sometimes in common with, the head of the *flexor longus hallucis*; an outer head, from the outer condyle of the femur under and partly in common with the origins of the *flexores perforati et perforantes*, and from which a strong fibrous connection, sometimes double, runs to the short arm of the *biceps* sling; and an *ambiens* head, sometimes fleshy, sometimes tendinous, from the tendon of the ambiens. From these the three tendons arise in a very definite manner. That of the fourth digit is always the most superficial; in every case it had a separate connection with each of the three heads. That of the third digit lies next below; it had origin in all but one case from each of the three heads. The exception is the Pheasant, in which the outer head was absent, while the head from the *ambiens* was much more muscular than in the others. The tendon of the second digit comes from the deepest part of the muscle and lies nearest the fibula. In *Aramides*, in *Psophia*, and in *Leptoptilus* it arose from each of the three heads; in *Hæmatopus* it arose from the *ambiens* and the inner head; in all the others from the *ambiens* and the outer head, as in the figure of the Crane. Thus in each of the nine birds the ambiens is connected with the perforated flexor of each toe.

Fig. 1.

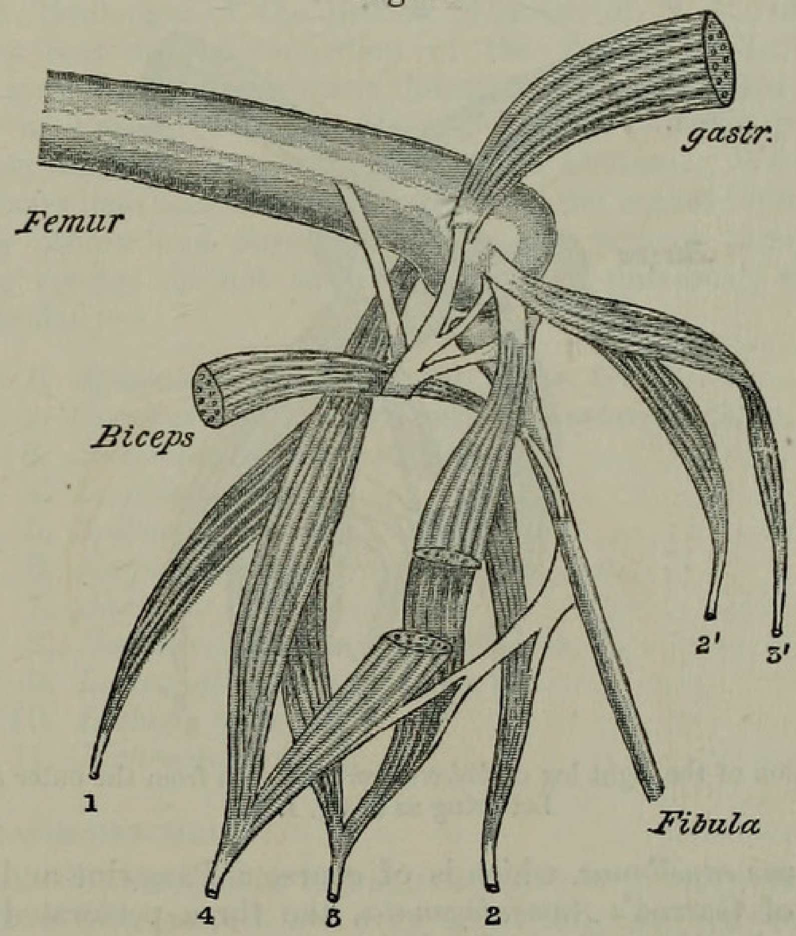


Dissection of the right leg of *Balearica chrysopelargus*, seen from the outer side.

gastr. Outer head of gastrocnemius, cut and reflected.
Biceps. Biceps, cut across shortly after its passage through the sling.
1. Flexor longus hallucis.
2. Flexor perforatus indicis.
3. „ „ medii.
4. „ „ annularis.
2′. Flexor perforatus et perforans indicis.
3′. „ „ „ „ medii.

In *Nycticorax gardeni*, as may be seen from fig. 2 (p. 497), a condition very closely resembling that in the Crane is present, but there is a difference of great interest. The three tendons of the perforated flexors have relations to the outer and inner heads of the muscle exactly as in the Crane. The *ambiens* is absent in the Heron, and in place of the heads from the *ambiens* a broad tendinous band arises from the *fibula* and is distributed to the three parts of the muscle, precisely as the *ambiens* is distributed in those birds which have it. I had the advantage of being able to show the actual dissection to my friends Mr. F. E. Beddard and Mr. Parsons, who are experts in muscular anatomy, and they both agreed with me that the relations of this slip from the fibula strongly suggested that it was a surviving vestige of the distal end of the *ambiens* tendon.

Fig. 2.

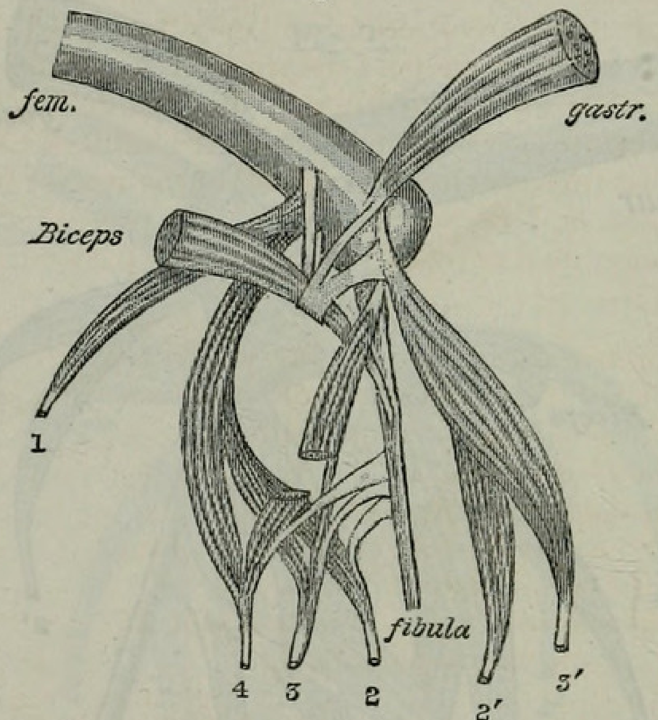


Dissection of the right leg of *Nycticorax gardeni*, seen from the outer side. Lettering as in fig. 1.

In *Eclectus roratus*, from a dissection of which fig. 3 (p. 498) was drawn, a similar possible relic of the *ambiens* is present. In that Parrot the relations of the perforated flexor of the fourth digit to the inner and outer heads of the muscle and to the tendinous band from the fibula are exactly as in the Heron. The outer head of the tendon to the third digit is represented by only a few muscular fibres, and the inner instead of the outer head of the tendon of the second digit is present, but both these tendons have a strong connection with the tendinous band from the *fibula*.

Now this Parrot and the Heron, though belonging to widely separated groups of birds, are alike in that they each belong to groups which Garrod unhesitatingly placed among the *Homalogonatæ*, although he knew that in their cases the *ambiens* was absent. In other genera of Parrots the *ambiens* is present; in the Storks, those near allies of the Herons, the *ambiens*, as Garrod showed, is absent in two cases, present in most. The existence of this possible rudiment in *Eclectus* and *Nycticorax* is therefore not surprising when the affinities of the birds are considered; and if it be found in other specimens, and still more in the case of those other members of Garrod's group that have no *ambiens*, the case for the *ambiens* as a character of great importance in classification will be confirmed.

Fig. 3.



Dissection of the right leg of *Eclectus roratus*, seen from the outer side. Lettering as in fig. 1.

In *Corvus capellanus*, which is of course a Passerine and therefore one of Garrod's *Anomalogonatæ*, the three perforated flexor tendons arise by a single head, in common with one head of the longus hallucis which corresponds with the inner head mentioned in this paper. In *Bubo maximus* there are representatives of the inner and outer heads for each perforated flexor, but there is no ambiens nor representative of a rudimentary ambiens, so that with regard to this point the Owl is intermediate between birds with a reduced ambiens and birds with no ambiens.

I hope to have further opportunity of pursuing the points mentioned in this note, but I bring it forward now in the hope that other observers into whose hands may come any of the few members of the *Homalogonatæ* without an ambiens may look for the vestige which I have described.

3. Biological Notes upon some of the Ophidia of Trinidad, B. W. I., with a Preliminary List of the Species recorded from the Island. By Messrs. R. R. Mole and F. W. Urich.

[Received May 3, 1894.]

The following biological notes are based on observations on a number of Ophidia kept in confinement from time to time, and on others seen in the field during the past four years. As we have not had access to any literature bearing on this subject, we hope to be pardoned if we have reiterated any well-known facts. Most of the determinations have been the results of the examination, by Mr. G. A. Boulenger of the British Museum of N. H., of living specimens sent to the collection of the Zoological Society of London, and of spirit-specimens determined by Professor Dr. O. Boettger of Frankfort-on-the-Main. We are indebted much to the Society and to these gentlemen for their kindness. We append a preliminary list (necessarily incomplete) of the snakes found in the island by others and ourselves up to the present time. The following species do not seem to have been previously recorded from Trinidad:—

1. *Epicrates cenchris*, L., var. *fusca*, Gray.
2. *Corallus cookii*, Gray, var. *ruschenbergii*, Cope.
3. *Streptophorus atratus*, Hallow.
4. *Liophis reginæ*, L.
5. *Spilotes pœcilostoma*, Wied.
6. *Herpetodryas macrophthalmus*, Jan.
7. *Ahætulla liocercus*, Wied.
8. *Homalocranium melanocephalum*, L.
9. *Leptognathus nebulatus*, L.
10. *Lachesis muta*, L.
11. *Bothrops atrox*, L.

Epicrates cenchris.

A snake of this species in captivity gave birth to twelve young ones. The little snakes are very beautifully marked with dark brown spots and stripes upon a light or coloured surface. Although called "Thick-necked Tree-Boas," we have only heard of one being caught in a tree, though they can climb well. They are more usually found in holes, and often frequent the palm-thatched roofs of kitchens in the country, where they go after mice and rats. They are also caught under houses, and often in or near water. The species exhibits many of the habits of the Anaconda, being fond of lying in water. In order to enjoy a bath it will contrive to get into a bottle of water, in which it would be almost impossible to put a dead specimen. So tightly does it coil, that it is with difficulty that it extricates itself from the bottle. It will remain in such a situation for a week or ten days at a time.

When given a large vessel of water it lies in it with the nose just above the surface, and when in this position woe to the unhappy mouse or rat which goes to drink, for it is immediately seized by the nose or foot, dragged into the water, and put to death by drowning and constriction with the rapidity of a flash of lightning—a convulsive flourish of an escaped limb or tail, a gasp for breath from lungs from which all air has been expelled, and all is over. The snake then devours its prey in the water, sometimes being as long as a quarter of an hour or twenty minutes without coming to the surface for air. Snakes of this species, newly born, only nine or ten inches long, will frequently prey in this manner. The species is possessed of great constrictive power, and, though it has a much smaller head than most snakes in proportion to its size, will devour very large animals, as the following incident will show:—On Nov. 20, 1893, a female common rat, in good condition—which after death gave the following measurements: $10\frac{1}{2}$ inches from tip of nose to root of tail; tail $8\frac{1}{2}$ inches long; $5\frac{1}{2}$ inches round the chest; head $2\frac{1}{2}$ inches from immediately behind the ear to the tip of nose—was put into a cage containing two Boa Constrictors and three *Epicrates cenchris*. The rat was exceptionally ferocious, and frequently rushed at the big Boas and nipped them. Not being hungry they coiled themselves up closely in a corner, as also did the *E. cenchris* with the exception of one, which at that time was 47 inches long, and the circumference of which at its thickest part was only $4\frac{3}{4}$ inches, while its head was only $1\frac{1}{4}$ inch long. This snake, which was in poor condition was born in captivity on June 14th, 1890, and for twelve months previously having had very little food, had reached a stage when it was with difficulty persuaded to eat. The rat in running about the cage passed once or twice near this snake, which on the third occasion seized it by the ear, threw it on its back, and encircled the animal with a couple of coils round the chest. Blood gushed from the rat's mouth, its eyes projected from their sockets, the hind legs and tail were violently convulsed, and in less than a quarter of a minute the rat was dead. The snake then proceeded to devour it, but was not allowed to do so because of its emaciated condition, as the meal would probably have resulted in its death or, at least, permanent injury. This snake eventually got so low, that it had to be fed compulsorily, and after months of careful attention is now showing signs of returning health.

Epicrates cenchris is essentially a night snake. We have never known it to eat lizards, in which it differs from *Corallus*. On one occasion, however, a large lizard, *Polychrus marmoratus*, being introduced into the cage of one of these snakes, threatened its rightful inmate. The snake resented the opened mouth and fierce attitude of the lizard, and seizing it threw several coils round it, gave it a tight squeeze and then let go again. The lizard thoroughly cowed retreated into the furthest corner. On another occasion one of these snakes was given half a dozen young hairless rats. They were so small that the snake could not constrict them. He bolted them one after the other, and one of them moving after it had been swallowed, he flew at the spot and buried his teeth in his own side.

This snake soon learns to know the person who habitually feeds it, and will manifest considerable interest when he approaches the cage, coming up to the glass and crawling out of the box, when opened, on to his hands and arms. It will often take mice and small birds from the fingers when offered to it. Like many poisonous snakes (*Crotalus horridus*, for instance), *E. cenchris* knows when an animal is disabled. A rat given to one was constricted. Contrary to the usual habit, the snake let go before all pulsation had ceased. The rat crawled away. The snake seemed surprised at this, but soon recovered its wits, and, taking hold of the rat by the tail, dragged it into the centre of the box and without constricting it a second time (not even attempting to do so), waited until the rat was dead, when it swallowed it in the usual manner.

A pair under our observation coupled in January.

We have seen specimens 7 feet in length, but the largest we have had under observation have not exceeded 5. One specimen we had inflated its neck when irritated in the style of *Coluber corais* and *C. boddaerti*, but not quite so prominently. When the snake has recently changed his skin the dark or reddish-brown closely scaled coat, when seen in sunlight, is glorious, with a lovely iridescent peacock-blue, which earns for the reptile the Creole name of Velvet Mapepire.

Corallus cookii, var. ruschenbergii.

These snakes couple in the months of February, March, and April, when many are found in the localities they frequent in close proximity. They produce some 20 or 30 young ones at a time, generally about August and September, though we have a young one which was given us when very young in May, so perhaps there is not much reliance to be placed in information as to breeding-time [1]. The young ones are very small and thin, with enormous heads, and probably their first meals consist of small lizards, such as *Anolis alligator*, very young birds, mice, and rats. The lizards they constrict. They are soon able, however, to catch full-grown mice, and it is really wonderful how the young snakes manage to pass down their excessively slender necks, which are not so thick as a lead-pencil, adult mice. These snakes sometimes lie in water, but very occasionally. The adults attain a length of 7 or 8 feet, and are sometimes of a yellowish-brown colour. More often they are of a deep dark brown, and as they lie in the slender twigs at the furthest extemities of the thick branches of the tree partially screened by the leaves are singularly inconspicuous.

[1] Mr. O. Reilly caught a pair coupling in February, and the young were produced the following August. They have coupled in our cages in February, March, and April.

When the snake is in motion, however, if he can be induced to move in sunlight he presents a remarkably beautiful appearance. The dull dark brown seems to change to a rich mosaic, over which shimmers a lovely bluish iridescence as he wends his sinuous way along the branches. Each scale is of a dark brown colour at the extremity furthest from its attachment to the skin, but underneath, where they are overlapped by the other scales, they are pale or bright yellow. The ventral scales are dark brown and rich yellow, sometimes punctured with black.

These snakes have very large and prominent eyes with a vertical pupil. Their teeth are numerous, long, and sharp, and when disturbed the snakes are always ready to bite, throwing their heads forward with a ferocious lunge, which is very formidable to those unused to snakes' ways; but they are not at all sure of their aim, and their widely distended jaws can be easily avoided. They rarely if ever retreat when threatened. This makes their capture very easy, and the boys who catch them do so by advancing upon them boldly, presenting to them the palm of the open hand, fingers and thumb erect and close together. The snake thrusts forward its muzzle to examine the strange object, and the boy simply closes his hand and secures its head. The reptile can then be disentangled from the branches and placed in a bag. This snake is known in Trinidad as "Cascabel Dormillon," which is *patois* for "sleeping rattlesnake"—Cascabel being the name given by the Venezuelan Spaniards to *Crotalus horridus*. The species is frequently found in bamboo clumps, and in bushes in the vicinity of or overhanging streams. They feed principally upon birds and rats, and are often met in the trees on the banks of the Caroni river, where no doubt the Porcupine Rat, *Loncheres guianæ* (Thos.), is its chief food.

Boa constrictor.

Boa Constrictors in Trinidad are known as "Macajuel" or "Macacouile," and tremendous stories are told of the enormous dimensions they are supposed to attain. Mr. A. B. Carr of Caparo, a very careful observer, who has seen and caught many of these reptiles, says that the largest he has ever seen was a female 11½ feet long. It contained 41 eggs. We have frequently seen them 6, 8, and 10 feet, and one in our possession now, which came from Chaguaramas, and the dimensions of which were taken the day after its purchase, measured from tip of nose to extremity of tail 10 feet 6 inches, but it is probable that it is at least 6 inches longer, as the difficulty of getting it to remain quiet was very great, and it could not be pulled out straight. It was 15½ inches in circumference at the thickest part of the body. Its head measured 4 inches long; the circumference of the head at the widest part was 8 inches; the tail from anus to tip was 11½ inches; and it weighed 50 lbs. exactly. It is probable that Boas (in Trinidad, at any rate) never exceed 12 feet. Boas are frequently found in trees, but we have never heard of large ones in such situations, those thus caught averaging 6 or 7 feet. Individuals vary considerably in the animals they prefer for food. One which we had from the time it was a baby (having the umbilical still attached) was brought up on mice and now eats rats with avidity, but will also eat opossums, snipes, and pigeons. After a meal of the latter he is loath to take rats when feeding-time comes round again. He would not eat a guinea-pig repeatedly offered to him at long intervals. Another fed readily upon two rats soon after it was caught, and a month later on a guinea-pig. A third, after a fast of 5 months and 20 days, during which he refused rats and guinea-pigs, ate a couple of pigeons. A large Boa fed on fowls and pigeons, and on one occasion ate an old fowl weighing 6 lbs. These snakes are essentially night animals, being very sleepy in the daytime; but it is questionable whether they are great travellers, one which escaped from an open shed being caught 12 days afterwards disappearing under the floor of the same building only a few yards distant from the box in which it had been confined. Another one after an absence of two months was similarly recovered. If well fed when young, Boas change their skins about every six weeks. A Boa we have watched for some three years changes its skin at intervals varying from five to seven weeks, during which periods it devours six or seven rats.

In their wild state Boas are found in damp localities, but not in swamps. In the woods at Mayaro hunters frequently have had their dogs caught by them, and Boas have been killed with young deer, *Cariacus nemorivagas*, and Ocelots in their stomachs. Their droppings contain evidences of the fact that they feed largely on agouti. In captivity they will frequently devour dead rats and other animals, but this is rather the exception than the rule. They all seem to have an aversion to the domestic cat. These snakes differ considerably in their general coloration, but the marking is always very much the same. The ground-colour varies from deep brown to light grey. This difference is probably owing to the various localities from which they come. In Trinidad these snakes couple in February and March—sometimes earlier. Like all the snakes belonging to the Boidæ, Boas have anal hooks, which are much more largely developed in some individuals than in others, probably owing to a difference in sex. Boas have been described as using these hooks in climbing trees. Although we have watched them carefully, we have never discovered them making the slightest use of their hooks for the purposes of arboreal locomotion, and their small size would appear to point to the impracticability for such a purpose. These claws, however, are capable of being slightly protruded and are endowed with considerable mobility. When about to couple, the male extends these hooks at right angles to the body and vibrates them in an extremely rapid manner, scratching, as he does so, the back and sides of his companion. The claws scratching the scales of his mate make a noise which can be distinctly heard two yards off. This habit has also been observed in *Epicrates cenchris.* Young

Boas soon know those who feed them and get exceedingly tame. These snakes are very tenacious of life; one which had been a long time in captivity—eight or nine months,—during which it had refused all food, had a hopeless cancer in the nose. It was deemed necessary to kill it, but as the skin was wanted uninjured it was resolved to strangle it, and a small rope was placed round its neck and drawn as tightly as two men could pull it. It was then hung up. At the end of two hours the snake was apparently dead. It was placed in a sack and sent to the person who wanted it. Next morning on being turned out of the sack it fiercely snapped right and left, and it was some time before it could be secured. Yet another instance. On April 9th, 1894, Mr. S. A. Cumberland asked us to assist him in poisoning a large Boa, caught on April 5th at St. Bartholomew Estate, Guanapo. At 4.55 P.M. we injected into the animal's mouth with a syringe half an ounce of prussic acid. Beyond expelling the air from its lungs a little violently the snake seemed uninjured. Mr. Mole was holding it at the time, and it gave his leg round which it had coiled a squeeze which lasted for about 15 seconds—had it lasted longer it would soon have been unbearable. He had had considerable experience, but never felt such tremendous pressure before, and had it been round his chest he believed the result would have been serious—broken ribs at least, if not worse. At 5.15 this poisoned snake crawled round the room, curiously examining with its tongue tables, chairs, boxes, &c. It got into a corner amongst some broken furniture, from which it was taken with considerable trouble. It coiled its tail round a table-leg and was dislodged with difficulty. It then seized with its tail a heavy chair which was carried with it into the middle of the room, and it was some time before the chair could be disengaged. There being no visible signs of an immediate approach of death, 5 grains of strychnine were injected into its throat at 5.30. This brought on a strong muscular contraction, but still the animal did not knot up. At 5.45, when a gentleman present went up to its head from behind to examine it, it made a strong effort to turn round and strike but failed. A rope was then tied to its neck and it was hung up, only about a foot of its length being on the floor. At 5.50 all life was apparently extinct. After it was hung up and all movement had ceased, it was measured and found to be 10 feet $2\frac{1}{2}$ inches long. Of this length the tail occupied $11\frac{1}{4}$ inches and the head 4 inches. Its girth was $14\frac{1}{2}$ inches. The weight was unfortunately not taken.

EUNECTES MURINUS.

This snake, known in Trinidad as the "Huilia," is the largest reptile found in the island. Specimens have been frequently killed 18 and 20 feet in length. It inhabits the rivers and lagoons on the east coast and has been found, but less seldom, at Cedros in the south-west portion. In shape it is very much like *Epicrates cenchris*, its neck being the same size as its head. The eyes are placed far forward and near the top of the head, so that it can lie in water and show very little more than the nostrils and eyes above the surface. Its body is thick and powerful. A fine young specimen lying before us as we write is of a dark greenish-brown colour, and its back is ornamented with a series of ovally-shaped bluish-black spots, arranged more or less regularly in pairs, sometimes joining and then exhibiting the appearance of an irregular hour-glass-shaped stripe across the back ; towards the tail these spots become round. The sides are marked with irregularly proportioned spots, some of them dark with yellow centres. The under surface is mottled without pattern in dark buff and black. The upper surface and sides of the tail are much lighter than the rest of the body. The black mark, so characteristic of all the Boa Constrictors we have ever seen, which extends from the eye backwards to the junction of the lower and upper jaws, is a conspicuous feature in *Eunectes murinus.* Its length is about 4 feet. This specimen, however, is not a native of Trinidad, and is one of five received from Pedesnales, Venezuela, on the 12th July, 1892. It was captured on the 1st July of the same year. The mother, which was 22 feet long, was on that date observed on the bank of one of the mouths of the Orinoco, giving birth to young ones. She was shot, and the 30 young ones, with the exception of 8, were killed. These eight were sent to Mr. Urich, three dying in transit. When they were received they had still traces of the umbilical cord. In length they were about 20 inches. They were placed in a zinc tank, with a thick branch to climb out upon. They habitually lay on the log, but upon the slightest disturbance slid quietly into the water. On the 22nd July one of them took a mouse, but the killing occurred when the snakes were not under observation. When in water they often anchored themselves by a turn of the tail round the submerged portion of the branch. At other times they would individually roll themselves into a tight ball and float on the surface. On August 1st one of them changed its skin. Eventually all died except the one under observation. On September 14, upon two mice being thrown into the tank, one of them swam across the water. A young Anaconda darted across the whole breadth, seized it, and constricted and swallowed it underneath the water. On March 20, 1893, it killed and ate a three-quarter grown common rat. On May 10th it killed two one-quarter grown rats. The first was sitting on the edge of the tank, and the snake, instead of seizing it with his teeth as these reptiles usually do, slid up over its back very gently and quietly, and then threw round it several coils without once biting it. Since then this Anaconda has progressed rapidly and is now in splendid condition. It kills full-grown rats, sometimes launching its head out of the water a distance of 15 inches to seize them. The victims are always dragged back into the water, and there constricted and swallowed. After killing them the snake comes up to take air, but does not do so again until after the prey is swallowed, a process which it assists with a coil of the body round the corpse of the rat. Gorging occupies from 10 minutes to three-quarters of an hour. This particular Anaconda refuses food out of the water, but, upon a rat in a trap being held close to the edge of its tank, has darted into the open door and seized the rat and constricted it inside the trap, trying to drag itself back into the water at the same time. After he has gorged, the part of his body containing the rat is naturally much swollen and frequently floats on the surface, the other portions of the snake except the head being submerged. Mr. J. S. Wilson informs us he has frequently seen Anacondas in the rivers of Demerara with a part of their bodies floating in this manner above the surface.

Anacondas are fond of lying on logs close to or over the water; their swallowing capacities are enormous, and they are probably assisted in this by the fact that they invariably take their food in the water. The one we have always knows when preparations are being made to give it food, and comes up to that side of the box (not always the same) it expects the rat will be driven in from. Anacondas know those who feed them, but they are uncertain in temper and allow very few liberties, biting when irritated with amazing quickness. The Trinidad Anaconda is, judging from the skins we have seen, identical with the Venezuelan snakes we have had under observation. We also kept for some time two larger specimens, each about 7 or 8 feet in length; one of them was remarkably quiet, but the other would not permit itself to be handled at all, biting fiercely, and when seized by the neck constricting with great strength so as to almost stop circulation in hands and wrists. It also used to ball.

GEOPHIS LINEATUS.

This very handsome little ground-snake is found, as a rule, tightly coiled up under stones and rubbish in yards and gardens. When it has changed its skin it is very iridescent. It probably is never more than 12 inches in length, and specimens of this size are extremely rare. It increases in numbers rapidly in the yards and gardens in towns, where they are safe from their principal enemies the Coral Snakes. They lay comparatively large eggs. One specimen contained five eggs.

LIOPHIS MELANOTUS.

This little snake rarely exceeds 2 feet in length. Its back is of a blue-black colour. Two longitudinal stripes run from head to tail on either side. The underpart is a bright yellowish colour. They are very harmless creatures, never attempting to use their tiny teeth on anything but the little lizards and frogs on which they feed. They sometimes constrict their prey—especially lizards, when rather too large to be easily managed. One snake of this species which we had for some time constantly quarrelled with other small snakes in the same box, and always threw several tight coils round them. So savage was he towards his companions that he had ultimately to be kept alone. *Liophis melanotus* breeds freely in captivity, but we have not been able to get any of the nine or ten eggs which they lay to hatch. They are exceedingly fond of water, in which they will lie for days at a time. They often fall a prey to *Elaps lemniscatus*, of which they stand in the greatest fear. They only survive its bite about four minutes. The Creoles call these snakes "Beh belle chemin," or "Beauty of the Road." They are frequently to be seen crossing dusty roads in the early morning or evening, probably for the purpose of hunting in the ditches which run on either side of our thoroughfares.

Liophis reginæ.

The adult snake is a very beautiful one, being in colour greenish yellow when it has freshly cast its skin, and looking as if a piece of black mosquito curtain had been strained over it. Sometimes the ground-colour is brighter. It feeds well on frogs and lizards and is not at all fierce. Perfect specimens are rare, a large part of the tail being usually missing. They flatten their necks when irritated. They are found in mangrove-swamps and in the vicinity of streams.

Liophis cobella.

This interesting little creature is found in the mangrove-swamps, sometimes in brackish water and close to the sea. It is known to the Creoles as "Mapepiri Mangue." It feeds almost solely on frogs, which it pursues with great energy and devours very quickly, sometimes eating as many as 12 or 14 at a meal of the little Yellow-throated Frog, *Phyllobates trinitatis* (Garman).

