



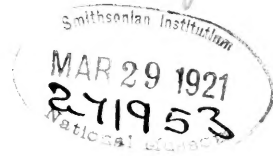




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ANNALS

OF THE



DURBAN MUSEUM

EDITED BY THE CURATOR,
E. C. CHUBB

VOLUME II.

28th December, 1917, to 25th August, 1920.

PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.



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CORRIGENDA.

- Page 64—plate IX should read plate X.
- Page 66—plate X should read plate IXc.
- Page 68—plate XIII should read plate XII.
- Page 81—4th line from bottom for *heroem* read *heroum*.
- Page 96—line 16 for Bembicidæ read Bembecidæ.
- Page 114—line 10 should read “Elytra deeply punctate, striate and intervals punctured.
- Page 175—line 6 for Bechuanaland read Bushmanland.
- Page 179—line 4-5 for Umvuma River read Umvuma.
- Page 185—Distribution Table for race *neglecta*, for Umvuma River read Umvuma.
- Page 186—*hereo* should read *herero*.
- Page 188—Plate XXV for Bechuanaland read Bushmanland.
- Page 303—line 13 for *Tetralonia nigropolisa* read *Tetralonia nigropilosa*.

DATE OF ISSUE OF THE PARTS.

- Part 1, pages 1-46, issued 28th December, 1917.
 Part 2, pages 47-96, issued 30th July, 1918.
 Part 3, pages 97-128, issued 31st March, 1919.
 Part 4, pages 129-204, issued 20th October, 1919.
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- Microlysias (Crustacea) page 63.
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VOL. II.

With Index
of Vol. I.

PART 1.

ANNALS
OF THE
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EDITED BY THE CURATOR,

E. C. CHUBB.

Issued 28th December, 1917.

PRICE 5/- NETT.



PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.

The Annals of the Durban Museum is devoted principally to South African Zoology and is issued from time to time as circumstances permit.

Contents of previous issues.

Part 1. Published 1st June, 1914. Price 5/- nett.

- I.—On some Pelagic Entomostraca collected by Mr. J. Y. GIBSON in Durban Bay, by G. STEWARDSON BRADY. (Plates I–IV).
- II.—On *Tursiops catalania* and other existing species of Bottlenose Porpoises of that Genus, by FREDERICK W. TRUE.
- III.—On further Pelagic Entomostraca collected by Mr. J. Y. GIBSON in Durban Bay, by G. STEWARDSON BRADY. (Plates V and VI).
- IV.—A Descriptive List of the Millar Collection of South African Birds' Eggs, by E. C. CHUBB. (Plate VII).

Part 2. Published 15th May, 1915. Price 5/- nett.

- V.—Contributions to the knowledge of the Anatomy of the Sperm Whale (*Physeter macrocephalus*) based upon the examination of a young Fœtus, by FRANK E. BEDDARD. (Plate VIII).
- VI.—Notes on several Four-lunged Spiders in the collection of the Durban Museum with descriptions of two new forms, by JOHN HEWITT.
- VII.—Notes on the Pelagic Entomostraca of Durban Bay, by G. STEWARDSON BRADY. (Plates IX–XIV).
- VIII.—Anoplura and Mallophaga from Zululand, by VERNON L. KELLOGG and G. F. FERRIS. (Plates XV and XVI).
- IX.—On a Collection of Rotifera from Natal, by C. F. ROUSSELET.
- X.—An Annotated List of Mosquitos occurring at Durban, by F. W. EDWARDS.

(continued on third page of cover).

*Obtainable through any S. African bookseller
or from Messrs. William Wesley & Son, Sole European Agents,
28 Essex Street, Strand, London.*

I.—The Malacostraca of Natal,

by the

Rev. T. R. R. Stebbing, M.A., F.R.S., F.L.S., F.Z.S.

WITH PLATES I-VI.

THE naturalists of Natal are essaying in these "Annals" to give special prominence to the fauna of their own district, instead of leaving it to be merged, or submerged, in the comprehensive but rather indefinite denomination of "South African." While still engaged in discussing the Malacostraca for the whole region, I could not but feel that difficulty might arise from my accepting Mr. Chubb's invitation to treat of the same group in this limited area. Some overlapping would be only too likely to occur among details of one subject in two contemporary channels of publication. On the other hand, the risk of needless repetition would be increased rather than diminished by the employment of two independent authors. Moreover, under present circumstances, not only may students welcome a two-fold opportunity for publishing the results of prolonged research, but editors may be equally pleased at dividing the responsibility.

Two of the species dealt with in the present report are introduced as new, but both have very near relations already known. Less gratitude perhaps is due to the patrons of new species than to those who supply information about forms which have been named without effective description or adequate illustration.

To Mr. H. W. Bell Marley especial acknowledgment should be made of his skill and enthusiasm as a collector. He has shown himself a worthy successor of Dr. Ferdinand Krauss, the highly distinguished pioneer in this field of investigation. The Durban Museum collection has also been enriched by the exertions of its assistants, Messrs. D. R. Boyce and A. L. Bevis, besides others whose names will occur as future opportunity serves.

BRACHYURA GENUINA.

TRIBE OXYRRHYNCHA.

FAMILY MAMAIDÆ.

(1)

Annals of the Durban Museum, Vol. II, part I, issued 28th December, 1917.

GENUS SCHIZOPHRYS, White.

For this family and genus see Ann. S. Afr. Mus., vol. vi, pp. 290, 292, 1910.

SCHIZOPHRYS ASPER (Milne-Edwards).

1834. *Mithrax asper*, Milne-Edwards, Hist. Nat. Crust., vol. i, p. 320.
 1838. *M. quadridentatus*, McLeay, Annulosa of S. Africa, p. 58.
 1839. *Maja (Dione) affinis*, de Haan, Crust. Japonica, decas quarta, p. 94, pl. G.
M. (Mithrax) dichotoma, Latr., pl. 22, figs. 4.
 1852. *Mithrax asper*, Dana, U.S. Expl. Exp., vol. xiii, p. 97, pl. 2, figs. 4a, b.
 1867. *M. spinifrons*, A. Milne-Edwards, Ann. Soc. Entom. France, vol. vii, p. 263.
 1884. *Schizophrys aspera*, Miers, Crust. Alert, p. 197.
 1886. *S. a.*, Miers, Rep. Voy. Challenger, vol. xvii, pt. 49, p. 67.
 1895. *S. a.*, Alcock, J. Asiat. Soc. Bengal, vol. lxiv, p. 243 (with synonymy).
 1898. *S. a.*, Alcock, Illustr. Investigator, pl. 35, figs. 1, 1a.
 1910. *S. a.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 292.

A female specimen from Durban, collected by Mr. Bell Marley, has a carapace 28 mm. broad with median length of 30 mm., the surface covered with tubercles large and small and setose. The two-branched horns of the rostrum have each a tooth on the inner margin, not indicated either by de Haan, Dana or Alcock, but Miers mentions that "the variety *spinifrons*, A. M.-Edwards" is "characterized by possessing an accessory spinule on each rostral spine." This small spine or tooth above at the base of the inner branch appears to have been the only specific distinction of *spinifrons* from *asper*. The greatest breadth of the female pleon is 17 mm., which is just exceeded by the length of the smooth slender hand and thumb of the cheliped, the movable finger being 6 mm. long.

Should *Schizophrys spinifrons* be upheld as a distinct species, that should be the name of the Durban specimen.

In *Schizophrys dama* (Herbst) the rostral horns are three-branched, but the third branch or tooth is on the outer side as shown in Herbst's figure and in Alcock's Illustrations of the 'Investigator', Crust, pl. xxxv, figs. 2, 2a, 1898, although Miss Rathburn, Pr. Zool. Soc., 1914, p. 663, writing of "the second or posterior spine on the outer margin of the rostral horn," by some oversight or misprint adds that "it is not shown in the 'Investigator' figure."

FAMILY PARTHENOPIDÆ.

For this tribe and family see Ann. S. Afr. Mus., vol. vi, pt. 4, pp. 283, 292; 1910.

GENUS PLATYLAMBRUS, Stimpson.

1871. *Platylambrus*, Stimpson, Bull. Mus. Comp. Zool., vol. ii, p. 129 (Rathbun).
 1873. *P.*, A. Milne-Edwards, Crust. Mexique, p. 146.
 1895. *P.* (Subgen), Alcock, J. Asiat. Soc. Bengal, vol. lxiv, pt. 2, pp. 259, 261.
 1901. *P.*, M. J. Rathbun, U.S. Fish. Comm. for 1900, vol. ii, p. 79.

For this genus (or subgenus of *Lambrus*) Miss Rathbun gives the characters, "Carapace strongly carinated or tuberculated, broadly triangular (considerably broader than long), with rounded sides and a broad but sharp-pointed projecting rostrum; no postocular constriction. Chelipeds with arm and hand straight, sharply trigonal, the edges of these joints, as also outer edge of carpus, being very sharply and stoutly serrated."

In assigning species authors have overlooked or ignored the fact that Herbst uniformly prints *Cancer pransor*, not *prensor* (see Krabben und Krebse, vol. ii, p. 170, pl. 41, fig. 3, 1796, and, with improved definition, vol. iii, pt. 3, p. 33, 1803). On the latter occasion he identifies with it *Parthenope regina*, Fabricius, Suppl. Ent. Syst. p. 353, 1798. Also the species of late years called *Platylambrus carinatus* was instituted by Milne-Edwards as *Lambrus carenatus* (Hist. Nat. Crust., vol. i, p. 358, 1834) and this spelling is retained by his son Alphonse Milne-Edwards in the Crust. Mem., p. 147, 1873.

PLATYLAMBRUS QUEMVIS, sp. nov. Plate I.

The present species is nearly allied to the other members of the genus, without fitting any of them. From *P. pransor* it is distinguished by wanting the great spine of the infra-orbital lobe; from *P. carenatus* by not having "the single, and very high and sharply cut carina on either branchial region" (Alcock), as well as differences in the hind border of the carapace; from *P. holdsworthii* (Miers) by not having a dentate edge to the fourth joint of the ambulatory legs; from *P. serratus* (Milne-Edwards) by less proportionate width of carapace and the presence of two large teeth behind that which terminates the antero-lateral border; from *P. validus*, de Haan, by the strong

transverse ridges of the pleon, and from de Haan's *P. laciniatus* by differences in the chelipeds.

A deep longitudinal boat-shaped furrow leads from the rostrum to the first of three successive uplifted tubercles, the last of which is in a line with the outstanding process ending the antero-lateral margin. This process is preceded by a convex row of seven tubercles. On the branchial regions irregular rows of tubercles are directed towards the process above-mentioned, and towards the following somewhat smaller process of the postero-lateral margin. A third process is much smaller than the two preceding, but much larger than any which follow. The carapace thus shows much resemblance to that of *Lambrus tumidus*, Lanchester, 1900.

The hand of the cheliped shows near agreement with that which Miss Rathbun describes for *P. serratus*, "outer margin cut into triangular, sharp teeth, of which nine, alternately large and small, are on the hand, teeth of inner margin smaller and more numerous (15 or 16 on the hand)." From the latter carina in our specimen, separated by a deep groove but parallel with it, is a third irregularly toothed, while between the two margins which agree with Miss Rathbun's description runs a series of very small tubercles along the top of the very slightly raised surface. The small ambulatory limbs have little spaced tubercles on the fourth and fifth joints, and like the carapace, pleon, and chelipeds are moderately setose. The pleopods are long and slender. The third segment of the pleon is the widest, slightly wider than the second. The telson has a single dorsal tubercle.

In the mandibles the third joint of the palp is the longest. In the first maxille the first joint of the palp is remarkably broad, with a second joint subequal in length but much narrower, tipped with two short spines. The third maxillipeds have the third joint long and broad, with tuberculate edges and a surface row of tubercles near the outer margin; the fourth joint is nearly as broad but much shorter, and has the short palp inserted in a notch of its distal margin.

The carapace of the specimen, a female, measures 15 mm. in length by 20 mm. in breadth. As preserved, the ambulatory limbs are banded with red. The general colour of the living animal recorded by Mr. Bell Marley was "pale stone grey."

Locality. Rock-pool, Durban Bay.

TRIBE CYCLOMETOPA.

See Ann. S. Afr. Mus., vol. vi, p. 293, 1910.

FAMILY POTAMONIDÆ.

See reference above.

GENUS POTAMONAUTES, McLeay, 1838.

See reference above.

POTAMONAUTES DEPRESSUS (Krauss).

See the same reference, p. 294.

The specimen which I refer to this species agrees very closely with the description given by Krauss, allowance being made for its being a female, whereas his specimen was a male. The carapace is depressed, the transverse very finely denticulate line behind the front measuring 20 mm.; the somewhat emarginate front sloping to a width of 7 mm. at its distal border. The left chela has long slender fingers, denticulate on the confronting margins; those of the considerably larger right chela being like them in this respect, the fingers closing together, not leaving a wide gap as in the male. The colour of the preserved specimen is dark orange on the carapace, orange and pale yellowish on the chelipeds, much of the ambulatory limbs being red.

Locality: Mr. Bell Marley writes that he dug out this crab from a hole in a bank at Eshowe bush, 1,800 feet above sea level. He adds "I think it must be insectivorous by some remains I saw of crickets, etc."

FAMILY XANTHIDÆ.

See Ann. S. Afr. Mus., vol. vi, p. 296, 1910,

GENUS LIOMERA, Dana.

1851. *Liomera*, Dana, Silliman's J. Sci. & Arts, Ser. 2, vol. xii, p. 124.
1898. *L.*, Alcock, J. Asiat. Soc. Bengal, vol. 67, pt. 2, pp. 72, 87.
1907. *L.*, Stimpson, Smithson. Misc. Coll., vol. 49, p. 38.

LIOMERA CINCTIMANUS (White).

1846. *Carpilius cinctimanus*, White, Ann. Nat. Hist. (this unpagged reference given by White could not be traced).

1847. *C. c.*, White, Crust. in Brit. Mus., p. 14.
1847. *C. c.*, Jukes' Voy. H.M.S. *Fly*, App. 8, vol. ii, p. 336, pl. 2, fig. 3.
1850. *C. c.*, Adams & White, Zool. Samarang. Crust, p. 37, pl. 7, fig. 4.
1852. *Liomera lata*, Dana, U.S. Expl. Exp., vol. xiii, p. 161, pl. 7, fig. 6a-d.
1893. *Carpilodes cincimannus*, Henderson, Tr. Linn. Soc. London, ser. 2, vol. v, pt. 10, p. 354.
1907. *Liomera lata*, Stimpson, Smithson. Misc. Coll., p. 38 (with footnote correction to *Liomera cincimana* by the editor, Miss M. J. Rathbun).

Several other references, but not the earliest, are supplied by Alcock. The dark band on the palm of the chelipeds, to which the specific name refers, is absent from the figure supplied by Dana, as it is from our Durban specimen. Henderson explains that it is sometimes absent from young specimens. The account given by Mr. Bell Marley of the freshly captured example, found beneath large stones, describes the colour as "bright red, edges of carapace white, claws and legs banded with two shades of red." To this it may be added that the fingers of the chelipeds are brownish-black with white tips, while the narrow fingers of the ambulatory legs are in the proximal half red, the distal half white, with the margins horn-coloured, in near agreement with Henderson's account.

The third maxillipeds have the fourth joint not half as long as the third, quadrangular, broader than long.

The pleon of the female is seven-segmented, narrow, the first segment the widest, the seventh the longest, with apex very obtuse. The carapace of Mr. Bell Marley's specimen is 21 mm. wide, 12 mm. long. A larger female example obtained by Mr. D. R. Boyce has a width of 37.5 mm. and length 22 mm.

GENUS ATERGATIS, de Haan.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 296, 1910.

For *Lophactæa picta*, A. Milne-Edwards, 1869, see M. Edw. Le Bouvier, Crust. Décap. Travailleur et Talisman, p. 101, pl. 1, figs. 7-11, pl. 17, figs. 8-12, 1900 (seemingly identical with the following species).

*ATERGATIS FLORIDUS (Linn). Plate II.

Under the reference given above to the Annals of the South African Museum it will be seen that I have there accepted Miss Rathbun's ruling that this species should be called *A. ocyroe* (Herbst). That, I suppose, takes it for granted that Montagu's *Cancer floridus* is identical with the species so named by Linnaeus. But if we accept de Haan's opinion that the Linnean species is the same as the *Cancer floridus* of Rumph, then that highly appropriate name will anticipate Herbst's *ocyroe*. Rumph regards it as equivalent to the Malay vernacular name Cattam Bonga, that is, Flower-crab, so called because it has the most beautiful carapace that there is, as if it were bestrewn with flowers.

When the several figures and descriptions referred to this species are compared, the differences, whether due to natural variation or some other cause, make its identification rather perplexing.

In defining the genus, Alcock says that the front of the carapace has "its edge shaped like cupid's bow (*i.e.*, not bilobed)." But Herbst gives "fronte subtruncata medio sulcata," which agrees with our specimen. This specimen attracted attention by the elegant symmetry of the markings, dark brown on an orange ground as preserved, but according to Mr. Bell Marley in the fresh state the ground is greenish-yellow with dark claret markings. Herbst observes that what gives the details of the pattern an extremely beautiful appearance is that each blotch and spot is surrounded by a fine white line. This is the case in the Natal specimen, though I have not known how to show it in the black and white drawing, nor has Herbst done so in his coloured figure. It is difficult to believe that Dana's species (U.S. Expl. Exp., vol. xiii, p. 159, pl. 7, fig. 4) can belong here with "colour deep green, passing into and covered with a network of white or yellowish-white." He is himself doubtful on the point. Stimpson says that living specimens from Loo Choo "are of a dark yellowish-brown color above, with reticulating cream-colored blotches."