The females have usually faint transverse stripes on the back, caused by the arrangement of slate-coloured scales with grey edges. The general appearance, however, is mottled slate and grey. The male is more gorgeous, being mottled with black, olive-brown, and dirty yellow; the scales of the lower jaw are grey. The ventrals are chequered with large black spots on a white surface. We have seen these snakes 3 feet in length, but the average size is 18 inches. Once, and only once, have we known a Cobella to devour a lizard—a gecko, *Thecadactylus rapicauda*. These snakes are good swimmers, and on one occasion we watched one for half an hour swimming in a little pool in the swamps. It constantly dived and thrust its head amongst the weeds at the bottom, from whence, after remaining a few minutes, it came to the surface for air. A snake of this species laid several eggs, one of which hatched. The young one was perfectly black; being deformed it only survived a week or two, refusing all food.

Coluber boddaerti.

This snake is known locally as "Machete couesse," which is explained as meaning "Grass Machete." Machete is Spanish for cutlass, and many snakes are known as Machetes because their backs are somewhat ridged, reminding the Creole labourer of a cutlass. But this description does not apply to *Coluber boddaerti*, the back of the species being rounded. When adult they are of a uniform greenish-brown or olive colour, with two lighter longitudinal stripes between back and side, extending the greater length of the body, one on either side. They are white underneath. When young these snakes are prettily mottled, the back being ornamented with cross bands of a lighter hue. The scales in these bands are edged with white. These bands extend as far as where the stripes will appear when the snake is adult, and there they abruptly end. Between these cross bands, beginning on the lower side of the stripes, are similar bands to those on the back. These latter extend as far as the ventrals. Towards the tail all these markings grow fainter, and at its beginning they cease altogether, the tail being of the colour which the snake will wear when adult. These snakes probably reach a length of 4 feet. They are tolerably common, and feed on frogs and lizards when young and mice and birds when full-grown. The adults have rarely perfect tails, these appendages being probably damaged in their fights with mice. They move with great swiftness, and when caught bite with determination, trying to work their tiny teeth well into the skin before letting go. They are found in trees and on the ground indiscriminately.

Coluber corais.

This reptile in Trinidad, called the "Cribo," is one of the commonest in the island and averages 4 or 5 feet in length, though specimens are not uncommon of 7 and even 8 feet. In colour it is black with a dirty yellowish-brown tail, which is brighter towards the extremity. The plates on its head and the labials frequently exhibit a tawny hue. It moves at a smart pace, especially when in long grass; climbs and swims well. When captured it turns fiercely on the aggressor, and, inflating its neck, bites him, emitting at the same time an offensive odour, which reminds one of the habit of the English ringed snake, *Tropidonotus natrix*. So long, however, as the person holding the Cribo has sufficient presence of mind not to withdraw the bitten part, the wounds inflicted by its teeth are the merest punctures; but if the bitten one forgets this axiom and pulls back, the Cribo, which is somewhat of a bulldog in disposition, does not let go without a struggle, and his teeth then inflict long ugly scratches. The Cribo lays from nine to twelve eggs, rather larger in size than a pigeon's. The Cribo preys upon frogs, young birds, and rats, and old specimens have invariably lost the tips of their tails, and are marked all over with the scars of wounds which they have received in battles with their victims. The Cribo, on seeing a rat, rushes on it with a sudden motion and seizes it by head, tail, or middle of the body, whichever part comes first, and at once begins to swallow. The victim turns round and buries his long rodent teeth in the Cribo's skin. But the snake keeps on rapidly working his jaws, and the wretched rat ultimately lets go in order the more freely to gasp for breath, when he is promptly engulfed in the snake's jaws.

Cribos are therefore invaluable to the cocoa and sugar planters, who are always much troubled with rats. Cribos, however, are not averse to young chicken, which they devour in the boldest fashion, in spite of the noisy but impotent demonstrations of their mother. The Cribo moves in bold, graceful, rapid, and continuous curves, and the worst that is said of him by the people of the island is that he is a terror to chicken—otherwise he bears a good character. They are said to be susceptible of kindness, and will even live in the houses of the peasantry if unmolested, when they amply repay this toleration by the relentless war they wage on rats and mice. A Cribo once in our possession struck at a mouse and caught his own tail; this he diligently swallowed, until at least one-fourth of his entire length disappeared down his own throat. In this position he looked like the numeral eight (8). After some minutes' consideration he disgorged. These snakes frequently devour their own and other species, and the country people credit them with killing the formidable Crotalines *Lachesis muta* and *Bothrops atrox*.

SPILOTES VARIABILIS.

This snake, which is sometimes entirely black, has, as a rule, pale yellow stripes and spots upon the first third of its length, the remaining portions and the tail being of a shining jet-black; underneath and as far back as where the black begins it is pale yellow, the ventral scales being edged with black. It is more slender in appearance than *Coluber corais*. Its scales are large and of a pointed oval form and are slightly keeled. Its teeth are small and it makes a great show of fighting, inflating its neck to treble its ordinary thickness, but, though darting its head at the offender, it seldom bites. Its length is usually 8 or 9 feet, and we have heard of specimens measuring 11. One we had laid nine eggs. They are with difficulty kept in captivity. They feed on frogs and birds; and the following incident related to us by Mr. A. B. Carr of Capard shows they have some claim to be called rat-snakes, though perhaps not such a strong one as the *C. corais*. One Sunday afternoon, as he was lying in his hammock in a house on a plantation he has formed on the verge of the primeval forest, he saw a Tigre (local name for *S. variabilis*) come out of the long grass a little way off, cross the pathway, and make for the house. It ascended one of the supports of the roof of the verandah in which he was taking his siesta and disappeared in the palm-leaf thatch. It had not been there long before sundry squeals and rustlings betrayed the fact that the Tigre had good reasons for its visit. The snake had caught and was swallowing a rat. It then descended and made off by the way it had come. The Tigre is very rapid in its movements when alarmed, and is frequently to be seen in cocoa estates in the higher branches of the trees. Like *Scytale coronatum* and *Coluber boddaerti*, it vibrates its tail when alarmed very quickly, making a noise amongst leaves like that produced by the rattle of *Crotalus horridus*. The Tigre's back is strongly ridged.

HERPETODRYAS CARINATUS.

This is another very lively and swiftly moving serpent, and we recollect chasing one a distance of 40 yards before catching it. Its underparts or rather sides are bright yellow; the ventral scales are paler, being edged with silver and a line of dark brown. The back is of a bronze-green colour, and the yellow scales on the sides have an edging of dark brown. The scales covering the spine are in pairs and are keeled, while the remainder are smooth. Another peculiarity about the scales is that those beginning at the back of the head for a considerable distance along the spine are minutely pitted at the extremities furthest away from their attachment. This snake is one of the most beautiful in the island. It feeds on frogs, and is found alike in trees and grassy savannas. We recollect well the first time we encountered it. We were shooting on the Caroni River when our attention was attracted by a streak of pale yellow dangling from a palm (*Bactris*, sp.) over the water. The reptile was gracefully turning its small head and brilliant eyes from side to side, as if admiring its perfect symmetry of form mirrored in the water beneath it. When caught, the Machete (local name) bites with surprising rapidity and lashes with its long tail in a manner not at all pleasant to its captor. One we had in our possession laid five eggs—each 2 inches long and as thick as the little finger.

AHÆTULLA LIOCERCUS.

Locally known as "Lora," a Spanish word for parrot, because the sheeny iridescent greenish gold on the neck and anterior portion when inflated is thought to be like the hues of the feathers on the neck of the yellow-crested green parrot. Ordinarily, this snake has a commonplace grey colour. Its head is of a dark greenish-brown colour, with an under surface of white. When caught, it opens its enormous mouth to its fullest extent and threatens in a most ferocious, but at the same time somewhat absurd, manner. It rarely bites, but when it does it is apt to inflict small wounds with the two long teeth which are placed one on each side in the posterior parts of the upper jaw-bones. They are exceedingly slender reptiles and their heads at first sight appear large and disproportioned to the rest of their bodies. They frequently reach a length of 3½ and even 4 feet. They feed on frogs and lizards. On several occasions lizards which have been partially swallowed by these snakes and have escaped have died soon afterwards. The Lora is swift in its movements, and when rushing along on a level surface the outside portions of its curves do not appear to touch the earth.

OXYBELIS ACUMINATA.

This remarkable-looking tree-snake has a sharply pointed snout, which in some individuals has the under jaw tinged with yellow, in others white. The general colour is greenish drab, sometimes minutely punctured with black. It much resembles the trailing branches of the shrubs which it rests upon. It has a peculiar habit of simulating the swaying of the branches under a gentle breeze, and it is only when one catches sight of the brilliant eyes that one realizes he is gazing at a beautiful tree-snake. When about to seize its prey, which consists principally of lizards, this reptile projects its head in the direction of the unfortunate saurian, at which it stares intently for a few minutes, advancing at the same time—almost imperceptibly—and sometimes imparting to its head and neck the swaying motion above referred to. It next puts out its long, brown, yellow-margined tongue once or twice. Just when about to seize the lizard it pauses and puts its tongue out, points together, stiffly standing upwards, sometimes at nearly right angles to the snout. After resting a few seconds, often half a minute in this attitude, it darts forward and catches the lizard usually by the middle of the body and draws back again. Its actions up to this point are so deliberate that the observer is always surprised at the sudden movement, and we have never been able to follow it well. One second the snake is simply watching the lizard, and the next he has it in his mouth; how it got there, one can hardly tell, so rapidly is it done. The lizard is now suspended in mid air. The snake holds its victim in this position for some time, and then slowly working its jaws towards the head swallows it. These snakes are frequently 4½ feet in length, and, except when distended with eggs or after having devoured an unusually large morsel, are rarely thicker than an ordinary lead-pencil. They seldom attempt to bite, and never inflict a wound. They are called by the Creoles "Liguis," a corruption of "Rigoise" or "horse-whip." They are exceedingly difficult to observe when wild and often disappear in the most mysterious and uncanny manner when an attempt is made to catch them, so stealthily rapid are they in their movements.

DIPSAS CENCHOA.

This is another very peculiar and at the same time extremely beautiful serpent. It is often 3½ feet in length and even longer. Its triangular-shaped body is marked with a series of saddle-like dark spots on a light-coloured ground. Its head is as blunt and round as the Horsewhip's is acuminate. Its eyes are very prominent. The Dipsas is even thinner than the Horsewhip, and on account of its attenuated appearance and its markings, which somewhat resemble those of *Lachesis muta*, is known by the Creole labourers as "Mapepire corde violon," or "Fiddlestring Mapepire." It is very inoffensive, and lives almost entirely upon the tiny *Gonatodes vittatus*, which frequents old walls, trunks of large trees with a rough bark, and tree-parasites and orchids. The growers of the latter plants frequently find a Dipsas amongst their treasures. In captivity it is of a most retiring disposition, during the daytime coiling its great length in a little heap in one corner of its cage. At night it moves about in a tolerably lively and a very graceful manner. It is most curious to watch these snakes passing from branch to branch, the distances which they manage to bridge over without any support, except that given by a small portion of their bodies and their long tails, being almost incredible.

Leptodira annulata.

This pretty snake, which never exceeds, so far as we have had opportunities of judging, 30 inches, has many of the habits of the last-named species, but is more active in its movements, is not triangular in shape, being more rounded, and has a longer head. It has a chain of dark brown spots down the back and its ground-colour is generally light brown. We have only had two specimens, one of which was caught in the rotten bough of a tree on a river-bank. The greater part of the bough was occupied by an ants' nest. *Leptodira annulata* feeds well on frogs and lizards, and when very much irritated attempts to bite, and when it has hold of a finger tries to work into the skin the large back teeth, one on either side of the upper jaw. One we kept for some months laid several eggs, which she afterwards devoured.

Scytale coronatum.

This snake when young is a bright coral colour, with a dark brown, sometimes nearly black, head, sometimes with a white collar. As the snake grows older it becomes brown, with a whitish-grey under surface. It is remarkable for its extreme shortsightedness, not being able to see its prey even when close to it. They feed largely on mice, and when one watches the clumsy efforts of these snakes to capture their nimble prey it is a matter for surprise how they manage to exist at all. The snake, when a mouse is in its cage, lunges out wherever he imagines the mouse to be. The nimble mouse avoids him with the greatest ease. It is only after hours of persevering effort the snake manages to get the mouse, probably when he is tired out with jumping about. There would be absolutely no chance for the snake at all if he had to catch his food in the open. In their wild state, therefore, they follow the mice and Ameiva lizards on which they feed into their holes and devour them in the furthest recess of their burrows. When the *Scytale* catches a mouse in the open or in a trap or bottle he constricts it, throwing as many as three coils round it and pulling hard with his jaws, just as the Boas do. If *Scytale* finds a nest of young mice he does not take the trouble to constrict them, but bolts them as *Coluber corais* does. *Scytale* has a very smooth coat, and there is a peculiar shimmer about it which gives it a slimy-looking appearance. They are fond of making their homes underneath houses (West-Indian houses are, with few exceptions, raised from a few inches to several feet above the ground) and are useful snakes because of their mice-eating propensities. One in our possession laid nine eggs, which stuck together after being deposited. The following incident occurred in our snake-boxes :—

A pair of *S. coronatum* occupied a box together with a Grenada Tree-Boa (*Corallus cookii*) which was about the same size. A mouse was introduced and one of the *Scytales* immediately made several frantic efforts to seize it. The *Corallus* on hearing the disturbance woke up from his sleep on a branch above and partly uncoiled, bringing his head near the level of the floor and retaining his hold on the branch. As the mouse passed he deftly caught and constricted it. *Scytale*, finding that the mouse had ceased to jump about, happening to come near the Tree-Boa found that he had killed the coveted morsel, and just as its rightful captor was preparing to swallow it (having relaxed his coils) it seized the mouse by the head. Boa finding the mouse being pulled away from him tighened his coils again and presently seized the mouse by the hind quarters and tried to swallow it in that way, whilst *Scytale* tried at the head, which he succeeded in getting into his throat, but was not able to proceed further because of the Boa's coil. The Boa gave up trying to swallow and simply climbed up to his former lofty perch, still holding the mouse with the *Scytale* dragging at its head. The Boa then formed his body into a loop and threw a coil round the free ends of it. In the loop he held the mouse firmly and then settled down quietly until the *Scytale* had tired of his futile efforts. At length the *Scytale*, after a quarter of an hour's fruitless endeavour, released the mouse's head, which was promptly seized by the Boa, who protected the rest of the body with coils. Just as the Boa had swallowed his well-earned meal and the tail was disappearing down his throat, the *Scytale*, who had been searching for the body, discovered that the *Corallus* had outwitted him. He then seized the victor by the throat and threw four coils round him. As the Boa was the most valuable snake, being our only one and having been obtained from Grenada only after considerable trouble, and fearing it might be injured, we put an end to the duel by removing the *Scytale* to another cage.

ELAPS RIISEI.

This snake varies considerably from *E. lemniscatus* in coloration and distribution of the annuli, and in size being smaller. Its habits are also at variance with those of *lemniscatus*. *Elaps riisei*, though lively at night, is not averse to feeding in the day. It is passionately fond of water, and one which we kept for some months used to bathe regularly every morning. If the bath was not changed at least twice a week the reptile neglected to take its diurnal "tub." Being much smaller than the *lemniscatus* to be referred to subsequently, it was with difficulty that snakes small enough could be obtained for it, and resort had to be made to the tiny ground-snake, *Geophis lineatus*, the largest specimens of which rarely exceed 12 inches in length. These snakes it would eat at any time during day or night, but it was noticeable that they did not succumb to its venom before they were swallowed. On March 17th, 1894, a *G. lineatus* 4 inches long was placed in the box. It was seized at 9.14 P.M., precisely in the manner of *lemnis-*

catus, and was swallowed by 9.24½ P.M. At 9.27 another one 9 inches long was introduced, and then directly it was caught just above the vent. At 9.59 the Coral got its victim's muzzle in its mouth, and swallowed it by 10.5½. Neither of these snakes, nor many more besides which we have seen swallowed, were dead when their tails disappeared down the Coral's throat. These little snakes resist the Coral vigorously to the very last, twining their bodies round their devourer's head in almost inextricable knots and doing everything in their power to hinder the gorging process.

ELAPS LEMNISCATUS.

This snake sometimes reaches the length of 4 feet, but specimens of this size are not at all common. Opinions in Trinidad are divided as to their being poisonous, owing probably to the fact that they have been frequently handled without disastrous consequences. There are, however, cases on record of persons having lost their lives through the bites of these reptiles when they have been inadvertently trodden upon. They usually lie dormant during the day under the dead leaves on sugar estates, but they are more frequently found in cocoa plantations. At night they are exceedingly lively and quick in their movements. The species feeds, so far as we can find out, exclusively upon other snakes, all efforts to induce *E. lemniscatus* and *E. riisei* to take frogs and lizards having been failures. *E. lemniscatus* wanders about at night searching in holes and crevices for the small diurnal Ophidia, and catches them when they are asleep. Being possessed of a comparatively solid head and, for a snake, very small mouth, in which are two short fangs (situated further back than those of the vipers), it is very difficult indeed for them to bite anything large. Naturalists, we understand, are divided in their opinions as to the use of the poison in these serpent-devouring Ophidia, and it is asserted that the Indian Ophiophagus does not use his venom to kill his prey. Though this may be the case with other snakes, it is certain that the Trinidad *Elaps lemniscatus* relies upon its poison very considerably in overcoming its victims; otherwise it would not be able to secure its active prey even when surprised asleep. A snake of this species 33 inches long, brought to us in the first week of May 1893, was placed in a small glass-fronted box with a jar of water and a wet pad of blotting-paper—it being an absolute condition for the well-being of these creatures that they should be kept damp. On May 15 we introduced a *Liophis melanotus*. The next day it had disappeared, and there was a slight increase in the Coral's circumference. On the night of May 23rd a *Coluber boddaerti* similarly vanished. Three days later another *L. melanotus* was disposed of. All these snakes manifested the greatest uneasiness and even terror of the Coral, giving it the largest berth possible, although, so long as daylight lasted, the Coral paid no attention to them.

On the night of June 11th we gave a *L. melanotus* (17¼ inches long) to the Coral. The moment it entered the box the Coral raised its head, but immediately resumed its quiescent attitude. Subsequently it suddenly bit the visitor near the tail. The poor little victim was at once released and crawled about as lively as possible, but with the tail raised. Five minutes later it laid its head down—slightly on one side; its body twitched as if in pain, and three minutes later it was dead. The Coral at once seized the dead snake four inches from the head, then worked it through its jaws to within an inch of its head. It then let go, and, seizing it again, worked down the body for about three-quarters of its length. It let go again, and then went up to within an inch of the head, worked up to the muzzle, and got it into its mouth, and proceeded to swallow by sharp sidelong jerks following each other in rapid succession. After it had got the dead snake half down, it began to make the drawing muscular motions which is a characteristic in the feeding of Boa Constrictor and other Ophidia, the jaws doing no work at all. After swallowing the Coral yawned several times. During the first part of the operation the Coral held its victim down by a bight of its body 2½ or 3 inches from where its jaws were working. The swallowed snake was nearly as thick as the Coral, and when the latter was going through the preliminary of passing the former through his jaws, there were to be heard sundry little cracks as if the bones were being broken. The whole operation of killing and gorging lasted an hour. In consequence of a fright the Coral disgorged during the night.

On the night of July 3rd another snake of the same species (15 inches long) was introduced at 7.59 P.M. It crawled about cautiously. At 8.4 the Coral raised its head, and the visitor lay down perfectly quiet. The Coral began to move about, and at 8.11½ caught its prey 2½ inches from the tip of the tail, and, contrary to the first occasion, retained its hold. At 8.15¼ the victim was dying and turned over on its back. At 17 minutes past 8 when examined it was quite dead—5½ minutes from the time of being bitten.

On July 21st at 8.15 P.M. the Coral was lying in a corner of its box, on a lamp-lighted table, perfectly indifferent to its surroundings. A *Liophis melanotus* (17 inches long) was introduced. The Coral roused immediately, and glided about with such rapidity and attacked its victim with such vigour that it was bitten three times, almost before we realized the fact. At the last bite the Coral held the *Liophis* about the middle of the tail. Four minutes afterwards the victim was dead. The quick lateral motion in swallowing was again observed, and the operation in this case lasted ten minutes.

These observations are interesting because they prove that the assertion that snake-poison has very little immediate effect upon the Ophidia, thus being useless in the capture of their prey, is an erroneous one. They are interesting also because they prove that the creatures feed on other snakes besides the Calamaridæ.

On July 29th we shaved the thigh of a large full-grown male rat, and forced the Coral to bite it at 8.3 P.M. The rat appeared to get drowsy almost immediately. It subsequently began to pant violently, but was still drowsy. Then the tail began to twitch, also the muscles in the region of the backbone. At 8.11 convulsions set in. At 8.14 the heart had ceased beating. In biting the Coral held on for about 15 seconds. This snake subsequently died, owing to being accidently exposed by a careless porter to the sun.

LACHESIS MUTA.

This snake is locally called "Mapepire Zanana," because its carinated scales are thought to be somewhat of the colour and the shape of the leaf-like scales on the pineapple fruit. "The average length," says Mr. A. B. Carr, "of those I have met and measured accurately (about fifty) is a little under 7½ feet; the largest of these having been 8 ft. 2 in. and the shortest 6 ft. 2 in. There is an instance on record (by de Verteuil) in the island, I believe, of an 11-footer." The Mapepire, unlike its cousin *Bothrops atrox*, prefers rising ground, and is often found on the crest of small hillocks, apparently because it prefers dry soil. According to Mr. Carr, the Mapepire is frequently found in holes, into which, when chased, the Lappe (*Cœlogenys paca*) and the Armadillo (*Tatusia novemcincta*) run; but rarely, if ever, is he found inhabiting the same hole (as has been for years believed) with either of these animals. Most of the bites from this snake occur at their holes. He rarely strikes without provocation, but once agitated he becomes vicious and may strike many times in succession. Dogs when hunting are bitten, and men occasionally, but seldom fatally. In a paper on Quenck, or Peccary-hunting, read before the Field Naturalists' Club, in No. 11, vol. i., Mr. Carr stated that on one occasion a pair of peccaries took refuge in the rotten trunk of a fallen balata tree. They were killed, and subsequently two more rushed out of the trunk. The dogs went in a third time and dragged out a Mapepire about 7 feet 10 inches long. In the fight which ensued it bit four dogs, and the two last bitten died in a very few minutes, owing to the inability of their masters to capture them for treatment with local bush remedies; the first two bitten recovered. The Mapepire is a sluggish brute. On one occasion one was seen on the top of a small hillock. The man who found it went to tell Mr. Carr. He was busily engaged at the time and could not go then. Subsequently he went home and had his dinner. A heavy shower of rain came on, which delayed him half an hour longer still. When he at last went he found the Mapepire as described still coiled on the ground, the water streaming down from his coils. His servant then went and cut a stick, and the snake, after all this delay of at least 2½ hours, was captured alive. The Mapepire and *Bothrops atrox* suffer from large parasitic worms in their lungs. The young ones of *L. muta* are very rarely seen, while those of *B. atrox* are often found. The few specimens of Mapepire we have seen have not done well in captivity.

BOTHROPS ATROX.

Found only in swampy places. It ascends a short distance little bushes 5 feet or so from the ground. *B. atrox* is very fierce, and sometimes ejects its poison a considerable distance. One which was being teased with a stick ejected its poison in this way. It fell on the face of a woman some twelve feet off. It is rather more active than the *Lachesis muta* and bites more readily. The largest specimens we have seen were about 6 feet long. The *B. atrox* is locally called "Mapepire Balsain," which is said to mean striped. It is called in some localities "Valsain," which no doubt means dancing (from the French), an allusion to the circling motion when in the attitude of defence, which all vipers exhibit.

A Preliminary List of the Ophidia of Trinidad, B. W. I.

NOTE.—The snakes found by us in Trinidad are marked with an asterisk; where we have not seen the snakes ourselves the name of the recorder is given.

The names of authorities given within square brackets after the species are those of the naturalists to whose kindness we are indebted for the determinations of the species.

OPHIDIA.

TYPHLOPIDÆ.

*1. *Typhlops reticulatus*, L.
Recorded from Trinidad by Boettger.

GLAUCONIIDÆ.

2. *Glauconia albifrons*, Wagl.
Recorded from Trinidad by Boulenger and Garman.

BOIDÆ.

*3. *Epicrates cenchris*, L. [Boulenger].

*4. *Epicrates cenchris*, L., var. *fusca*, Gray [Boettger].
New to Trinidad.

5. *Corallus cookii*, Gray, var. *melanea*, Gray.
Recorded from Trinidad by Boulenger.

*6. *Corallus cookii*, Gray, var. *ruschenbergii*, Cope [Boettger].
New to Trinidad.

*7. *Boa constrictor*, L. [Boettger & Boulenger].

8. *Boa diviniloqua*, Laur.
Recorded from Trinidad by Boulenger.

*9. *Eunectes murinus*, L.

Colubridæ.

a. *Colubrinæ.*

*10. *Streptophorus atratus*, Hallow. [Boulenger].
New to Trinidad.

*11. *Geophis lineatus*, Dum. & Bibr. [Boettger].

*12. *Liophis melanotus*, Shaw [Boettger & Boulenger].

*13. *Liophis reginæ*, L. [Boettger & Boulenger].
New to Trinidad.

*14. *Liophis cobella*, L. [Boettger & Boulenger].

*15. *Coluber boddaerti*, Seetz. [Boettger & Boulenger].

*16. *Coluber corais*, Boie [Boettger & Boulenger].

*17. *Spilotes variabilis*, Wied [Boettger & Boulenger].

*18. *Spilotes pœcilostoma*, Wied [Boettger].
New to Trinidad.

*19. *Herpetodryas macrophthalmus*, Jan [Boettger].
New to Trinidad.

*20. *Herpetodryas carinatus*, L. [Boettger & Boulenger].

*21. *Ahætulla liocercus*, Wied [Boettger & Boulenger].
New to Trinidad.

*22. *Petalognathus nebulatus*, L. [Boettger & Boulenger].
New to Trinidad.

b. *Dipsadinæ.*

*23. *Homalocranium melanocephalum*, L. [Boettger].
New to Trinidad.

*24. *Oxybelis acuminatus*, Wied [Boettger].

*25. *Dipsas cenchroa*, L. [Boulenger].

*26. *Leptodira annulata*, L. [Boettger].

*27. *Scytale coronatum*, Schneid. [Boettger & Boulenger].

28. *Oxyrrhopus plumbeus*, Wied.
Recorded from Trinidad by Boulenger.

c. *Elapinæ.*

*29. *Elaps riisei*, Jan [Boettger].

*30. *Elaps lemniscatus*, L. [Boettger].

31. *Elaps corallinus*, L.
Recorded from Trinidad by Günther.

Viperidæ.

*32. *Lachesis muta*, L. [Boettger].
New to Trinidad.

*33. *Bothrops atrox*, L. [Boettger & Boulenger].
New to Trinidad.

4. On the Spiders of the Island of St. Vincent.—Part II.[1] By E. Simon[2].

[Received May 2, 1894.]

Familia Pholcidæ.

Artema atalanta, Walck. Apt. i. 1837, p. 656.

Pholcus convexus, Blackw. Ann. Mag. Nat. Hist. ser. 2, iii. 1858, p. 332 (pars).

? *Pholcus rotundatus*, Karsch, Stettin. entom. Zeitung, 1879, p. 106.

Insula Sancti Vincentii.

Espèce répandue dans l'Amérique du sud et les Antilles.

Smeringopus elongatus, Vinson, Ar. Réun. &c. 1864, p. 135 (*Pholcus*).

Pholcus phalangioides, Dolesch. Act. Soc. Sc. Ind. Neerl. v. 1859, p. 47 (pars).

Pholcus tipuloides, L. Koch, Ar. Austr. 1872, p. 281, t. xxii. f. 5.

Pholcus distinctus, Cambr. J. Linn. Soc., Zool. x. 1876, p. 380, t. xi. ff. 28–30.

Pholcus elongatus, Thorell, St. Rag. Mal. &c. ii. 1878, iii. 1881; v. Hasselt, Tijds. v. Ent. xx. 1877, p. 53.

Pholcus margarita, Workman, Ann. Mag. Nat. Hist. 1878, ii. p. 451, t. xviii. ff. 1, 2.

Pholcus tipuloides, Marx, Pr. Acad. N. S. Phil. 1889, t. iv. f. 5.

Insula Sancti Vincentii.

Espèce répandue dans toutes les régions tropicales du monde.

Physocyclus globosus, Tacz.