In the specimen from Natal, on the gastric region a central spot is prettily surrounded by six similar spots. The middle of the carapace is occupied by a large artistic design, followed by an ovate blotch, the rest of the pattern being only in a general way symmetrical. But the

* Mr. Bell Marley has called my attention to a mistake in the colour-description of *Atergatis roseus*, volume i, p. 437. The colours referred to under *Eurycarcinus natalensis*, p. 436, rightly belong to *Atergatis roseus*, and those referred to under the latter belong to another species. [Editor].

pleon, distinctly seven-jointed and rather narrow in the female, the limbs and the third maxillipeds, carry on the scheme of coloration by numerous spots variously disposed. The fingers of the equal chelipeds are very dark with white teeth; those of the walking legs are coated above and below with a dark felt which leaves bare a curved unguis; the three preceding joints are smooth, broad, and sharp-edged.

The three-jointed palp of the mandible by its colour contrasts with the whiteness of the trunk. The inner plate of the first maxilla is very narrow. The fourth joint of the third maxillipeds is less than half the length of the third, but distally slightly broader.

Carapace 29 mm. broad by 21 mm. long.

Mr. Bell Marley recording this specimen from Isipingo Beach, near Durban, notes that it burrows in sand very quickly.

GENUS XANTHO, Leach.

1814. *Xantho*, Leach, Edinburgh Encyclopædia, vol. vii, p. 430.

XANTHO HYDROPHILUS (Herbst).

1790. *Cancer hydrophilus*, Herbst, Krabben und Krebse, vol. i, pt. 8, p. 266, pl. 21, fig. 124.

I have already discussed the synonymy of this species in the Ann. S. Afr. Mus., vol. vi, pt. 1, p. 7, 1908. See also vol. vi, pt. 4, p. 297, 1910.

Now I have to acknowledge a specimen obtained by Mr. Bell Marley, which is nearly of the same size as that figured by Herbst, and also exhibits remarkable agreement with it in coloration, having a large red blotch on the gastric region, with the rest of the carapace uniformly light, described by Mr. Bell Marley as white in the living state. The specimen is a male, with the third, fourth and fifth segments of the pleon coalesced, but their limits well defined.

XANTHO QUINQUEDENTATUS, Krauss.

1843. *Xantho 5-dentatus*, Krauss, Südafrik, Crust., p. 30, pl. 1, fig. 3, a-c.

A prettily marked specimen agrees well with the figure and description given by Krauss. It is, however, a female laden with eggs which, as preserved, are a bright red. The width of the carapace at the penultimate tooth is 20 mm., the median length 13 mm. Krauss gives, apparently for the male, breadth 7.2 lines, length 5.3 lines. The

hindmost tooth of the antero-lateral margin is very small and less prominent than the penultimate. The fingers of the chelipeds are dark with white tips, but so far differing from Krauss's account that they are not sharp.

Miers notes this species doubtfully as a synonym of *Leptodius exaratus* (Milne-Edwards). Mr. Bell Marley sends it from Durban, where also it has been taken by Mr. D. R. Boyce.

GENUS PILUMNUS, Leach.

PILUMNUS XANTHOIDES, Krauss, 1843.

See Ann. S. Afr. Mus., vol. vi, p. 301, 1910, and vol. xv, p. 57, 1915.

This species has been already recorded as taken at Durban by Mr. H. W. Bell Marley. It has been taken in the same locality by Mr. D. R. Boyce. The large pad of felt on the outer side of the large hands of the chelipeds is a notable feature. The ambulatory limbs are very short; the two anterior teeth of the antero-lateral margins of the carapace are very obtuse.

FAMILY PORTUNIDÆ.

GENUS SCYLLA, de Haan, 1833.

SCYLLA SERRATUS (Forskål), 1775.

For this family, genus, and species, see Ann. S. Afr. Mus., vol. vi, pp. 305, 308; 1910.

Mr. Bell Marley has favoured me with a large male specimen from Durban Bay, and describes the colouring as "blackish-green, with brown and white markings and spots."

TRIBE CATOMETOPA.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 312, 1910.

FAMILY GRAPSIDÆ.

GENUS SESARMA, Say, 1817.

For the family and genus see Ann. S. Afr. Mus., vol. vi, pt. 4, pp. 316, 320; 1910.

SESARMA QUADRATUS (Fabricius), 1798.

See reference as above, p. 321.

Two female specimens carrying numerous ova were obtained by Mr. D. R. Boyce in Durban Bay.

SESARMA TETRAGONUS* (Fabricius), 1798.

See reference as above, p. 321.

The length and breadth of a female specimen measured between the antero-lateral angles and from front to posterior margin were just equal, 30 mm., the breadth of the sinuous front from orbit to orbit being 18 mm. The sharp tooth behind the antero-lateral projects a little beyond it, thus at that point making the breadth of the carapace slightly greater than its length. The pleon of the female is very broad, reaching 25 mm. in the third and fourth segments, but the telson abruptly diminishes to a width of 5 mm., equal to its length.

Locality. The specimen was taken in Durban Bay by Mr. D. R. Boyce.

GENUS PARASESARMA, de Man.

1895. *Parasesarma* (Subgen), de Man, Zool. Jahrb., vol. ix.
 1897. *P.*, Rathbun, Pr. Biol. Soc. Washington, vol. xi, p. 90.
 1916. *P.*, Tesch, Zool. Med. Mus. Leiden, pt. 3, pp. 127, 235.

PARASESARMA CATENATUS (Ortmann).

1897. *Sesarma catenata*, Ortmann, Zool. Jahrb., vol. x, p. 334, pl. 17, fig. 9, a, b.
 1905. *Sesarma catenatum*, Stebbing, Mar. Invest. S. Afr., vol. iv, p. 44 (S.A. Crust., pt. 3).
 1910. *S. c.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 322, (S.A. Crust., pt. 5).
 1916. *Sesarma (Parasesarma) catenata*, Tesch. Zool. Med. Mus. Leiden, pt. 3, pp. 141, 220.

This species I have already discussed at some length in 1905. Characters for distinguishing *Parasesarma* from the other subdivisions of the old genus *Sesarma* are supplied in Dr. Tesch's elaborate treatise.

The specimen now examined was collected by Mr. H. W. Bell

* Misprinted *tetragonum*, in vol. i, p. 438. [Editor].

Marley at Durban. The wide gape between the fingers of the chela is extensively occupied by dense fringes of hair. The male telson is longer than broad.

GENUS PERCNON, Gistel, 1848.

See Ann. S. Afr. Mus., vol. vi, p. 324, 1910.

PERCNON PLANISSIMUS (Herbst).

See reference given above.

Specimens of this species have been obtained from Durban Bay by Mr. D. R. Boyce, and also by Mr. Bell Marley who describes the colouring as "chocolate, legs banded yellow, green lines on back and legs."

FAMILY OCYPODIDÆ.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 325, 1910.

GENUS OCYPODE, Fabricius.

See Ann. S. Afr. Mus., vol. vi, p. 325, 1910.

OCYPODE URVILLEI, Guérin.

- 1830-1838. *Ocypode urvillii* (on plate), Guérin, Voy. Coquille, pl. 1, fig. 1, *Ocypode urvillei* (in the later text), Zool. vol. ii, pt. 2, p. 9.
1837. *Ocypoda urvillii*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 49.
- 1842-1853. *Ocypoda pallidula*, Hombron and Jacquinot, Voy. Astrolabr and Zélée, pl. 6, fig. 1, a.
- 1852-1855. *O. p.*, Dana. U.S. Expl. Exp., vol. xiii, p. 324, pl. 20, fig. 1, a-c.
1897. *Ocypoda urvillei*, Ortmann, Zool. Jahrb., vol. x, pp. 360, 366, pl. 17, fig. 10.

The Durban specimen, which seems to me to answer the figures and description above cited, has a breadth of carapace between the anterior angles of 14 mm., with a length of about 11 mm. The stout eyes have a very small distal process carrying a setule. The surface of the carapace is finely granular, as is that of the large cheliped on the left,

of which the fourth joint has a dentate margin, the grooved fingers have the opposing margins serrate and the tips pointed, and the upper and lower margins of the hand serrate. The ambulatory legs have the scale-like markings noted by Guérin.

The specimen, a male, was obtained by Mr. T. H. Dale.

GENUS MACROPHTHALMUS, Latreille.

1829. *Macrophthalmus*, Latreille, Le Règne Animal, vol. iv, p. 44.
 1835. *M.*, de Haan, Crust. Japonica, decas 2, pp. 26, 54.
 1852. *M.*, Milne-Edwards, Ann. Sci. Nat. ser. 3, vol. xviii, pp. 155-159.
 1852. *M.*, Dana, U.S. Expl. Exp., vol. xiii, p. 312.
 1858. *M.*, Stimpson, Pr. Ac. Sci. Philad., vol. x, p. 96 (42).
 1867. *M.*, A. Milne-Edwards, Ann. Soc. Entom. France, vol. vii, p. 285.
 1887. *M.*, de Man, J. Linn. Soc. London, vol. xxii, pt. 2, p. 122.
 1894. *M.*, Ortmann, Zool. Jahrb., vol. vii, p. 744-747.
 1900. *M.*, Alcock, J. Asiat. Soc. Bengal, vol. lxi, pt. 2, p. 375.
 1902. *M.*, de Man, Abh. Senckenb. Naturf. Ges. vol. xxv, p. 492.
 1903. *M.*, Borradaile, Mald. Laccadive Crust., vol. i, pt. 4, p. 433.
 1906. *M.*, Laurie, Rep. Pearl Fishery, p. 427.
 1906. *M.*, M. J. Rathbun, U.S. Fish Comm. for 1903, pt. 3, p. 334.
 1910. *M.*, M. J. Rathbun, Bull. Mus. Com. Zool., vol. lii, p. 306.
 1913. *M.*, M. J. Rathbun, Pr. U.S. Mus., vol. xlv, p. 618.
 1914. *M.*, M. J. Rathbun, Pr. U.S. Mus., vol. xlvii, p. 82.
 1915. *M.*, Kemp, Mem. Ind. Mus., vol. v, p. 228.

Several other references may be gleaned from the above by anyone in a position to give a clear synopsis of this interesting genus. The shape of the carapace with the arrangement of the three antero-lateral teeth and the relative length of the ocular peduncles offer trustworthy characters. The fringing and coating of various parts with setæ are perhaps not so much to be depended on. The difficulties of the subject are illustrated by the fact that Alcock makes *M. inermis*, A. Milne-Edwards, a synonym of *M. convexus*, Stimpson, while Miss Rathbun considers them quite distinct.

MACROPHTHALMUS GRANDIDIERII, A. Milne-Edwards. Plate III.

1867. *Macrophthalmus grandidierii*, A. Milne-Edwards, Ann. Soc. Entom. France, vol. vii, p. 285.

1868. *M. g.*, A. Milne-Edwards, Arch. Mus. d'Hist. Nat. Paris, vol. iv, p. 84, pl. 20, figs. 8-11 (Rathbun).
1914. *M. brevis* (Herbst), M. J. Rathbun, Pr. U.S. Mus. vol. xlvii, p. 83.
1916. *M. grandidieri*, Tesch, Zool. Med. Mus. Leiden, vol. i, pp. 150, 153, 166, pl. 6, figs. 3a, b.

The present specimen agrees so closely with the description given by A. Milne-Edwards in 1867 for his species from Zanzibar that it must, I think, be conspecific. Miss Rathbun, however, in instituting *M. sandakani*, a new species from Borneo, makes *M. grandidieri* a synonym of *M. brevis* (Herbst), relying, it seems, largely on the fact that the Borneo species has "three granulated tubercles in a longitudinal row on the branchial region." It is true that such a series is not mentioned by Herbst, but his figure (pl. 60, fig. 4) appears definitely though rudely to indicate its presence. The Zanzibar specimen is expressly declared to be entirely smooth, thus agreeing with our own in being only microscopically punctate. There are other difficulties, as Herbst says that the movable finger has a strong tooth on the middle of the inner margin, though his figure does not show it, and he neither mentions nor figures the broad tooth-like elevation with granulate margin on the middle of the thumb, which is seen in our specimen and no doubt answers to the "large conical tooth" described by Milne-Edwards. That author makes no allusion to Herbst's species, but names de Haan's *M. dilatatus* among the many from which he discriminates *M. grandidieri*.

Between the first antero-lateral teeth the carapace from Durban measures 23 mm., but 25 mm. between the apices of the larger second teeth which overlap the first. The small third pair of teeth were invisible until the thick fringe of setæ was removed. To the rear not far from the margin occurs a small pimple on the right side only. The median length is 10 mm. in a straight line, without regard to the downward slope of the inter-orbital front and that towards the hind margin. The carapace agrees with Herbst's description of *M. brevis* in having on the front half on both sides (two transverse) fold-like elevations and depressions, but his further remark, that the middle of the carapace has considerable elevations, the hinder of which is granular, does not apply. The lower margin of the orbit for some distance from the inter-orbital front is tuberculate and visible in dorsal aspect, but becomes smooth and disappears as it slopes towards the first antero-lateral tooth, which the eye in repose just outstrips, without reaching the large second tooth.

The great disparity between the length and breadth of the carapace may account for some strange features in the mouth-organs, the great breadth of the third joint in the third maxillipeds and of the outer plate in the first maxillæ, but especially the obstinate folding over of the massive terminal part of the endopod in the first maxillipeds. The vibratory lamina of the second maxillæ is normal, which only needs mention, because it is omitted in de Haan's figures of the mouth-organs of this genus.

The hands of the chelipeds are long and strong, with a regular line of granulations on the outer surface, a large strip of the inner being felted, with a pearly tubercle near the wrist; the movable finger has at the base a tooth covered by the felt which conceals its depressed inner border.

Locality: Durban. The specimen was obtained by Mr. Bell Marley. Specimens collected by Mr. A. L. Bevis have since been sent me by Mr. Chubb.

GENUS *UCA*, Leach.

1814. *Uca*, Leach, Edinb. Encycl., vol. vii, p. 430.
 1908. *Uca*, Stebbing, S. Afr. Crust., pt. 3 p. 39 (with synonymy).
 1900. *Uca*, M. J. Rathbun, Pr. Washington Ac. Sci., vol. ii, p. 134.
 1900. *Uca*, M. J. Rathbun, American Naturalist, vol. xxxiv, no. 403, p. 585.
 1901. *Uca*, M. J. Rathbun, U.S. Fish. Comm. for 1900, vol. ii, p. 6.
 1902. *Uca*, M. J. Rathbun, Pr. Washington Ac. Sci., vol. iv, p. 275.
 1904. *Uca*, M. J. Rathbun, Crust. N.W. America (Harriman Exp.), p. 190.
 1910. *Uca*, M. J. Rathbun, Men. Ac. Roy. Danemark, ser. 7, vol. v, p. 322.
 1910. *Uca*, M. J. Rathbun, Bull. Mus. Comp. Zool., vol. lii, p. 305.
 1910. *Uca*, M. J. Rathbun, Pr. U.S. Mus., vol. xxxviii, p. 550.
 1913. *Uca*, M. J. Rathbun, Pr. U.S. Mus., vol. xlv, p. 615.
 1914. *Uca*, M. J. Rathbun, Pr. U.S. Mus., vol. xlvii, p. 126.
 1914. *Uca*, M. J. Rathbun, Pr. Zool. Soc. London, p. 661.
 1914. *Uca*, A. S. Pearse, Smithsonian Report for 1913, p. 415 (Habits of Fiddler Crabs).
 1907. *Gelasimus*, Stimpson, Smithsonian Misc. Coll., vol. xlix, p. 104.
 1915. *G.*, Kemp, Mem. Ind. Mus., vol. v, p. 221.

After all the pains devoted to this genus by de Man, Ortmann, Alcock, Miss Rathbun, and others, an unenviable task awaits the investigator qualified and willing to examine the claims of its numerous nominal species. After noting "The common practice of using the larger cheliped of the male for the discrimination of the species," with the caution that this organ is apt to change greatly with advancing age, the indefatigable Alcock, adds, "I must also confess here that the synonymy of species has defied me." With this confession, as will be seen, I can heartily sympathize.

The mouth-organs show one or two peculiarities to which attention may be directed. The mandibles are comparatively small, with the third joint of the palp rather long. The first maxillæ have the inner plate of unusual size, broader than long, much broader than the outer plate, the rounded summit surmounted by stiff spines of which the central are the longest. I suspect that de Haan's figure represents only the thick basal portion of this plate, as in my first dissection I found it broken precisely in that manner. The two-jointed palp is weak. The second maxillæ have the large chitinous bow, from which the two lower plates are produced, closely fringed with very long setæ. The vibratory lamina, omitted by de Haan, is very fragile. In the first maxilliped the large joint is flat-topped, the rest of the endopod long and folded. In the second maxillipeds the long fourth joint, besides the fringe of long setæ, has, on the distal portion a special armature of setæ varying in length but with little saucer-like tips suggestive of some adhesive function. In the species figured the terminal joint has a similar apical group, but this if present was inconspicuous in our *U. arcuatus*. The third maxillipeds are well known for the great size of the third joint, nearly as broad as long, and about three times as long as the fourth joint.

The stomach of *Uca bellator* (Adams and White) is described by Nauck in his dissertation, "Das Kaugezust der Brachyuren," p. 21.

UCA ARCUATUS (de Haan).

1835. *Ocypode (Gelasimus) arcuata*, de Haan, Crust. Japon, decas 2, pp. 26, 53, pl. 7, fig. 2, ♂, and pl. B (mouth-organs).
 1852. *Gelasimus arcuatus*; Milne-Edwards, Ann. Sci. Nat., ser. 3, zool., vol. xviii, p. 146, pl. 3, figs. 8, 8A.
 1905. *Uca arcuata*, Stebbing, S. Afr. Crust., pt. 3, p. 40 (with synonymy).