Pholcus gibbosus, Keyserl. Verh. z.-b. Ges. Wien, 1877, p. 208.

Physocyclus gibbosus, E. Sim. Hist. Nat. Araig. éd. 2, 1893, p. 470.

Insula Sancti Vincentii.

Espèce répandue dans presque toutes les régions tropicales du monde.

Modisimus glaucus, E. Sim. Ann. Soc. ent. Fr. 1893, p. 322.

Insula Sancti Vincentii.

Espèce propre aux Antilles : je la possède de S. Domingue, de S. Thomas et de la Jamaïque.

Psilochorus nigrifrons, sp. nov.

♂. *Long. 4 mm.—Cephalothorax paulo latior quam longus, utrinque ample rotundus, parte thoracica profunde longitudinaliter sulcata, lurido-testaceus, regione frontali clypeoque valde infuscatis et macula thoracica nigricante magna, latiore quam longa, antice recte truncata, utrinque dentata et postice breviter*

[1] For Part I., see P. Z. S. 1891, p. 549.

[2] Communicated by Dr. D. Sharp, F.R.S., F.Z.S., on behalf of the Committee for Investigating the Fauna and Flora of the West-Indian Islands.

acuta, notatus. Oculi ordinarii, quatuor antici (apicibus) lineam rectam formantes, medii minutissimi lateralibus plus sextuplo minores, inter se contigui sed a lateralibus distincte separati. Abdomen anguste elongatum, supra omnino luteo-testaceum, subtus dilutius, macula epigasteris subquadrata, linea ventrali angusta et abbreviata, et postice utrinque macula

Fig. 1.

Psilochorus nigrifrons.
Præmaxillaris maris.

confusa, nigricantibus, ornatum. Partes oris, chelæ et pedes-maxillares nigricantes. Sternum luridum. Pedes longissimi et gracillimi, obscure fulvi, femoribus tibiisque ad apicem sat late albido-annulatis. Chelæ, antice ad apicem, prope radicem unguis, dente parvo obliquo granuloque armatæ. Pedum-maxillarium femur claviforme ad basin angustum et apophysi inferiore parva et obtusa munitum, ad apicem subtus valde inflatum et subglobosum; patella brevis; tibia sat longa, convexa; apophysis tarsalis longa, leviter sinuosa, antice, prope medium, minute dentata, apice longe attenuata et laciniosa. (Femina adulta ignota.)

Insula Sancti Vincentii.

Dans les forêts sur les troncs d'arbres.

Psilochorus lemniscatus, sp. nov.

♂. *Long. 5 mm.—Cephalothorax paulo latior quam longus, utrinque ample rotundus, parte thoracica profunde longitudinaliter sulcata, fulvus, regione oculari utrinque nigra, clypeo infuscato, parte thoracica vitta media lata, antice bifida, subparallela sed leviter dentata, vittaque marginali lata et leviter sinuosa, fuscis, ornatus. Oculi ordinarii, quatuor antici (apicibus) lineam rectam designantes, inter se subcontigui et valde inæquales, medii lateralibus saltem sextuplo minores. Abdomen longum, teretiusculum, supra testaceo-viride, maculis nigro-virescentibus biseriatis 5–5 (maculis 2^i paris reliquis majoribus) et utrinque maculis plurimis ornatum, subtus vitta nigricanti late leviter attenuata et truncata et apicem haud attingente, notatum. Chelæ, partes oris sternumque fusca, hoc late testaceo-marginatum. Pedes longissimi et gracillimi, fusci; femoribus tibiisque apice sat anguste albido-annulatis. Chelæ antice, prope medium, dente crasso attenuato sed obtuso instructæ. Pedes-maxillares fere præcedentis, sed fulvo-rufescentes.*

♀. *Mari subsimilis. Pedes-maxillares fusci. Chelæ muticæ. Plaga genitali simplex, fusco-nitida, semicircularis, a petiolo sat late remota sed dimidium ventris haud attingens.*

Insula Sancti Vincentii.

Familia THERIDIIDÆ.

ARGYRODES CANCELLATUS, Hentz.

Theridion cancellatum, Hentz, Bost. J. N. H. vi. 1850, p. 278, t. ix. f. 8.

Lasæola cancellata, Emerton, Tr. Conn. Acad. 1882.

Argyrodes cancellatus, Keyserl. Spinn. Amer., Therid. ii. 1886, p. 243, t. xx. f. 297.

Insula Sancti Vincentii.

Répandu dans tout le sud des États-Unis, les Antilles, et le Vénézuela.

ARIAMNES PARADOXUS, Taczanowski.

Argyrodes paradoxus, Tacz. Hor. Soc. ent. Ross. ix. 1872, p. 58, t. v. f. 13.

Ariamnes paradoxus, Keyserl. Spinn. Amer., Therid. i. 1884, p. 168, t. viii. f. 103.

Insula Sancti Vincentii.

Répandu dans une grande partie de l'Amérique tropicale.

ARIAMNES LONGISSIMUS, Keyserl.

Ariamnes longissimus, Keyserl. Spinn. Amer., Bras. Spinn. iii. p. 202, t. vii. f. 145.

Insula Sancti Vincentii.

Existe aussi au Vénézuela et au Brésil.

SPINTHARUS FLAVIDUS, Hentz.

S. flavidus, Hentz, Bost. J. N. H. vi. 1850, p. 284, t. x. f. 8; Keyserl. Spinn. Amer., Therid. i. 1884, p. 176, t. viii. f. 107.

Insula Sancti Vincentii.

Très répandu dans le sud des États-Unis.

THERIDION STUDIOSUM, Hentz.

Theridion studiosum, Hentz, Bost. J. N. H. vi. 1850, p. 275, t. ix. f. 5; Emerton, Trans. Conn. Acad. vi. 1882, p. 14; Keyserl. Spinn. Amer., Therid. i. 1884, p. 20, t. i. f. 7.

Insula Sancti Vincentii.

Répandu dans toute l'Amérique depuis les États-Unis jusqu'à la République Argentine.

THERIDION FRONDEUM, Hentz.

Theridion frondeum, Hentz, loc. cit. p. 274, t. ix. f. 7; Emerton, loc. cit. p. 15, t. iii. f. 1; Keyserl. loc. cit. p. 69, t. iii. f. 42.

Insula Sancti Vincentii.

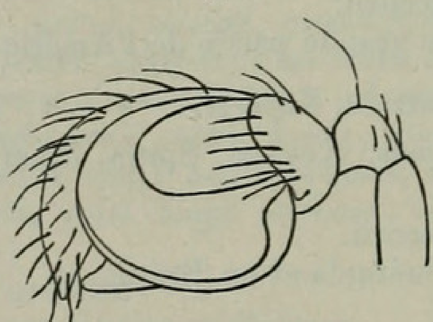
Répandu dans une grande partie de l'Amérique.

THERIDION ANTILLANUM, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax albido-testaceus, lævis, parte thoracica linea media longitudinali abbreviata nigra notata. Oculi singulariter et tenuiter nigro-cincti, parvi, inter se æquales et late distantes, medii postici inter se quam a lateralibus remotiores (spatio interoculari oculo plus quadruplo latiore). Area oculorum mediorum paulo latior quam longa et antice quam postice paulo angustior. Abdomen globosum, parcissime et longe pilosum, pallide luteum, supra punctis nigris minutissimis, quadratum magnum designantibus, ornatum. Chelæ, partes oris pedesque albido-testacei subpellucentes; patellis, tibiis metatarsisque* (3^{i} *paris exceptis*) *apice minutissime nigro-notatis. Pedes longi inter se valde inæquales (antici posticis multo longiores) sat longe setosi. Vulva simplex, plagula parva subrotunda notata.*

♂. *Long.* 3·6 *mm.—Feminæ subsimilis, sed abdomine multo minore. Pedes-maxillares albidi, tarso bulboque luteis; patella brevi, nodiformi, convexa, seta longa supra munita; tibia breviore sed latiore cupuliformi; tarso maximo, compresso, apice sat abrupte subacuto et inflexo; bulbo maximo, valde compresso, stylo longo, circumdato.*

Fig. 2.



Theridion antillanum.
Bulba genitalis maris.

Insula Sancti Vincentii.

T. sexmaculato, Keyserl., verisimiliter affine sed certe distinctum.

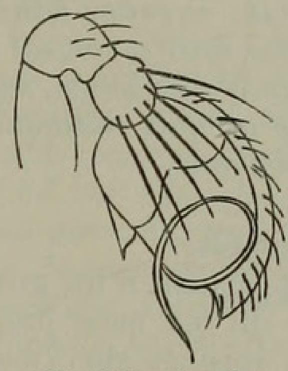
THERIDION FUESSLYI, sp. nov.

♀. *Long.* 3 *mm.—Cephalothorax lævis et nitidus, læte fulvo-rufescens, utrinque sat anguste nigro-marginatus, linea media nigricante, sæpe obsoleta, abbreviata (foveam thoracicam postice haud superante), interdum in parte cephalica ampliata et ramosa, notatus. Oculi postici in lineam levissime procurvam, magni, medii lateralibus paulo majores et a lateralibus quam inter se paulo remotiores, spatio interoculari oculo paulo angustiore. Oculi antici in lineam subrectam, vix procurvam, medii lateralibus paulo majores et inter se remotiores. Area mediorum circiter æque longa ac lata et antice quam postice paulo latior. Sternum fulvo-rufescens concolor vel rarius anguste nigro-marginatum, læve. Partes oris fuscæ vel nigræ. Chelæ fulvæ nigricanti-variatæ. Abdomen globosum, obscure cinereo-testaceum, nigricanti-variatum et subsegmentatum, parce albido-punc-*

tatum, vitta media integra, leviter dentata, crebrius albido-punctata ornatum, subtus obscure fulvum et vitta transversa nigra validissime arcuata, fere semicirculari, leviter sinuosa et in medio, prope mamillas, sensim angustiore, notatum. Pedes luridi concolores, interdum femoribus tibiisque ad apicem tenuissime nigro-cinctis, interdum nigricanti-variati et subannulati, sat longe pilosi, setis erectis patellarum et tibiarum longis, tibiis metatarsisque anticis circiter æquilongis. Area vulvæ fusco-rufula, convexa, fovea superficiali ovato-transversa impressa.

♂. *Long. 3 mm.—A femina differt abdomine minore et præsertim multo angustiore, pedibus, præsertim anticis, multo longioribus. Pedes-maxillares luridi; femore gracili; patella brevi, convexa, valde arcuata; tibia brevi sed subtus ampliata, rotunda atque ad*

Fig. 3.



Theridion fuesslyi.
Bulba genitalis maris.

marginem longe ciliata; tarso ovato, apice breviter uncato; bulbo ad apicem stylo longo, circulum formante, munito.

Insula Sancti Vincentii.

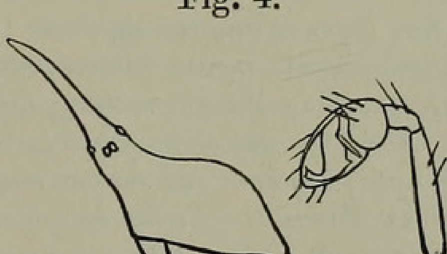
Th. differenti, Emert., et *T. antonii*, Keyserl., affine.

Theridion stylifrons, sp. nov.

♂. *Long.* 1·8 *mm.—Cephalothorax lævis, fulvo-rufescens, fronte valde acclivi turbinata, ad apicem (inter oculos medios) processu longissimo (cephalothorace toto vix breviore) sat gracili, recto et apice acuminato insigniter instructa. Oculi postici inter se*

Fig. 4.

a



b

Theridion stylifrons.
a. *Cephalothorax maris.* b. *Præmaxillaris maris.*

æqui, in lineam valde recurvam, medii a lateralibus quam inter se plus duplo remotiores. Oculi antici inter se parum inæquales, *in lineam valde procurvam. Clypeus altissimus et obliquus. Sternum late cordiforme, convexum et sublæve sed parcissime rugosum, fulvo-rufulum. Abdomen globosum, album, subtus plagula epigasteris fulvo-nitida munitum. Pedes sat longi et graciles, olivacei, femoribus dilutioribus. Pedes-maxillares fulvi; femore gracili, recto; patella brevi, leviter convexa; tibia brevi sed subtus ampliata et apice truncata; tarso bulboque magnis et ovatis.*

♀. *Long.* 2 *mm.—Cephalothorax pallide luteo-rufescens, versus marginem leviter infuscatus. Oculi postici in lineam plane rectam, inter se fere æquidistantes (spatiis interocularibus oculis angustioribus), medii leviter elongati et obtusissime triquetri. Oculi antici in lineam vix procurvam, posticis paulo minores et inter se æquales, medii a sese quam a lateralibus remotiores. Clypeus area oculorum paulo latior, sed chelis brevior. Sternum pedesque pallide lurida, sternum haud longius quam latum, leviter convexum, postice, inter coxas, sat late obtusum. Abdomen magnum, globosum, cinereo-testaceum, supra vitta media abbreviata et utrinque vittis obliquis radiantibus paulo obscurioribus sed parum distinctis ornatum.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

Nota.—Cette espèce appartient à un groupe remarquable assez répandu dans l'Amérique du sud mais jusqu'ici peu connu. Les femelles sont normales et voisines du *Theridion pallens*, Blackw., d'Europe; tandis que les mâles présentent des déformations frontales analogues à celles qui s'observent dans les genres *Cornicularia* et *Lophocarenum* du groupe des *Erigonineæ*.

Gen. Sphyrotinus, nov.

A Theridio *imprimis differt oculis anticis inter se valde inæqualibus, mediis lateralibus plus duplo minoribus et area oculorum mediorum antice quam postice multo angustiore.*

Sphyrotinus luculentus, sp. nov.

♀. *Long.* 1·2 *mm.—Cephalothorax fusco-olivaceus, tenuiter nigromarginatus et leviter nigro-reticulatus, versus marginem subtilissime coriaceus. Oculi postici in lineam leviter recurvam, magni, inter se fere æque et anguste separati (spatiis interocularibus oculis angustioribus), medii lateralibus paulo majores et late ovati. Oculi antici in lineam rectam, medii lateralibus plus duplo minores. Abdomen globosum, cinereo-lividum, vitta media fusca sæpe interrupta, angusta sed postice sensim ampliata supra notatum. Sternum fuscum. Pedes longi et graciles, pallide luridi, femore tibiaque* 4^{i} *paris apice minute fusco-notatis; tibiis subtus setis longis paucis munitis.*

♂. *Long.* 1 *mm.—Cephalothorax subtiliter coriaceus, obscure rufescens, ad marginem et supra fusco-lineatus. Oculi feminæ. Abdomen minus, ovatum, antice leviter emarginatum, albo-*

testaceum, postice vitta pennata nigra notatum, subtus obscure fulvum. Sternum fusco-rufescens, subtiliter nigro-cinctum. Pedes valde inæquales, antici reliquis multo longiores, femoribus incrassatis, fusiformibus aurantiaco-tinctis, reliqui pedes graciles pallide luridi; femoribus tibiisque 4^i paris apice leviter infuscatis. Pedes-maxillares flavidi, parvi et debiles; patella globosa; tibia cylindracea; tarso bulboque sat anguste ovatis.

Insula Sancti Vincentii.

J'en ai trouvé une seconde espèce voisine au Vénézuela: *S. bimucronatus*, E. Sim.

Gen. Janulus, Thorell.

Janulus, Thorell, St. Rag. Mal. &c. iii. 1881, p. 163.

Theridium, Keyserling, Spinn. Amer., Bras. Spinn. iii. p. 193 (ad part.: *T. bicorne*, Keyserl.).

Cephalothorax fere Episini *sed paulo latior, striis cephalicis foveaque thoracica parva transversa et utrinque leviter ampliata, impressus, fronte angusta. Oculi postici magni inter se subæquales, in lineam valde recurvam, medii inter se anguste distantes a lateralibus haud vel vix separati. Oculi medii antici valde prominuli, lateralibus paulo majores. Area oculorum mediorum subparallela, paulo longior quam lata, pone oculos anticos tuberculis binis geminatis insigniter munita. Oculi laterales utrinque contigui. Chelæ, partes oris pedesque* Episini. *Abdomen haud longius quam latum, trapezoidale, postice ampliatum truncatum et plerumque utrinque angulosum.*

Ce genre qui a pour type une espèce de Malaisie *J. bicornis*, Thorell, a des répresentants dans toutes les régions tropicales du monde; une espèce du Brésil a été décrite par Keyserling sous le nom de *Theridium bicorne* (*J. bicorniger*, E. Sim.).

Janulus erythrophthalmus, sp. nov.

♂. *Long. 2 mm.—Cephalothorax pallide luridus, linea marginali exillima lineaque submarginali latiore sinuosa, nigricantibus notatus, tuberculis frontalibus contiguis et obtusis nigris, oculis, saltem posticis, singulariter rufulo-cinctis. Oculi postici in lineam valde recurvam, subæquales, medii inter se distantes (spatio interoculari oculum circiter æquante) sed a lateralibus haud separati. Abdomen circiter æque longum ac latum, antice rotundum, postice ampliatum, truncatum, cum angulis prominulis atque in medio, supra mamillas, plus minus productum, supra pallide luridum, grosse et inordinate albo-guttulatum, utrinque et postice linea nigra sinuosa marginatum, postice in declivitate fuscum. Sternum pedesque pallide flavida. Pedes longi, antici leviter rufulo-tincti, tibiis ad apicem minute fusco-notatis, femoribus tibiisque 4^i paris sat late nigricanti-annulatis et subvittatis. Pedes-maxillares luridi, femore fusco-lineato, tarso rufulo, patella tibiaque gracilibus et circiter æquilongis, tarso sat parvo et ovato.*

♀. *Long.* 2·5 *mm.—Mari subsimilis, sed cephalothorace vittis marginalibus latioribus, interdum omnino fusco-reticulato, abdominis pictura dorsali valde variabili, plerumque fulva nigricante reticulata et postice, in declivitate, late nigricanti-vittata, sterno fusco, pedibus luridis, femoribus tibiisque* 4ⁱ *paris apice nigricanti-annulatis.*

Insula Sancti Vincentii.

Espèce très répandue au Vénézuela.

THERIDULA OPULENTA, Walck.

Theridion opulentum, Walck. Apt. ii. 1841, p. 322.

Theridion sphærula, Hentz, Bost. J. N. Hist. vi. 1850, p. 279, t. ix. f. 22.

Theridion gonygaster, E. Sim. Aran. Nouv. 2ᵉ mém., Liège, 1873; id. Ar. Fr. v. 1881, p. 109.

Theridula sphærula, Emerton, Keyserling, &c.

Chrysso niveopicta, Butler, P. Z. S. 1882, p. 763.

Insula Sancti Vincentii.

Espèce extrêmement disséminée, car elle existe dans la région Méditerranéenne (*T. gonygaster*, E. Sim.), dans l'Afrique occidentale et australe, à Madagascar (*Chrysso niveopicta*, Butler), à Ceylan, et dans l'Amérique du nord, d'où elle a été décrite pour la première fois par Walckenaer sous le nom de *Theridion opulentum*.

5. Description of a new Species of Slug of the Genus *Janella*. By WALTER E. COLLINGE, Demonstrator of Zoology and Comparative Anatomy, Mason College, Birmingham[1].

[Received May 8, 1894.]

I have recently received from Mr. H. Suter, of Christchurch, New Zealand, a series of Slugs belonging to the genus *Athoracophorus*, Gould, better known to European malacologists under the generic name of *Janella*. Although this latter name is preoccupied by a synonym, I am decidedly in favour of its retention, for reasons set forth by Professor Cockerell[2].

Of the above specimens, six are *J. bitentaculata*, Q. & G., four *J. papillata*, Hutton, and two I am here describing as belonging to a new species, which I shall term *J. maculata*.

To what extent *J. bitentaculata* varies I am not aware; certainly no two of the above six specimens are alike. The two examples which I am naming *J. maculata* Mr. Suter included with *J. bitentaculata*; but he has evidently not examined the series, or I feel sure he would have noticed the very distinct form and colour of these particular two.

[1] Communicated by E. R. SYKES, B.A., F.Z.S.
[2] 'The Conchologist,' 1893, vol. ii. p. 215.

JANELLA MACULATA, sp. nov.

Animal much flatter than *J. bitentaculata*. Dorso-median groove distinct and continuous to the tip of the tail. Ground-colour dirty yellow, with numerous irregular black spots and dashes; a large, black, oval-shaped mark immediately behind the pulmonary orifice. Head slightly lighter than the rest of the body. Foot dirty yellow, marginal portions distinct from median plane. Pulmonary orifice small and inconspicuous.

Length in alcohol 33 millim.

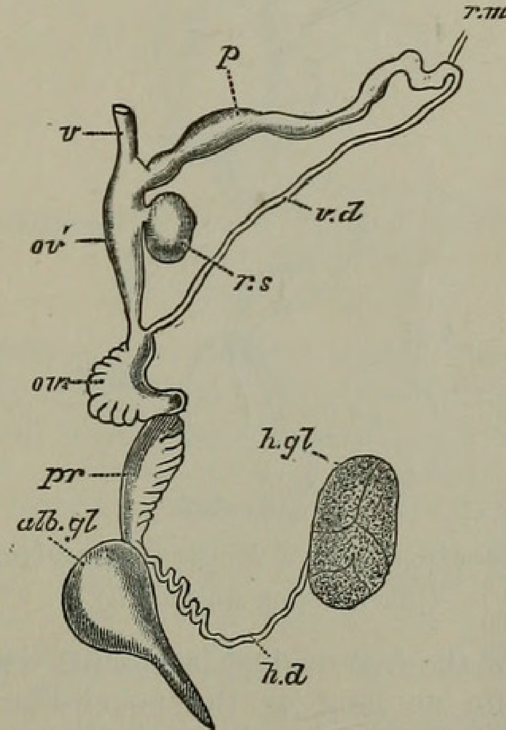
Habitat. Forty Mile Bush, North Island, New Zealand (*H. Suter*).

The flat back of this species reminds one of *Veronicella*, whilst the colouring is similar to dark-coloured examples of *Geomalacus maculosus*, Allm., which I have occasionally seen.

Anatomy.

Generative System.—There is a single vestibule, from which the penis passes off as a lateral organ. In its natural position it is twisted upon itself, as shown in fig. 3. Its first portion is slightly

Fig. 1.



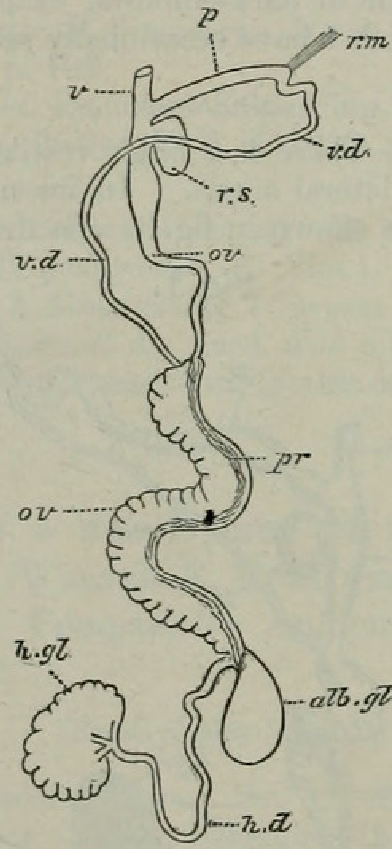
Generative system of *Janella maculata*.

(Lettering of this and the four following figures.)

alb.gl, albumen gland.	*ov*, oviduct.
b.c, buccal cavity.	*pr*, prostate.
c, crop.	*p*, penis.
h.d, hermaphrodite duct.	*r*, rectum.
h.gl, hermaphrodite gland.	*r.m*, retractor muscle.
i, intestine.	*r.s*, receptaculum seminis.
l, liver.	*st*, stomach.
œ, œsophagus.	*v*, vestibule.
ov', free oviduct.	*v.d*, vas deferens.

constricted, and again a little higher up; its upper portion is convoluted and opens into a long thin tube—the vas deferens. In *J. bitentaculata* the penis is much shorter, and usually exhibits a sharp distinction between that organ and the vas deferens (*cf.* Keferstein [1] and Macdonald [2]). Attached to the distal end of the penis is a small short retractor muscle; its point of attachment to this organ affords a ready means of distinguishing between penis and vas deferens. The continuation of the vestibule forms a simple pouch-like cavity—the free portion of the oviduct. From reference to figs. 1 & 3, it will be seen that in *J. maculata* the long

Fig. 2.



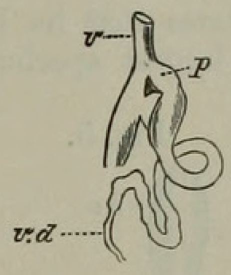
Generative system of *Janella bitentaculata*.
(For lettering see p. 527.)

tube-like portion of the free oviduct is absent, whilst in *J. bitentaculata* it is quite as long as the pouch-like portion. The receptaculum seminis is a large oval or circular sac, opening into the lower portion of the free oviduct, just above the opening of the penis into the vestibule. The combined oviduct and prostate form a short convoluted tube, not more than two-thirds the length of that organ in *J. bitentaculata.* Covered partly by the large hermaphrodite gland and its duct is a very peculiarly shaped albumen-gland, consisting of a large oval-shaped mass with a thin flattened upper portion. The hermaphrodite duct is large and oval in form,

[1] Zeit. f. wiss. Zool. 1865, Bd. xv. t. xxxiv. fig. 3.
[2] Ann. & Mag. N. H. 1856, vol. xviii. (ser. 2) pl. iii. fig. 6.

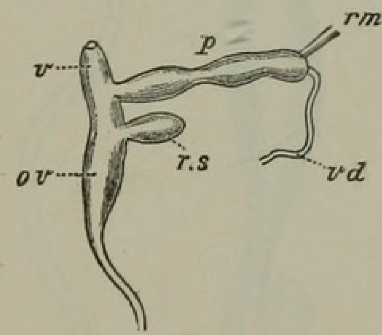
and consists of a number of loosely-connected lobes. This same organ in *J. bitentaculata* is very definite and compact in form, and may readily be divided into two villiform portions (fig. 2, *h.gl*). A long convoluted duct connects the gland with the common duct.

Fig. 3.



Portion of the generative organs of *Janella maculata* in natural position. (For lettering see p. 527.)

Fig. 4.



Showing the distinctness between the penis and vas deferens in an example of *Janella bitentaculata*.
(For lettering see p. 527.)

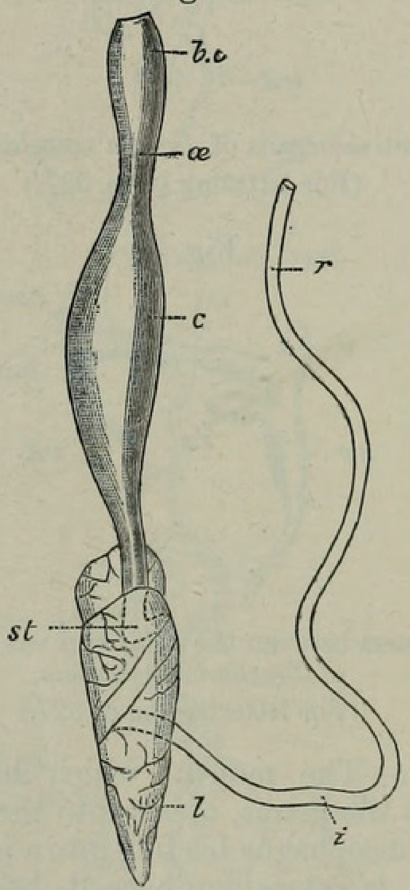
Digestive System.—The mouth, which has the usual ventral position common to the genus, opens into the buccal cavity, which passes into a short œsophagus leading into a wide crop. In neither this species nor *J. bitentaculata* have I been able to trace any diverticulum of the crop as figured by Keferstein [1]. The intestine makes a double fold in the lobes of the liver, which is proportionately larger and more loosely folded than in *J. bitentaculata*. Embedded in the lobes of the liver is the small ovoid stomach. The intestine continues as a long convoluted tube terminating at the anus.

The two specimens of *J. maculata* measured 33 and 34 millim. in length, and the specimen of *J. bitentaculata* which was dissected 48 millim. Professor Cockerell [2], in describing the characteristics of *Neojanella dubia*, states that it was 53 millim. long (in alcohol), while the example of *J. bitentaculata* he examined was only 16 millim., and he further mentions that Gray's type in the British Museum collection is only 19 millim. long. Of course, if these sizes were characteristic of the species named, they would lend

[1] *Op. cit.* fig. 3.
[2] *Op. cit.* p. 226.

great weight to the separation of *N. dubia* from *J. bitentaculata*, the specific distinctness of which yet remains to be proved[1]. It will be as well, perhaps, to here state the sizes of the specimens I have received from Mr. Suter, as indicating possibly the average length which *J. bitentaculata* attains: these sizes are 32, 32, 40, 43, 45, and 48 millim. In a recent communication received from Mr. Charles Hedley, he states that he has seen *J. papillata* 53 millim. in length. My largest specimen, in alcohol, measures 32 millim.