To these references I should be inclined to add *Gelasimus vocans*, Milne-Edwards, in the work above cited, p. 145, pl. 3, fig. 4, which

exhibits a large chela just like one received from Durban in connection with the species now under consideration. Milne-Edwards gives the reference to Herbst for this *Cancer vocans minor?* as plate 1, fig. 1, instead of fig. 10. Figures 1-7 on Herbst's first plate illustrate his quotation from Réaumur. His figure of *C. v. minor* does not show a very narrow front. The specimens from Durban here referred to de Haan's species have the narrow front combined with a massive chela, which is evidently variable in details of structure, one of the specimens showing the remarkable widening of the apex of the fixed finger which Milne-Edwards has figured for his *U. vocans*. Apparently there is a similar development in *U. cultrimanus* (Adams and White).

UCA LACTEUS (de Haan). Plate IV.

1835. *Ocypode (Gelasimus) lactea*, de Haan, Crust. Japon. decas 2, pp. 26, 54, pl. 15, fig. 5.

1910. *Uca lactea*, Stebbing, Ann. S. Afr. Mus., vol. vi, pt. 4, p. 327.

Here the comparatively broad front is deflected to its apex without intermediate constriction. When dealing with the single specimen from Durban Bay sent me by Mr. Bell Marley I was tempted to name a new species by the armature of the fingers in the great left cheliped. But other specimens, some of rather larger size, collected by Mr. Boyce, and subsequently received from Mr. Chubb, showed that no dependence could be placed on these minute characters. In de Haan's figure the immovable finger projects beyond the movable, but that I take to be a casual variation.

UCA ANNULIPES (Milne-Edwards).

1837. *Gelasimus annulipes*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 55, *G. lasima annulipes*, in expl. pl. 18, figs. 10-13.

1887. *G. a.*, de Man, J. Linn. Soc. London, vol. xxii, no. 137, p. 118, pl. 8, figs. 5-7.

1897. *Uca annulipes*, Ortmann, Zool. Jahrb., vol. x, p. 354.

1900. *Gelasimus annulipes*, Alcock, J. Asiatic Soc. Bengal, vol. lxix, pt. 2, pp. 352, 353 (with synonymy).

1912. *G. a.*, A. S. Pearse, Philippine J. Sci., vol. vii, p. 113 (habits).

1915. *G. a.*, Kemp, Mem. Ind. Mus., vol. v, p. 221.

In this species de Man says, "The inferior orbital margin is simple in the male; but in the female it is bordered, at the bottom of the orbits, by an accessory row of small acute granules, close and parallel

to it, thus resembling *G. forceps*, Milne-Edwards. This character was hitherto unknown." Alcock also says, "in the female only there is a short row of granules inside of and parallel with the lower border of the orbit."

Numerous specimens have been obtained by Mr. D. R. Boyce and Mr. H. W. Bell Marley at Durban. The latter assiduous collector has noted the colouring of various specimens; in the male, carapace black with dots and lines, large claw on the right orange and white; carapace black and white, legs paler, large claw missing; carapace black with pale blue dots, eyes pale grey, large claw on right vermilion and white; carapace nearly all blue, large claw on left, bright red, other legs red and black; in the female, carapace black and blue with margin of white, legs red and marked dark; carapace black with red; carapace mottled brown, legs brown and black; carapace black and blue with grey.

GENUS DOTILLA, Stimpson.

1858. *Dotilla*, Stimpson, Pr. Ac. Philad., vol. x, p. 98 (44).
 1900. *D.*, Alcock, J. Asiat. Soc. Bengal, vol. lxxix, p. 363 (with synonymy).
 1903. *D.*, Nobili, Bull. Mus. Torino, vol. xviii, no. 447, p. 22, and no. 452, p. 20.
 1907. *D.*, Stimpson, Smithson. Misc. Coll., vol. xlix, p. 101.
 1914. *D.*, Rathbun, Pr. U.S. Mus., vol. xlvii, p. 83.
 1915. *D.*, Kemp, Mem. Ind. Mus., vol. v, p. 222.
 1915. *D.*, R. D. Laurie, J. Linn. Soc. London, vol. xxxi, pp. 407, 467.

In the illustrated edition of the Règne Animal, figures 3, 3a and 3b, on pl. 18, profess to be copied from Savigny's Egypte, Crust. pl. 4, fig. 4. In fact they are from his pl. 1, fig. 3. De Haan in 1833, when defining *Doto* as a subgenus of *Ocypode*, used a preoccupied name, and from want of specimens was forced, as he explains, to borrow the characters from the figures given by Savigny on the plate which he quotes correctly. Hence de Haan's figures of the mouth-organs have no independent value. In Savigny's beautiful drawings the palp of the mandible is rather indefinite, as though the artist could not make up his mind whether it was two-jointed or three-jointed. In the species here dealt with it is not even two-jointed, and folds closely down upon the cutting edge of the membranaceous trunk.

DOTILLA CLEPSYDRA, sp. nov. Plate V.

The name *clepsydra* is chosen to denote the agreement between this species and Alcock's *D. clepsyradactylus* in regard to the chelipeds, of which he writes, "The fingers are much longer than the palm; in the adult male they are extremely slender, and each has a large tooth arranged so that when the tips of the fingers are closely opposed these two teeth meet and leave an hour-glass-shaped space between the closed fingers" (loc. cit., p. 367). The second sentence is emphasized by italics and agrees with fig. 2 on pl. 63, Illustr. Zool. Investigator, published in 1902. On further testing the agreement, however, I found that it did not extend to the fourth joint of the chelipeds, since Alcock states that in his species they "have no spine on the arm." By spine is evidently intended the proximal tooth or process which Dr. de Man finds in the adult male of the typical species *D. sulcatus* (Forskäl), though wanting in the female (Zool. Engebn. in Nederland. Ost. Indien, vol. ii, p. 311, 1892). On a character variable between the two sexes of the same species reliance could scarcely be placed for distinction between species and species, if it stood alone. This is not the case here. In the Durban specimen the surface of the carapace agrees more nearly with Alcock's *D. affinis*, especially in respect of the large distal area, a triangle with convex sides and the base rectilinear; and, besides differences in the tympana, the fingers of the ambulatory limbs show a marked divergence, being here all nearly of the same size, while in Alcock's species those of the fifth peraeopods are much longer than those of preceding pairs.

As is well known, the third maxillipeds in this genus have a boat-like bulge, formed by the large third joint and larger fourth, the latter almost concealing the last three setose joints, and helping to conceal the slender exopod which is devoid of a flagellum. The close packing of other mouth-organs within the boat adds something to the difficulty of their disentanglement.

In the mandibles the very large single-jointed palp by its curvature and notching implies a small basal joint coalesced; it carries long feathered setae on its outer margin proximally, followed by rows of unequally short setae of minutely battledoor shape. Similar setae of various sizes occur also on the large middle lamina of the second maxilla, and fringing the terminal joints of the second maxillipeds. The part which seems to represent the three terminal joints in question is broader than either of the two preceding joints and a little longer than both combined; this compact mass has an oblique line perhaps marking the area of the finger.

The carapace of the larger specimen measured about 8.5 mm. in length, by 12 mm. in breadth.

Locality: Durban Bay, collected by Mr. D. R. Boyce.

TRIBE OXYSTOMATA.

FAMILY CALAPPIDÆ.

GENUS CALAPPA, Fabricius, 1798.

For the tribe, family, and genus, see Ann. S. Afr. Mus., vol. vi, pt. 4, p. 333, 1910.

CALAPPA SPINOSISSIMUS, Milne-Edwards.

1837. *Calappa spinosissimus*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 106.

1896, *C. s.*, Alcock, J. Asiat. Soc. Bengal, vol. lxxv, p. 144.

Alcock distinguishes this species from *C. hepaticus* (Linn.) chiefly by "the teeth on the antero-lateral border of the clypeiform expansions" being "in the form of sharp upcurved spines," by the presence of three spines on the postero-lateral border of those expansions, and by some of the tubercles on the outer surface of the palm in the chelipeds having sharp spinous points. All these characters are present in the smaller specimens procured by Mr. Bell Marley in Durban Bay. He notes as to one that the colour was "greyish, legs yellow, slightly coral-spotted," of another that it was "darker, only without spots," and that the specimens were obtained "near water's edge, among empty shells, in sandy depressions." One of the specimens had a carapace about 17 mm. long, by 27 mm. broad, in another the measurements were 15 by 23 mm., thus considerably less than the length of 15 lines recorded by Milne-Edwards. But a specimen found "among rocks," "dark grey, legs yellow," is about 32 mm. long by 41 mm. broad. That it has no sharp spines on the cheliped may be due to attrition.

MACRURA ANOMALA.

TRIBE PAGURIDEA.

FAMILY PAGURIDÆ.

For this tribe and family see Ann. S. Afr. Mus., vol. vi, pt. 4, pp. 349, 350; 1910.

GENUS PAGURUS, Fabricius, *sensu restricto*.

Reference as above.

PAGURUS EUOPSIS,* Dana.

1852. *Pagurus euopsis*, Dana, U.S. Expl. Exp., vol. xiii, p. 452, pl. 28, figs. 6, a-c.
 1905. *P. e.*, Alcock, Indian Decap. Crust., pt. 2 fasc 1, pp. 80, 86, pl. 9, fig. 2 (with synonymy).

Two specimens from Durban, sent me by Mr. Bell Marley, agree well with the figures and descriptions of this species furnished by Dana and Alcock. Both authors call attention to the character that "the joints of the distal half of the antennal flagellum have the antero-internal angle produced." Also both mention the broad maroon stripe across the merus and carpus of the second and third peræopods, which appears to be very persistent in spirit. Dana remarks that the chelipeds are only "moderately unequal," and Alcock points out that this is the case "especially in the female" a remark not specially confirmed by the Durban female specimen, which Mr. Bell Marley informs me inhabited the shell of *Litorium olearium*. In the male specimen the very hirsute left chela is much darker than the right. Of one large specimen Mr. Bell Marley notes its springing in and out of the covering shell when alarmed, and that the pleon was "banded deep red."

PAGURUS DEFORMIS, Milne Edwards.

1836. *Pagurus deformis*, Milne-Edwards, Ann. Sci. Nat., ser. 2, vol. vi, p. 272, pl. 14, fig. 2 (Alcock), pl. 13, fig. 14 (M.E. in next reference), pl. 13, fig. 4 (Miers).
 1837. *P. d.*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 222.
 1874. *P. d.*, Miers, Zool. Erebus and Terror, Crust., p. 3 (with *Pagurus cavipes* on pl. 2, fig. 3, the plate of much earlier date but hitherto unpublished).
 1905, *P. d.*, Alcock, Indian Decap. Crust., pt. 2, fasc. 1, pp. 81, 88, pl. 9, fig. 4 (with synonymy).

The specimen from Durban, for which I am indebted to Mr. Bell Marley, was occupying a land shell (*Livinicia kraussii*) he informs me. It agrees well with the description of the species given by Milne-Edwards. The eyes are short and stout, widest at the cornea. The

* Misprinted *enopsis*, vol. i, p. 439. [Editor].

large left chela has the character on which Alcock lays stress, "the inner edge of the upper surface of its dactylus forms an upstanding crenulated crest," and the second and third peræopods are even more characteristic by their difference from those on the right, in that the upper margins of the last two joints form sharp ridges, by which especially in the third pair their sides to the rear show a deep furrow, while dorsally they are flattened.

A specimen of this species from the same locality has been obtained by Mr. D. R. Boyce.

PAGURUS VARIPES, Heller.

1861. *Pagurus varipes*, Heller, Sbe. K. Akad. Wien, vol. xlv, p. 244, pl. 1, pl. 2, figs. 2, 3.

1905. *P. v.*, Alcock, Indian Decap. Crust., pt. 2, fasc. 1, pp. 81, 90, pl. 9, fig. 7 (with synonymy).

A female specimen from the Durban Museum answers well to Heller's description and figures of this species, in regard to the eyes, the markings of the carapace which he describes in detail, the quadrate sixth segment of the pleon with its median longitudinal furrow, and the armature of the large left cheliped. The second and third peræopods on the left are without the sharp-edged flat-topped character of the two terminal joints so conspicuous in *P. deformis*, but the third peræopod has the lateral carina and groove as shown for those joints in Heller's pl. 2, fig. 3.

PAGURUS MEGISTOS (Herbst).

See Ann. S. Afr. Mus., vol. vi, p. 21, 1908.

A small specimen of this handsome species was collected by Mr. D. R. Boyce from Durban Bay. The *Strombus* in which it was lodged only yielded for examination the chelipeds and ambulatory limbs.

GENUS DIOGENES, Dana.

See Ann. S. Afr. Mus., vol. vi, p. 353, 1910.

DIOGENES COSTATUS, Henderson.

1893. *Diogenes costatus*, Henderson, Tr. Linn. Soc. London, ser. 3, vol. v, p. 418, pl. 39, figs. 7, 8.

1905. *D. c.*, Alcock, Indian Decap. Crust., pt. 2, pp. 61, 70, pl. 6, figs. 7, 7a.

1908. *D. c.*, Stebbing, Ann. S. Afr. Mus., vol. vi, pt. 1, p. 24.

Small specimens occupying shells of *Natica mamilla*, collected from Durban Bay by Mr. A. L. Bevis and Mr. D. R. Boyce, are in near agreement with the available accounts of this species. But while Henderson writes that the ophthalmic scales have "merely two or three spinules towards the apex," I find the distal margin fringed with six teeth in a very small specimen. The large left cheliped has all the borders of its fourth joint serrated, as noted by Alcock, but neither author shows the great comparative length of the laterally grooved fingers in the second and third pereopods, a feature attracting attention in our specimens, along with the close pad on the convex border of the preceding joint, especially noticeable in the limbs of the left side. Faint longitudinal streaks of red have been retained on these legs.

GENUS CLIBANARIUS, Dana, 1852.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 352, 1910.

CLIBANARIUS VIRESCENS (Krauss).

See Reference above given.

Specimens of this little species, obtained by Mr. Dale in Durban Bay, have been submitted to me by Mr. Chubb. They fully agree with the description given by Krauss, except for some alterations of colour, the blues and greens having no doubt faded, but the cross-band and dark apex of the fingers are still conspicuous in the second and third pereopods.

CLIBANARIUS LONGITARSUS (de Haan).

1849. *Pagurus longitarsus*, de Haan, Crust. Japon, Decas., 7, p. 211, pl. 50, fig. 3.
 1852. *Clibanarius longitarsis*, Dana, U.S. Expl. Exp., vol. xiii, p. 464.
 1888. *C. l.*, de Man, Arch. Naturg., vol. liii, p. 441.
 1899. *Clibanarius longitarsus*, Nobili, Ann. Mus. Genoa, ser. 2, vol. 20, p. 492 (20),
 1905. *Clibanarius longitarsis*, Alcock, Indian Decap. Crust., pt. 2, fasc. 1, p. 158 (with synonymy).

Round this species cluster others, such as *C. striolatus*, Dana, and *C. padavensis*, de Man, with bewildering proximity. This makes it difficult to guarantee any particular name without illustrative figures, which it is not just now convenient to offer.

The specimen from Durban Bay, specially examined from several obtained by Mr. D. R. Boyce, has the rostral apex abruptly acute, the ocular scales near together, ending in two unequal points, eye-stalks 5 mm. long, slightly swollen at either end, the cornea one-tenth of the total length. The chelipeds are subequal, with short fifth joint and the fourth much longer and very broad. The second and third peræopods have long tarsi (seventh joint) with dark tips, and the pale stripe with coloured borders on the last three joints, as shown in de Haan's figure.

Among features probably of no specific value may be mentioned, the strong spine on the palp of the first maxilla, the angularly produced end of the large vibratory lamina of the second maxilla and the narrowly produced apex of its endopod, the abruptly narrow terminal to the broad exopod in the first maxilliped, the remarkably powerful exopod in the second maxilliped compared with the rather short endopod, and the still more powerful exopod in the third maxilliped, where however the endopod is also long and strong. In both the second and third pairs the fourth joint is longer than the third. The endopods of the third pair are contiguous at their bases.

In the pleon there are unequally biramose appendages on the left side pertaining to the second, third, fourth, and fifth segments, those of the third and fourth being slightly longer than the preceding pleopod but very greatly larger than that which follows.

FAMILY CÆNOBITIDÆ.

1852. *Cænobitida*, Dana, U.S. Expl. Exp., vol. xiii, pp. 432, 435.
 1905. *C.*, Alcock, Indian Decap. Crust., pt. 2, fasc. 1, p. 138 (with synonymy).

GENUS CÆNOBITA, Latreille.

1825. "*Cænobite*," Latreille, Faun. Nat. Règne Animal, p. 277 (the generic name only in French).
 1829. *Cænobita*, Latreille, Règne Animal, vol. iv, p. 77.
 1905. *C.*, Alcock, Indian Decap. Crust., pt. 2, p. 139 (with very numerous references, but all under *Cænobita*, though Milne-Edwards, Krauss, and Dana agree in using the inaccurate form *Cenobita*).

CÆNOBITA CAVIPES, Stimpson.

1858. *Cenobita cavipes*, Stimpson, Pr. Ac. Sci. Philad., p. 245 (83).
 1862. *Cenobita violascens*, Heller, Verl. Zool. Ges. Wien, vol. xii, p. 524.
 1865. *C. v.*, Heller, Crust. Novara, p. 82, pl. 7, fig. 1.
 1900. *Cænobita cavipes*, Nobili, Ann. Mus. Genov., Ser. 2, vol. xx, p. 495 (23).
 1902. *C. c.*, de Man, Abh. Senck. Nat. Ges., vol. xxiv, p. 743, pl. 24, fig. 46.
 1905. *C. c.*, Alcock, Indian Decap. Crust., pt. 2, p. 146, pl. 14, fig. 1 (with synonymy).

The Durban specimen has the characters which Alcock selects for distinguishing this species from others in the Indian group of the genus; the acicle fused with the second joint of the second antennæ; eye-stalks strongly compressed; a brush of hairs on the inner surface of the palm in both chelæ; no stridulating mechanism on the palm of the left chela, coxæ of the fifth peræopods little produced. As to this last point Alcock says that the coxæ "are hardly more prominent in the male than they are in the female." Appearances justify the expectation.

For identification of this species the great size suggested *C. clypeatus*, but there it is only the right chela that has the brush of hairs and the ophthalmic scales have the free edge serrulate or crenulate, whereas here they are simple, acute. Next, a large dark patch on the outer surface of the palm in the left chela suggested *C. rugosus*, but that chela has a stridulating mechanism which is here wanting, and Nobili has already noticed that the brown patch of colour is common to the two species.

The length of the carapace in the middle line is 39 mm. Alcock gives that of a large female as 31 mm., for *C. rugosus*. He says that a carapace 30 mm. long was comparatively rare, and that of the largest egg-laden female in the Indian Museum was only 24 mm. long. The left chela of the Durban specimen has the length and breadth of the palm equal, 26 mm. The third peræopod on the left has the finger strongly ridged on the concave side, which is not the case with the corresponding finger on the right.

The specimen was collected in Durban Bay by Mr. D. R. Boyce.

TRIBE HIPPIDEA.

FAMILY HIPPIDÆ.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 366, 1910.

GENUS EMERITA, Meuschen, 1778.

See under the preceding reference. The specimen there named *Emerita emeritus* should probably be transferred to the following species.

EMERITA ASIATICUS (Milne-Edwards).

1837. *Hippa asiatica*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 209.
 1878. *H. a.*, Miers, J. Linn. Soc. London, vol. xiv., no. 76, p. 325, pl. 5, fig. 11.
 1903. *H. a.*, Nobili, Bull. Mus. Torino, vol. xviii, no. 452, p. 16.
 1907. *H. a.*, Nobili, Ann. Sci. Nat., ser. 9, Zool., vol. iv, p. 143.
 1912. *H. a.*, Lenz, Arkiv. for Zoologi, vol. vii, no. 29, p. 5.

For this species Milne-Edwards gives a confused reference to Herbst, the difficulty being caused by the fact that Herbst in describing his *Cancer emeritus* refers it to plate 22, fig. 4, while on the plate itself it is fig. 3, which answers to his description.

The small specimen collected by Mr. A. L. Bevis, and the very large one, with carapace 35 mm. long, obtained by Mr. D. R. Boyce, alike have the terminal joint of the first peræopod as described by Nobili, lanceolate, with acute apex and denticulate margins. They agree too with the descriptions of the three spines on the second antennæ, of which the median is much the largest, and the antero-internal lobe on the fourth (meral) joint of the third maxillipeds is broadly rounded, practically though not verbally in agreement with the description by Miers. The carapace is very convex, as Miers and Nobili say, though in the Durban specimens scarcely to be called very narrow. The second antennæ by their flagella agree much better with the figure given by Miers for *E. emeritus*, than with that for *E. asiaticus*.

Locality: Durban Bay.

FAMILY ALBUNEIDÆ.

1904. *Albuneida*, Benedict, Pr. U. S. Mus., vol. xxvii, p. 621, (ref. overlooked in 1914).

GENUS ALBUNEA, Fabricius.

- 1904.
- Albunea*
- , Benedict, Pr. U.S. Mus., vol. xxvii, p. 623.

ALBUNEA GUERINII, Lucas.

- 1914.
- Albunea guerinii*
- , Stebbing, Tr. R. Soc. Edin., vol. L, pt. 2, p. 281.

For references regarding the family, genus, and species, see the Transactions above noted. The specimen now under consideration was collected in Durban Bay by Captain Fraser. The teeth on the frontal margin number ten on the left and thirteen on the right. This shows that dependence can be placed on this armature for specific distinction only with some reserve or caution.

MACRURA GENUINA.

FAMILY RHYNCHOCINETIDÆ.

- 1890.
- Rhynchocinetidæ*
- , Ortmann, Zool. Jahrb., vol. v, p. 459.
-
- 1907.
- R.*
- , Borradaile, Ann. Nat. Hist., ser. 7, vol. xix, pp. 467, 472.

RHYNCHOCINETES, Milne-Edwards.

- 1837.
- Rhynchocinetes*
- , Milne-Edwards, Ann. Sci. Nat., ser. 2, vol. vii, p. 165.
-
- 1837.
- R.*
- , Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 382.
-
- 1849.
- R.*
- , Nicolet, in Gay. Hist. Chile. Zool., vol. iii, p. 215.
-
- 1852.
- R.*
- , Dana, U.S. Expl. Exp., vol. xiii, p. 534.
-
- 1860.
- R.*
- , Stimpson, Pr. Ac. Sci. Philad., vol. xii, p. 105 (36).
-
- 1876.
- R.*
- , Miers, Catal. Crust. of New Zealand, p. 77.
-
- 1882.
- R.*
- , Haswell, Catal. Austral. Crust., p. 179.
-
- 1890.
- R.*
- , Ortmann, Zool. Jahrb., vol. v, pp. 459, 507.
-
- 1909.
- R.*
- , McCulloch, Rec. Austral. Mus., vol. vii, no. 4, p. 310.

Milne-Edwards placed this genus in his tribe of Palæmoniens, Dana in the *Alpheinæ*, a subfamily of his *Palæmonidæ*; Miers, followed by Haswell, assigned it to the *Crangonidæ*; Borradaile groups it with the *Alpheidæ*, *Hippolytidæ*, and *Palæmonidæ* in his "superfamily" *Palæmonoida*.

RHYNCHOCINETES TYPUS, Milne-Edwards. Plate VI.

1837. *Rhynchocinetes typus*, Milne-Edwards, Ann. Sci. Nat., ser. 2, vol. vii, p. 165, pl. 4.
1837. *R. t.*, Milne-Edwards, Hist. Nat. Crust., vol. ii, p. 383.
1849. *R. t.*, Nicolet, Hist. Chile. Zool., vol. iii, p. 216, atlas, pl. 1, figs. 7, 7 a-d.
1852. *Rhynchocinetes typicus*, Dana, U.S. Expl. Exp., vol. xiii, p. 568, pl. 36, figs. 7 a-d.
1871. *Rhynchocinetes typus*, Cunningham, Tr. Linn. Soc. London, vol. xxvii, p. 497.
1876. *R. t.*, Miers, Catal. Crust. N.Z., p. 77.
1882. *R. t.*, Haswell, Catal. Austral. Crust., p. 180.
1890. *R. t.*, Ortman, Zool. Jahrb., vol. v, p. 507, pl. 37, fig. 7d, f-i.
1909. *R. t.*, McCulloch and Rathbun, Rec. Austral. Mus., vol. vii, p. 312.
1910. *R. t.*, Rathbun, Pr. U.S. Mus., vol. xxxviii, p. 562, pl. 52, fig. 2.

Cunningham remarks of this species that "it is an exceedingly beautiful creature when alive, the body and legs being elegantly mottled and banded with various shades of red and brown." This is in agreement with Nicolet's account of the colour, and with the African specimens. Of Stimpson's *R. rugulosus*, McCulloch says "it is very beautifully marked when alive with streaks and dots of a bright blue colour on a darker ground." In spirit the difference of hue would cease to be distinctive, but *R. typus* seems to have none of that rugosity on which Stimpson relied in instituting his species. Miers, therefore, is not likely, as McCulloch supposes, to have confused the two species. In dealing, however, with the specific differences in this genus there are some pitfalls. Thus Dana says "it is important to observe, that the external maxillipeds are very much more elongate in the male than in the female, being in the former as long as the body." So also in the two specimens from Durban, the uropods of the larger specimen are decidedly longer than the telson, whereas this is not the case in the smaller. Also in the smaller, the second peraeopod reaches beyond the first, while in the larger the reverse is the case. As will be seen by the figures, the first peraeopods differ much in the two specimens, although in their striking colour pattern they were an excellent match.

Mr. Bell Marley found this strongly humped species on sociable terms with *Leander affinis* and *Stenopus hispidus*, among stones likely to protect it from predaceous fishes but not from marauding crabs.

STOMATOPODA.

FAMILY SQUILLIDÆ.

GENUS SQUILLA, Fabricius, 1793.

For this classification see Ann. S. Afr. Mus., vol. vi, pt. 4, pp. 404, 405, 1910.

SQUILLA NEPA, Latreille.

See Ann. S. Afr. Mus., vol. vi, pt. 1, p. 44, 1908.

A smaller specimen, about 75 mm. in length, has been collected by Mr. R. A. Hunter.

GENUS GONODACTYLUS, Latreille.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 406, 1910. And references.
 1894. *Gonodactylus*, Bigelow, Pr. U.S. Mus., vol. xvii, p. 492.
 1913. *G.*, Kemp, Tr. Linn. Soc. London, Ser. 2, vol. x, pt. 8, pp. 145, 155, pl. 9, fig. 107.

GONODACTYLUS CHIRAGRA (Fabricius).

See reference as above.

In Mr. Bell Marley's specimen from Durban, the carapace from the apex of the rostrum to the hind margin is 13 mm. long, from the hind margin of the carapace to extremity of fifth pleon segment the length is about 28 mm., and thence to a point between the distal lobes of the telson about 10 mm., making at full stretch a total length of two inches. In the uropods the long first joint of the exopod has its outer margin fringed with eleven spines, successively larger to the rear.

Mr. Bell Marley describes the colour as violet black, with dark red about the tail; legs and antennæ orange; the raptorial claws bright violet about the folding place. He notes that the animal is very active and makes defensive use of its tail.

AMPHIPODA.

TRIBE CYAMIDEA.

FAMILY CYAMIDÆ.

GENUS CYAMUS, Latreille, 1796.

CYAMUS BOOPIS, Lütken, 1873.

See, for the order, tribe, family, genus, and species, *Ann. S. Afr. Mus.*, vol. vi, pp. 447, 464, 471, 473; 1910.

Many specimens of this species have been obtained by Mr. E. C. Chubb from the humpback whale at Durban.

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EXPLANATION OF PLATES I-VI,

Illustrating paper by the Rev. T. R. R. Stebbing on
"The Malacostraca of Natal."

PLATE I.

Platylambrus quenvis, sp. nov.

- n.s. Lines indicating natural size of carapace figured below in dorsal aspect.
- prp. 1, prp. 5. Distal portion of a cheliped and the fifth peræopod to the same scale of enlargement.
- m., mxp. 1, 2, 3. Mandible, first, second, and third maxilliped, on a uniform scale of enlargement.
- mx. 1, mx. 2. First and second maxillæ, more enlarged than the preceding mouth-parts; inner plate of mx. 1, detached.
- Pl. Pleon in dorsal view.

PLATE II.

Atergatis floridus (Linn.).

- n.s. Lines indicating natural size of carapace, enlarged above in dorsal aspect.
- m. Mandible, seen from inner, upper surface, enlarged to the same scale as the other mouth-organs.
- mx. 1, mxp. 1, 2, 3. First maxilla, first, second, and third maxillipeds.
- prp. 1, prp. 2. A cheliped and an ambulatory leg, figured of the natural size, with the seventh joint of the latter much magnified.

PLATE III.

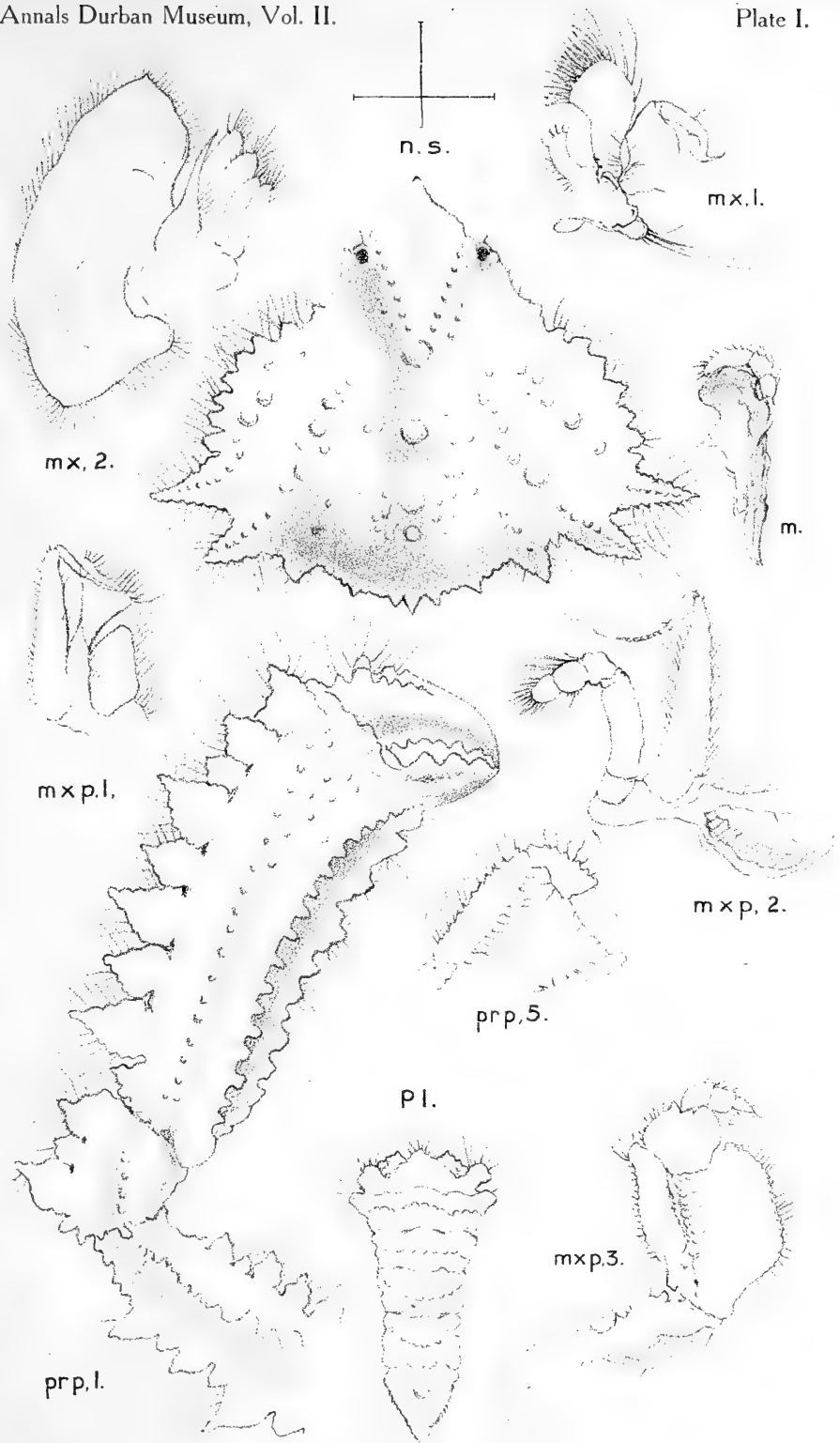
Macrophthalmus grandidierii, A. Milne-Edwards.

- n.s. Carapace, with first peræopod attached, in dorsal view, of the natural size. The upper, right-hand portion of the same magnified.
- Pl., plp. Dorsal view of the pleon, and one of the male pleopods.
- m., m., mx. 1, mxp. 1, 2, 3. The two mandibles, first maxilla, first and second maxillipeds incomplete, and third maxilliped.
- prp. 1, prp. 1. First peræopod natural size, hand in oblique position, and hand magnified, showing the outer surface, with a small portion of inner surface, showing the pearly tooth.
- prp. 4. Fourth peræopod, natural size.

PLATE IV.

Uca lacteus (de Haan).

- n.s. Dorsal view of the specimen, natural size, with first, fourth, and fifth peræopods attached.
- m. Mandible from the inner side.
- mx. 1, mx. 2, mxp. 1, 2, 3. First and second maxillæ, first, second, and third maxillipeds. These and the mandible magnified to a uniform scale.
- mxp. 2, sp. Some spines of the second maxilliped on the fourth and seventh joints much more highly magnified.
- prp. 1. First peræopod, showing the outer surface of the chela and the inner surface of its palm, with the tips of the fingers more highly magnified.

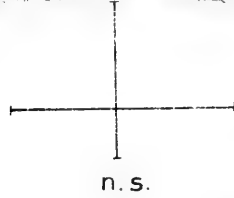
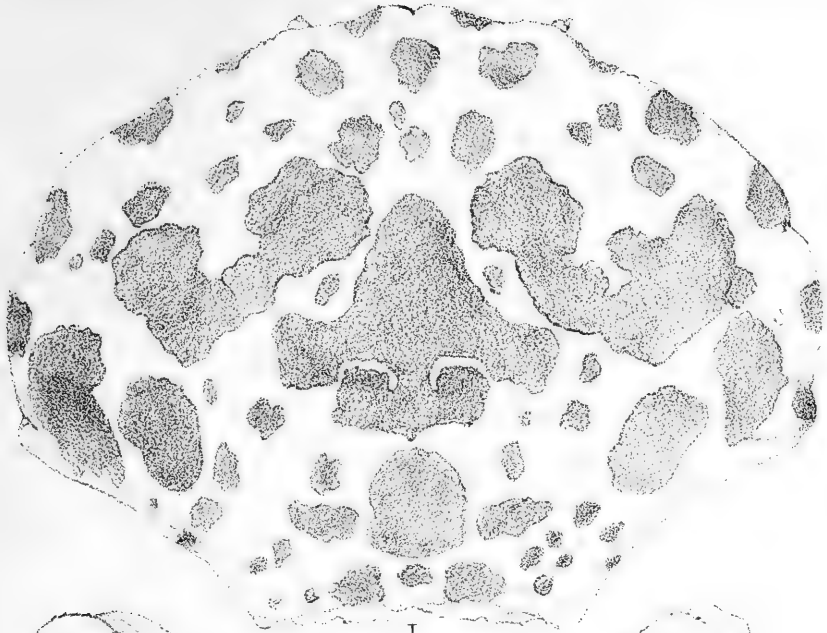


T. R. R. Stebbing del.

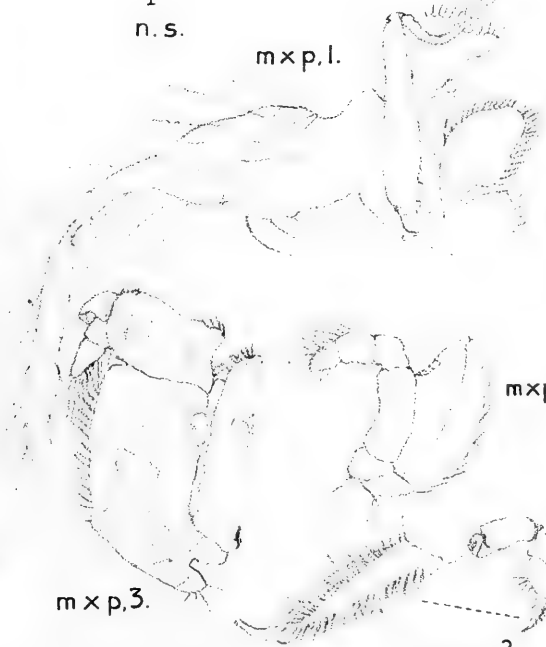
John Singleton & Sons lith.