Fig. 5.



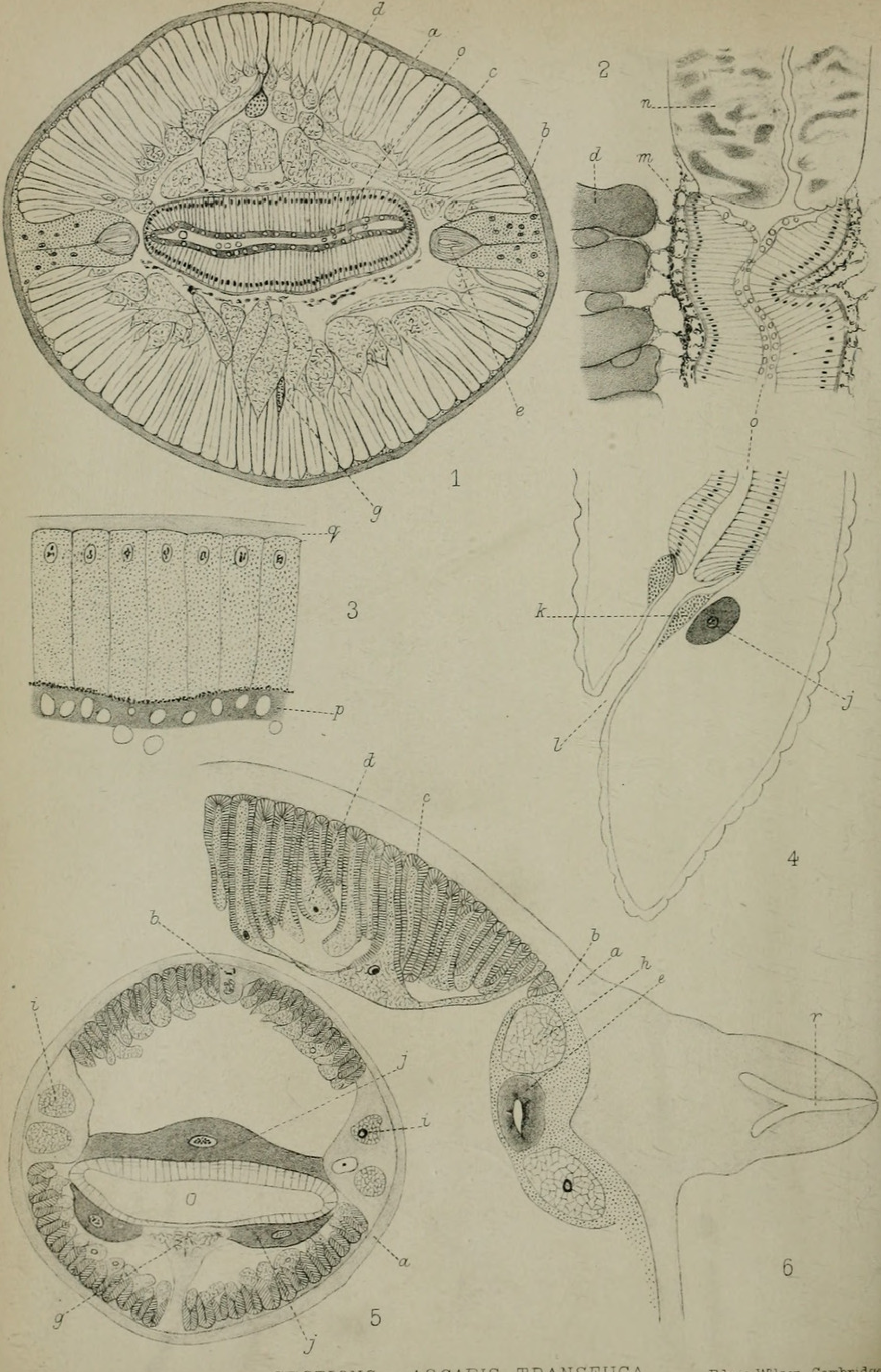
Digestive system of *Janella maculata*.
(For lettering see p. 527.)

The chief points of difference between *J. maculata* and *J. bitentaculata* may be summarized as follows:—

The form and length of the free oviduct and penis, the shortness of the common duct, the form and divisions of the hermaphrodite gland, the distinct form of the albumen-gland, and the minor differences in the liver, colour of the animal, and general flattened form of the whole of the body.

In concluding this description I would remark that the whole family *Janellidæ* requires revision. It is very desirable that we should have a series of coloured drawings taken from actually living specimens of each species and variety, with careful drawings of their anatomy.

[1] Ann. & Mag. N. H. 1892, vol. ix. (ser. 6) pp. 169–171; Trans. New Zealand Inst. 1892, pp. 156–162; Journal of Malacology, 1894, vol. iii. p. 13.



SECTIONS OF ASCARIS TRANSFUGA

Edwin Wilson, Cambridge.

6. Notes on Nematode Parasites from the Animals in the Zoological Gardens, London. By Arthur E. Shipley, M.A., Fellow and Tutor of Christ's College, Cambridge.

[Received June 8, 1894.]

(Plate XXXV.)

The materials for the following notes on internal parasites found during the post-mortem examination of various animals which died in the Gardens of this Society were forwarded to me by my friend Mr. F. E. Beddard during the autumn of 1893.

The collection included examples of five species of Nematodes and of one specimen of *Pentastoma*. I was unable to identify one small species of Nematode, of which there was but one specimen, taken from the walls of the lower intestine of a *Canis virginianus*. The other Nematodes belonged to the following four species:—

1. Dicheilonema bispinosum, Diesing.

There was but one specimen of this species, and this was rather shrivelled and distorted. It was a male, 28 cm. in length, about 3 to 4 mm. in breadth in the middle of the body, and tapering gradually at either end.

The specimen was taken from the tissue surrounding the intestine of a *Boa constrictor*; according to Diesing it is found under the skin as well as in the abdominal cavity of this snake, and also amongst the coats of the intestine in *Ophis saurocephalus*, and in the membranes surrounding the lungs and œsophagus of *Thamnobius pœcilostoma* in Brazil.

This species was first called *Filaria boœ-constrictoris* by Leidy in the 'Proc. of the Acad. of Philadelphia,' vol. v. Diesing in his 'Systema Helminthum,' 1851, refers to it under the name *Filaria bispinosa*, a name accepted by Leidy in the 'Proc. of the Acad. of Philadelphia,' 1856, p. 56; but in his "Revision der Nemotoden," in the 'Sitzungsberichte der k. Akad. in Wien,' Bd. xlii. 1861, Diesing mentions it under the name quoted above, *Dicheilonema bispinosum*.

2. Physaloptera turgida, Rud.

Numerous specimens of this species were taken from the stomach and intestine of Azara's Opossum, *Didelphys azaræ*. The species is described by Dujardin in his 'Histoire Naturelle des Helminthes,' 1845, p. 92, under the name *Spiroptera turgida*, and by Schneider in his 'Monographie der Nematoden,' 1866, p. 62. It has also been found in *Didelphys cancrivora* and *D. nudicaudata* and *virginiana*.

3. Ascaris transfuga. (Plate XXXV.)

Numerous specimens taken from the stomach and small intestine of *Ursus arctos*, var. *piscator*. This seems to be the commonest nematode parasitic in the intestine of Bears. Dujardin ('Histoire Naturelle des Helminthes,' 1845, p. 158) describes specimens from the alimentary canal of *Ursus arctos* and *Ursus maritimus*, and Linstow in his 'Compendium der Helminthologie,' 1878, adds *Ursus americanus* and *U. labiatus* to the lists of its hosts. Blanchard gives a short description of this species in the 'Annales des Sciences Naturelles,' sér. 3, vol. ii., and a figure of the anatomy of a male.

4. Ascaris lumbricoides.

A single specimen from the small intestine of *Simia satyrus*.

Note on the Histology of Ascaris transfuga.

The histology of *Ascaris transfuga* has not been described, and although the structure of the animal departs in but few particulars from that which obtains in the unusually monotonous group of Nematodes, I have added a few notes on some of the more interesting features.

The subcuticular layer of Nematodes has recently attracted a good deal of attention; in *Ascaris transfuga* it exhibits the usual structure—that is, it is composed of numerous fine fibrils closely matted together, with occasional nuclei scattered through the mass. The nuclei are small and seem to be degenerating. This subcuticular sheath surrounds the single layer of muscles, and is heaped up along the ventral and dorsal middle lines and around the lateral excretory canals; it is most abundant in the latter position, especially in the region of the middle of the body; here it shows signs of being divided into two halves by a line which runs from the canal towards the cuticle (Plate XXXV. fig. 1), and in longitudinal sections it often splits along this line. In this region this tissue with the lateral canal may reach a quarter the breadth of the body, but anteriorly and posteriorly the bands are much more flattened. The dorsal and ventral accumulations of this tissue are much less bulky, only a narrow membrane, compressed between two contiguous muscles, passes from the subcuticular layer and surrounds the dorsal and ventral nerves (fig. 1).

Jammes[1] is of the opinion that this subcuticular layer forms with the nerves a single tissue, whose basis is the ectodermic neuro-epithelial element. He attributes the loss of the cellular outline of the embryonic ectoderm to the direct influence of the cuticle, which is formed at a very early stage in the life of the individual, and serves to protect the embryo from the action of digestive juices of the host in which it lives. This explanation of the early formation of the cuticle applies, however, only to the

[1] Ann. des Sci. Nat. vol. xiii. 1892, pp. 321–342.

parasitic forms, and does not include the numerous cases of free-living Nematodes, unless we are justified in assuming that the latter are descended from parasitic forms.

Rohde [1] describes the contractile part of the muscle-cells of *Ascaris* as consisting of homogeneous pillars, arranged in two radial rows on the outer side of each fibre; between these pillars is an "Interfibrösmasse," the fibrils composing which are continuous on the one hand with the fibrils of the spongioplasm of the medullary part of the muscle-cell, and on the other with the fibrils which compose so large a part of the subcuticular tissue. In the dorsal and ventral longitudinal ridges the fibrils of the subcuticular layer form a sheath round the nerve-cords. The exact function of this fibrillar tissue which so closely connects different systems of tissues is still obscure, but as Rohde points out, in criticizing the work of Apathy (and the same applies to Jammes), it can hardly be nervous in function.

My sections of *Ascaris transfuga* confirm the work of Rohde. Thus in Nematodes we have a very intimate connection between the subcuticular tissue (ectoderm) and the muscular and nervous systems.

The best account of the nervous system of Nematodes is contained in Hesse's paper "Ueber das Nervensystem von *Ascaris megalocephala*." [2] The lateral nerves which he describes, lying on each side of the lateral line, are in *Ascaris transfuga* very large at the anterior third of the body, and lie surrounded by the heaped up subcuticular tissue which forms the lateral line; behind they diminish in size and are difficult to distinguish from the subcuticular tissue in which they are embedded. At the posterior end nerves again became conspicuous in the same position; these are the bursal nerves connected with the ventral median nerve and they run forward along the lateral line. I believe them to be connected with the anterior lateral nerves by a very fine filament.

The lateral lines are continued beyond the opening of the cloaca and at the extreme posterior end pass into one another. In this region of the lateral lines the cells, which more anteriorly seem to be degenerate and show little or no structure beyond a broken-down nucleus, are more distinct.

The alimentary canal consists of three very clearly marked regions—the muscular œsophagus, the intestine, and the proctodæum; these pass suddenly into one another (figs. 2 and 4). Of these three divisions the intestine is by far the longest; it is lined throughout by the familiar high columnar epithelium, which does not change in character from one end to another. Both inside and out this tube is lined with a well-marked cuticle, which on the inner surface is frequently charged with vacuoles or vesicles, which seem to make their way into the lumen of the tube in which many of them lie freely (figs. 1 and 3, Plate XXXV.). The nuclei are arranged

[1] "Apathy als Reformator der Muskel- und Nervenlehre," Zool. Anz. no. 439, p. 38.

[2] Zeitschr. f. wiss. Zool., Bd. liv.

very regularly towards the external end of the cells, and the body of the cell is crowded with granules, in some cases a thin layer of black granules lies just within the internal ends of the cells (fig. 3). There is no differentiation into parts of this long tube of columnar cells, but the tube is a compressed one, its long axis lying between the two lateral lines; at the sides, as is shown in fig. 1, the lining cells are much flatter, and instead of being columnar become cubical. As seems to me not unfrequent in parasitic Nematodes, the intestine contains no trace of food, only the above-mentioned vesicles, and these sometimes in great numbers.

The body-cavity, which, as Hamann [1] has pointed out, cannot be regarded as homologous with the cœlom of, for instance, a *Lumbricus*, contains a fluid in which numerous small deeply staining granules, probably cells, float. It had coagulated in the anterior end of the body of my specimens in irregular strands and fibrils, which formed a loose network running between the inner ends of the muscles and the outside of the intestine, as shown in fig. 2. At first I was almost inclined to regard this as evidence of the existence of a splanchnic layer of mesoblast, but its true nature soon became apparent.

The proctodæum is very short and lined by a cuticle, continuous on one side with that of the intestine and on the other with the external cuticle. The line of demarcation is very sharply marked (fig. 4). The columnar epithelium ceases suddenly, and just behind this is a recess or groove, partly formed by the increase at this spot of the thickness of the wall of the tube by a muscle which probably acts as a sphincter.

In this region of the body the distribution of the nerves has been admirably described by Hesse for *Ascaris megalocephala*, and although the preservation of my material did not permit me to follow out all finer details of this system, I have no reason to doubt the correctness of his observations.

Immediately behind, or at about the same level as the sphincter muscle, lie three problematical bodies, which are very conspicuous in both longitudinal and transverse sections, yet which have as a rule escaped the notice of workers at this group. Hesse mentions these structures and calls them "Gewebepolstern," which does not help us much; he suggests they may have an excretory function. It is of course not impossible that these bodies may serve as a place where the waste nitrogenous material is stored up within the body of the animal, such as is found in some Ascidians; but there is no evidence of this, and the canals in the lateral line, which are usually regarded as excretory, have a quite adequate opening to the exterior.

At first sight these "Gewebepolstern" might easily be taken for three gigantic cells encircling the rectum close behind the level where the columnar cells of the intestine cease and the rectum

[1] "Zur Entstehung des Exkretionsorganes der Seitenlinien und der Leibeshöhle der Nematoden," Centralbl. für Bakteriologie, Bd xi. 1892.

commences (figs. 4 and 5), two being situated on the ventral surface and one, by far the largest, on the dorsal. In the centre of each is an oval body, which stains more deeply than the substance in which it lies, though that also stains well, and which to this extent, at any rate, resembles a nucleus. On the other hand, its structure is not that of a very typical nucleus; it consists of a thick coat which encloses a number of deeply staining large granules, which have the appearance of concretions. The substance of the matrix in which these oval bodies lie is also differentiated; it consists of a number of apparently homogeneous bodies pressed together, with thin lines or triangular chinks between them, which stain somewhat more deeply than the rest. In spite of the peculiarities of the structure of these "Gewebepolstern," I am inclined to regard them as cells, but I can offer no suggestion as to their function. I could not trace in my sections any connection between them and the lateral lines or with the nerves; they seem to fade away at their ends into the connective tissue which in this region surrounds the rectum.

DESCRIPTION OF PLATE XXXV.

Sections of *Ascaris transfuga*.

Fig. 1. Transverse section of the middle of the body. The body-cavity is almost occluded by the medulary part of the muscle-cells.

2. Longitudinal section through the line of junction of the œsophagus with the intestine. The coagulated fluid of the body-cavity is seen broken up into strands and strings.

3. A transverse section of part of the wall of the intestine.

4. A longitudinal section through the line of junction of the intestine with the rectum and the anus, to show the position of the problematical bodies and of the sphincter muscle.

5. A transverse section through the rectum showing the relations of the problematical bodies.

6. Section of the integument in the anterior region, to show the lateral line and the fin strengthened by the forked plate.

Explanation of lettering in all the figures.

a. Cuticle.
b. Subcuticular layer.
c. Contractile portion of muscle-cells.
d. Body of muscle-cell containing the nucleus.
e. Lateral canal.
f. Dorsal nerve-cord.
g. Ventral nerve-cord.
h. Dorso-lateral nerve-cord in lateral line.
i. Bursal nerves.
j. Problematical organs surrounding rectum.
k. Sphincter muscle surrounding rectum.
l. Anus.
m. Coagulated fluid of body-cavity.
n. Muscular œsophagus.
o. Intestine.
p. Layer full of vesicles at inner end of cells lining intestine.
q. Cuticle covering intestine.
r. Forked plate which strengthens the lateral flaps on anterior end of body.

7. On the Anatomy of *Palamedea cornuta*. By F. E. Beddard, M.A., F.R.S., Prosector to the Society, and P. Chalmers Mitchell, M.A., F.Z.S.

[Received June 18, 1894.]

The Horned Screamer which had been in the Society's Gardens since September 9, 1890, having died upon April 5, 1894, we determined to examine its anatomy with some minuteness, as it is a member of a small group of birds about the position of which systematists differ in opinion. Moreover, although *Chauna* has been dissected more than once, there is no account extant of the anatomy of the soft parts of *Palamedea*.

§ External Characters.

Our specimen was a female. The skin was very emphysematous, as in the case of *Chauna*; but there were patches of skin not blown out with air upon the under surface of the humerus near the shoulder, and the under surface of the greater part of the arm was similarly undistended.

The number of rectrices was 14. The wing was quintocubital and the large oil-gland was natiform, covered with feathers and tufted. This tuft did not completely surround the aperture of the gland, but formed an arch over the dorsal and lateral margins of the aperture. From this a median line of feathers bisected the aperture of the gland. All these feathers were black; two small white feathers form the middle of each half of the lower margin.

§ Viscera of Abdomen.

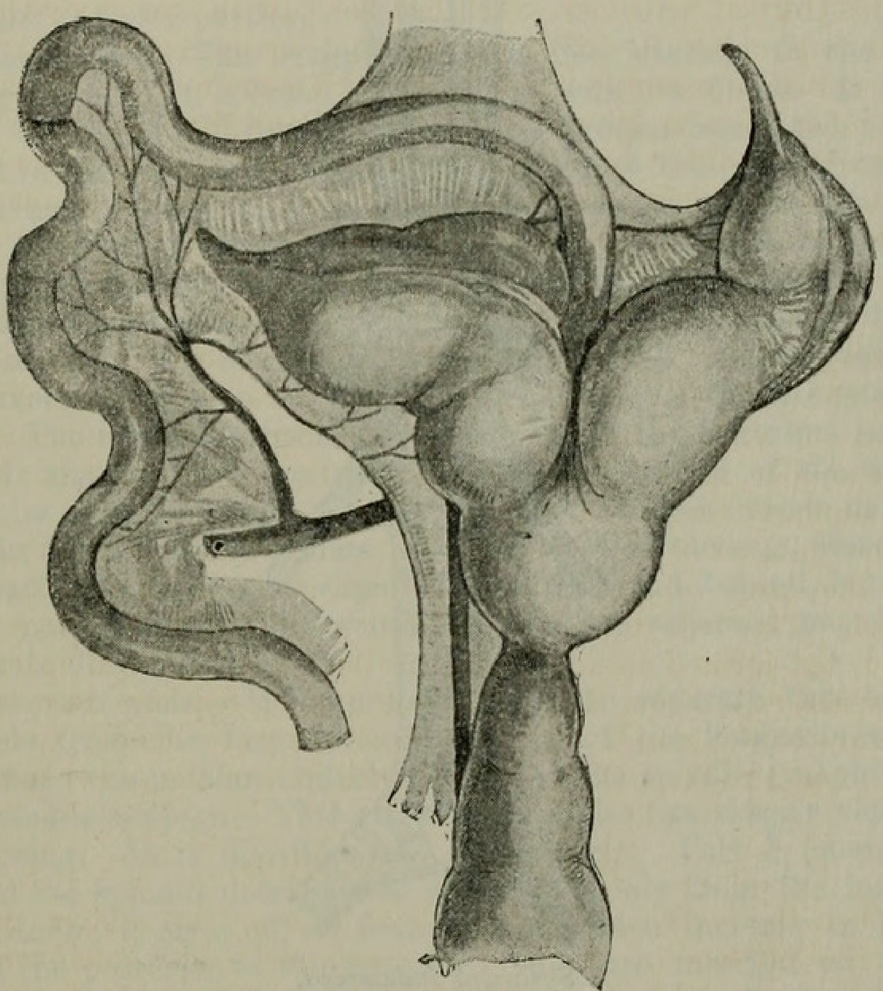
When the body-wall was cut through near the midventral line only the left lobe of the liver was exposed. The falciform ligament was pressed to the right side and neither lobe of the liver was shut off from the subomental space. The omentum was attached to the parietes and to the oblique septa in front up to the level of the proventriculus. The stomach was covered by an emphysematous patch.

A large gall-bladder was present. The cystic duct entered the intestine at the summit of the ascending lobe of the duodenum; next below it, and therefore nearer to the stomach, the hepatic duct entered, and below that again a single pancreatic duct.

The proventriculus was large relatively to the gizzard; the proventricular glands, clearly visible from the outside, formed a continuous cap interrupted only by the entrance of the œsophagus over the upper end of the proventriculus. The lower margin of this cap reached to the end of the first quarter of the length of the proventriculus.

The small intestine was 8 feet 2 inches in length; where it joined the large intestine the calibre of the gut increased very greatly. The two large and peculiar cæca are represented in fig. 1; each was sacculated on a fibrous band and rapidly narrowed to a blunt-pointed extremity. We did not stretch the cæca, as we desired to preserve them. Measured in a straight line

Fig. 1.



Cæca of *Palamedea.*

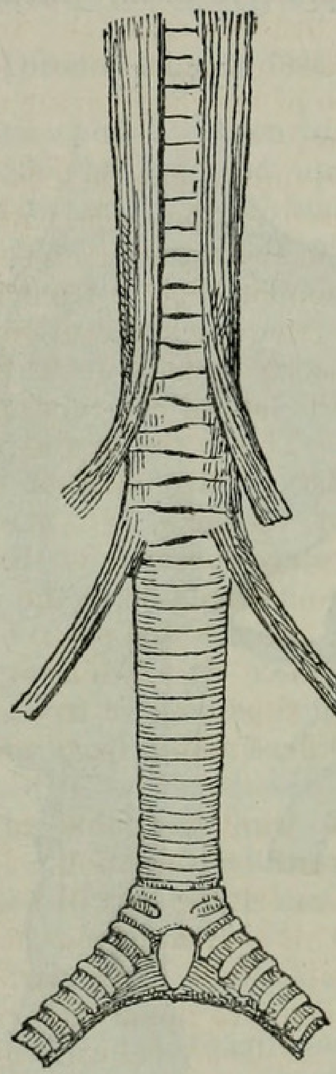
from their wide aperture into the gut to their extremities the left cæcum was 4 inches long, the right an inch shorter. The large intestine, measured from the origin of the cæca to the cloaca, was 15 inches.

§ Wind-pipe.

The tracheal rings are ossified; this occurs in no bronchial semiring; of these latter there were 9 in the left bronchus, 8 on the right. The syrinx is deeply notched in front and behind. A ligament, which may represent an intrinsic muscle, passes from the tracheal ring which is fifth from the end to be inserted in the first bronchial semiring. The sternotracheal muscles arise unusually high up the trachea. The superior pair of extrinsic muscles come very close together on the ventral face of the trachea.

The syrinx, with its muscles, is displayed in the accompanying drawing (fig. 2).

Fig. 2.



Syrinx of *Palamedea.*

§ Myology.

Muscles of Neck and Trunk.

Biventer cervicis.—The two muscles are perfectly separate from each other. They arise tendinous from the spinous process of the first dorsal vertebra. Then follows a tendon of an inch long, a belly of two inches, again a tendon of four inches, then another muscular belly of one and a half inches, which is inserted fleshy on to the occipital below the *complexus.*

Complexus.—This muscle arises from the transverse processes of the third and fourth cervical vertebræ, and from the fibres covering the *intertransversarii* of the same. It is inserted, separated from its fellow by a septum, on to the transverse ridge of the occipital. The muscle is entirely fleshy.

Longissimus dorsi.—It arises by a series of fleshy fibres from the front edge of the ileum, becomes tendinous in the middle, and then is inserted by fleshy fibres on to the lateral surface of the vertebral spine next in front; the next anterior part arises tendinously from the spinous process of the most posterior uncovered dorsal vertebra, and is inserted on to the vertebra next in front; then follow two of precisely similar relations; the next is carried on to the dorsal surface of the longissimus dorsi, as also is the last or most anterior portion.

Ileo-costalis.—This complex muscle lies laterally to the foregoing muscle; it is fused at the edge with its fibres. It arises from the ileum and from the transverse process beside the attachment of the rib; two similar slips in front of this arise from the transverse process and from the adjacent surface of the rib. The ends of the slips are inserted partly on to the surface of the ribs and partly pass on to the lateral musculature of the neck.

Cervicalis ascendens.—This is the lateral muscle anterior to the ileo-costalis. It consists of five distinct slips arising from the transverse processes of vertebræ XVI.–XI. with the exception of XII. The two posterior are inserted on to the vertebræ next in front; the next two are inserted on to the surface of the oblique muscles next in front; the last one on to oblique muscle next but one in front. Behind these slips, which were obvious, there were indications of additional slips both in front and behind, but these were not sufficiently differentiated from the adjacent muscles for separate description.

Longus cervicis.—We were not able to separate this median muscle from the forward continuation of the longissimus dorsi and from the median underlying part of the spinalis complex.

Spinalis complex.—This system of muscles lies deeper than the foregoing. It is divisible into three parts. Part I. (sometimes called the spinalis dorsi) arises apparently only from the longissimus dorsi; it gives off six fleshy bellies which increase in length from the posterior to the anterior; they are inserted on to the upper posterior surface of the oblique processes of cervicals X.–XVI. In addition the superior fibres from these heads form a well-marked rounded muscular cord, which runs forward to form the *longus colli posticus.* Part II. consists of only four well-differentiate slender bellies; these arise from the spinous processes of cervicals XIII.–XV., and they are inserted on to a continuous longitudinal band, the posterior part of which sends slips to the three posterior branches of the *spinalis dorsi*, while the anterior end is inserted on to the oblique processes of cervicals X., XI., at the roots of the anterior two *spinalis dorsi* bellies. Part III. (*longus colli posticus*) arises from the sides of the spinous processes of cervicals II.–XI., and from part I. of the spinalis complex; it is inserted by digitations which merge with the intervertebral muscles in front of its origins.

Rectus capitis posticus.—It arises from the spinous process of atlas and axis; its fibres spread out over the occipital under the complexus.

Intertransversales.—These muscles were obvious all the way along from the ilium to the neck.

Obliqui (*transverso-spinales*).—They are clearly differentiated only from the last to the VIIth cervical. They are large fleshy digitations arising from the transverse processes, and inserted on to the lateral face of the spinous processes next but one in front.

Rectus capitis anticus major.—It arises all along the neck from the hypapophyses and from fascia; about the middle of the neck it grades into the *longus colli*, from a slip of which it first arises about the level of the seventh vertebra. Its broad fleshy insertion is tendinous on the outside, is fused with its fellow in the middle line, and extends for about a quarter of an inch on the anterior outer edge of the basi-occipital.

Rectus capitis anticus minor.—This is a fleshy broad muscle underlying the preceding. Its origin is fleshy and continuous from first four vertebræ. It has a broad fleshy insertion to the extreme outer posterior face of the ridge behind the meatus auditorius.

Longus colli.—It arises from the middle of the centrum of the second dorsal vertebræ tendinously, and then by a series of tendons from each vertebra up to the overlap of the *rectus capitis*. It is inserted by a series of slips to the vertebræ in front of its origins.

Intertuberculares.—These are present, apparently normal.

Interappendiculares costarum.—The first arises from the end of the last free rib, and runs backwards and downwards to the lateral anterior process of the sternum; the second from the junction of the sternal and costal parts of the first complete rib, it shortly fuses with the third, which arises from the costal part of the next rib. These two are then inserted together. The fourth arises from the third, fourth, and fifth costal ribs and from the space between them, and is inserted immediately behind the others. The posterior ones are smaller.

Intercostales externi.—These are confined to the whole of the costal part; the fibres run from above in front and downwards towards the caudal end.

Intercostales interni.—These are confined to the lower half of the costal ribs, and are chiefly tendinous.

Costi-sternales.—Four slips arising tendinously from the sternal ribs, and inserted fleshy to the sternum.

Costo-sternalis externus.—The peculiar muscle to which we have given this name apparently replaces physiologically the uncinate processes, as its broad ribbon-like belly runs diagonally across the outer surface of the ribs. It arises by a very thin flat tendon from the third, fourth, and fifth ribs, and from the interspaces between them. It is inserted to the costal edge of the sternum half an inch from the posterior end.

Head-Muscles.

Dermo-temporalis.—Arising by a narrow but fleshy head from about half an inch behind and above temporal fossa, contiguous with upper anterior border of biventer maxillæ, spreads out on to the skin of sides and ventral surface of throat.

Platysma myoides.—This is a narrow fleshy muscle arising from the ramus of the mandible just at the angle of the jaw. It spreads out fanwise both anteriorly and posteriorly and is inserted on to the skin between the jaws, meeting the last-mentioned muscle behind.

Biventer maxillæ.—It arises from a well-marked area on the squamosal above and behind the ear, contiguous above and behind with the complexus. It is inserted on to the inner side of the angle of the lower jaw.

Digastric or *depressor mandibulæ.*—This muscle is divided into an outer and inner part.

Temporal.—This muscle is divided into three external portions, which lie so close together as to form a continuous mass separated only by fibrous septa. An internal portion is quite distinct.

Pterygoid.—This muscle consists of three parts. Part I., usually present in birds, is absent. Parts II. and III. are well-marked. Part IV. is not separable.

The Hyoid Group.

Mylohyoid anterior.—This muscle is divided into two parts. The posterior is larger and quite free of the hyoid; the fibres run right across the lower jaw, there being no distinct raphæ. They meet the fibres of the *platysma myoides* behind. The anterior part is much thinner and has a distinct raphe. It is attached to the front end of the hyoid.

Mylohyoid posterior.—It springs tendinously from the lower posterior margin of the quadrate and from the posterior outer surface of the angle of the jaw; it at once divides in two. The posterior smaller portion has been already described as *platysma myoides.* The anterior part is a broad mass of muscle (*stylohyoid*), which runs to be inserted along the cornu of the hyoid, reaching as far as just under the *mylohyoid anterior* and meeting its fellow of the other side.

Geniohyoid.—This muscle springs from the inner side of the jaw just behind the anterior *mylohyoid*; it passes dorsally to posterior *mylohyoid.* It is wrapped round the thyrohyoid bone to the very end. The texture of the muscle is somewhat coarse.

The genioglossus is entirely absent.

Ceratoglossus[1].—This muscle is divided into two parts. The first part arises from the side of the *os entoglossum* by a fleshy belly which meets its fellow in the middle ventral line. It is inserted by a long tendon to the tip of the tongue.

The second part arises fleshy from the upper and outer side of

[1] This is in accordance with Gadow's description of the muscle, but in fig. 33 of plate xxxii. of his volume in Bronn's 'Klass. u. Ordn.' he letters it *cerato-hyoid.*

thyrohyal under the geniohyoid, extending nearly to its tip. It ends in a long tendon inserted at the side of the *os entoglossum.*

Ceratohyoid.—This is a broad fleshy muscle arising from the inner side of basal joint of thyrohyal; the fibres run inwards and forwards, meeting those of the other side, and are inserted into the base of urohyal.

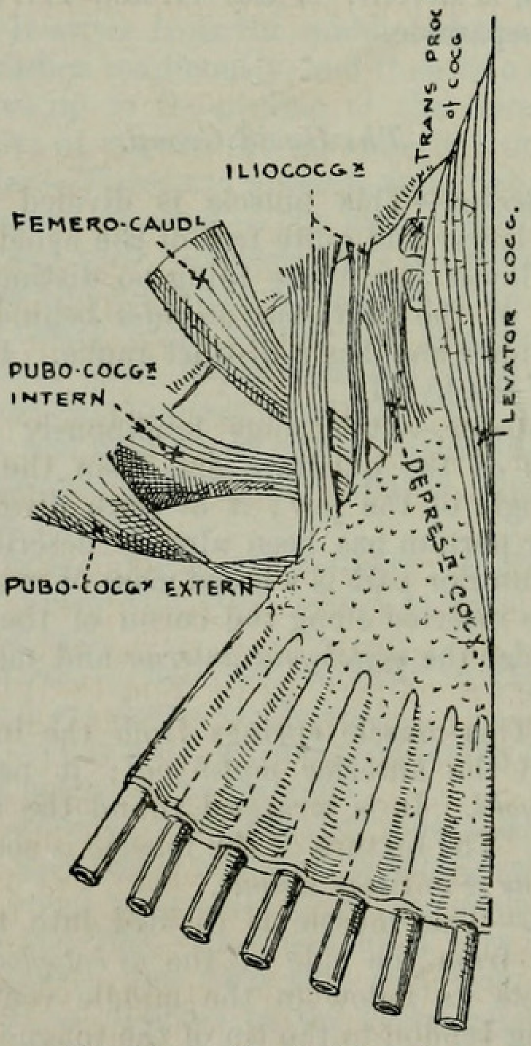
Hypoglossals.—These muscles cannot be separated from part I. of *ceratoglossus.*

Sternohyoid.—This system is represented by a band of muscle which arises from the basihyal and entoglossus. It spreads out over thyroid cartilage and trachea.

Caudal Muscles.

Levator coccygis.—One pair of these muscles, two and half inches long, very fleshy. It arises from the os ileum and from the lateral

Fig. 3.



Caudal muscles of *Palamedea.*

faces of the spinous processes and from lateral processes of anterior to posterior caudal vertebræ. It is inserted on to membrane covering rectrices, meeting its fellow in the median line.

Ileo-coccygeus.—This muscle is divided into two slips. The outer thicker slip is entirely fleshy; it arises from the dorso-medial face of distal ileum only. It is inserted on to the outermost rectrix.

The inner thinner portion of the muscle is also entirely fleshy. It arises from the sacro-ileal ligament. It is only one quarter the size of the outer muscle.

Pubo-coccygeus externus.—This muscle is a flat band with its wide and fleshy origin from outer posterior dorsal margin of the pubis behind its connection with ischium. It narrows to be inserted fleshy upon the under surface of the external rectrix.

Pubo-coccygeus internus.—It arises from the ends of the pubis and ischium under the last-named muscle. It is inserted on to the underside of the last one or two caudal vertebræ.

Depressor coccygis.—It arises partly from the transverse process of the last sacral vertebræ, and partly from adjacent surface of ileo-sacral ligament. It is inserted on to the transverse processes and hæmapophyses of last three or four caudal vertebræ.

Shoulder-girdle.

Rhomboideus externus.—This muscle arises tendinously, the width of the tendinous part being about the same as that of the muscular part from the last cervical vertebra and all the dorsal except the last. The fibres run forwards to be inserted fleshy along the whole length of the scapula. The extreme front part of the muscle is double, and may represent a portion of the cucullaris.

Rhomboideus internus.—This muscle arises tendinously, but has much less tendon than the last. The fibres run backwards, both the origin and insertion of this muscle being shorter than in the case of the externus.

Serratus anticus.—This consists of three portions. The first arises from the last incomplete and from the first complete rib. It is inserted on to the scapula between the two parts of the *sub-scapularis.* The second part arises from the upper part of last incomplete rib and runs to the scapula. The third part arises from the upper part of the first complete rib.

Serratus posticus.—Pars metapatagialis arises from the fifth complete rib. Part 2 consists of two digitations arising from complete ribs 3, 4, 5, at the points where the uncinate processes should be and from the fascia between them. Insertion is on to the tip of the scapula.

Latissimus dorsi.—This muscle, as usual, consists of two parts, which are quite separated by a wide space. The anterior part arises from dorsals 1 to 3; it has a broad and fleshy insertion one inch long ending just before the end of the deltoid. The posterior division of the muscle is narrow and strap-like; it arises from the last three dorsals and from the anterior margin of the ileum. It bifurcates just before its insertion; part goes to form a metapatagialis fascia and the anterior tendon is inserted as is described under the anconæus.

Pectoralis major.—This muscle arises from the entire length of the carina sterni, from the lateral and posterior regions of the sternum, and from the clavicle. There is no origin from the ribs. The posterior margin of the muscle is entirely tendinous. It is inserted on to the fasciæ covering the biceps and on to the deltoid ridge of the humerus.

Pectoralis minor.—As usual a markedly bipinnate muscle. It arises from the entire keel of the sternum, except the extreme anterior end, from the adjacent part of the sternum to a distance of about half an inch of the keel, from the lower half of the coracoid, and from the anterior part of the ligament between coracoid and clavicle. It is inserted on to the beginning of the deltoid crest by an apparently unusually short though strong tendon.

Sterno-coracoid.—This muscle is entirely fleshy. It passes from the anterior lateral border of the sternum to the adjoining part of the coracoid.

Coracobrachialis longus.—This arises from the distal half of the coracoid, with a slight overlap on to the sternum. It is inserted on to the great tuberosity of the humerus, on the side of the insertion of the biceps remote from that of the teres major.

Coracobrachialis brevis (*subcoracoideus*).—This arises entirely from the coracoid, not at all from the ligament between the coracoid and the clavicle. A little before its insertion it is fused with the ventral half of the subscapularis.

Coracobrachialis anterior.—This muscle is large and springs from the anterior process of the coracoid dorsal to the biceps head. It is inserted fleshy over a very broad area of the anterior face of the humerus under the deltoid crest, where it is covered by the pectoralis major.

Coracobrachialis internus.—This small muscle lies immediately under the deltoid minor. It is inserted by a very short flat tendon on to the end of deltoid ridge, just above but internal to insertion of deltoides major.

Deltoides major.—This arises from the junction of the scapula and clavicle. There is a trace of division into two parts, of which the more dorsal is inserted further down on to the humerus, with a strongly tendinous insertion; the other part is inserted fleshy, but this is quite continuous with that of the last. The entire insertion of the muscle extends for three inches down the humerus.

Deltoides minor.—This springs entirely fleshy from the scapula and clavicle at their junction. It lies under the patagial muscle, but is narrower than that. It is inserted on to the anterior edge of deltoid crest.

Patagialis.—This arises as a broad band covering the junction of the scapula and clavicle, external to but broader than the *deltoides minor.* It gives rise chiefly to the *brevis* tendon, but gives off a narrow slip to the *longus* tendon; the pectoral part is represented by a broad tendinous slip. From this the thickened anterior edge goes to the longus and the broader thinner portion to the brevis. A band of tendon arising from the humeral ridge also runs to the *brevis*.

The *longus* tendon passes straight along the edge of the patagium and gives off to the brevis a rather widish slip, which goes to the brevis just at the emergence of the nerve.

The *brevis* tendon is thickened on the outer side; the nerve passes beneath the outer half of it and superficial to the inner half, but there are no signs of distinct division of the tendon into two. Just below the emergence of the nerve a branch is given off which is fused below with the fleshy head of the *extensor metacarpi radialis*. Another branch is given off on the outer side, which is inserted in common with the origin of the *extensor metacarpi radialis* tendon. The main part of the tendon passes towards the elbow, and ends on the radius by a short tendon.

There is no *biceps patagialis*.

Teres major.—This arises from the whole of the outer border of the scapula. Its tendon is inserted on to the great tuberosity of the humerus distal to the biceps.

Teres minor (*supraspinatus*).—This is an excessively delicate and slender muscle. It arises from the lower border of the scapula anteriorly, and is inserted on to the humerus between the two heads of the triceps.

Subscapularis.—There are two heads of origin, from the anterior half of the under surface of the scapula; the deep head is also from the coracoid. Both are fleshy, and the superficial muscle arises exactly above the scapular head of the deeper muscle, the first part of the serratus anticus being inserted between the two. The two parts of the muscle fuse about halfway between origin and insertion.

Expansor secundariorum.—This arises fleshy from the quills covering the elbow-joint, and ends in a characteristically ciconiine manner.

Biceps.—The long head arises in common with the deltoid; the short head in common with the insertion of a portion of the pectoralis major. The latter head is narrow. The insertion of the muscle is double, and the division into two parts commences in the fleshy belly of the muscle. The radial tendon is more than twice the width of the other, and itself divides into two.

Anconæus longus.—It arises by a forked tendinous head from the scapula, the lower head being thicker than the upper. There is a double accessory head formed by two equisized tendons separated by a space, across which run two tendinous bars. With the upper of these the tendon of the latissimus dorsi posterior is fused and the extreme superior tip of the latissimus dorsi anterior fuses with the lower accessory head. There is a broad tendinous insertion to the ulna, and on to the fascia covering the elbow-joint.

Triceps.—This arises right down the humerus, and the origin bifurcates above.

Extensor metacarpi radialis.—This has two heads, and the outer of these is tendinous and is connected with the tendon of the patagium. The inner head is fleshy, but is covered with fascia on the side turned towards the radius. The tendons from the two heads remain separate to about half an inch from the common insertion at the base of the metacarpal spine; but the two tendons are wrapped together by fascia.

Ectepicondylo-radialis.—This is a strong muscle arising from the outer condyle of the humerus, where it is covered by a ligament passing from the outer condyle to the ulna. Its flat tendon of origin is in common with that of the extensor digitorum communis. It passes over to be inserted fleshy on to the second eighth of the proximal surface of the radius.

Ectepicondylo-ulnaris.—This is a stronger muscle than the last. It arises tendinously from the outer condyle to the humerus, and passing over to the ulna is inserted fleshy to the first third of its radial face.

Extensor metacarpi ulnaris.—This arises from the outer condyle of the humerus, its tendon being immediately external to that of the foregoing. It is also connected by a strong band of fascia with the proximal end of the ulna. It is inserted just above the junction of the second and third metacarpals.

Extensor digitorum communis.—The tendon of this arises from the external condyle of the humerus. Its slender belly extends a quarter of the length of the ulna, but it receives no fibres from the ulna. After passing over a groove in the distal end of the ulna its tendon forks, a short branch going to the phalanx of the thumb, and a long branch to the base of the first phalanx of the second digit.

Extensor longus pollicis.—This arises fleshy from four inches after the first of the shaft of the radius and from the third proximal inch of the ulna. The tendons from the two heads fuse about half an inch from their common insertion to the tendon of the extensor radialis metacarpi.

Extensor indicus longus.—Of the two heads of this the first arises fleshy from the third quarter of the radius. The second is much smaller and arises from the ligaments binding the radial carpal to the distal ends of the radius and ulna. The insertion is to the second phalanx of the index at its base, but it sends a broad ligament to the base of the first phalanx.

Pronator sublimis.—This arises proximal to the inner condyle of the humerus, and its fleshy insertion is at the end of the first third of the radius.

Pronator profundus.—This has exactly the same length as the sublimis. It arises from the inner condyle of the humerus, and its tendon of origin sends a slip to the flexors. It is inserted fleshy on to the radius and on to fascia covering the sublimis.

Brachialis inferior.—This flat entirely fleshy muscle arises from the distal end of the humerus, passes over the radius to be inserted for an inch after the first half inch of the ulna.

Flexor digitorum sublimis.—A strong band of tendon arises from the inner condyle of the humerus immediately below the origin of the pronator profundus. This band is attached by strong fasciæ to the ulna, and runs parallel with that bone to be attached to the ulnar carpal bone. From the dorsal surface of this two inches above its insertion there arises by a small fleshy head the flexor sublimis. It is inserted by a tendon to the base of the second phalanx of the second digit.

Flexor digitorum profundus.—This arises fleshy from the two middle quarters of the ulna. Its tendon is inserted halfway down the second phalanx of digit 2.

Flexor carpi ulnaris.—This arises from the inner condyle of the humerus by a strong tendon in which there is a well-marked sesamoid; it runs down the inner side of the ulnar to be inserted in the great tuberosity of the ulnar carpal bone. A thinner muscle arising from this passes into a tendon which is connected with the secondary feathers and is inserted alongside the great tendon of this muscle.

Ulni-metacarpalis ventralis.—This arises fleshy from the radial face of the last quarter of the ulna. Its tendon after passing over a groove in the radial carpal is inserted into the base of the first metacarpal proximal to the spur.

Extensor brevis pollicis.—This small muscle arises fleshy from the base of metacarpal one; it is inserted to the end of the first quarter of the phalanx of the thumb.

Abductor pollicis.—This arises fleshy from the ventral surface of the tendon of the extensor metacarpi radialis; its insertion is fleshy to half of the first phalanx of the thumb. A ligament continuous with it runs to the second phalanx of the thumb.

Flexor pollicis.—This arises fleshy between the root of the metacarpal spur and a knob on the ventral side of the metacarpal; its tendon is inserted on to the inner side of the base of the first phalanx of the thumb, but its fleshy belly gives rise to a slip of muscle which passes to the abductor indicis.

Abductor pollicis.—This arises from the outer surface of the metacarpal just beyond the articulation of the thumb; its belly runs across and is inserted by slips to the feathers on the thumb having no connection with the thumb-bones.

Abductor indicis.—This arises as a delicate fleshy slip from the flexor pollicis and from nearly the whole of the shaft of the second metacarpal. Its tendon is inserted at the base of the first phalanx.

Flexor digiti III.—This arises fleshy from the last two-thirds of metacarpal 3, and its tendon is inserted at the base of the first phalanx.

Radio-metacarpalis ventralis.—The tendon of origin comes from the lateral face of the distal end of the radius; the muscular belly divides in two. The superficial division is inserted by a short broad tendon to the upper surface of metacarpal III. The deep division is inserted fleshy to immediately below the superficial tendon.

Interosseus dorsalis.—The fleshy heads of this muscle arise from the greater part of the internal surface of the shaft of the second metacarpal and from the first quarter of the third metacarpal. The common tendon is inserted at the base of the second phalanx of the second digit.

Interosseus palmaris.—The origin of this is partly from the shaft of metacarpal III., but chiefly from the second metacarpal. The tendon is inserted to the flat part of the first phalanx of the second digit.

Muscles of the Thigh and Leg. (Figs. 4, p. 549, & 5, p. 552.)

Sartorius.—This is very large and strong, it is separated by a wide space from the gluteus maximus. It arises from fascia over the gluteus medius, and from the anterior upper and lower margins of the ileum. It is inserted on to the ligament containing the patella and on to the crest of the tibia. The patella was not ossified, but was represented by a cartilaginous nodule.

Gluteus maximus.—There is no postacetabular part of this muscle. The origin is entirely tendinous from fascia over the gluteus medius and from the ridge of the ileum above the acetabulum as far as the anterior margin of the biceps, with which it was fused for a short distance. The insertion is entirely tendinous to fascia covering the vastus and the cruræus. The innervation of the muscle, so far as it has yet been described, was from the crural plexus. At the posterior margin of the muscle is a separate well-developed muscular slip innervated by a twig from the ischiadicus. This part probably represents the postacetabular division of the muscle.

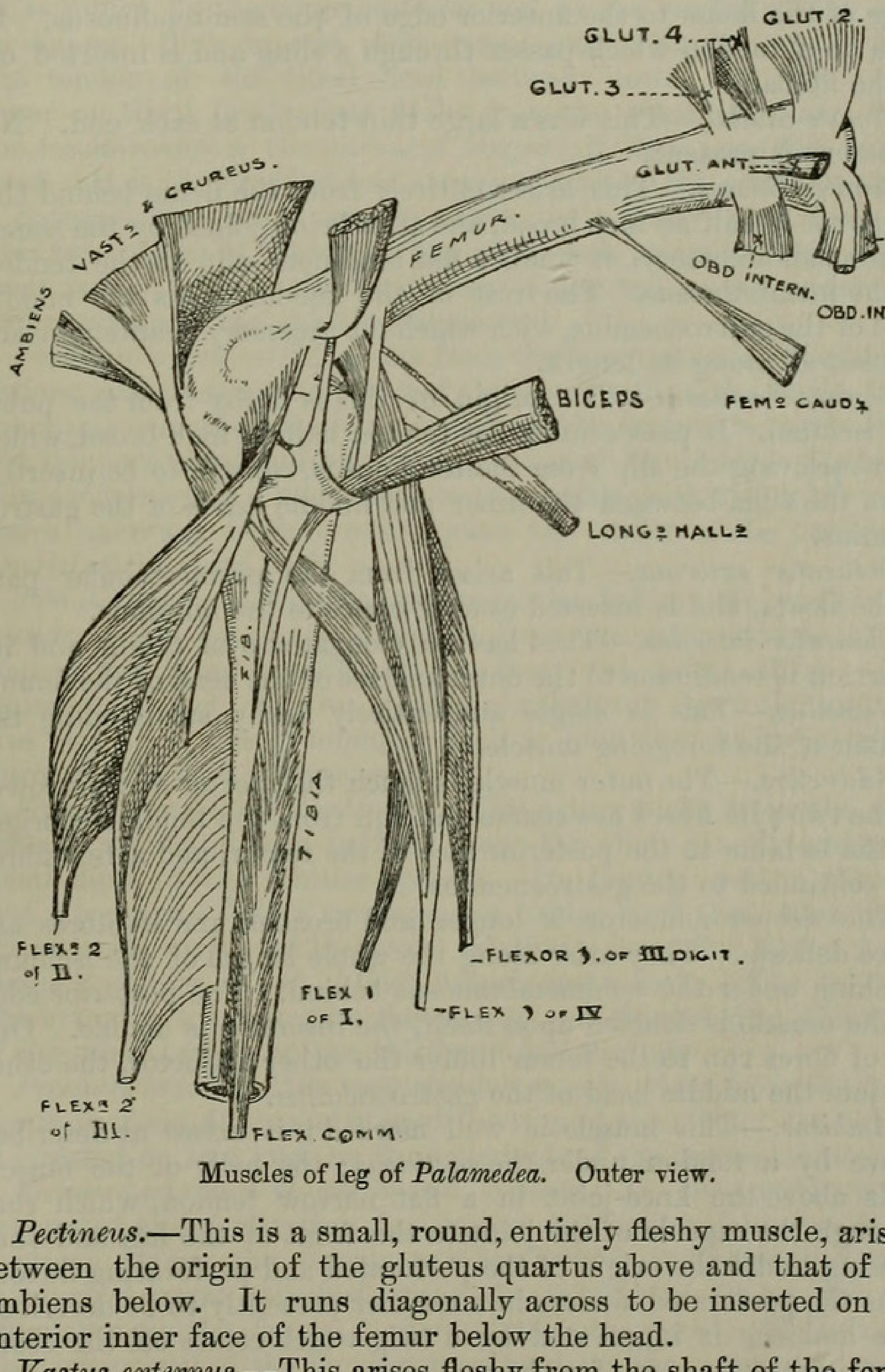
Gluteus anterior.—This is a small but very distinct triangular muscle arising fleshy from the ridge of the ileum above the acetabulum, being covered exactly by the part of the preceding muscle which arises from the same region; its tendon rapidly narrows to its insertion on the outer face of the femur between the tendons of the external obdurator and those of the third and fourth gluteals. It is the most superficial of the muscles inserted on to the upper extremity of the femur. Its nerve comes from the ischiadic plexus.

Gluteus medius.—The origin of this strong muscle underlaps that of the sartorius, but does not extend to the anterior edge of the ileum. The fleshy origin is confined to the ileum, and the strong short tendon is inserted broadly on to the outer face of the head of the femur; it has a double innervation, a large branch from the crural plexus, and a small twig from that branch of the ischiadicus that supplies the gluteus anterior.

Gluteus minimus.—This muscle arises fleshy from the anterior lower border of the ileum, not reaching on to the ribs, and contiguous with the lower margin of the medius in its anterior region, while near its insertion it is separated from that muscle by the gluteus quartus. It is inserted tendinously on to the upper end of the shaft of the femur lower down than the insertion of the other gluteals. It is supplied by a large branch from the crural plexus.

Gluteus quartus.—This small muscle lies between the last two muscles, from both of which it is quite distinct, though partially overlapped and concealed by them. It arises fleshy from the lower edge of the ileum between the minimus and the acetabulum. Its insertion is by a broad tendon to the femur between the insertions of the medius and minimus. Its nerve is a V-branch of the crural plexus.

Fig. 4.



Muscles of leg of *Palamedea*. Outer view.

Pectineus.—This is a small, round, entirely fleshy muscle, arising between the origin of the gluteus quartus above and that of the ambiens below. It runs diagonally across to be inserted on the anterior inner face of the femur below the head.

Vastus externus.—This arises fleshy from the shaft of the femur from the gluteus to the biceps sling. It is fused with the crureus in front and terminates in the patellar ligament.

Crureus.—This is tendinous on the outer surface at its origin from the neck of the femur; it also arises from a considerable part of the shaft of the femur and is inserted with the vastus.

Vastus internus.—This arises from the whole length of the inner surface of the shaft of the femur, starting from immediately below the insertion of the pectineus. It is inserted on to the tibia alongside the tibial insertion of the sartorius.

Biceps.—This arises fleshy from the whole of the postacetabular ridge of the ileum to the anterior edge of the semitendinosus. It ends in a tendon which passes through a sling and is inserted on to the fibula.

Femoro-caudal.—This was a large thin tendon at each end. No accessory is present.

Semitendinosus.—This arises entirely from the ileum behind the biceps; it is half an inch broad, and after being joined by the somewhat small accessory, it sends a flat tendinous slip to the tendon of the membranosus. The rest of the tendon joins the middle head of the gastrocnemius, with which the accessory semitendinosus is fused all along its length.

Semimembranosus.—The origin of this is fleshy from the pubis and ischium. It passes into a flat tendon half an inch broad, which after receiving the slip from the tendinosus, runs in to be inserted on to the tibia between the inner and middle heads of the gastrocnemius.

Obturator externus.—This arises from the postacetabular part of the ileum, and is inserted exactly opposite the minimus.

Obturator internus.—This has an elongated oval origin and its insertion is tendinous to the outer surface of the head of the femur.

Gemellus.—This is single and entirely fleshy, surrounding the tendon of the foregoing muscle.

Adductors.—The outer muscle is much the shorter and narrower of the two; its fibres are coarse and run from the tendinous origin on the ischium to the posterior face of the femur, and a few fibres are continued to the gastrocnemius.

The deeper adductor is longer and broader, and its fibres are more delicate. They arise along the whole length of the ischium, reaching under the semimembranosus behind. The posterior edge of the muscle is doubled upon itself, the insertion is double. One set of fibres run to the femur under the other adductor, the other set join the middle head of the gastrocnemius.

Ambiens.—This muscle is well marked; it arises as described above by a tendon under the *pectineus*; the belly of the muscle ends above the knee-joint in a flat narrow tendon, which runs through the capsule of the joint to the front of the leg, and then passing under the origin of the perforated and perforating flexors, joins the perforated flexors in a manner presently to be described. The ambiens is innervated by a twig which comes off the crural plexus with the nerve for the *sartorius.*

Gastrocnemius.—The outer head is entirely tendinous, and arises from the femur distal to the long head of the *biceps* sling. The short arm of the *biceps* sling arises from the underside of this head of the *gastrocnemius* very close to its origin. From this short arm of the sling a broad tendinous band, thicker at the lower edge, runs in to join the origins of the perforated and perforating muscles. The outer head becomes tendinous halfway down the leg, and joins the *tendo Achillis* just above the ankle. The middle head arises tendinously from the inner condyle of the femur in common with the *accessory semitendinosus*, with which it is fused. It is joined by the outer *adductor* and by the tendon of the *semitendinosus.* This muscle then passes into a tendon which joins the tendon of the tibial head halfway down the leg. The inner or tibial head arises fleshy from the *crista tibiæ* and from the fascia covering the *peroneus longus*; it then joins the middle head. It is the broadest and strongest part of the *gastrocnemius.*

Soleus.—This small muscle arises by a fleshy head from the tibia for a space of three quarters of an inch below its head on the inner face. Its long slender tendon is inserted on the under and inner surface of the ankle-cartilage.

Peroneus longus.—This arises from the fascia covering the tibialis anticus, and from a small part of the upper end of the fibula, from the fascia over the knee-joint, and from the septum between itself and the perforated and perforating flexor of the index. Its broad thin tendon sends a wide fork to the cartilage of the ankle-joint, and a narrower tendon which joins the tendon of the perforated muscle of the third digit.