PLATYLAMBRUS QUEMVIS, sp. nov.





m x p. 1.



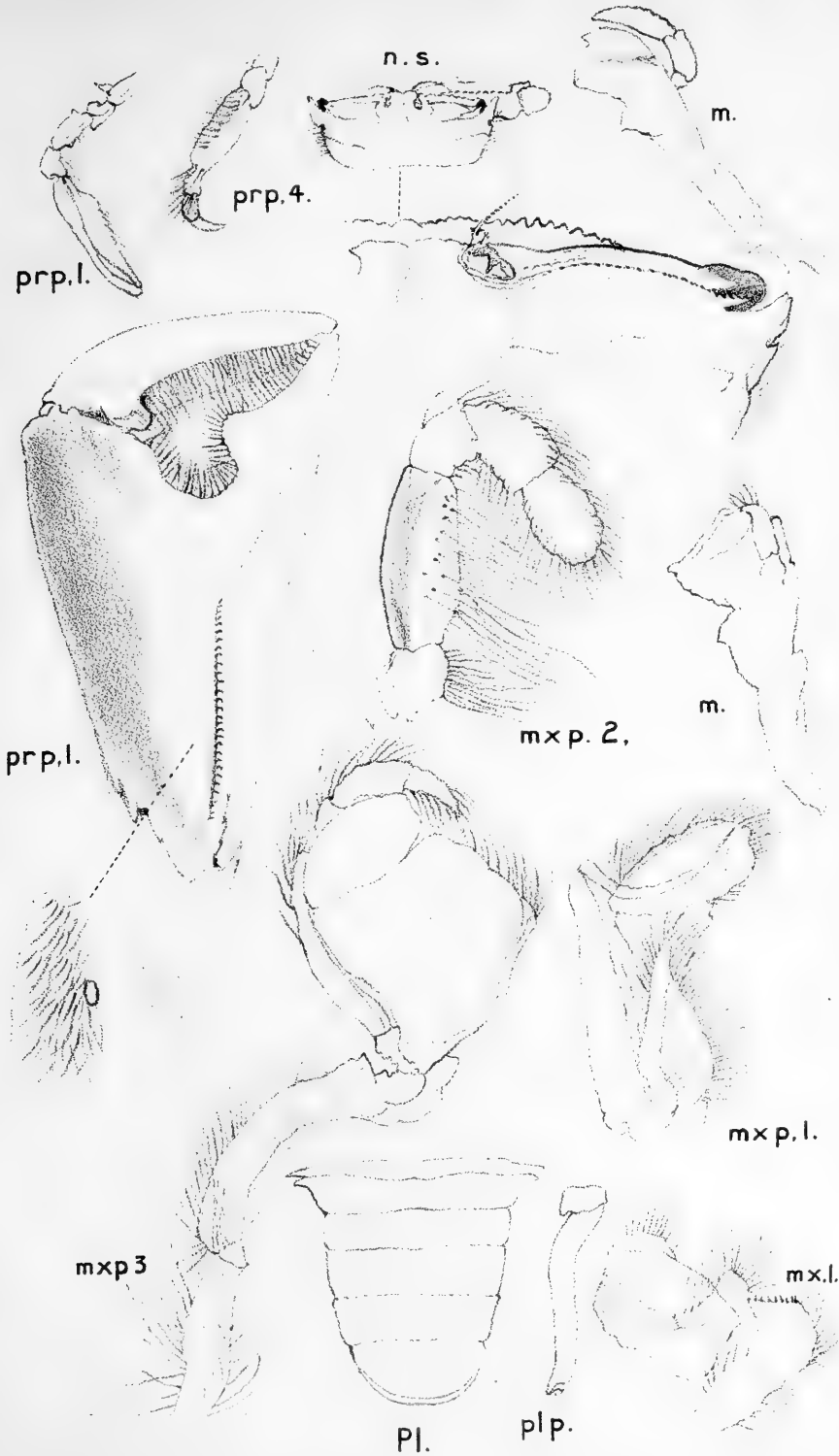
m x p. 2.

m x p. 3.

m x l.

prp. 2.



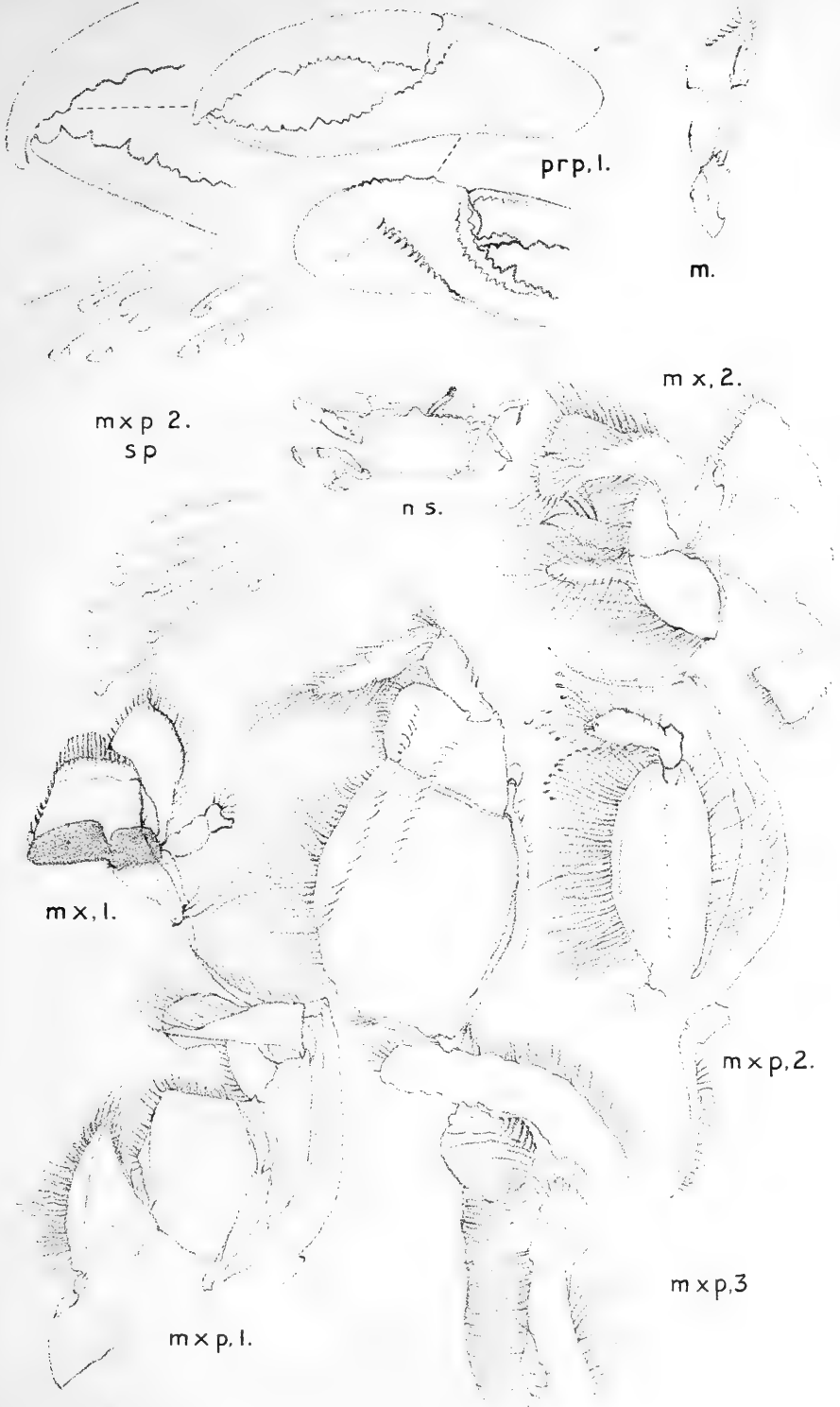


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MACROPHTHALMUS GRANDIDIERII, A. Milne-Edwards.

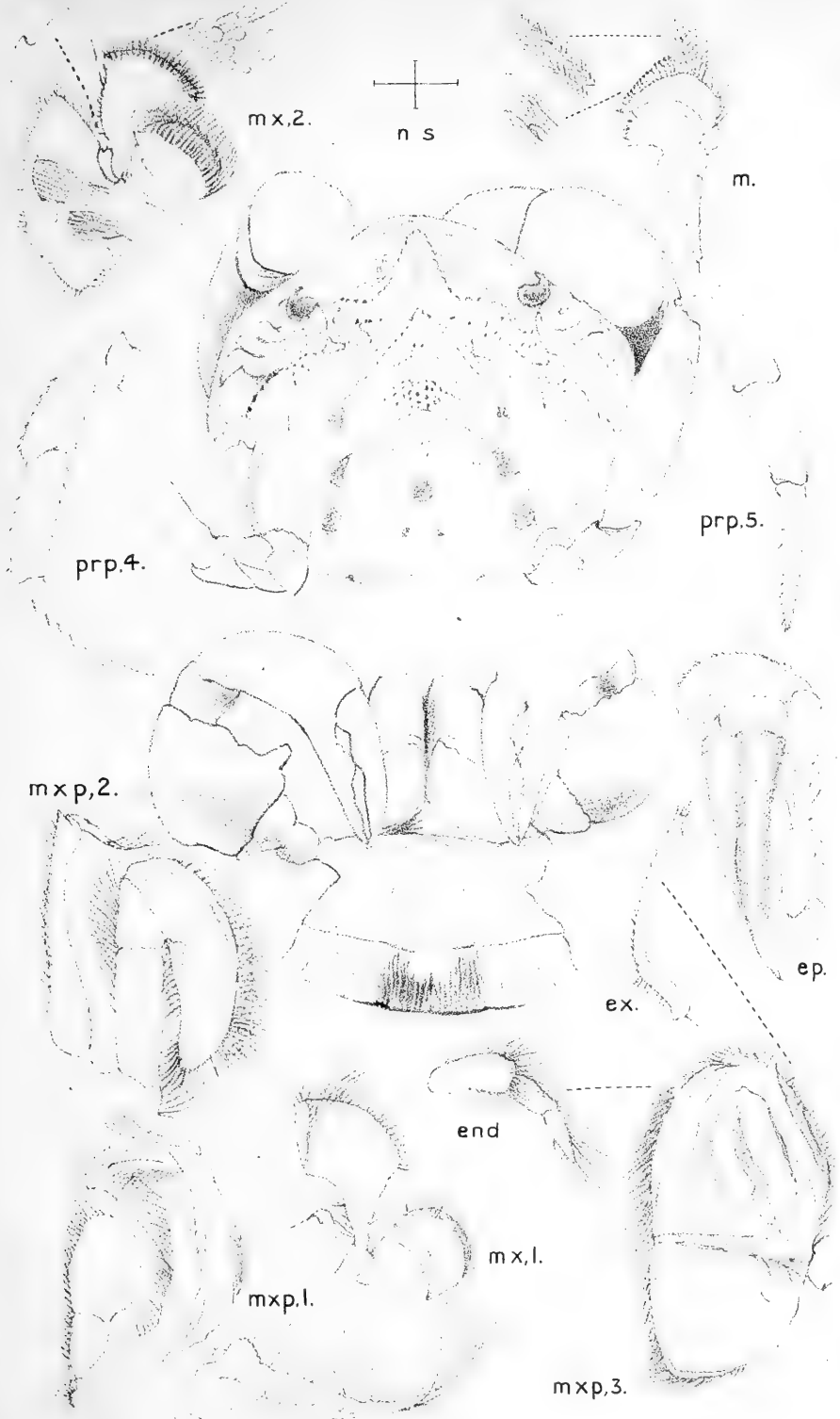




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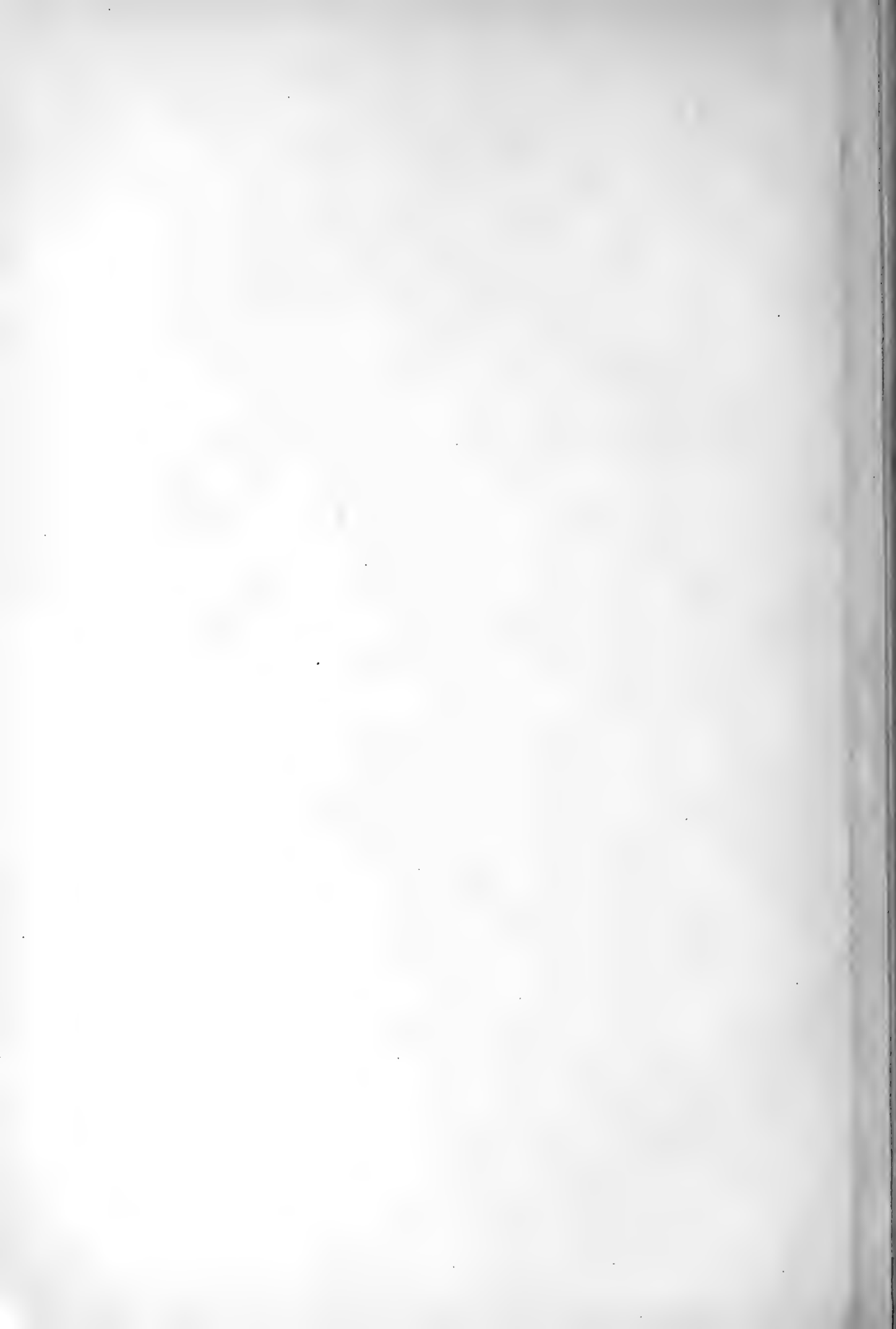


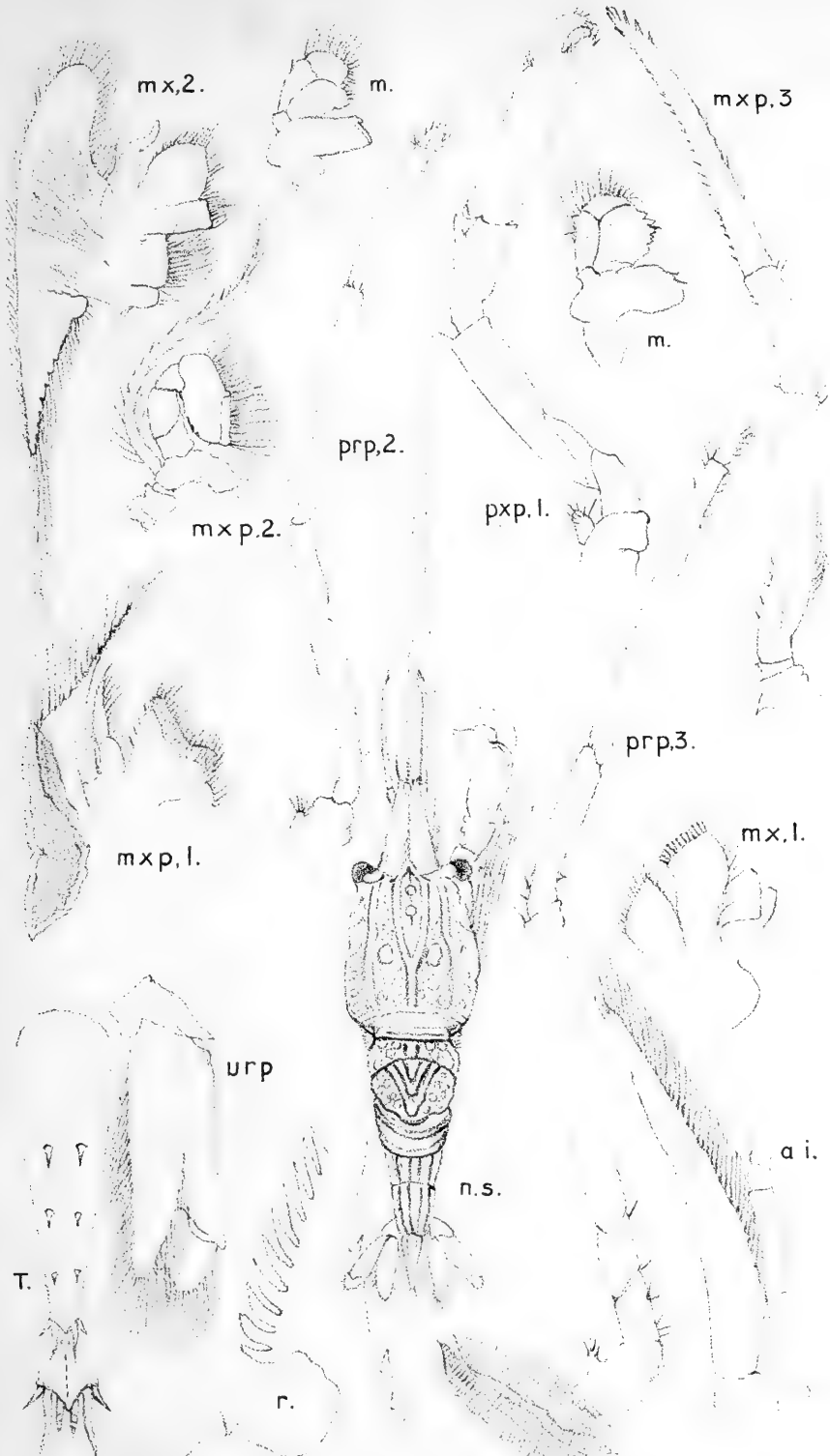


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DOTILLA CLEPSYDRA, sp. nov.





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RHYNCHOCINETES TYPUS, A. Milne-Edwards.



PLATE V.

Dotilla clepsydra, sp. nov.

- n.s. Lines indicating natural size of specimen shown below in dorsal and ventral aspects, the dorsal showing the carapace with chelipeds and fourth and fifth peræopods (prp. 4, prp. 5,) in attachment; the ventral showing the chelipeds in position partly overlapping the third maxillipeds, and the last three segments of the pleon, with the antepenultimate almost covered by the setæ of the preceding segment.
- m. Mandible, with further enlargement of the setæ on the terminal joint of the palp. This figure is magnified on the same scale as the other mouth-organs.
- mx. 1, mx. 2. The first maxilla and the second, with further enlargement in the latter of the apex of the endopod and of the setæ of the preceding plate.
- mxp. 1, mxp. 2, mxp. 3, end., ex., ep. First and second maxillipeds, and third maxilliped, with exopod and epipod detached, and separate figure of the last three joints of the endopod.

PLATE VI.

Rhynchocinetes typus, Milne-Edwards.

- n.s. Dorsal view of specimen natural size as seen in the preserving receptacle, omitting the first and second antennæ and the limbs of the left side. All the detail figures are from a much smaller specimen.
- r. Proximal portion of the (imperfect) rostrum.
- T. Dorsal view of the telson, with higher magnification of the apex.
- a.i. Part of second antenna, with the scale.
- m., m., mx. 1, mx. 2, mxp. 1, mxp. 2. The mandibles, first and second maxillæ, and first and second maxillipeds, all to a uniform scale, more highly magnified than the following.
- mxp. 3, prp. 1, prp. 2, prp. 3, urp. Third maxilliped, first, second, and third peræopods, and a uropod.

II.—The varieties of *PAPILIO DARDANUS CENEA*
in the collection of the Durban Museum.

by

C. N. Barker, F.E.S.

WITH PLATE VII.

THE variations that occur among the females of *Papilio dardanus* throughout its range, which extends over the greater part of the non-arid regions of Africa—and in the form *meriones*, Feld. to Madagascar—is, perhaps, the most wonderful illustration of polymorphism that occurs in nature. The males are invariably tailed, the females generally without these appendages, though there are not a few exceptions to the rule. The following are some of the exceptions, as figured by Dr. Eltringham in his beautifully illustrated work “African Mimetic Butterflies.”

Papilio dardanus-meriones, Feld. from Madagascar. The males and females are alike in coloration, form and markings, except that in the latter respect the female has retained, or developed from the costa, at about one-third of the length of the cell, a broad, very oblique, band which crosses more or less the width of the cell and follows on its upper-side the direction of the white, or light-coloured, cellular bar which is common to all forms of *P. dardanus*, ♀. The presence of this oblique black band, immediately beneath the light cellular streak, in the Madagascar and Comoro Islands forms, appears to me to be strong evidence of its ancestral character, which has its fuller development in all other forms of *Papilio dardanus*.

Abyssinia provides us with two remarkable fully-tailed forms, i.e. *P. dardanus antinorii*, female forms *niavioides*, Kheil, and *ruspinæ*, Kheil. The former follows in the contour of its pattern and coloration *cenea-hippocoon*, Fabr.; the latter that of *cenea-trophonius*, Westw., except that in both cases the spots forming the sub marginal series of the hind-wings are much enlarged and elongated.

Possessing rudimentary tails, Dr. Eltringham figures two interesting examples, viz.: *P. dardanus*, ♀ *hippocoon*, Fabr., from the Gaboon, and an extraordinary form *P. dardanus polytrophus*, ♀ form *trimeni*, Poulton, from the Kikuyu Escarpment, British East Africa, which in ground colour and suppression, or its replacement by dusky suffusion,

of the black markings of the upper-surface fore-wings is a distinct approach towards the male form.

Among the tailless varieties or forms, Dr. Eltringham figures *tibullus-dorippoides*, Trim., from Nairobi, British East Africa, which with a great attenuation of the black margins and markings of both wings, and the consequent enlargement and semi-coalescence of the sub marginal spots of the hind-wings, also shows some approach to the male form. It also shows incipient signs of tail development in the prolongation of the second median nervule of the hind-wings. The colour, as figured, is a tawny shade intermediate between that of the *trophonius* and male coloration.

Of purely tailless forms the following are figured: *cenea-cenea*, two varieties; *polytrophus-cenea*, from the same locality as *polytrophus-trimeni*; *dardanus trophonius*, from Victoria Nyanza; *cenea-trophonius*, from Natal; *cenea-hippocoon*, from Mombasa; and finally two very aberrant types, viz.: *dardanus-planemoides*, Trim., from Kisumu, and *dardanus-dionysos*, from West Africa. In addition to the types cited above there are probably numerous intergrades linking up these local forms.

But what I am concerned with in this paper is to pass a few remarks on the specimens contained in the Millar collection of the Durban Museum. The cabinet contains twenty female examples of the three group forms, *dardanus cenea-cenea*, Stoll., *d. cenea-hippocoon*, Fabr., and *d. cenea-trophonius*, Westw. Most are, unfortunately, unlabelled as to localities, and in a few cases as to dates of capture; but it can be inferred with safety that all were taken, or bred, in or near Durban.

Numbers 1 to 6, inclusive, belong to the group *dardanus cenea-cenea*, 7 to 12 to that of *dardanus cenea-hippocoon*, and 16 to 20 to that of *dardanus cenea-trophonius*. Nos. 13 to 15 are very aberrant forms, having some of the attributes of both *cenea* and *hippocoon*. In the coloration of the spots of the fore-wings in reference to those of the hind-wings they diverge from both these groups and assimilate with that of *dardanus-planemoides*, Trim.

No. 1 is a very melanic form in which many of the spots have disappeared, and those that remain are much attenuated. The submarginal spots of both wings are entirely absent. The large spot of the discal series between the first and second median nervules is much reduced and is of the same colour as the premedian band of the hind-wings. Dated 15th March, 1910.

No. 2. A nearly typical *cenea-cenea*. All the spots of the fore-wings are white, except for a very narrow, yellow edging inferiorly to the large spot of the discal series, between the first and second median nervules. The submarginal spots of the fore-wings are obsolescent. Dated 25th October, 1909.

No. 3. The only divergence from type in this specimen lies in a narrow streak of cream colour immediately below the large spot of the discal series, which is of the same colour, showing a disposition towards *cenea-hippocoon*. Dated 6th February, 1910.

No. 4. In this example all the spots of the fore-wings are largely developed and are white, except the subapical spot which is very small and diffused. The band of the hind-wings is pale cream, shading off to whitish towards the inner-margins. Dated 29th March, 1907.

No. 5. A very similar specimen to no. 4. The premedian band of the hind-wings is narrowed by encroachment of the black marginal area. There is also a very narrow suffused yellow streak below the first median nervule of the fore-wings, as in no. 3.

No. 6. In this example the fore-wing spots of the discal row and the cellular streak are well developed. There is an additional spot between the second and third costal nervules and a narrow streak, almost touching the spot immediately above, lying along the second radial nervule. All the spots of the fore-wings, except those nearest the costa, are tinted with yellow. The black margins of the hind-wings are very broad and sharply defined inwardly. Labelled "Hatched 12th December, 1910."

No. 7. This is a melanic form of *cenea-hippocoon*, as no. 1 is of *cenea-cenea*. It is devoid of all the submarginal spots on both fore- and hind-wings, and the subapical spot of the fore-wing is only diffusely present. The discal band is only represented by three irregular, detached spots, and the disco-cellular streak is entirely absent. Captured on the Berea, Durban, 10th January, 1909.

No. 8 is a typical *cenea-hippocoon*. The subapical spot is absent.

No. 9. The spots of the discal band are disconnected and less developed. The inner-marginal patch is irregularly encroached upon by black atoms about its margins, especially below the first median nervule. Labelled "6th February, 1910."

No. 10. The discal band and cellular streak are well developed. There is no subapical spot. The black margin of the hind-wings is narrow, shading off into sepia inwardly. Labelled "Hatched 12th December, 1910."

No. 11. This is a fine specimen, normal in its fore-wing pattern. The hind-wing has a very narrow black margin giving off strongly defined black nervular rays. There is an inner border of light sepia, strongly contrasting both with the black margin and the white discal area. The basal black is greatly reduced as in *cenea-trophonius*. Durban, 20th February, 1900.

No. 12. In this the white of the inner-marginal patch, fore-wings, is deeply tinged with orange-ochreous between the first median nervule and the submedian nervule over its basal two-thirds. There is no subapical spot. The nervules from the margins of the hind-wings are prolonged towards the base and are very broadly black.

Nos. 13 and 14. These are extremely interesting duplicates of one another, only differing in minor details. The pattern of the fore-wings is transitional from *hippocoön* to *cenea*, though nearer to the former. The coloration, however, is quite aberrant. With the exception of the costal end of the cellular streak and the spot of discal series immediately below costa, the whole of the spots and patches of the fore-wings are of a bright orange-ochreous colour. In no. 13, the discal area of the hind-wings shades off from orange immediately against the black margins to cream and finally whitish about the inner-margins. In no. 14, the black of the border is narrower, leaving a very broad band of sepia intersected by the black nervules. The discal area is paler cream colour and pure white above the cell. The rich orange-ochreous of the spots of the fore-wings, contrasted with the lighter coloration of the hind-wings gives these two examples a very unique appearance. The only form known to me in which the coloration of the two wings affords similar contrasts is *dardanus planemoides* as figured by Dr. Eltringham. No. 13 is dated 3rd May, 1900, and no. 14 was bred by Mr. G. F. Leigh on 19th October, 1910.

No. 15. This is another interesting specimen, in which all the markings of the fore-wings are yellow-ochreous, and those of the hind-wings pale cream. The pattern is that of *hippocoön*, with slight approaches to *cenea* in the encroachment of the black upon the inner-marginal patch, in the same way as occurs in a lesser degree in no. 9. The coloration of the spots and patches of the fore-wings takes a deeper shade than that shown in the discal area of the hind-wings, agreeing in this respect with nos. 13 and 14.

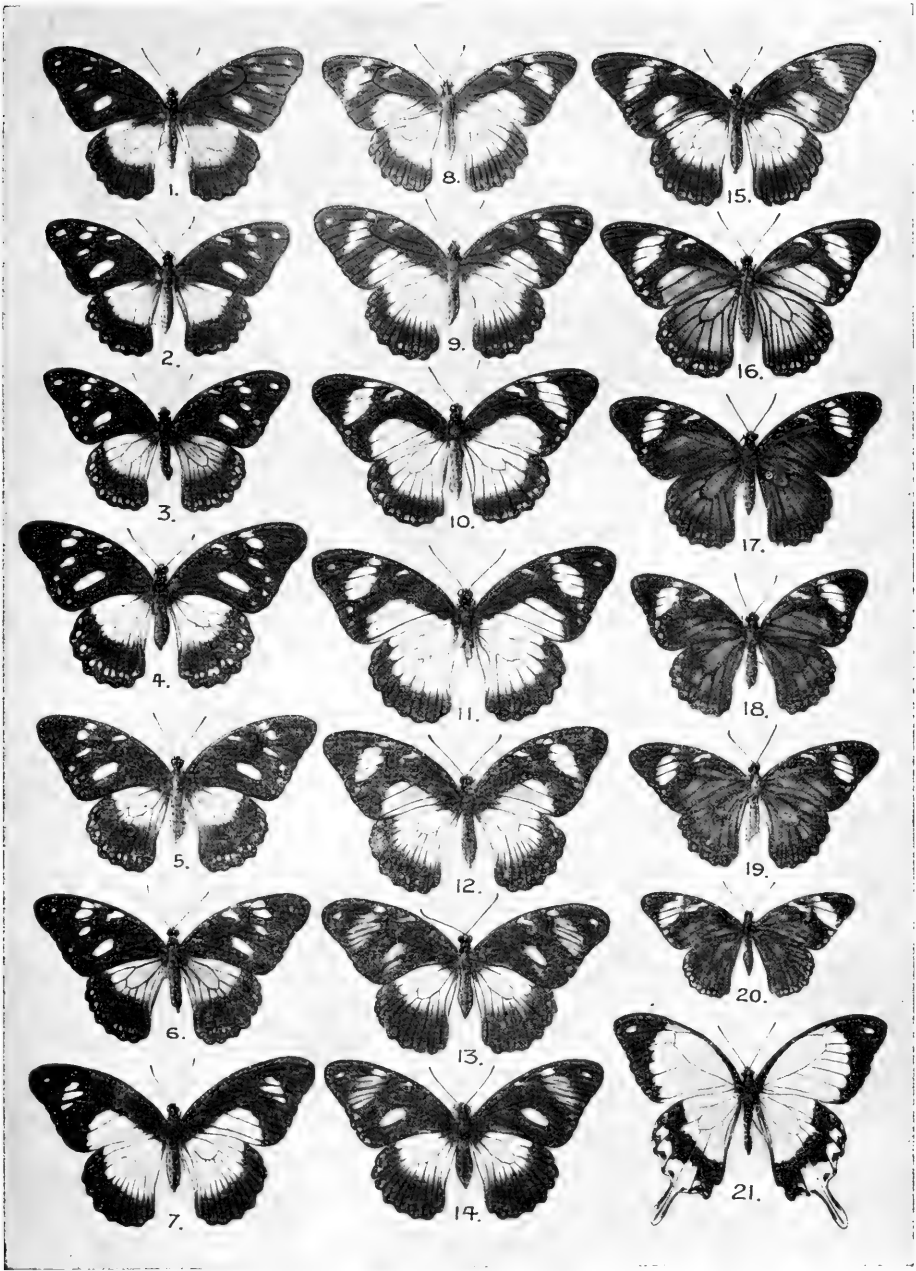
No. 16. A *trophonius*, with leanings towards *hippocoön* in its lighter shade of colour, cinnamon-yellow.

Nos. 17 and 18. These are both typical *trophonius*, with only slight differentiation one from the other that does not require comment.

No. 19. This is a shade lighter in colour than usual, and has the white discal patch of the fore-wings suffused with dull orange-ochreous.

No. 20. A very interesting dry-season example of *trophonius*. The colour is a deep brick-red. The discal patch and disco-cellular streak are very largely developed and nearly coalesce. They are obscured over the greater part of their surfaces by a brick-dust suffusion. The black hind-marginal border of the hind-wings is reduced to a narrow band enclosing the spots of the submarginal series, which are relatively larger and more ovate than is usual. It was taken on the Berea, Durban, on 10th August, 1907.

I have not thought it necessary to describe the under-sides of the specimens submitted because such variation as occurs is chiefly a modified reproduction of the upper-side pattern.



John Singleton & Sons eng.

About three-eighths natural size.

PAPILIO DARDANUS CENEA, Stoll.

1-20, females; 21, male.

III.—New Records of Natal Bees (Second Contribution),

by

T. D. A. Cockerell, University of Colorado.

ANTHOPHORA ADVENA, Smith.

♀. Umbilo, 2nd Oct., 1915 (L. Bevis; 1706); ♂. Umbilo, 9th May, 1915 (L. Bevis), and 17th Oct., 1915 (L. Bevis; 1709). I find that a male from Durban (1025), collected by Mr. H. M. Millar, which I reported as *advena*, is a variety of *A. acraënsis*, having a sprinkling of white hair on the fourth abdominal segment. In true *advena* male, the fourth segment is densely covered with white hair. The variety requires investigation; could it be a hybrid between the two species?