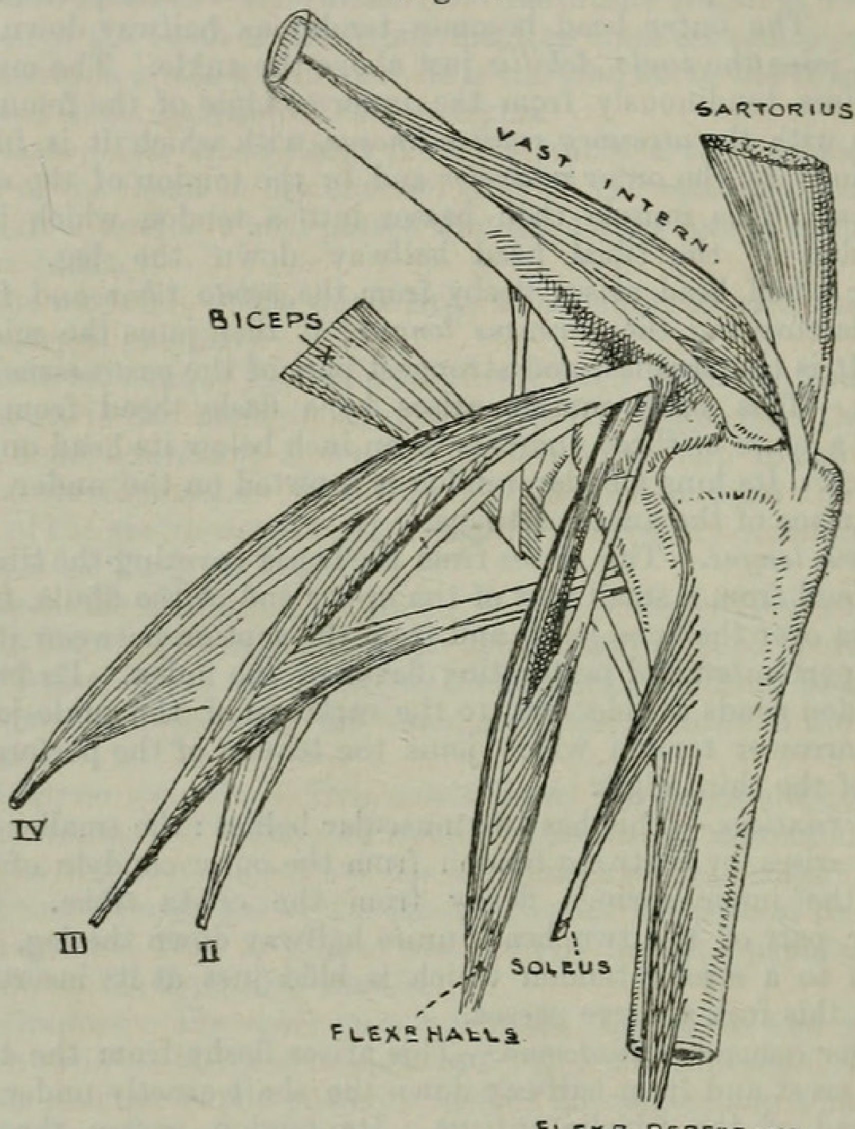
Tibialis anticus.—This has two muscular bellies: the smaller and rounder arises by a strong tendon from the outer condyle of the femur; the inner springs fleshy from the crista tibiæ. The muscular part of the two heads unite halfway down the leg, and give rise to a strong tendon which is bifid just at its insertion. Through this fork a nerve passes.

Extensor communis digitorum.—This arises fleshy from the tibia from its crest and from halfway down the shaft exactly under the tibial head of the tibialis anticus. Its tendon passes through first a bony and then a membranous bridge, and then runs down the anterior surface of the foot. Halfway down the tarsus metatarsus it divides in two. Each branch again forks. The forks of one branch are inserted on the second and third digits; the forks of the other branch on the third and fourth digits.

Peroneus brevis.—This very slender muscle arises from the anterior face of the fibula and a small portion of the tibia. Its tendon is inserted on to a knob on the outer side of the tarsus metatarsus.

Flexor perforans et perforatus indicus.—In the woodcut the perforated and perforating flexors are distinguished by the figure 2 placed before the roman number, which indicates the digit to which they are attached, while the perforated flexors are distinguished by the figure 1 correspondingly placed. This is the most superficial of the flexors; it arises from the outer condyle of the femur and from the septum between itself and the peroneus longus, and from the septum between itself and the flexor perforatus et perforans of the middle finger. Its tendon is inserted to the base of the second phalanx of its digit.

Fig. 5.



Muscles of leg of *Palamedea*. Inner view.

Flexor perforatus et perforans medii.—This has a similar origin to the last, which it underlies; but in addition it has an extensive origin from the fibula. Beginning opposite the insertion of the biceps, its tendon is inserted to the base of the second phalanx of the middle finger. Above the first phalanx a short tendinous connection runs down to it from the flexor perforatus tendon of the same digit.

Flexor perforatus.—The parts of this muscle are closely united. The mass arises from two heads. The inner head is large and fleshy and comes from the intercondylar notch. The outer head arises tendinously from the outer condyle of the femur, below the origins of the perforated and perforating flexors. With this outer head the tendon of the ambiens unites after it has crossed the fibula. Each of the three tendons running to the digits has a share in both tendons, and the ambiens tendon can be traced splitting up to each. The tendons of the index and of the middle finger are inserted to the base of the first phalanges of their digits. The tendon of the fourth digit is inserted similarly, but in addition has a tendinous slip running to the base of the second digit, taking the place of the absent perforatus and perforans.

Flexor longus hallucis.—This has two heads—one fleshy from the lower face of the external condyle, with a tendinous slip from the outer side of the intercondylar notch; one tendinous and slight in common with the inner head of the flexor perforatus. The whole muscle is very slender. The tendon passes through the ankle-joint alongside that of the flexor communis, then crosses over that, giving off to it a slip which is thick relatively to the very slender tendon which runs to the base of the first phalanx of the thumb.

Flexor profundus.—This common deep plantar tendon arises fleshy from the fibula and tibia, halfway down the tibial shaft, and its tendon after receiving slip from the longus hallucis breaks up into a branch, which runs to the base of the claw on digits II., III., and IV.

Popliteus.—There is only one popliteal running from its fleshy origin from the head of the fibula to a fleshy insertion just under the head of the tibia.

In the ankle-cartilage the tendons of the perforated and perforating flexors are most superficial; the tendon of the perforated muscle of the third digit wraps round that of the fourth. The tendon of the perforatus of the index is more deebly situated, and the tendon of the longus hallucis passes through the cartilage of the extreme outer side.

Flexor brevis hallucis.—This is stronger than the longus hallucis. It arises from the upper part of the shaft of the tarso-metatarsus on the inner side. It is inserted at the base of the phalanx.

Flexor brevis hallucis secundus.—This arises from the posterior side of the greater part of the shaft of the tarsus metatarsus and is inserted in common with the last.

Flexor brevis indicis.—This is a short broad muscle lying in between the diverging ends of the metatarsal shaft, and inserted to the base of phalanx I.

Adductor annularis.—This is a large muscle arising from the whole of the metatarsal shaft.

Extensor hallucis.—A fleshy muscle from the middle quarter of the metatarsal shaft to the middle of the first phalanx.

Extensor hallucis secundus.—A short entirely muscular slip with origin similar to the last, and insertion to the base of the first phalanx.

Abductor indicis.—This is a very short muscle from the metatarsal shaft to the inner side of the basal phalanx.

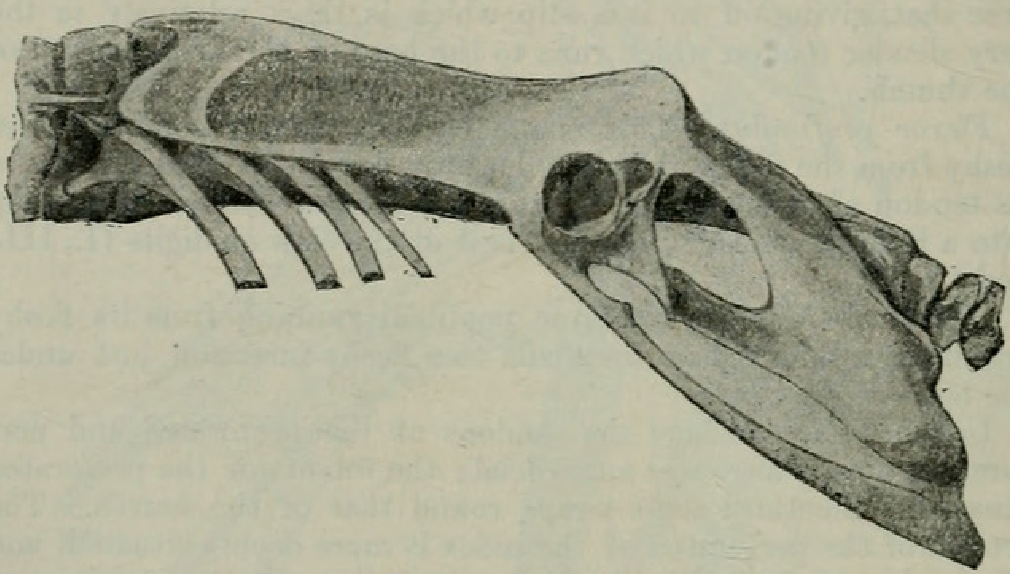
Extensor medii.—This is represented by a rudimentary patch of muscle attached to the fascia covering the base of the first phalanx.

Adductor annularis.—This long muscle arises down the upper surface of the metatarsal shaft. Its tendon passes through a foramen in the metatarsus, and is inserted about the middle of the first phalanx.

§ Comparison of *Palamedea* with *Chauna*.

We have not deemed it necessary to give a detailed separate account of the osteology of *Palamedea*, as all the differences between it and *Chauna* will be found set out in the subjoined table. We have, however, thought it worth while to figure the pelvis of *Palamedea*, because of the great difference in the angle of inclination of the postacetabular region.

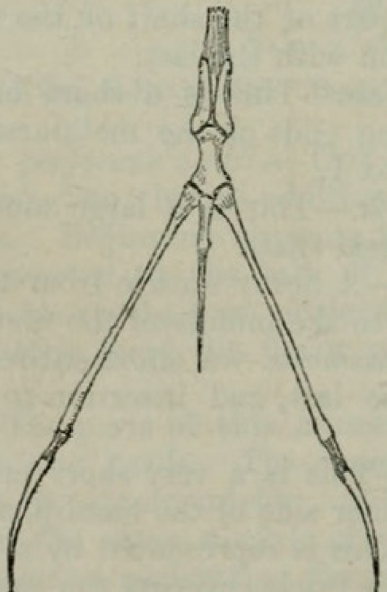
Fig. 6.



Pelvis of *Palamedea*.

We also figure the hyoid, because there is not, so far as we are aware, any figure of this bone in the Palamedeidæ.

Fig. 7.



Hyoid bone of *Palamedea*.

The *basihyal* or *copula* is longer than it is broad, and in form is intermediate between the short, broad, *copula* of Ducks, Accipitres, and Parrots, and the long slender *copula* of Waders.

The *urohyal* is very long, and cartilaginous at the extremity. As in the Tinamu, it is movable upon the *copula*.

The *entoglossum* is in the extremely primitive condition of being paired. This paired condition is indicated by a central aperture in Geese and some other birds.

The *ceratohyals* consist each of two bony pieces, with a short cartilaginous segment between them.

Table of Chief Differences between *Palamedea* and *Chauna*.

	PALAMEDEA.	CHAUNA DERBIANA.
Pterylosis and cutaneous system.	Differences very slight, as *Nitzsch* has stated.	
Rectrices	14.	12.
Proventricular glands.	Continuous cap.	Single patch.
Liver-lobes	Right layer.	Subequal.
Duodenum	Hepatic and pancreatic ducts enter at summit of ascending loop.	Ducts enter at the bend (*Garrod*).
Cæca	Identical in their very peculiar structure, but slightly larger in *Palamedea*.	
Bronchial semirings	Unossified; 9 and 8 in number.	First two are ossified; 7 at each side.
Syrinx	Deeply notched back and front.	Notched only at back.
Sternotracheal muscles.	Two pairs; arising 4 rings higher up.	Two pairs.
Expansor secundariorum.	Ciconiine.	Ciconiine.
Biceps patagialis	Absent.	Absent.
Brevis tendon	Ends on radius.	Passes over to ulna (*Fürbringer*).
Pectoralis minor	Does not reach the posterior margin of the sternum.	
Origin of obdurator internus.	Elongate oval.	Elongate oval.
Postacetabular part of gluteus maximus.	Represented by a small slip with separate nerve from the *ischiadic plexus*.	Absent.
Ambiens	Present.	Present.
Semitendinosus	Present.	Present.
Accessory semitendinosus.	Present, but fused with gastrocnemius middle head.	Present.
Femoro-caudal	Present.	Present.
Accessory femoro-caudal.	Absent.	Present.
Long flexor to hallux	Present.	Absent.
	Skeleton.	
	The whole skeleton generally slighter and long bones longer.	
Sternum	Posterior lateral processes shorter and broader.	More anserine.
Ribs	No uncinate processes.	No uncinate processes
	6th and 7th ribs are broad and have a faint	

	Palamedea.	Chauna derbiana.
	Skeleton (continued).	
	projection in region of uncinates.	
	8th sternal rib short and does not reach sternum.	8th sternal rib articulates with costal rib and with sternum.
	Penultimate sternal rib plain.	Penultimate sternal rib has a sharp backwardly directed process near articulation with costal rib.
Clavicle	V-shaped; broadest region just beyond coracoid.	U-shaped; broadest region halfway down from coracoid.
Pelvis	Ilea cover fourth but last ribs; hinder part of pelvis is bent down on the fore part (see fig. 6, p. 554). 'Waist' of pelvis very broad.	Ilea cover third but last rib; long axis of pelvis straight and more duck-like. Waist narrow.
Wings	Proportionately much longer and bones slighter. This especially so with second metacarpal.	
Legs	Femur and tibia more slender; fibula and digits much longer.	
Cervical vertebræ	16.	17.
	Ventral processes of anterior cervicals much less marked.	
Dorsal vertebræ	First pair have a ventral process.	First three have a ventral process.
	Neural processes flatter and higher.	
Ploughshare bone	More short and slender.	
Skull	In proportion and absolutely much smaller. The horn arises from a bony process on middle line, a quarter of an inch from the anterior margin. Flatter.	
	Foramen magnum larger.	
	The anserine oval space between periotics and supraoccipitals absent.	Ibid.
	Anterior part of the face from tip of bill to end of palatines broad, long, and goose-like.	Ibid.
	Desmognathous.	Ibid.
	Outer long edge of palatine with a sharp angular projection as in Geese.	Ibid.
	Basipterygoid facets wide apart, not close together as in Geese.	Ibid.
	Middle superior ramus of premaxilla separate from the lateral pieces as in gallinaceous birds, *not* fused as in Geese.	Ibid.
	Angulare of lower jaw nearly straight.	Angulare of lower jaw sharply upturned as in Geese.

For the present we are content merely to point out the very wide distinctions existing between the genera *Chauna* and *Palamedea*. Those who are best acquainted with the anatomy of birds will realize most readily how considerable these distinctions are. We hope on a subsequent occasion, when we have had the opportunity of examining again and more minutely some points in the structure of *Chauna*, to deal with the systematic position of the Palamedeidæ. The fact that so great differences obtain between the genera is confirmatory of the generally received opinion that this form is one of great antiquity.

8. On a Collection of Lepidoptera from British East Africa, made by Dr. J. W. Gregory between the Months of March and August 1893. By Arthur G. Butler, Ph.D., F.L.S., F.Z.S., &c., Assistant-Keeper Zoological Department, British Museum (Nat. Hist.).

[Received June 8, 1894.]

(Plates XXXVI. & XXXVII.)

The present collection is rich in species and in number of specimens, though, unfortunately, many of the latter are not in first-rate condition: indeed most of the small moths are unidentifiable. Nevertheless the collection contains several novelties, a fair series of specimens in good preservation, and is particularly interesting as including a considerable number of grades between species which hitherto have been easy to distinguish, but are now clearly shown to be, at most, localized dimorphic developments from one widely-distributed species.

Of the species which it has been possible to name, or, at any rate, to assign to their genera, there are no less than 215, of which 10 are described as new to science. Of the remainder several are new to the Museum, whilst others have previously only been represented by single examples.

Of Butterflies previously received from Somali-land the collection contains the following:—

1. Limnas chrysippus (vars. *dorippus* and *klugi*).
2. Ypthima asterope.
3. Neocœnyra duplex.
4. Junonia (Precis) limnoria.
5. Junonia cebrene.
6. Byblia ilithyia (*Hypanis ilithyia* of my Somali paper).
7. Hamanumida dædalus.
8. Polyommatus bæticus.
9. Catochrysops osiris.
10. Terias zoe.
11. Teracolus helvolus (separated subsequently to the publication of my paper on Somali Lepidoptera).

12. Teracolus protomedia.
13. Teracolus nouna.
14. Teracolus thruppi.
15. Belenois lordaca = var. of *B. mesentina*.
16. Sarangesa djælælæ.

Of the above-named species, *Neocœnyra duplex*, *Teracolus helvolus*, and *Teracolus thruppi* were only known from Somali-land; but the others are more or less widely distributed. The species obtained from Kilima-njaro are represented in about an equal degree, as also those from Nyassa-land.

RHOPALOCERA.

1. Amauris dominicanus.

Amauris dominicanus, Trimen, Trans. Ent. Soc. 1879, p. 323.

Steppes of Thika-Shika, among patches of acacia-scrub; Kibwezi and Ndoli.

Some of the specimens obtained have the black outer border of the secondaries considerably narrower than in the typical form.

2. Limnas chrysippus.

Papilio chrysippus, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

♂ ♀, Steppes N.W. of Longari.

The typical form of this species appears to have been rare.

2 *a*. Limnas klugi.

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

Thiriati, 12th June; Kithu-Uri, Maranga, 13th June; Ngatana, December; Barra, near Merifano; Ndara; Guaso, Narok; Ukikuigu, Thika-Shika, 16th July; Ndangi River; Kibwezi.

This seems to have been the prevalent form of the species.

2 *b*. Limnas dorippus.

Euplœa dorippus, Klug, Symb. Phys. pl. 48. figs. 1–4.

♂, Ngatana in January; ♀, Alng'aria.

One male and two females were obtained, all of them less varied with white on the secondaries than in the typical form of this race.

3. Tirumala petiverana.

Danais limniace, var. *petiverana*, Doubleday, Gen. Diurn. Lep. p. 93. n. 37, pl. 12. fig. 1 (1847).

Steppes of Thika-Sika; Tana, 16th July.

Only three examples were obtained, west of the Lower Falls.

4. Melanitis solandra.

Papilio solandra, Fabricius, Syst. Ent. p. 500 (1775).

♂ ♀, Ngatana, 29th January, 1893.

5. MYCALESIS (MONOTRICHTIS) EUSIRUS.

Mycalesis eusirus, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 641. n. 13.

Ngatana, December and January; shores of Lake Dumi, 13th February; Njempo; steppes of Thika-Shika on grassy plateau west of the Lower Falls, 16th July.

6. ENOTESIA, sp.

One poor example of a species near to *E. ankoma* (*Mycalesis ankoma*, Mabille); the primaries, however, are a little less angular than in that species, and the outer edge of the dark central belt is zigzag throughout.

Ndoro; steppes at base of Kenya, 7000 feet.

NEOCŒNYRA, Butl.

The present collection proves that this genus must be much more extensive than I had supposed. In the first place, there are sexes of my *N. duplex* agreeing very closely in pattern, the female being entirely without the red markings of my supposed female from Somali, thus proving that the latter is a distinct species (for which, therefore, I propose the name of *N. rufilineata*). Secondly, there is a species allied to *N. duplex* and *N. ypthimoides*, but nearer to the former.

Neocœnyra, at first sight, would appear to be scarcely distinct from *Strabena*, Mab., if we were to accept that author's decision as regards the type of his genus. Although in 1877 M. Mabille had already described a single species under the generic name *Strabena* (*S. smithii*, Pet. Nouv. p. 157), he stated in M. Grandidier's 'Hist. de Madagascar' that *Satyrus tamatavæ*, Boisd., was the type of his new genus.

If this loose treatment of the types of genera is permitted, it will necessitate alteration of the names of scores of well-known groups, the types of which have been figured or referred to by both Hübner and Felder, without any definite statement that the species thus indicated are the types of their genera.

The only safeguard is strictly to follow the method adopted by Scudder, accepting the author's first mention of his genus, as then used, and ignoring all his subsequent decisions: the first species recorded under a new generic name, if unaccompanied by other species, or any statement as to the type of the said genus, thus becomes, and must for ever after remain, the typical species.

The genus *Strabena*, as represented in the 'Histoire de Madagascar,' contained heterogeneous material, and the so-called type differs in no structural character from one of the species placed by the same author under *Pseudonympha*: thus M. Mabille says that the latter genus is characterized by its long antennæ, the club of which is distinct, oboval, and laterally compressed; but his *P. goudotii* has the club cylindrical and with a longitudinal groove below, as in *S. rakoto*, *vinsonii*, *ibitina*, *tamatavæ*, &c.; it also has the median vein somewhat swollen at the base, though less so than in *Ypthima*, of which genus the whole of these Madagascar forms might well be considered a section, the angulated-winged species being alone kept distinct under the generic name of *Strabena* [1].

The absence of any swelling at the base of the median vein in *Neocœnyra* at once separates it from *Ypthima*, and, as a matter of course, from Mabille's second version of *Strabena*.

7. Neocœnyra gregorii, sp. n. (Plate XXXVI. fig. 2.)

Nearest to *N. duplex*: considerably larger. Olivaceous brown, slightly rufescent in certain lights on the basal half, which is always slightly darker; a well-defined dark brown submarginal line, somewhat sinuated on the secondaries, particularly towards the apex; a second more slender line close to outer margin: primaries with a large, rounded, subapical, black bipupillated ocellus; the pupils white, edged with blue or lavender scales; iris tawny orange, with external dark brown zone: secondaries with three or four similarly coloured, but smaller and unipupillated ocelli as follows:—one subcostal towards apex, very small in the male but large in the female, and three in an oblique series from third median branch to near anal angle, the third smaller than the others and sometimes wanting in male examples. Wings below slightly more olivaceous than above, the submarginal lines sienna-red externally, the inner one of the secondaries zigzag towards apex; two other irregular lines, dark brown in the male but red in the female, crossing the wings, angulated on the secondaries; base of costa and discoidal cell red in both sexes; ocelli nearly as above, but the subanal ocellus of the secondaries always present and usually double or geminate, the opposite wings sometimes showing two small ocelli near together or one geminate ocellus respectively. Body blackish, with a red spot on the patagia. Expanse of wings, ♂ 43 millim., ♀ 46 millim.

Karianduri, ascent of Kilima Meza, Elmeteila Basin, Nawashi to Baringo Valley, Kariandur, 6100 feet, wooded ravines and cliffs to the east and salt marshes to the west; Alng'aria; Thegu and steppes north of Thegu; Ndora steppes at base of Kenya, 7000 ft.; Rangatan, Ndari.

8. Neocœnyra duplex. (Plate XXXVI. fig. 1.)

♂. *Neocœnyra duplex*, Butler, P. Z. S. 1885, p. 758. n. 4.

The true female of this species has the tawny area on the primaries much larger than in the male and continued downwards to the first median branch, enclosing a second small and unipupillate ocellus on the first median interspace; the secondaries show a sinuous dark brown line beyond the cell on the under surface. Expanse of wings 36 millim.

Ngomeni to Kinani.

[1] Apart from colour characters, I fail to see any good reason for distinguishing "*Strabena*" *tamatavæ* and allies, even as a Section, from true *Ypthima*, the only structural distinction being one of degree.

PHYSCÆNURA, Wllgr.

In my last paper (on Mr. Johnston's collections) I failed to recognize this genus as the *Periplysia* of Gerstäcker, and consequently, in going through the Records, I overlooked Mr. Godman's *Physcœnura pione* and renamed it as a new *Periplysia*.

9. PHYSCÆNURA LEDA.

Periplysia leda, Gerstäcker, Arch. für Naturg. 1871, i. p. 358; Van der Decken's Reisen, iii. 2, p. 371, pl. 15. figs. 3, 3 *a* (1873).

Ngatana.

10. YPTHIMA ASTEROPE.

Hipparchia asterope, Klug, Symb. Phys. pl. 29. figs. 11–14 (1832).

Ngomeni to Keriani.

One rather poor example was obtained.

11. EURYTELA DRYOPE.

Papilio dryope, Cramer, Pap. Exot. i. pl. lxxviii. E, F (1779).

Ngatana, 29th January, 1893; Kibwezi and Fuladoya.

12. EURYTELA OPHIONE.

Papilio ophione, Cramer, Pap. Exot. ii. pl. cxiv. E, F (1779).

Ngatana, December or January.

13. BYBLIA ILITHYIA.

Papilio ilithyia, Drury, Ill. Exot. Ent. ii. pl. 17. figs. 1, 2 (1773).

Ngatana, 29th and 30th January, 1893; Golbanti; Ndara in the afternoon; Kinani; Mtoto wa Ande; steppes N.W. of Longari; steppes of Kiroruma.

14. BYBLIA CORA.

Hypanis cora, Feisthamel, Ann. Soc. Ent. France, 1850, p. 249.

Ndara and Thagana, in woods beside and park-land between Ukikuya.

15. BYBLIA ACHELOIA.

Hypanis acheloia, Wallengren, Lep. Rhop. Caffr. p. 29 (1857).

Urtu in garden; Ngatana; Mtoto wa Ande.

16. CHARAXES GUDERIANA.

♂. *Nymphalis guderiana*, Dewitz, Nova Acta Akad. Naturf. Halle, 1879, p. 200, pl. 2. fig. 18.

♀. *Charaxes guderiana*, Butler, P. Z. S. 1893, p. 648. n. 18; Trimen, P. Z. S. 1894, pl. v. fig. 8.

♂, Fuladoya.

17. Charaxes candiope.

Nymphalis candiope, Godart, Enc. Méth. ix. p. 352. n. 10 (1823).

Summit of Mt. Höhnel, 16,000 feet.

18. Palla varanes.

Papilio varanes, Cramer, Pap. Exot. ii. pl. clx. D, E (1779).

No record of exact locality on the specimen: probably Sabaki Valley.

Dr. Gregory informs me that the bulk of the specimens obtained in the Sabaki Valley were not labelled; thus nearly all unlabelled examples would be from that locality.

19. Hypolimnas misippus.

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

♂ ♀, Ngatana, December and January.

19 *a*. Hypolimnas inaria.

Papilio inaria, Cramer, Pap. Exot. i. pl. ccxiv. A, B (1779).

♂, Lamu; ♀, Witu; Ngatana, 28th December, 1892; Kinani; Njempo; Athi, plains near Chjanjavi.

20. Euralia deceptor.

Diadema deceptor, Trimen, Trans. Ent. Soc. 1873, p. 105.

Euralia deceptor, Trimen, South Afr. Butt. i. p. 286. n. 93, pl. vi. fig. 3.

♀, Sabaki Valley.

21. Junonia ethyra (or a nearly allied new species).

Salamis ethyra, Feisthamel, Ann. Soc. Ent. Fr. 1850, p. 250.

Alng'aria.

22. Junonia natalica.

Precis natalica, Felder, Wien. ent. Monatschr. iv. p. 106. n. 65 (1860).

Sandy steppes of the Kiroruma, Tana; Thika-Shika, west of the Lower Falls.

23. Junonia limnoria.

Vanessa limnoria, Klug, Symb. Phys. pl. 48. figs. 6, 7 (1845).

Kibwezi.

24. Junonia simia.

Precis simia, Wallengren, Kongl. Svenska Vetensk.-Akad. Handl. 1857, p. 26. n. 2; Trimen, South Afr. Butt. i. p. 227 (1887); P. Z. S. 1894, p. 33, pl. iv. fig. 5.

Junonia micromera, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 482 (1876).

Kinani; Mtoto wa Ande; Njempo, shores of Lake Baringo, taken at night.

Evidently a common though somewhat local species. Mr. Trimen says that he recognized it by the help of a coloured drawing of the type. I have only recently recognized it through Mr. Trimen's plate, a coloured proof of which was submitted to me to pass for printing. In the description by Trimen (South Afr. Butt.) this species is clearly compared with my *J. calescens*, which I find that Staudinger has superseded in his letterpress, though not on his plate, by calling it *Precis octavia*, var. *natalensis*. That it is not a variety (as Staudinger imagined from the fact that he had, apparently, only one example from Natal) is certain; for it occurs in localities where the allied *Junonia octavia* is not found, and which it evidently replaces, as *J. simia* does in the present collection. Whether the names *natalica* and *natalensis* should both stand may be questioned.