ANTHOPHORA ACRAËNSIS, Fabricius.

♂. Umbilo, 17th Oct., 1915 (L. Bevis; 1709, in part). This species has been confused with *A. advena*, but appears to be unquestionably distinct. The hair of the pleura is black.

ANTHOPHORA VESTITA, Smith.

♀. Umbilo, 17th Oct., 1915 (L. Bevis; 1708), five specimens, of which four have a yellow marginal band on clypeus, while the fifth has only a spot on each side.

♂. Umbilo, 17th Oct., 1915 (L. Bevis; 1709, in part). Compared with a male from Willowmore, Cape Colony (Brauns) this is smaller, with the black marks on upper part of clypeus larger. Possibly a good series would indicate a racial difference between the Umbilo and Willowmore forms, but they have the same essential characters and certainly represent one species. The type of *A. vestita* was from Natal.

Among the Natal species of *Anthophora*, *vestita* will be known by the abdomen being covered with red or fulvous hair. The male has the face-markings lemon-yellow, and when the abdominal segments are extended, the abdomen appears more or less distinctly banded; the fifth and sixth segments have black hair at the base, which is almost entirely concealed when the segments are contracted.

ANTHOPHORA CIRCULATA, Fabricius.

♀. Umbilo, 2nd Oct., 1915 (L. Bevis; 1706); 10th Oct., 1915 (L. Bevis; 1708). ♂. Umbilo, 10th Oct., 1915 (L. Bevis; 1708). The male has large black markings on the clypeus, and is *A. fallax*, Smith. I am now convinced that *fallax* represents only a variation of *A. circulata*.

ANTHOPHORA CALIGATA, Gerstaecker.

♀. Umbilo, 2nd, 10th and 17th Oct., 1915 (L. Bevis); 9th June, 1915 (L. Bevis). Lr. Umkomaas, 18th Dec., 1914 (L. Bevis; 1485).

TETRALONIA SHEFFIELDI UMBILOENSIS, sub-sp. nov.

♀. Scutellum covered with very dark fuscous hair; abdomen with dark hair at extreme base. The hind margins of the abdominal segments are so broadly ferruginous, that the tegument of the abdomen appears red, evidently black only at bases. Umbilo, 28th April, 1915 (L. Bevis; 1565). Additional material is necessary to show whether this is a distinct sub-species, or only a variety. The insect superficially resembles *Anthophora vestita*, but the venation is different.

CÆLIOXYS LORICULA, Smith.

The hitherto unknown female comes from Umbilo, 28th April, 1915 (L. Bevis; 1565). The end of the abdomen is entirely of the type of the European *C. quadridentata*, except that the lower plate is shorter and less deflected downward, and its lateral notches are rectangular. In Friese's table of African species this runs to *C. caffra*, but the legs are not red, and the apical lobe of apical inferior plate of abdomen is broader and shorter. Evidently *C. caffra* is a distinct though closely allied species. At first sight one might suppose the female *loricula* to belong with the male *C. dolichacantha*, which also occurs at Umbilo; but it differs from the new species in the shorter, curved, axillar spines, the more finely punctured abdomen (much more closely punctured on ventral surface), and the first recurrent nervure joining the second submarginal cell further from the base (in *dolichacantha* at or very near the base).

CÆLIOXYS DOLICHACANTHA, sp. nov.

♂. Length 11–12 mm.; black, including legs, antennæ and mandibles; hair on eyes short; face covered with appressed cream-coloured hair; labial palpi with first joint about half as long as second, and mainly black, contrasting with the remaining joints, which are pale reddish; mesothorax with extremely large punctures, well separated on disc; scutellum with rather smaller extremely dense punctures, its surface like a fine network; hind margin of scutellum gently rounded, faintly inclined to be emarginate; axillar spines very long and nearly straight; pleura and sides of metathorax with white hair, and two lines of white hair at base of scutellum; tegulæ piceous; wings fuliginous, pale basally; spurs very dark reddish; tarsi with orange hair on inner side; abdomen with pure white hair-bands, linear in middle, expanded at sides; surface of abdomen shining, with well-separated punctures; fifth segment unarmed; sixth six-spined, the lower apical longer than the upper.

Umbilo, 17th Oct., 1915 (L. Bevis; 1709, in part). Also Umbilo, 28th March, 1915 (L. Bevis; 1533).

In Friese's table runs to *C. seaxspinosa*, Friese, but is much larger.

MEGACHILE MELLIFERINA, Cockerell.

Both sexes collected by Miss Robarts at Durban. The male, hitherto unknown, is about 10 mm. long, with the same general coloration as the female, the tegument of the abdomen largely red on basal segments. Antennæ slender, black, not clubbed or expanded at end; face densely covered with cream-coloured hair; anterior tibiæ and tarsi ferruginous, the tibiæ with long fulvous hair behind, the tarsi pallid, only moderately expanded, with long white hair behind, and an oval black spot on inner side at base of this fringe; anterior coxæ with blunt and rather short spines; middle legs with extremely long white hairs behind; sixth abdominal segment strongly emarginate, but not dentate. This male resembles *M. unguolata*, Smith in the coloration of the abdomen, but the legs are quite different.

MEGACHILE VENUSTELLA, sp. nov.

♀. Length about 11 mm., broad, black, with white and black hair; superficially like the European *M. apicalis*. Closely related to *M. venusta*, Smith (Kalahari specimen compared), but differing thus:

smooth median line on clypeus less distinct; vertex with black hair; mesothorax and scutellum with a strong admixture of black hair; wings distinctly brownish; sixth abdominal segment with hair all black; ventral scopa pure white at sides, fulvous in middle, black at extreme apex.

Umbilo, 10th Oct., 1915 (L. Bevis; 1708).

The following key separates this from several rather similar species:

Abdomen with fulvous hair-bands; ventral scopa mainly red, but white at base and black at apex *ekuvella*, Ckll. (Benguella).

Abdomen without fulvous hair-bands 1.

1. Hair on scutellum all, or practically all, black; ventral scopa coloured as in *ekuvella* *caricina*, Ckll.

Hair on scutellum all or partly pale 2.

2. Hair on scutellum entirely pale; hair around ocelli tinged with fulvous *venusta*, Smith.

Hair on scutellum partly black 3.

3. Length about 8 mm.; disc of mesothorax glistening between the punctures *gratiosa*, Gerst. (Transvaal).

4. Length about 11 mm.; disc of mesothorax dull *venustella*, Ckll.

My *M. gratiosa* was determined by Strand, and represents that species as understood at the Berlin Museum. It was collected by F. Wilms at Lydenburg, Johannesburg.

HERIADES BEVISI, Ckll., variety *a*.

♂. Length 5 mm., anterior wing 4 mm.; black, coarsely punctured, with white hair, on abdomen only forming distinct bands at sides of first and second segments; axillar spines well developed. Differs from typical *bevisi* by the brownish wings and shorter second submarginal cell; it may possibly prove to be a distinct species.

Umbilo, 16th March, 1915 (L. Bevis; 1531).

HERIADES CHLOROPS, sp. nov.

♂. Like *H. bevisi* variety *a*, with brownish wings and relatively short second submarginal cell, but distinct hair-bands only at sides of first abdominal segment, and flagellum long and slender (about 2.4 mm. long), distinctly crenulate, the middle joints about 190 microns long.

The eyes are greyish-green, with the lower end pale; in *bevisi* and variety *a* they are brown. The ocelli are pale greenish-yellow; in *bevisi* var. *a* they are pale reddish.

Umbilo, Durban, 8th Dec., 1914 (L. Bevis).

Extremely close to *H. bevisi* var. *a*, but evidently a distinct species. Also very close to *H. longicornis*, Friese, from Kigonsera, but the hair is white, the thorax is shining between the punctures, and the femora are not red-brown. Also related to *H. argentatus*,*Gerst.

On the same day, at Umbilo, Mr. L. Bevis took a female *Heriades*, 7 mm. long, agreeing with *H. chlorops* in the dusky wings, and also in the possession of two pairs of spines on the posterior part of the thorax, one axillary, the other at sides of base of metathorax. The ventral scopa is white. Superficially, this looks like *H. chubbi*, but the punctures of the mesothorax are very much finer. The mesothorax is shining, with the punctures as dense as possible, and much smaller in the middle than sub-laterally. In *chlorops* (male) the punctures are larger, and not reduced in the middle. No such sexual difference appears in a number of *Heriades* examined. This female is not *H. albiscopanus*, Strand, which is smaller (length 5.5 mm.) and has no axillary spines. It seems best to regard this Umbilo female as a distinct species, which may be named:

HERIADES PUNCTULATUS, sp. nov.

Other characters are: clypeus as densely punctured as possible, not at all carinate, with an even, slightly concave lower margin; mandibles with two large teeth, occupying the outer half of the cutting edge; eyes greyish-brown; axillar and metathoracic spines stout and curved, thorn-like; second recurrent nervure joining second submarginal cell at apex; hair on inner side of hind tarsi white, faintly yellowish apically, but on inner side of anterior tarsi orange; abdomen with very narrow thin hair-bands, broadened and dense at sides of first segment.

ALLODAPE VARIEGATA, Smith.

Umbilo, 15th Oct., 6th Dec., 22nd Feb. (L. Bevis); Widenham, 14th Dec., 1914 (L. Bevis; 1482).

A small species, with broad yellow band on scutellum, and abdomen largely red. A specimen from F. Smith's collection, from the Cape of Good Hope, differs by the red abdomen, only faintly dusky on apical

half, and without lateral blackish marks. This is probably a distinct race, but the type locally is Port Natal, and the specimens collected by Mr. Bevis represent the typical form as described by Smith.

ALLODAPE MAURULA, sp. nov.

♂ (Type). Length a little over 5 mm.; shining black, with clavate abdomen, narrowed basally; hair very scanty, and white; clypeus creamy-white, equally broad above and below, but constricted in middle; small cuneiform lateral marks between lower half of clypeus and eye; eyes prominent, converging below, the face very narrow; scape with a white stripe in front, flagellum entirely black; mesothorax shining, but scutellum dullish; tubercles cream-colour, but rest of thorax black; tegulae hyaline; wings faintly dusky, stigma and nervures fuscous; legs black, with the tarsi cream-colour, reddened apically; abdomen black, without markings, hair at apex white.

♀. Length about 6 mm., rather slender; white clypeal area with upper half broader than lower; no lateral marks; antennae entirely black; tarsi black basally and ferruginous apically.

Type from Durban, 24th Feb., 1915 (H. M. Millar; 1507). Females from Umbilo, 22nd Feb., 1914 (L. Bevis; 1120), and 18th April, 1915 (L. Bevis; 1563).

Very like *A. lacteipennis*, Brauns, but the female of that species has only the upper edge of the clypeus white. *A. albipennis*, Friese, is also related, but has milk-white wings, and is distinctly smaller.

ALLODAPE CORDATA, Smith.

Umbilo, 6th & 18th Dec., 18th & 28th April (L. Bevis). Widenham, 13th Dec., 1914 (L. Bevis; 1481).

Of the four Widenham specimens, three have the hind margins of abdominal segments more or less reddened.

ALLODAPE STELLARUM, Cockerell.

Females from Umbilo, 5th & 18th April (L. Bevis), and Widenham, 17th Dec., 1914 (L. Bevis; 1484).

Male from Widenham, 13th Dec., 1914 (L. Bevis; 1481). The male is new; it has the clypeus white except a small black spot on each lateral margin near the middle.

PROSOPIS BEVISI, sp. nov.

♂. Length a little over 6 mm.; black, with legs, sides and extreme base of first abdominal segment red; entire face below antennæ red (probably orange in life), including supraclypeal mark (quadrate, broader than long), and with lateral marks ending in a point on orbit at about upper level of antennal sockets; mandibles and labrum red; scape red, but the short thick flagellum black, reddish only at base; a well developed keel mesad of each antenna; front and vertex minutely rugose; mesothorax dull and densely punctured; prothorax and tubercles red, but rest of thorax black; base of metathorax shining, with strong short plicæ; pleura dull and rugulose; tegulæ testaceous; wings hyaline, very faintly dusky, stigma and nervures dark brown; first recurrent nervure joining first submarginal cell at end; second recurrent meeting outer transverso-cubital; abdomen broad, shining, with white lateral hair-bands on first segment, but not on the others; surface extremely finely sculptured, appearing rather sericeous; margin of second segment elevated.

Umbilo, 22nd Feb., 1914 (L. Bevis; 1120).

Resembles *P. rubriplagiata*, Cam. = *P. braunsi*, Alf. (this synonymy due to Dr. Brauns in litt.), but easily distinguished by the entirely red legs, lack of distinct (visible under lens) punctures on abdomen, different base of metathorax, short and broad supraclypeal mark, short and dark flagellum, etc. In Friese's 1911 table it runs nearest to *P. braunsi*. It agrees with none of the species more recently described by Alfken and Strand.

THRINCHOSTOMA MILLARI, Cockerell.

♀. Umbilo, 10th & 17th Oct., 1915 (L. Bevis).

NOMIA MEGALEPIS, Cockerell.

♀. Umbilo, 25th Oct., 1914 (L. Bevis; 1427).

In Ann. Durban Mus., vol. i, p. 463, the "following bee" referred to under *Crocisa arcuata* is of course *Nomia nigripes* (p. 464), which did follow in the MS. as originally written.

HALICTUS JUCUNDUS, Smith.

♀. Umbilo, 10th Oct., 1915 (L. Bevis; 1708). Smaller and less robust than usual.

HALICTUS RHODASPIS, sp. nov.

♀. Length about 10 mm.; black, including the antennæ, mandibles and tarsi; hair of face, cheeks, pleura and metathorax greyish-white, of vertex and mesothorax pale fulvous, of scutellum and middle of post-scutellum bright ferruginous; upper part of clypeus (except the margin) opaque and very densely rugosopunctate, below this are larger, distinct punctures, while the swollen lower marginal area is polished; vertex glistening; mesothorax very finely and closely punctured, shining between the punctures; area of metathorax covered with fine vermiform wrinkles, without radiating plicæ; tegulæ red; wings faintly dusky, stigma and nervures dark brown; legs with pale hair; hind spur minutely serrate; abdomen shining, very minutely punctured; a broadly interrupted band of ochreous tomentum at base of second segment, and a very broad entire band at base of third; hair at apex pale fulvous; venter with long pollen-carrying hair.

Umbilo, 17th Oct., 1915 (L. Bevis; 1709).

In Meade-Waldo's table of African *Halictus* this runs to *H. capicola*, Cam., which is smaller, with the clypeus differently sculptured. It agrees with none of the species described by Cameron, Friese or Vachal. It is larger than *H. diversus*, Sm., and differs in having the area of metathorax sharply limited posteriorly, the flagellum all black, etc. From *H. diversiformis*, Ckll., it is known by the red tegulæ, dark stigma, etc.

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XIX.—Catalogue of Natal Marine Fishes (1), by Messrs. GILCHRIST & THOMPSON.

Part 4. Published 21st May, 1917. Price 5/- nett.

- XIX.—Catalogue of Natal Marine Fishes (2), by Messrs. GILCHRIST & THOMPSON.
XX.—A new Silurid Fish from Natal, by G. A. BOULENGER.
XXI.—A new Bat (*Otomops icarus*), by E. C. CHUBB. (Plate XXI).

Part 5. Published 25th July, 1917. Price 5/- nett.

- XXII.—The Malacostraca of Durban Bay, by the Rev. T. R. R. STEBBING.
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VOL. II.

PART 2.

ANNALS
OF THE
DURBAN MUSEUM

EDITED BY THE CURATOR,
E. C. CHUBB.

Issued 30th July, 1918.

PRICE 5/- NETT.

PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.

The Annals of the Durban Museum is devoted principally to South African Zoology and is issued from time to time as circumstances permit.

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IV.—Some Crustacea of Natal,

by the

Rev. T. R. R. Stebbing, M.A., F.R.S., F.L.S., F.Z.S.

WITH PLATES VIII-XII.

IN the present contribution, species belonging to seventeen families of Malacostraca and of Leptostraca are considered for various reasons, in several cases chiefly for the notes supplied by Mr. H. W. Bell Marley on the habits and colours of the freshly captured specimens. Among the Brachyura anomala a new species is described as *Cryptodromia monodous*. A new species is added to the Isopoda anomala under the name *Haplocope oculatus*. The Amphipoda are provided with three new species and a new genus, *Microlysias*, to which may be added a detailed account of *Echyaella natalensis*, both genus and species having been briefly introduced in December, 1917.

But the point which has, perhaps, the best chance of exciting something like general interest rests with the association of species from thirteen different genera found all sheltering in a single specimen of a sponge. It may be convenient here to bring together the names of this motley assemblage of crustaceans. They are *Eriphia scabriculus*, Dana; *Petrolisthes speciosus* (Dana); *Porcellana dehaanii*, Krauss; *Processa* sp.; *Tanais philetærus*, Stebbing; *Leptocheilia dubius* (Kröyer); *Haplocope oculatus*, sp. nov.; *Paramæra schizurus*, sp. nov.; *Echyaella natalensis*, Stebbing; *Eurystheus holmesi*, Stebbing; *Cheiriphotis walkeri*, sp. nov.; *Podocerus inconspicuus* (Stebbing); *Nebalia bipes* (O. Fabricius). Besides these there were other amphipods too mutilated after their long journey to repay investigation, and some miscellaneous objects, including a small star-fish. The protection which sponges afford to Crustacea has, of course, been long ago noticed by several writers, such as Canon Norman, the late H. J. Carter, F.R.S., and E. J. Miers. Also, M. Ed. Chevreux found twenty-three species of amphipods among the alien growths on the carapace of *Mamaia squinado*, probably distributed over several specimens. Similarly, it is not clear that the ten species in Dr. Willey's gregarious Crustacea from submerged cocoa-nut piles in Ceylon were found together on any single pile.