25. Junonia terea, var.

Papilio terea, Drury, Ill. Exot. Ent. ii. pl. 18. figs. 3, 4 (1773).

♂, Gopo lal Mavari, Laitsipia; ♀, Alng'aria.

A very dark suffused pair with orange band almost as narrow as in *J. elgiva*, which it tends to link to *J. terea*.

26. Junonia cuama.

Junonia cuama, Hewitson, Exot. Butt. iii. *Jun.* pl. 1. figs. 4, 5 (1864).

Kinani, afternoon; Mtoto wa Ande; steppes of Thika-Shika.

27. Junonia cloantha.

Papilio cloantha, Cramer, Pap. Exot. iv. pl. cccxxxviii. A, B (1782).

Guaso Laschau, Guaso Nyiro.

28. Junonia sesamus.

Precis sesamus, Trimen, South Afr. Butt. i. p. 231, pl. iv. fig. 3 (1887).

Maka.

29. Junonia boöpis.

Junonia boöpis, Trimen, Trans. Ent. Soc. London, 1879, p. 331.

Witu; Njempo.

30. Junonia clelia.

Papilio clelia, Cramer, Pap. Exot. i. pl. xxi. E, F (1779).

Witu; Ngatana, December and January; Njempo; Guaso Laschau; Thagana woods beside Ukikuya; steppes between Athi and Thika; Sabaki Valley at Tanganyika.

In some of Dr. Gregory's examples the blue patch is unusually large on the secondaries, exhibiting the first step in the direction of *J. boöpis*: it varies from cobalt to lilac in tint.

31. JUNONIA CEBRENE.

Junonia cebrene, Trimen, Trans. Ent. Soc. London, 1870, p. 353.

Kinani; platform on Kikuyu escarpment, Kedong, Naiva; shores of Lake Baringo; Njempo; Guaso Narok; Guaso Laschau; steppes N.W. of Longari; Thagana; steppes of Thika-Shika; steppes between Athi and Thika; Athi plains, Chjanjavi; Maka; Ndoli; Sabaki Valley at Tanganyika and near Makongeni.

As regards the form of the tawny patches and the size, shape, and colouring of the blue or violet spot on the secondaries the specimens vary not a little; it therefore seems doubtful whether the Malagasy form, *J. paris*, will prove to be specifically distinct.

32. PYRAMEIS ABYSSINICA.

Pyrameis abyssinica, Felder, Reise der Nov., Lep. iii. p. 397. n. 589 (1867).

No exact locality on the specimen; probably Sabaki Valley.

This interesting little species is quite intermediate between *P. atalanta* and *P. dejeanii*; but, as Felder says, belongs to the *P. atalanta*-group. In colouring it more nearly resembles *Eurema schœneia*, Trimen, but has a short ochreous bar beyond the cell of the primaries representing the white bar in *P. atalanta.*

Trimen observes that I evidently included *E. schœneia* under my *Hypanartia commixta* (in which he is quite correct); but whether the date printed with Oberthür's paper was that of its actual publication is, I think, open to question.

33. PYRAMEIS CARDUI.

Papilio cardui, Linnæus, Faun. Suec. p. 276. n. 1054 (1761).

Guaso Laschau; Thagana; Kenya, camp below the old ice-fall; steppes between Athi and Thika; Ndangi River.

34. PROTOGONIOMORPHA AGLATONICE.

Vanessa aglatonice, Godart, Enc. Méth. ix. p. 299. n. 8 (1819); ♂, Lucas, Lep. Exot. pl. 57. fig. 2 (1835).

Var. ♂. *Salamis definita*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iv. p. 230 (1879).

♀. *Protogoniomorpha definita*, Butler, P. Z. S. 1893, p. 653.

♂ ♀. *Salamis nebulosa*, Trimen, Trans. Ent. Soc. Lond. 1881, p. 441; South Afr. Butt. i. p. 246. n. 79 (1887).

♀ ♀. Sabaki Valley.

Three examples exactly corresponding with typical females of the three supposed species; thus distinctly proving that they are mere sports of one variable form, as I previously suggested.

35. PROTOGONIOMORPHA ANACARDII.

Papilio anacardii, Linnæus, Mus. Lud. Ulr. p. 236 (1764).

Lanjoro, south of Guaso Thegu.

36. Euphædra violacea.

Euryphene violacea, Butler, P. Z. S. 1888, p. 91.

No exact localities on the pair obtained; probably from the Sabaki Valley.

An example from Zanzibar in the series of *E. neophron* recently presented to the Museum by Messrs. Salvin and Godman shows a decided approach to the colouring of *E. violacea*, but has the wing-form of typical *E. neophron*. The latter varies remarkably in colouring, examples from Lake Nyasa being bright green above, those from Delagoa Bay bluish green or greenish blue, those from Zanzibar having a more or less pronounced violaceous suffusion, usually confined to the external area. None, however, have the produced primaries or uniform violaceous colouring of my species, though it is possible that more transitional forms may hereafter be obtained.

37. Hamanumida dædalus.

Papilio dædalus, Fabricius, Syst. Ent. p. 482. n. 174 (1775).

Golbanti; steppes of Thika-Shika; Ndoli; Ndangi River.

38. Godartia wakefieldii.

Godartia wakefieldii, Ward, Ent. Month. Mag. x. p. 152; Afric. Butt. pl. vi. fig. 3 (1873).

No exact localities on specimens, which were therefore probably obtained in the Sabaki Valley.

39. Neptis agatha.

Papilio agatha, Cramer, Pap. Exot. iv. pl. cccxxvii. A, B (1782).

Ngatana; Guaso Laschau; Thiriati; steppes of Thika-Shika.

40. Atella columbina.

Papilio columbina, Cramer, Pap. Exot. iii. pl. ccxxxviii. A, B; iv. pl. cccxxxvii. D, E (1782).

No exact locality on the specimens; probably Sabaki Valley.

41. Acræa cabira.

Acræa cabira, Hopffer, Ber. Verh. Akad. Berlin. 1855, p. 640. n. 7; Peters, Reise nach Mossambique, p. 378, pl. 23. figs. 14, 15 (1862).

Thiriati (shrub-covered plateau, with deep gorges) in Tana river-basin.

42. Acræa ventura.

Acræa ventura, Hewitson, Ent. Month. Mag. xiv. p. 51 (1877); Butler, P. Z. S. 1893, p. 655. n. 61.

Rangatan, Ndari, Laitsipia.

43. Acræa planesium.

Acræa planesium, Oberthür, Études d'Entom. 17th livr. p. 24, pl. 1. fig. 11 (1893).

Thiriati; Machakos; Kavaluki Valley; Maka.

Apparently not a rare species.

44. Acræa perrupta.

Telchinia perrupta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 102. n. 4 (1883).

Golbanti; Mbololo near summit, 5600 ft.; shores of Lake Baringo, S.W. corner; Njempo; Gopo lal Mavari; Guaso Laschau; Thiriati.

45. Acræa lycia.

Papilio lycia, Fabricius, Syst. Ent. p. 464. n. 94 (1775).

Ngatana; Ndara; Njempo; shores of Lake Baringo.

45 *a*. Acræa cæcilia.

Papilio cæcilia, Fabricius, Spec. Ins. ii. p. 34. n. 142 (1781).

Ngatana.

One example of the variety noted P. Z. S. 1888, p. 66. The true *A. cæcilia* is probably a seasonal (certainly a dimorphic) form of *A. lycia*: it only differs from the typical phase in its tawny coloration.

46. Acræa doubledayi.

Acræa doubledayi, Guérin, Lefebvre's Voy. en Abyss. vi. p. 378 (1847).

No exact locality recorded; probably Sabaki Valley.

47. Acræa pudorina.

♂. *Acræa pudorina*, Staudinger, Exot. Schmett. p. 84, pl. 33 (1888).

Acræa acrita, var., Trimen, P. Z. S. 1894, p. 28, pl. iv. fig. 4.

Ndara, in the afternoon; steppes of Thika-Shika and between Athi and Thika; Athi plains near Chjanjavi; Bondoni and Kapte plains; Kibwezi.

Described, according to Staudinger, from a single fresh male; this does not appear from the illustration, for fresh males have the wings far more rosy above, and, below, the apical area of the primaries and disc of the secondaries are cream-coloured, with internervular reddish tawny streaks; after they have flown for a time the cream-colouring seems to get worn (or perhaps darkened) and the streaking is thereby lost; most males show three black spots in a slightly angular oblique series across the centre of primaries, but in some examples the two lower spots are wanting (Staudinger's figure shows a trace of the lowest, but not the middle spot). The female above is of a smoky vinous tint, blackish towards the base, and quite black at base of cell in secondaries; the apical area of primaries smoky fulvous, the costal third and the outer margin more broadly black than in any of the male examples; the external border of the secondaries black, with faint brownish indications of the submarginal spots. Expanse of wings 56 millim.

There is not the slightest question that this is a local representative of *A. acrita*, from which it only differs in the absence of the broad apical black patch on the primaries; in well-marked examples all the spots (on the absence of which Dr. Staudinger relies) are well defined; one specimen even shows an additional spot on the subcostal area, nearer to apex.

48. Acræa natalica.

Acræa natalica, Boisduval, Voy. de Deleg. p. 590. n. 57 (1847).

Ngatana, December and January.

49. Acræa menippe.

Papilio menippe, Drury, Ill. Exot. Ent. iii. pl. 13. figs. 3, 4 (1782).

One worn female from Ngatana.

50. Acræa anemosa.

Acræa anemosa, Hewitson, Exot. Butt. iii., *Acr.* pl. 3. figs. 14, 15 (1865).

Two good specimens without labels of locality, but probably from the Sabaki Valley.

51. Acræa insignis.

Acræa insignis, Distant, P. Z. S. 1880, p. 184, pl. ix. fig. 4.

No exact locality; probably Sabaki Valley.

52. Planema montana.

♂. *Planema montana*, Butler, P. Z. S. 1888, p. 91.

♀. Pattern of male, decidedly larger, the primaries to outer border of secondaries fuliginous; the band of primaries and central area of secondaries white, interrupted by blackish veins; base of secondaries suffused with dull tawny buff, the black spots of the under surface showing through. Expanse of wings 82 millim.

♀, Kibwezi.

We have received both sexes of this species from Kilimanjaro.

53. Hyreus æquatorialis.

Lycæna æquatorialis, E. M. Sharpe, P. Z. S. 1891, p. 637, pl. xlviii. fig. 5.

♂ ♀, Summit of Mount Höhnel, 16,000 feet; Kenya and camp below the old ice-fall, 10,500 feet.

Strictly speaking this species and *H. webbianus* hardly belong to *Hyreus*, as their hind wings are not tailed.

The figure is taken from a somewhat abnormal specimen; most examples have the dark discal band toothed in the centre, the prominence emitted from the centre of the band and sometimes entirely dividing the white submarginal band; this is the case with Dr. Gregory's pair of the species, and with several unset specimens shown to me by Miss Sharpe.

54. Zizera knysna.

Lycæna knysna, Trimen, Trans. Ent. Soc. Lond. 3rd ser. vol. i. p. 282 (1862).

♂ ♀, Mtoto wa Ande; shores of Lake Baringo; Njempo.

55. Zizera gaika.

Lycæna gaika, Trimen, Trans. Ent. Soc. Lond. 3rd ser. vol. i. p. 403 (1862).

♂ ♀, Njempo.

56. Lycænesthes amarah.

Polyommatus amarah, Guérin, Lefebvre's Voy. en Abyss. p. 384, pl. 11. figs. 5, 6.

♂ ♀, Larabwal, Laitsipia.

57. Lycænesthes kersteni.

Lycæna kersteni, Gerstäcker, Archiv für Naturg. 1871, p. 359. n. 27; Van der Decken's Lep. Ost-Sibiriens, p. 373. n. 27, pl. xv. fig. 5 (1873).

One fragmentary male, from Mtoto wa Ande.

I am at a loss to understand why Mr. Trimen regarded this species as synonymous with *L. larydas*; the two forms appear to me as distinct as any of the species in the genus and only show a resemblance to each other on the upper surface; but even there the shade of deep blue in the males differs and the form is strikingly different, the front wings of *L. kersteni* being elongate-triangular, those of *L. larydas* comparatively short in the costa and consequently with the outer margin almost straight instead of very oblique. Taking the entire outline of *L. larydas* it roughly represents a semicircle, whilst that of *L. kersteni* more nearly approaches a triangle with truncated apex.

58. Catochrysops osiris.

Lycæna osiris, Hopffer, Ber. Verh. Ak. Berlin, 1885, p. 642. n. 21; Peters's Reise nach Mossambique, v. p. 409, pl. 26. figs. 11, 12 (1862).

No exact locality given; probably Sabaki Valley.

59. Polyommatus bæticus.

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

♂ ♀, Ngatana *in coitu*; Kavaluki Valley, Ukamba.

60. Castalius gregorii, sp. n. (Plate XXXVI. fig. 3.)

♂. Allied to *C. calice* and *C. cretosus*; above nearest to the latter, the white area of the primaries still wider, the submarginal spot crossed by the radials larger, but no white spots on the outer border below it: secondaries above with the basal third greyish, traversed by nearly straight blackish bars, partly visible through the wing, and further obscured by long greyish hair; outer border rather narrow and quite regular; only the first of the disco-submarginal series of spots being present, close to apex; white submarginal lunules small and inconspicuous. Below, the primaries are almost the same as in *C. calice*, but the black spots on the submarginal white band are smaller, the lowest being absent; the white areas generally are also broader: the secondaries below differ from those of *C. calice* in that the two irregular series of black spots crossing the basal half are confluent, forming black bands, the discal series of spots being only represented by a small subapical dot; the submarginal partly blue-edged black spots smaller and reduced to five in number. Expanse of wings 31 millim.

Bondoni and Kapte Plains.

Only one example was obtained, but in tolerably good condition.

61. Azanus occidentalis.

Azanus occidentalis, Butler, P. Z. S. 1887, p. 571. n. 32.

♀, Gopo lal Mavari; ♂, Thagana, woods beside Ukikuya.

62. Plebeius trochilus.

Lycæna trochilus, Freyer, Neuere Beitr. v. pl. 440. fig. 1 (1844).

Njempo.

63. Plebeius, sp.?

One much-worn and broken female example of a species which I have been unable to identify.

Rangatan, Ndari.

64. Tatura philippus.

Hesperia philippus, Fabricius, Ent. Syst. iii. 1, p. 283. n. 87 (1793).

No exact locality recorded.

65. Virachola anta.

Lycæna anta, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 402 (1862).

Sabaki Valley.

66. Stugeta bowkeri.

Iolaus bowkeri, Trimen, Rhop. Afr. Austr. p. 225. n. 130, pl. 4. fig. 4 (1866).

S.W. corner of Lake Baringo.

This is quite distinct from *S. marmorea*, from the White Nile; that species shows no trace of the conspicuous blue colouring of *S. bowkeri*.

67. Spindasis nyassæ. (Plate XXXVI. fig. 4.)

Aphnæus nyassæ, Butler, Ent. Mo. Mag. xx. p. 250 (1884).

Two females, without exact locality.

68. Axiocerses perion.

Papilio perion, Cramer, Pap. Exot. iv. pl. ccclxxix. B, C (1782).
♂, Steppes N.W. of Longari, Laitsipia.

69. Cigaritis abbottii.

Chrysophanus abbottii, Holland, Entomologist, xxv. (Suppl.) p. 90 (1892).
Guaso.

70. Mylothris agathina.

Papilio agathina, Cramer, Pap. Exot. iii. pl. ccxxxvii. D, E (1782).
Mbololo near summit, 5600 feet; Kibwezi.

71. Mylothris rüppellii.

Pieris rüppellii, Koch, Indo-Austr. Lep. Fauna, p. 88 (1865).
♀, Alng'aria, Laitsipia.

72. Nychitona alcesta.

Papilio alcesta, Cramer, Pap. Exot. iv. pl. ccclxxix. A (1782).
Ngatana, December and January.

73. Colias edusa, var. electra.

Papilio electra, Linnæus, Syst. Nat. i. 2, p. 764. n. 101 (1767).
Steppes N.W. of Longari; Thagana, in woods; Thegu, in park-land; Mt. Kenya, below the old ice-fall, 10,500 feet; Karati, Konu, Ukikuya, beside swamp; Thiriati, Konu, on shrub-covered plateau.

In British East Africa this species is very variable, both in size and depth of colour: one of the males from the first-mentioned locality has all the appearance of typical *C. edusa* (nor do I believe that it possesses a character to distinguish it therefrom), and none of the distinctive points indicated in Trimen's 'South African Butterflies' avail to separate it, seeing that it does not possess them. The "inward nervular dentations of the hind-marginal border" are very variable in both types; indeed a male in the Museum from Malta shows stronger dentations than those normally exhibited in *C. electra*, whilst in the specimen above mentioned they are hardly so well marked as in the majority of typical *C. edusa*, and a specimen in the Museum from Kilimanjaro, though dark in colour and smaller than usual, shows no inward dentation of the border.

74. Terias brigitta.

Papilio brigitta, Cramer, Pap. Exot. iv. pl. cccxxxi. B, C (1782).
Steppes N. of Thegu.

75. Terias zoë.

Terias zoë, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 640. n. 5; Peters, Reise nach Mossamb., Zool. pl. 23. figs. 10, 11 (1862).

Ngomeni to Kinani; Mtoto wa Ande; Miviruni, Baringo Valley, Mguki; shores of Lake Baringo; steppes of Thika-Shika; Athi plains near Chjanjavi; Machakos; Bondoni and Kapte plains; Ndangi River.

76. Terias regularis.

Terias regularis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 486 (1876).

Mbololo, near summit, 5600 feet.

77. Terias desjardinsii.

Xanthidia desjardinsii, Boisduval, Faune Ent. de Madag. p. 22, pl. 2. fig. 6 (1833).

♂, Mbololo, near summit.

One rather ragged, but very singular, male specimen, in which the outer border of the primaries is formed as in *T. formosa*, Hübn., and the black edging of the costal margin is wanting.

78. Terias boisduvaliana.

Terias boisduvaliana, Mabille, Hist. Nat. de Madag. i. pl. 32. figs. 4–7.

Ngatana in wood, 30th January, 1893; Njempo; Larabwal, Laitsipia; Ndoro, steppes at base of Kenya, 7000 feet.

This species is not unlike a pale brimstone-coloured representative of my *T. ceres*, to which Mr. Trimen has unaccountably given the new designation of *T. ethiopica*; our examples of the latter are from S. Africa, Natal, Mauritius, and Madagascar. The outer border of the primaries in *T. boisduvaliana* usually resembles that of *T. brenda*.

79. Terias orientis.

Terias orientis, Butler, P. Z. S. 1888, p. 71. n. 87.

♂ ♀, Ngatana, December and January.

Specimens of the preceding species sometimes agree closely with this on the upper surface, but not below.

80. Teracolus calais.

Papilio calais, Cramer, Pap. Exot. i. pl. liii. C, D (1779).

Ngatana, near wood on barra, 30th January, 1893; east shore of Lake Losugata, on grass and scrub.

81. Teracolus hanningtonii.

Teracolus hanningtoni, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 104. n. 8 (1883).

♀, Sabaki Valley. We originally received this species from the Victoria Nyanza.

82. Teracolus catachrysops.

Teracolus catachrysops, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. ii. p. 178 (1878).

♂ ♂, Ndoli.

Described from specimens collected at Masasi, and since received from Kilimanjaro.

83. Teracolus aurigineus.

Teracolus aurigineus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 103. n. 7 (1883).

Njempo; Guaso Narok; Guaso Laschau; Guaso Nacrotia; steppes N.W. of Longari; Thagana, woods beside Ukikuya; Thegu.

84. Teracolus helvolus.

Teracolus helvolus, Butler, P. Z. S. 1888, p. 94.

Sabaki Valley, at Tanganyika.

My supposition that *T. helvolus* would prove to be restricted to Somaliland is thus proved incorrect.

85. Teracolus protomedia.

Pontia protomedia, Klug, Symb. Phys. pl. 8. figs. 13, 14 (1829).

♂ ♀, Golbanti.

86. Teracolus agoye, ♀ ? (= *Idmais fatma*, Feld.)

♂. *Anthopsyche agoye*, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 15. n. 11.

♂ ♀. *Anthocharis agoye*, Trimen, Rhop. Afr. Austr. p. 325. n. 219 (1866).

♀. Var.? without indication of exact locality; probably Sabaki Valley.

This female differs from that described by Mr. Trimen in having traces of two spots on the median interspaces of the primaries, and a faintly indicated internal streak ending in a third spot; it comes nearest to the form which I described under the name of *Teracolus johnstoni* (the descriptions of which and of *T. opalescens* Mr. Trimen seems to have overlooked), Ent. Month. Mag. xxiii. p. 29 (1886). I strongly suspect it to be the female of the "♂ from the Lydenburg District of the Transvaal," which Mr. Trimen mentions, as the underside of the hind wings and apex of fore wings are tinted with pale creamy pinkish; it clearly demonstrates the affinity of *T. agoye* to the *T. eris* group.

Since Mr. Trimen examined our collection, we have added, through the generosity of Mr. C. G. Barrett, two pairs of *T. johnstoni* from Amshaw, King William's Town. The male is very distinct from that of typical *T. eris*; the apical area of the primaries is more restricted, with the ochreous spots brighter, broader, shorter, and only separated by slender black veins; on the second (upper) median interspace also there is a very large oval white marginal spot, and below this again the black is externally undulating, leaving three pure white indentations confluent with the white fringe. On the secondaries the black costal border, instead of extending almost to the apex, is cut across transversely and therefore terminates much more abruptly. I have no doubt that both this and *T. opalescens* constitute constant local races, far more worthy of specific rank than many of the species which my excellent, but, as I think, inconsistent, friend has considered distinct [1].

The markings in Dr. Gregory's example are less strongly defined than in Felder's figure; but there cannot be a question as to the identity of the species; at the same time, I should doubt whether the two males associated in the Hewitson collection under the name of *T. agoye* are actually one species.

87. Teracolus puniceus. (Plate XXXVI. figs. 5, 6.)

Teracolus puniceus, Butler, P. Z. S. 1888, p. 72. n. 92.

♂, without label of exact locality; probably Sabaki Valley. The female we received from the Victoria Nyanza.

88. Teracolus foliaceus, sp. n. (Plate XXXVI. fig. 7.)

♀. Above chalky white, the basal third irrorated with fine grey scales: primaries with a conspicuous spot at the end of the cell; the apical two-thirds of costa and the apical third of wing to inner margin, as well as a large almost wedge-shaped spot only separated from the latter by a large round white spot near external angle, black, slightly suffused with brown near outer margin; a series of six sordid white spots in an arched series between costa and the above-mentioned large white spot, the first small, the second large and pyriform, the remainder regularly decreasing in size, the second, third, and fourth spots flecked with magenta; submedian vein, base of inner margin, and subcostal vein of secondaries tinted with sulphur: secondaries with a very broad external black border, occupying about one-fourth of the wing, its inner edge strongly dentated on the veins, and an oblique squamose subapical black streak from costa to centre of third median branch: body normal. Primaries below white, the base primrose-yellow, followed in the cell by a transverse greyish nebula; black spot at end of cell as above; costa and a broad apical border, tapering to first median branch, buff-yellowish, the latter transversely striated with grey and bounded internally by whitish spots, of which the first three are defined by an inner diffused bordering of argillaceous brown shading into grey-brown, and the remainder by a series of more or less acutely angulated black spots curving inwards to submedian area, the upper ones also placed on a diffused grey-brown area answering to the inner edge of the black area of the upper surface: secondaries whitish, tinted with pearl-grey and

[1] It has always been a puzzle to me that Lepidopterists, who in one genus allow unlimited variability and extraordinary ranges to the species, in a nearly-allied genus restrict both in an equally remarkable degree.

buff and transversely striated with grey; base of costal margin saffron-yellow; a rounded pale buff spot at end of cell upon a triangular greyish testaceous area, partly bounded externally by a well-defined dull copper-brown oblique bar from costa to third median branch; this bar is continued, almost at right angles, by three brown spots on a buff-tinted nebula; outer border buff; abdominal area creamy whitish: body below white. Expanse of wings 43 millim.[1]

No exact locality given; probably Sabaki Valley.

Although evidently belonging to the *T. regina* group, this female is much more heavily black-bordered than any other species of the group; the striated and clouded under surface give the insect (when its wings are closed) the appearance of a dead and mouldering leaf.

89. Teracolus phlegyas.

Anthocharis phlegyas, Butler, P. Z. S. 1865, p. 431. n. 3, pl. xxv. figs. 3, 3 *a*.

♂ ♂, no exact locality recorded; probably Sabaki Valley.

90. Teracolus imperator.

Teracolus imperator, Butler, P. Z. S. 1876, p. 132. n. 20.

♂ ♂, no exact locality recorded; probably Sabaki Valley.

91. Teracolus phœnius.

♂. *Teracolus phœnius*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 488 (1876).

♀. *Albino form*, Butler, P. Z. S. 1888, p. 74. n. 95.

Ngatana; shores of Lake Baringo; Njempo; steppes of the Kiroruma; Kavaluki Valley; Ndangi River.

Three of the four females in the above series have crimson tips to the primaries and therefore differ very slightly from females of *T. miles*. The latter will, I think, have to be considered synonymous with this species.

92. Teracolus incretus.

♀. *Teracolus incretus*, Butler, Ent. Month. Mag. xviii. p. 146 (1881).

♂. *Callosune vulnerata*, Staudinger, Exot. Schmett. pl. 23.

♂ ♂, Steppes of Thika-Shika and Ndangi River.

One of the specimens is larger than any previously received.

93. Teracolus syrtinus.

♂. *Teracolus syrtinus*, Butler, P. Z. S. 1876, p. 163. n. 124.

♀. White, with black markings above almost exactly as in the female of *T. phillipsii*; the base of the wings more suffused with grey, but less so than in *T. xanthevarne*, ♀; apical area pale

[1] The under surface of Westwood's reputed female of *T. buxtoni* somewhat approaches this species.

salmon, sometimes extending beyond the subapical irregular black band; under surface nearly as in *T. phillipsii*, but more strongly tinted with yellow, buff, and pink, and with the discal brown markings larger and better defined.

Expanse of wings 42–43 millim.

Ngatana; platform on Kikuyu escarpment, Kedong, Newà in forest; shores of Lake Baringo; Njempo.

This is evidently an abundant species.

93 *a*. TERACOLUS CITREUS.

Teracolus citreus, Butler, P. Z. S. 1876, p. 162. n. 120.

Kinani, in the afternoon; also probably Sabaki Valley.

This differs from *T. syrtinus* in its usually inferior size, less black-bordered primaries, and the pink colouring on the under surface of the secondaries. It probably bears the same relationship to *T. syrtinus* that *T. eucharis* of India does to *T. titea*. Unfortunately only one example has an indication of exact locality, so that it is impossible to tell whether the two types occur together; but with our present knowledge of the variability of species I hesitate to consider them distinct.

94. TERACOLUS NOUNA.

Anthocharis nouna, Lucas, Expl. Alg., Zool. iii. p. 350. n. 14, pl. i. fig. 2 (1845).

♂, Machakos, two damaged specimens.

95. TERACOLUS THEOGONE?

Anthocharis theogone, Boisduval, Sp. Gén. Lép. i. p. 575. n. 23 (1836).

♂, Thagana, woods beside Ukikuya; ♀, park-land between Thegu and Ukikuya.

Only one damaged pair was obtained. The male is almost exactly like typical *T. theogone*, but has larger marginal spots to the secondaries: the female has no trace of the inner marginal broad black band to the primaries, and therefore nearly approaches that sex of *T. epigone*; the under surface of the secondaries also is pink, not yellowish. Possibly this is a species between *T. theogone* and *T. epigone*; but the two specimens are not good enough to describe.

96. TERACOLUS PYRRHOPTERUS, sp. n. (Plate XXXVI. figs. 8, 9.)

Allied to *T. theogone*; the male above with the patch upon the black apical area orange-vermilion, as in the female of that species; the costal margin black quite to the base; a broad truncated black streak on internal area from base to second third of wing: secondaries with a similar though less regular costal streak; two ill-defined unequal spots on third median and radial veins (recalling the marking of female *T. hippocrene*), and a marginal series of hastate black spots, almost confluent: body normal. Primaries below white, the costa, apex, outer margin, and fringe soft rose-colour, but towards external angle the fringe is tipped with white; a large subapical patch of deep orange-salmon, blending with the rose-colour at apex: secondaries rose-colour; a white diffused subapical nebula; the surface, especially towards the base, sparsely irrorated and striated with blackish; a black-dotted orange-salmon spot at end of cell and an imperfect angulated band, as in *T. theogone*, of brown: body below white. Expanse of wings 40 millim.

♀. Rather smaller than the male: in pattern nearly resembling *T. procne*; but the orange subapical band coloured as in the male, and the base of both wings much more widely and densely dusted with blackish; the fringe of primaries rosy as in the male: below as in the male, but slightly deeper in colour, especially on the secondaries, where the interrupted band is gravel-red. Expanse of wings 36 millim.

One slightly damaged pair, at Thagana, in woods beside Ukikuya.

In the fiery colouring of the under surface this species is quite remarkable. A male variety also occurs which above more nearly approaches *T. omphale*, and below has the apical border of primaries and ground-colour of secondaries creamy whitish, with the band of secondaries brick-red.

97. Teracolus zera.

♂ ♀. *Anthocharis zera*, Lucas, Revue et Mag. de Zool. iv. p. 423 (1852).

♂, Guaso Laschau; ♀, Guaso Nacrotia; ♂, Ndoro, steppes at base of Kenya, 7000 feet.

The description by M. Lucas probably confounds several different types (species?); the only safe guide in the description seems to be the orange tint which he mentions as pervading the under surface of the secondaries in the male; he, however, fails to note that on the under surface the veins are dusky; in the examples above recorded they are black towards anal angle and on the abdominal fold. The absence of the small orange spot attached to the black discocellular dot is not likely to be a constant character.

98. Teracolus helle.

Teracolus helle, Butler, P. Z. S. 1876, p. 149. n. 75.

Gopo lal Mavari, Laitsipia; Guaso Narok; Guaso Laschau; Guaso Nacrotia; steppes N.W. of Longari; Ndoro, steppes at base of Kenya, 7000 feet; Karati, Konu, Ukikuya, Tana, in dense forest; sandy steppes on the south bank of the Kiroruma.

99. Teracolus subvenosus.

Teracolus subvenosus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 105. n. 10 (1883).

♂ ♀, Miviruni, Elmeteila Basin, Baringo Valley, Mjaki; Gopo lal Mavari, Laitsipia; Alng'aria; Guaso Laschau; Thagana, woods beside Ukikuya; Thegu; Kavaluki Valley, Ukamba.

100. Teracolus hero.

Teracolus hero, Butler, P. Z. S. 1876, p. 150. n. 81, pl. vi. fig. 12.

♂ ♀, no exact locality recorded; probably Sabaki Valley.

101. Teracolus antevippe.

Anthocharis antevippe, Boisduval, Sp. Gén. Lép. i. p. 572. n. 18, pl. 18. fig. 3 (1836).

♂ ♀, Guaso Narok.

In *T. zera*, *helle*, *subvenosus*, and *hero* the veins are more or less blackened on the under surface, but in *T. antevippe* they are uniform with the white ground-colour; the black veins when present do not result from abrasion, but are clothed with black scales. Of course it is possible that this character may prove to be unimportant, but that remains to be seen.

102. Teracolus omphale.

Pieris omphale, Godart, Enc. Méth. ix. p. 122. n. 12 (1819).

♂ ♀, no exact locality recorded; probably Sabaki Valley.

103. Teracolus exole.

♂. *Anthocharis exole* (part), Reiche, Ferr. Gal. Voy. Abyss., Ent. p. 460, pl. 31. fig. 4 (1849).

♀. *Anthocharis achine*, Lucas (not Cramer), Lep. Exot. pl. 37. fig. 2 (1835).

♀, no exact locality recorded; probably Sabaki Valley.

This is probably an extreme form (possibly a brood) of the preceding.

104. Teracolus thruppi.

Teracolus thruppi, Butler, P. Z. S. 1885, p. 771, pl. xlvii. fig. 10.

Barra near Merifano; S.W. corner of Lake Baringo, Ukikuya.

105. Teracolus minans.

Teracolus minans, Butler, Ent. Month. Mag. xviii. p. 229 (1882).

♂ ♀, Njempo.

A melanistic form of the female occurs in this, as in other allied species.

106. Catopsilia pyrene.

Colias pyrene, Swainson, Zool. Ill. i. pl. 51 (1820–21).

♂ ♀, Ngatana; Kinani; Thika-Shika.

107. Catopsilia florella.

Papilio florella, Fabricius, Syst. Ent. p. 479. n. 159 (1775).

♂ ♀, Ndoro, steppes at base of Kenya, 7000 feet; Ndangi River.

108. Glutophrissa contracta.

Glutophrissa contracta, Butler, P. Z. S. 1888, p. 75. n. 102.

♂, Ngatana; ♀, Lake Losuguta.

109. Phrissura lasti.

Mylothris lasti, Grose-Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 124 (1889).

Belenois lasti, Smith & Kirby, Rhop. Exot. ii. pl. *Belen.* ii. figs. 1–3 (1892).

♂ ♀, Sabaki Valley, at Tanganyika.

This is probably the species mimicked by *Mylothris narcissus.*

110. Belenois thysa.

Pieris thysa, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 639. n. 1; Peters's Reise nach Mossamb., Zool. v. p. 349, pl. 21. figs. 7–10 (1862).

Kibwezi.

111. Belenois severina.

Papilio severina, Cramer, Pap. Exot. iv. pl. cccxxxviii. G, H (1782).

Ngatana; Barra near Merifano; Golbanti; Miviruni; steppes of Thika-Shika.

The majority of the specimens were obtained at Golbanti.

111 *a*. Belenois infida. (Plate XXXVII. figs. 1, 2.)

Belenois infida, Butler, P. Z. S. 1888, p. 78. n. 111.

Golbanti; Miviruni; Lake Losuguta; shores of Lake Baringo; Njempo; Gopo lal Mavari; Guaso Narok; steppes N.W. of Longari; Thagana; Thegu; Ukikuya; Kithungulu; steppes of Thika-Shika; steppes between Athi and Thika; Athi plains near Chjanjavi; Machakos; Maka; Ndangi River; Sabaki Valley.

The enormous series of this species collected by Dr. Gregory proves, beyond dispute, that *B. infida* is only a Central and East African development of *B. severina*, to which every possible link exists; it is only by eliminating all the specimens having dark veins on the under surface from the series, that *B. severina* can be at all distinguished from this race. The black bar at the end of the cell, in this genus, proves to be a most unreliable character for the discrimination of species; indeed I have very little doubt that *Pieris ogygia* of Trimen will prove, when a large series can be obtained, to be simply a development of *Belenois thysa* of Hopffer. *Belenois zochalia* (as will be shown presently) varies in the same way.

112. Belenois mesentina.

Papilio mesentina, Cramer, Pap. Exot. iii. pl. cclxx. A, B (1782).

Golbanti; Kinani; Njempo; Guaso Laschau; Kithungulu, Konu, Ukikuya, on shrub-covered plateau with deep gorges; sandy steppes on the south bank of the Kiroruma, Tana river-basin; steppes of the Thika-Shika; steppes between Athi and Thika; Athi plains near Chjanjavi; Bondoni and Kapte Plains; Ndangi River.

Represented by the form *B. lordaca*, and the larger but otherwise exactly similar *B. agrippina*.

113. Belenois gidica.

Pieris gidica, Godart, Enc. Méth. ix. p. 131. n. 37 (1819).

Witu, in garden; Golbanti; Njempo; Ukikuya; steppes of Thika-Shika; steppes between Athi and Thika; Ndoli; Kibwezi.

One female nearly approaches typical *B. abyssinica*.

114. Belenois zochalia. (Plate XXXVII. fig. 3.)

Pieris zochalia, Boisduval, Sp. Gén. Lép. i. p. 508. n. 100 (1832).

♂ ♀, Gopo lal Mavari, Laitsipia; Guaso Laschau; steppes N.W. of Longari; Thagana, in woods beside Ukikuya; Thegu; Ndoro, steppes at base of Kenya, 7000 feet; on shrub-covered plateau at Kithungulu, Konu, Ukikuya, Tana river-basin.

Two forms of this species were obtained, the first only differing from the southern type in its usually slightly superior size; the male with slightly narrower oblique black bar at end of cell, larger white hastate spots on the apical black area, and primrose-whitish colouring of the under surface of the secondaries. The second form, however, has the black discocellular bar reduced to a spot at the inferior angle of the cell in the male, but in the female only slightly narrower than in the first form; on the under surface the veins are more heavily defined and sometimes quite black. It is useless to attempt to separate the latter from *B. zochalia*; and as it shows a decided tendency in the direction of *B. crawshayi*, it is within the range of possibility that, as the fauna of Africa becomes better known, a series of gradations between *B. zochalia* and that apparently distinct form will be discovered. Indeed, after seeing the series of grades between typical *B. infida* and *B. severina* nothing will surprise me in the way of linking the African species of *Belenois*. I am quite satisfied that *B. gidica* and *B. abyssinica* cannot be regarded as distinct species.

115. Synchloë johnstonii.

Synchloë johnstonii, Crowley, Trans. Ent. Soc. 1887, p. 35, pl. iii. figs. 1–3.

Gopo lal Mavari; Guaso Laschau; steppes N.W. of Longari; Thagana, in woods beside Ukikuya.

116. Pinacopteryx ortygna.

♂. *Mylothris ortygna*, Hübner, Exot. Schmett. Zutr. figs. 985, 986 (1832).

♂ ♀, on grassy steppes at Miviruni.

117. Pinacopteryx liliana.

♂ ♀. *Belenois liliana*, H. Grose Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 122 (1889).

Pinacopteryx liliana, Smith & Kirby, Rhop. Exot. ii. *Pinac.* 1, figs. 7–9 (1893).

♀, Ngatana, 30th January 1893, near wood.

118. Pinacopteryx pigea.

Pieris pigea, Boisduval, Sp. Gén. Lép. i. p. 523. n. 124 (1836).

♂, Steppes of Thika-Shika.

119. Herpænia iterata. (Plate XXXVII. fig. 4.)

Herpœnia iterata, Butler, P. Z. S. 1888, p. 96. n. 8.

Njempo.

120. Nepheronia capensis.

Eronia buquetii, var. *γ*. *capensis*, Hopffer, in Peters's Reise Mossamb. p. 363 (1862).

Nzoai.

Only one example, somewhat shattered, was obtained.

121. Nepheronia buquetii.

Callidryas buquetii, Boisduval, Sp. Gén. Lép. i. p. 607. n. 1 (1836).

♂ ♀, Shores of Lake Baringo. (Common.)

122. Nepheronia thalassina.

Pieris thalassina, Boisduval, Sp. Gén. Lép. i. p. 443. n. 8 (1836).

♂, no exact locality recorded; probably Sabaki Valley.

123. Nepheronia argia.

Papilio argia, Fabricius, Syst. Ent. p. 470. n. 118 (1775).

♂ ♀, no exact locality recorded; probably Sabaki Valley.

The female corresponds with that noted by me (P. Z. S. 1888, p. 96, from Kilimanjaro), excepting that the patch of red is wanting on the upper surface of the primaries.

124. Eronia dilatata.

Eronia dilatata, Butler, P. Z. S. 1888, p. 96. n. 9.

Eronia cleodora, var. *latimarginata*, Weymar, Stett. ent. Zeit. 1892, p. 96. n. 13.

Kibwezi.

125. Papilio kirbyi.

Papilio kirbyi, Hewitson, Ent. Month. Mag. ix. p. 146 (1872); Exot. Butt. v., *Pap.* pl. 13. fig. 42 (1873).

No record of exact locality; probably Sabaki Valley.

126. Papilio colonna.

Papilio colonna, Ward, Ent. Month. Mag. x. p. 151 (1873).
Papilio tragicus, Butler, l. c. xiii. p. 56 (1876).
Kibwezi.

127. Papilio nyassæ.

Papilio nyassæ, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 459 (1877).

No exact locality recorded; probably Sabaki Valley.

128. Papilio philonoë.

Papilio philonoë, Ward, Ent. Month. Mag. x. p. 152 (1873).
Ngatana.

129. Papilio demoleus.

Papilio demoleus, Linnæus, Mus. Lud. Ulr. p. 214 (1764).
Ndara; Guaso Laschau; Ndangi River.

130. Papilio constantinus.

Papilio constantinus, Ward, Ent. Month. Mag. viii. p. 34 (1871); Afr. Lép. p. 1, pl. i. figs. 1, 2 (1873).
Kibwezi.

131. Papilio erinus.

Papilio erinus, Gray, Cat. Lep. Ins. B. M. i. p. 35. n. 127 (1865).
Kibwezi.

132. Papilio phorcas.

Papilio phorcas, Cramer, Pap. Exot. i. pl. ii. B, C (1775).
Alng'aria; Rangatan, Ndari.

133. Papilio merope.

Papilio merope, Cramer, Pap. Exot. ii. pl. 151. figs. A, B (1779).

One female, in bad condition, of the form figured by Trimen (Trans. Linn. Soc. xxvi. pl. 43. fig. 4, 1869).
Golbanti.

134. Sarangesa motozioides.

Sarangesa motozioides, Holland, Ann. & Mag. Nat. Hist. ser. 6, vol. x. p. 288. n. 9 (1892).

Mtoto wa Ande; Karianduri; shores of Lake Baringo, Njempo.

135. Sarangesa djælælæ.

Pterygospidea djælælæ, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 54.

Ndoro, steppes at base of Kenya 7000 feet; Athi Plains, near Chjanjavi.

136. Osmodes ranoha.

Pamphila ranoha, Westwood, in Oates's 'Matabele-land,' p. 353 (1881).

Fuladoya.

137. Gegenes letterstedti.

Hesperia letterstedti, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 49.

Guaso Nacrotia, Laitsipia.

When Mr. Samuel Scudder was last in Europe, he brought with him a number of carefully coloured drawings of *Hesperiidæ* for comparison with types in various collections. Among other species thus cleared up, he proved, by camparison with Latreille's type of *G. hottentota*, that (instead of being a form of *G. letterstedti*) it was the *G. obumbrata* of Trimen.

138. Baoris fatuellus.

Pamphila fatuellus, Hopffer, Monatsber. k. Akad. Wiss. Berlin, 1855, p. 643. n. 25; Peters's Reise nach Mossamb. v. p. 417, pl. 27. figs. 3, 4 (1862).

No record of exact locality; probably Sabaki Valley.

139. Baoris inconspicua.

Hesperia inconspicua, Bertoloni, Mem. Acc. Bol. 1849, p. 15.

Ngatana; Njempo.

140. Rhopalocampta pisistratus.

Hesperia pisistratus, Fabricius, Ent. Syst. iii. 1, p. 345. n. 311 (1793).

Kibwezi.

141. Rhopalocampta keithloa.

Rhopalocampta keithloa, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 48.

No exact locality recorded; probably Sabaki Valley.

There is also one much damaged male, apparently of *Cyclopides quadrisignatus*, from Rangatan.

The Moths, unfortunately, are, in many cases, too much injured for identification, but I have succeeded in determining the following:—

142. Macroglossa trochiloides.

Macroglossa trochiloides, Butler, P. Z. S. 1875, p. 5. n. 6.

Ngatana.

143. Chærocampa celerio.

Sphinx celerio, Linnæus, Syst. Nat. i. 2, p. 800 (1767).

One worn example at Alng'aria.

144. Ægocera meneta.

Noctua meneta, Cramer, Pap. Exot. i. pl. lxx. D (1775).

One worn example from Kinani.

145. Ægocera tricolor.

Ægocera tricolor, Druce, Ent. Month. Mag. xx. p. 155 (1883).

One fairly good female, without record of exact locality, but probably from the Sabaki Valley.

146. Charilina amabilis.

Noctua amabilis, Drury, Ill. Exot. Ent. ii. pl. 13. fig. 3 (1773).

Ngatana.

Either all the specimens are uniformly faded, or they represent a distinct race in which the whole of the black and red of typical *C. amabilis* are replaced by pale brown, almost like dead gold; the markings are absolutely normal in pattern.

147. Euchromia africana.

Euchromia africana, Butler, Journ. Linn. Soc. vol. xii. p. 364.

No record of exact locality; probably Sabaki Valley.

148. Deiopeia pulchella.

Tinea pulchella, Linnæus, Syst. Nat. i. p. 534. n. 238 (1758).

No record of exact locality; probably Sabaki Valley.

149. Argina cingulifera.

Deiopeia cingulifera, Walker, Lep. Het. ii. p. 569 (1854).

Var. *Deiopeia ocellina*, Walker, l. c. p. 571 (1854).

Ndoli.

150. Ghoria nigricostata, sp. n. (Plate XXXVII. fig. 5.)

Primaries dull silvery white with golden reflections; costal margin black: secondaries pale golden buff; thorax above silvery, vertex of head brownish; abdomen golden ochreous. Primaries below leaden grey, with costal and external borders golden ochreous; secondaries and body below golden ochreous. Expanse of wings 37 millim.

Platform on Kikuyu Escarpment, Kedong.

151. Lithosia ?, sp.

One much damaged example of a species with coarsely pectinated antennæ; probably new, but not in condition to describe.

Ukikuya.

152. Rhanidophora phedonia.

Bombyx phedonia, Cramer, Pap. Exot. iv. pl. cccxlvii. C (1782).

Alng'aria; Maka.

Two much-damaged examples were obtained.

Single examples of *Nolidæ* and *Sarrothripinæ* in poor condition are also in the collection, including one specimen of a species of *Siccia* allied to *S. caffra*. With one exception, these are without exact localities; therefore probably from the Sabaki Valley.

153. Sænura lineata.

Spilosoma lineata, Walker, Lep. Het. iii. p. 672. n. 17 (1855).

No exact locality recorded; probably Sabaki Valley.

154. Alpenus purus.

Alpenus purus, Butler, P. Z. S. 1878, p. 382.

Two examples from Njempo.

155. Teracotona submacula, var. rhodophæa.

Spilosoma submacula, Walker, Lep. Het. iii. p. 672. n. 15 (1855).
Var. *Aloa rhodophæa*, Walker, l. c. Suppl. i. p. 302 (1864).

No exact locality recorded; probably Sabaki Valley.

It is just possible that *T. rhodophæa* may prove to be a constant local form: the chief differences from typical *T. submacula* consist in the absence of the black discocellular spot on the upper surface of the primaries, the white variegation of these wings, and the uniformly rosy ground-colour of the secondaries; this last character is, however, shared by a specimen from Natal, to which I gave the name of *T. roseata*.

156. Pleretes tigris.

Hypercompa tigris, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 106. n. 13 (1883).

No exact locality recorded; probably Sabaki Valley.

The three specimens obtained are all more or less damaged; they differ from the types in the much broader leaden-grey bands, the more creamy ground-colour of the primaries, and the deeper orange of the secondaries.

157. Secusio parvipuncta.

Secusio parvipuncta, Hampson, Ill. Typ. Lep. Het. viii. p. 46, pl. 139. fig. 6.

Secusio strigata, Hampson (? Walker), Fauna of Brit. India, Moths, vol. ii. p. 50. n. 1272, fig. 23.

Steppes of the Thika-Shika; steppes between Athi and Thika, and Kavaluki Valley, Ukamba.

It is quite possible that this may be only a variety of Walker's *S. strigata*=*hymenæa*, Gerst.; but, hitherto, intermediate links between the two forms have not been received, and therefore, for the present, I prefer to keep them separate; at the same time the difference between them is no greater than between individual examples of *S. parvipuncta*.

158. Leptosoma restrictum, sp. n.

Allied to *L. leuconoë*, of which it appears to be an Eastern representative; it differs in having the band of primaries pure semitransparent white, without the strong indentations on the veins which are present in *L. leuconoë*; the white area of the secondaries much more restricted, owing to the considerably greater width of the external black border. Expanse of wings 49 millim.

Sabaki Valley.

We have a male from Wasin in the Museum; it is slightly smaller than female examples, but otherwise similar in pattern and coloration.

159. Lacipa gracilis.

♂ ♀. *Lacipa gracilis*, Hopffer, in Peters's Reise nach Mossamb. pl. xxviii. figs. 4, 5.

♂, Tzavo, at night; ♀, var. Sabaki Valley.

The female example has lost all the black spots on the primaries and is larger than in Hopffer's figure, but I believe it to be a simple variety.

160. Psalis securis.

Psalis securis, Hübner, Samml. exot. Schmett. Zutr. figs. 291, 292.

Sabaki Valley.

Does not differ at all from Ceylonese examples.

161. Lymantria, sp.

A single example, probably from the Sabaki Valley, of a species new to us; but it is without head, and is too much worn for certain determination.

162. Heteranaphe, sp.

One very rubbed example of a species which I have hitherto been unable to identify; it is not good enough to describe.

Mbololo, near summit, 5600 feet elevation.

Phasicnecus, gen. nov. (*Lasiocampidæ*).

Aspect of *Lemonia*, but differing entirely in neuration. Costal vein of primaries normal; discoidal cell short and narrow, terminating at basal third; subcostal branching beyond the end of cell, the first branch thrown off just beyond the cell, running obliquely upwards to costal vein, which it joins just beyond its middle; the two other branches forming a long fork to outer margin immediately below apex; upper radial also emitted from the subcostal vein immediately beyond the cell; upper discocellular oblique and slightly inangled at its upper extremity; lower discocellular nearly transverse; costal vein of secondaries normal; discoidal cell short, narrow, almost elliptical, not quite extending to basal third of wing; subcostal branches emitted from a long footstalk, upper discocellular very oblique, almost in a line with the radial; lower discocellular less oblique, half the length of upper; radial and median branches nearly equidistant, the first and second branches being widest apart at their origins.

163. Phasicnecus gregorii, sp. n. (Plate XXXVII. fig. 6.)

♀. Wings semitransparent buff; primaries with ochreous costal margin and basal hairy clothing; a slightly sinuous series of six vinous spots across the disc from below subcostal vein to below first median branch; body ochreous; antennæ rufous brown with buff pectinations: under surface paler and immaculate, antennæ below somewhat greyish. Expanse of wings 40 millim.

Sabaki Valley.

One slightly rubbed female example.

164. Lebeda, sp.

A very much shattered female specimen of a species very close to (if distinct from) *L. ferruginea*; in pattern it seems to correspond almost exactly; but it is smaller and more sandy in colouring; in any case it has been too much injured by *Dermestes* to be worth preserving.

Clearing through forest six miles east of Witu, 22nd December, 1892.

165. Trilocha varians, var. albicollis.

Naprepa albicollis, Walker, Journ. Linn. Soc. vi. p. 171 (1862).

Ngatana.

166. Saturnia oubie.

Bombyx oubie, Guérin, Voy. in Abyss. p. 387, pl. xii. figs. 1, 2.

Platform on Kikuyu Escarpment above Kedong, Newia.

One much shattered example.

167. Saturnia, sp.

Two extremely worn pairs of a species close to *S. wallengrenii*; possibly that species.

♂ ♀, Tzavo.

Felder's figure is not very good, and the specimens now received are much shattered and rubbed; so that it is impossible to be certain whether they are really distinct.

168. Antheræa arata.

Antheræa arata, Westwood, see Maassen & Weymer, Beitr. Schmett. fig. 59 (1881).

♂, in wood on flanks of Mbololo, 4000 feet

169. Gynanisa maia.

Saturnia maia, Klug, Neue Schmett. pl. 5. fig. 1 (1836).

♀, Ndara, 31st March, 1893.

Slightly larger and more varied with white than southern specimens, in which respects it is intermediate between the latter and the example mentioned in P. Z. S. 1893, p. 678.

170. Duomitus capensis.

Zeuzera capensis, Walker, Lep. Het. vii. p. 1533. n. 11 (1856).

Lari lal Morjo, Laitsipia.

171. Azygophleps inclusa.

♀. *Zeuzera inclusa*, Walker, Lep. Het. vii. p. 1534. n. 12 (1856).

♂, Sabaki Valley.

A third species of *Cossidæ*, from Njempo, is too much shattered for determination: this is also the case with many of the species in the remaining families of Moths; but the following can be determined:—

172. Heliothis armigera.

Noctua armigera, Hübner, Noct. pl. 79. fig. 370 (1805–24).

One very worn example from Njempo.

173. Leucania torrentium.

Leucania torrentium, Guenée, Noct. i. p. 88. n. 132.

Sabaki Valley.

174. Microsemyra, sp.

Sabaki Valley.

Not in good condition; but apparently the same as a species from Amshaw, S. Africa, presented by Mr. Barrett.

175. Acrapex, sp.

Sabaki Valley.

One worn example of a species allied to *A. leucophlebia*, Hampson, without palpi or antennæ.

176. Laphygma orbicularis.

Caradrina orbicularis, Walker, Lep. Het. x. p. 294. n. 26 (1856).

Maka.

177. Caradrina indicata.

Caradrina indicata, Walker, Lep. Het. x. p. 299. n. 39 (1856).

Sabaki Valley.

178. Perigea conducta.

Caradrina conducta, Walker, Lep. Het. x. p. 296. n. 32 (1856).

Thiriati.

179. Ilattia axis.

Amyna axis, Guenée, Noct. i. p. 407. n. 378 *b*.

Sabaki Valley.

180. Euphasia umbrigera.

♀. *Acontia umbrigera*, Felder, Reise der Nov., Lep. Het. pl. cviii. fig. 34.

♂, Tzavo, at night.

Felder's figure is peculiar, the secondaries being intermediate between the white coloration of the male and the brown of the female.

181. Tarache insocia.

♂. *Acontia insocia*, Walker, Lep. Het. xii. p. 788. n. 18 (1857).

♀, Tzavo.

The female was described by Walker under the name of *Acontia pyralina*.

182. Tarache secta?

Acontia secta, Guenée, Noct. ii. p. 221. n. 997.

♂ ♀, Njempo.

183. Tarache upsilon.

Calophasia upsilon, Walker, Lep. Het. Suppl. iii. p. 763 (1865).

Sabaki Valley.

184. Tarache tropica?

Acontia tropica, Guenée, Noct. ii. p. 217. n. 988.

Ngatana. (Very much faded!)

185. Metachrosta mianoides.

Ozarba mianoides, Hampson, Ill. Typ. Lep. Het. ix. p. 98, pl. clxii. fig. 16 (1893).

Sabaki Valley.

Perhaps slightly greyer than specimens from the Nilgiris, but not otherwise differing.

186. Eublemma reducta, sp. n. (Plate XXXVII. fig. 7.)

Allied to *E. olivacea*, Walk., but considerably smaller; primaries of male whity brown irrorated with grey, of female brownish grey;

subbasal line only indicated by a dusky costal spot, antemedial line by an oblique costal dash and greyish irregular scaling; the female also with a short oblique line from inner margin almost to cell; one or two additional badly-defined costal dusky spots from middle of costa and a little group of ferruginous scales towards apex partly enclosed by a horseshoe-shaped dark grey marking, the outer arm of which is confluent with a dark grey apical patch enclosing two black dots; fringe of male creamy white: secondaries of male white, of female greyish brown; body of male white, of female greyish white; under surface white, the costal area of primaries more or less sprinkled with grey scales, a dusky spot in cell, and a second, better defined, at end of cell. Expanse of wings, ♂ 16 millim., ♀ 17 millim.

Sabaki Valley.

187. Cyligramma latona.

Phalæna (*Noctua*) *latona*, Cramer, Pap. Exot. i. p. 20, pl. xiii. B (1779).

Kinani; shores of Lake Baringo; Larabwal, Laitsipia; Thagana; Thiriati.

188. Cyligramma limacina.

Cyligramma limacina, Guérin, Icon. Règne Anim., Ins. pl. 89. fig. 2, texte, p. 520.

Thagana and steppes of Thika-Shika.

189. Baniana intorta.

Athyrma intorta, Swinhoe, Trans. Ent. Soc. 1891, n. 150.

Baniana intorta, Hampson, Ill. Typ. Lep. Het. ix. p. 106, pl. clxiii. fig. 3 (1892).

Sabaki Valley.

190. Plecoptera reversa.

Poaphila reversa, Walker, Lep. Het. Suppl. iii. p. 991 (1865).

Sabaki Valley.

191. Colbusa pentagonalis, sp. n. (Plate XXXVII. fig. 8.)

Primaries above cupreous brown, purplish beyond the middle; costal edge creamy white; a white very oblique stripe commencing near base of inner margin, bounding the subcostal vein to end of cell, where it is acutely angulated, and passing obliquely backwards across the wing to just below first median branch, where it is again abruptly angulated and runs inwards to inner margin; this stripe thus encloses a large purplish-black pentagonal patch; a broad blackish marginal band, its inner edge diffused, its outer edge bounded by a white stripe and then a slender black line; fringe white: secondaries with the basal half sericeous whity brown, bounded externally, from anal angle to cell, by a white stripe; external half dusky greyish; a submarginal slender white