(47)

BRACHYURA GENUINA.

TRIBE OXYRRHYNCHA.

FAMILY MAMAIDÆ.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 290, 1910.

GENUS CAMPOSCIA, Leach.

1829. *Camposcia*, Leach, in Latreille, Le Règne Animal, vol. iv, p. 60.
 1829. *C.*, Guérin, Iconographie du Règne Animal, p. 9, pl. 9, fig. 1.
 1839. *C.*, de Haan, Crust. Japonica, decas quarta, p. 87.

CAMPOSCIA RETUSUS, Latreille.

1829. *Camposcia retuja*, Latreille, Le Règne Animal, vol. iv, p. 60.
 1829. *C. r.*, Guérin, Icon. Règne Animal, pl. 9, fig. 1 (*retusa* on p. 9).
 1834. *C. retusa*, Milne Edwards, Hist. Nat. Crust., vol. i, p. 283, pl. 15, fig. 15.
 1839. *C. retusus*, de Haan, Crust. Japon., pl. li.
 1895. *C. retusa*, Alcock, Journ. Asiat. Soc. Bengal, vol. lxiv, p. 184.
 1906. *C. r.*, R. D. Laurie, Herdman's Pearl Fish., Rep. xl, in pt. v, p. 371.

Alcock supplies an ample bibliography and an excellent description of this species, ignoring however its original name, *retuja*, which was no doubt due to a misreading of the manuscript label, *retufa*. It may be noted that the fourth joint of the third maxillipeds, though narrow at the base, is expanded distally. The extension of the third joint along the inner margin of the fourth is a notable feature. The carapace of the female specimen collected by Mr. Bell Marley at Durban measures roughly 40 mm. in length by 27 mm. in breadth. The pleon is, as described by de Haan, in the last four segments widely orbicular. According to Mr. Bell Marley, its coating of dark red hairs accumulates a variety of objects, such as seedpods of mangroves, so that as it floats about with the tide it looks more like a bunch of seaweed than a crab.

FAMILY ACANTHONYCHIDÆ.

GENUS ANTILIBINIA, M^cLeay.

ANTILIBINIA SMITHII, M^cLeay.

See Ann. S. Afr. Mus., vol. vi, pt. 4. pp. 286, 287, 1910.

A male specimen, taken by Mr. Bell Marley at Vetch's Pier, Durban, last year, has a carapace measuring 20 mm. in length and about 16 mm. in width, therefore much smaller than the specimens described by M^cLeay and Krauss. The pleon answers to the figure given by the latter, being seven-segmented, but with the median segments perhaps immovable. Krauss says that this species is never overgrown with marine organisms, and the present specimen answers to that statement, but, whereas M^cLeay says that "the shell of this species is without hairs," here the numerous tubercles which he describes are conspicuously furnished with groups of setæ, which probably enable it to dispense with alien growths. The brown spots are still visible all over the under surface and in some other parts of the specimen.

GENUS DEHAANIUS, M^cLeay.

See Gilchrist's Marine Investigations, vol. i, p. 18, 1900.

DEHAANIUS QUADRIDENTATUS (Krauss).

See Ann. S. Afr. Mus., vol. vi, p. 288, 1910.

A male specimen from Isipingo, Natal, has been sent me by Mr. Bell Marley. It was taken on seaweed, and some of its numerous curved setæ were furnished with the weed, faded but greenish. Its length in the middle line is 15 mm., or 17 mm. if extended to a point between the tips of the horns. The breadth between the tips of the penultimate lateral teeth of the carapace is 12 mm. The size is therefore rather larger than that given by Krauss, but the proportions do not materially differ. Krauss states the colour to be yellowish-brown; Mr. Bell Marley records it as green. In other respects it closely agrees with the description and figures supplied by Krauss.

FAMILY BLASTIDÆ.

See Ann. S. Afr. Mus., vol. vi, p. 288, 1910.

GENUS HYASTENUS, White.

1847. *Hyastenus*, White, Proc. Zool. Soc., p. 56.

1895. *H.*, Alcock, Journ. Asiat. Soc. Bengal, vol. lxiv, p. 206.

Many later references might be given, but they are not appropriate to the present occasion.

HYASTENUS FASCICULARIS (Krauss).

1843. *Pisa fascicularis*, Krauss, Südafrik. Crust., p. 50, pl. 3, figs. 5, a-d.

1910. *P. f.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 288.

The typical *Blastus* (or *Pisa*) *tetraodon* (Pennant) belongs to that division of the family in which the rostral horns do not diverge from the base, as they do in the present South African species. It seems proper, therefore, to transfer it to *Hyastenus*. The male pleon, however, with its widened penultimate segment agrees with that of *Blastus tetraodon*. The Durban specimen, obtained by Mr. T. H. Dale, is about 8 mm. long and slightly over 6 mm. broad. It agrees well with the figures and description given by Krauss. The palp of the first maxilla has a very wide base with a narrow terminal. The third joint of the third maxillipeds has the inner margin fringed with about a dozen very conspicuous teeth; the exopod is rather broad, except distally.

TRIBE CYCLOMETOPA.

FAMILY PORTUNIDÆ.

GENUS CHARYBDIS, de Haan.

See Ann. S. Afr. Mus., vol. vi, p. 306, 1910.

CHARYBDIS ORIENTALIS, Dana.

1852. *Charybdis orientalis*, Dana, U.S. Expl. Exp., vol. xiii, p. 285, 1855, pl. 17, fig. 10.

1899. *C. (Goniosoma) o.*, Alcock, J. Asiat. Soc. Bengal, vol. lxxviii, pp. 50, 63 (with synonymy).

1906. *C. o.*, Rathbun, U.S. Fish. Comm. for 1903, pt. 3, p. 872, pl. 13, fig. 1, and text-fig. 32.

Miss Rathbun excludes Alcock's species from the synonymy, but without giving the reasons for so doing, which are not obvious, since Alcock's description seems to include the few points supplied by Dana.

The female specimen collected by Mr. Bell Marley at Durban measures 34 mm. in length by 52 mm. in breadth at the hindmost of the antero-lateral teeth of the carapace. The six frontal teeth are obtuse, especially the median four. The second antero-lateral tooth is very small and the last of the six not larger than the others. The transverse ridges on the carapace correspond with those faintly outlined by Dana. The posterior margin is straighter than that shown by Miss Rathbun. The postero-lateral margins have the lobule which she mentions. Her description gives "hands swollen," Alcock's "hand not tumid"; the Durban specimen agrees with the latter, and has five large spines. The hind border of the sixth joint in the fifth pereopods is denticulate.

FAMILY XANTHIDÆ.

GENUS XANTHO, Leach.

XANTHO QUINQUEDENTATUS, Krauss.

1843. *Xantho 5-dentatus*, Krauss, Süd-afrik. Crust., p. 30, pl. 1, figs. 3, a-c.
 1910. *X. quinquedentatus*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 298.

Specimens from the Durban Museum, submitted to me by Mr. E. C. Chubb, completely agree with the figures and description supplied by Krauss.

XANTHO DISTINGUENDUS, de Haan.

1835. *Cancer (Xantho) distinguendus*, de Haan, Crust. Japon., decas 2, p. 48, pl. 13, figs. 7, 7a.
 1858. *Chlorodius d.*, Stimpson, Pr. Ac. Sci. Philad., vol. x, p. 34 (32).
 1861. *Xantho d.*, Heller, SB. Ak. Wien, vol. xliii, p. 323.
 1884. *X. macgillivrayi*, Miers, "Alert" Crustacea, p. 211, pl. 20, figs. C, c.
 1886. *Lophozozymus (Lophoxanthus) bellus*, Stimpson, var. *leucomanus*, Lockington, Miers, "Challenger" Brachyura, p. 115, pl. 11, figs. 1, 1a, 1b.

1887. *Medeus distinguendus*, de Man, Pr. Linn. Soc. London, vol. xxii, p. 31.
 1893. *M. d.*, Henderson, Tr. Linn. Soc. London, vol. v, p. 359.
 1898. *Xantho d.*, Alcock, J. Asiat. Soc. Bengal, vol. lxvii, p. 113.

A male specimen which I assign to this species occurred in company with the specimens of *X. quinquedentatus*, from which it is distinguished in many details. As preserved, the lighter colour of the fingers of the chelæ at once attracts attention. The frontal margin, more truncate, is also distinctive, and the dorsal sculpture of the carapace is altogether different. The synonymy, however, for which as so often I am deeply indebted to Alcock's elaborate research, involves some perplexities. Thus the figure by Miers of *X. macgillivrayi* in the "Alert" Crustacea is the only one which, in my opinion, adequately indicates the numerous transverse ridges or series of granules on the carapace. But Henderson thinks de Haan's figure a better representation of *X. macgillivrayi*. Of that species Miers says that the male pleon has "the third to fifth segments coalescent," with which Alcock's account agrees, but of *leucomanus* in the "Challenger" Report we read that of the pleon segments "the third and fourth, and the fifth and sixth, are coalescent."

The carapace of the Durban specimen is 12 mm. long and 17 mm. broad at the hindmost of the antero-lateral teeth. The broader cheliped is on the right. There are other specimens in the collection, and one sent me by Mr. Bell Marley retains elegant colour markings on the carapace.

GENUS CHLORODOPSIS, A. Milne-Edwards.

See Ann. S. Afr. Mus., vol. vi, p. 300, 1910.

CHLORODOPSIS CÆLATUS (Dana).

1852. *Etisodes cælatus*, Dana, U.S. Expl. Exp., vol. xiii, p. 188, pl. 9, figs. 4a-d.
 1906. *Chlorodopsis areolata*, Rathbun, U.S. Fish. Comm. for 1903, pt. 3, p. 858.

Miss Rathbun follows Alphonse Milne-Edwards in identifying this species with *C. areolatus* (Milne Edwards). But the Natal specimens obtained at Durban by Mr. D. R. Boyce so well agree with Dana's figures that they may perhaps justify a specific distinction. Dana takes no notice of *C. areolatus*, but must have been well aware that it had been described by Milne Edwards.

GENUS PILUMNUS, Leach, 1815.

See Ann. S. Afr. Mus., vol. vi, p. 301, 1910.

PILUMNUS SPINIFER, Milne Edwards.

1834. *Pilumnus spinifer*, Milne Edwards, Hist. Nat. Crust., vol. i, p. 420.
1861. *P. savignyi*, Heller, Sitzb. Ak. Wiss. Wien, vol. xliii, p. 345.
1863. *P. spinifer*, Heller, Crust. südl. Europa, pp. 73, 313.
1906. *P. savignyi*, Nobili, Bull. Sci. Franco-Belgique, vol. xi, p. 138.
1907. *P. s.*, Nobili, Ann. Sci. Nat., ser. 7, zool., vol. iv, p. 277.

Milne Edwards and Heller alike refer their species to the figures supplied in Savigny's Crust. d'Egypte, pl. 5, fig. 4, and Nobili in 1906 discusses the difficulty of deciding between the two names, which is enhanced by the fact that Heller himself seems to have changed his mind on the subject between 1861 and 1863.

The shaggy specimen which I am here assigning to the older name is a female obtained by Mr. Bell Marley at Durban. The carapace has a breadth of 25 mm. and a length of 19 mm.

GENUS ERIPHIA, Latreille, 1817.

ERIPHIA SCABRICULUS, Dana, 1852.

See Ann. S. Afr. Mus., vol. vi, pp. 302, 303.

A specimen, male, with carapace measuring 11 mm. in breadth and 8 mm. in length, was obtained by Mr. Bell Marley from the sponge *Cerao chalinus* taken off Vetch's pier, Durban. "Colour carmine, dotted white."

FAMILY CANCRIDÆ.

GENUS KRAUSSIA, Dana.

1852. *Kraussia*, Dana, U.S. Expl. Exp., vol. xiii, pp. 297, 300.

This genus was originally placed by Dana in the *Corystoidea*, family *Thiidae*. In 1887, de Man assigns it to the tribe *Catometopa* (Arch. Naturg., vol. liii, p. 217). In 1899, Alcock places it in the *Cyclometopa*, family *Cancridæ*, sub-family *Thiinae*. In 1911, Miss Rathbun assigns

it to the *Atelecyclidæ* (Tr. Linn. Soc. London, ser. 2, vol. xiv, p. 211). Alcock, in defining the genus, says that the sternum is narrow, but he does not appear to have seen the type species, to which such a statement is surely inapplicable.

KRAUSSIA RUGULOSUS (Krauss).

1843. *Platyonichus rugulosus*, Krauss, Südafrik. Crust., p. 26, pl. 1, figs. 5, a-d.
 1852. *Kraussia rugulosa*, Dana, U.S. Expl. Exp., vol. xiii, pp. 301, 302; 1855, pl. 19, figs. 1a-f.
 1887. *K. r.*, de Man, Arch. Naturg., vol. liii, p. 343, pl. 14, fig. 2.
 1906. *K. r.*, Rathbun, U.S. Fish. Comm. for 1903, p. 875.
 1910. *K. r.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 310.

A male specimen, with carapace 15 mm. broad and between 12 and 13 mm. long, was taken by Mr. Bell Marley at Durban Bluff. He says that it "burrows in sand quickly under rocks and stones." The correspondence of the teeth on front and sides and the scale-like markings on the back of the carapace with the figures and descriptions above cited make the identification of this apparently rare species secure.

TRIBE CATOMETOPA.

FAMILY OCYPODIDÆ.

GENUS EUPLAX, Milne Edwards.

1852. *Euplax*, Milne Edwards, Ann. Sc. Nat. ser. 3, vol. xviii, p. 160.
 1858. *Chænostoma*, Stimpson, Pr. Ac. Philad., vol. x, p. 97 (43).
 1886. *Euplax*, Miers, "Challenger" Brachyura, p. 251.
 1887. *E.*, de Man, J. Linn. Soc. London, vol. xxii, no. 137, p. 125.
 1907. *Chænostoma*, Stimpson, Smithson. Misc. Collections, vol. xlix, p. 97.

In establishing the genus, Milne Edwards identifies the third maxillipeds with those of *Macrophthalmus*, while de Man, in Arch. Naturg., vol. li, p. 353, says that *Euplax* is distinguished from *Macrophthalmus* by having the merus in these maxillipeds only a little smaller than the ischium and almost as long as broad. Stimpson distinguishes his *Chænostoma* from de Haan's *Cleistostoma*, because of the gap between the pair of third maxillipeds.

EUPLAX BOSCH (Audouin).

1825. *Macrophthalmus boschii*, Audouin, Explic. pl. Crust. d'Égypte, Savigny, pl. 2, figs. 2 ♂, 2D ♂, 2 ♀, and ♂, ♀ nat. size.
1835. *Cleistostoma boschii*?, de Haan, Crust. Japon., decas 2, p. 27.
1837. *Cleistotoma b.*, Milne Edwards, Hist. Nat. Crust., vol. ii, p. 68.
1843. *Macrophthalmus b.*, Krauss, Südafrik. Crust., p. 40, pl. 2, figs. 5, a-c.
1852. *Cleistostoma b.*?, Dana, U.S. Expl. Exp., vol. xiii, p. 313, pl. 19, figs. 3a-d.
1852. *Euplax boschi*, Milne Edwards, Ann. Sci. Nat., ser. 3, vol. xviii, p. 160.
1858. *Chaenostoma orientale*, Stimpson, Pr. Ac. Philad., vol. x, p. 77 (43).
1883. *Euplax (Chaenostoma) boschii*, A. Milne-Edwards, Nouv. Arch. Mus. Hist. Nat., vol. ix, p. 281 (Miers).
1884. *E. (C.) b.*, Miers, "Alert" Crust., pp. 238, 542.
1886. *E. (C.) b.*, Miers, "Challenger" Brachyura, p. 252.
1887. *E. b.*, de Man, J. Linn. Soc. London, vol. xxii, p. 125.
1888. *E. b.*, de Man, Arch. Naturg., vol. liii, p. 357.
1907. *Chaenostoma orientale*, Stimpson, Smithsonian Misc. Collections, vol. xlix, p. 98 (footnote: *Euplax boschii*, Rathbun).

Krauss refers this species to Savigny's pl. 2, fig. 1, by mistake for fig. 2, and in this error is followed by Milne Edwards in 1852 (though correct in 1837) and by Miers in 1896. Krauss, in his Latin description, confuses the dimension of the front with that of the eyes, but his German account rightly states that the eyes are somewhat longer than a third of the breadth of the carapace.

Two specimens, a male and a female, have been collected in Durban Bay by Mr. D. R. Boyce. The male pleopods agree with Savigny's figure 2D. The carapace is 9.5 mm. broad, 7.5 mm. long, with frontal lobe somewhat over 2 mm. wide. The lower margin of the orbit is nearly straight, crenulate with some dozen bead-like granules. The right hand chela is the larger, with a broad tooth near the base of the inner margin of the movable finger, while the fixed finger is continuously crenulate on that margin, the components being enlarged towards the spooned tip. The sixth pleon segment widens slightly to a raised point on either side, the sides then slightly converging. The pleon of the female is very broad. The mandibles have a well developed three-jointed palp. The palp of the first maxilla is much widened near its apex. There is a wide gap between the third maxillipeds.

BRACHYURA ANOMALA

TRIBE DROMIIDEA.

FAMILY DROMIIDÆ.

See Ann. S. Afr. Mus., vol. vi, pp. 341, 342; 1910; and add 1913,
Dromiidae, Ihle, Siboga Exp., Dromiacea, vol. xxxixb, p. 3.

GENUS CRYPTODROMIA, Stimpson.

1858. *Cryptodromia*, Stimpson, Pr. Ac. Philad., vol. x, p. 225.
 1887. *C.*, de Man, Arch. Naturg., vol. liii, p. 398.
 1888. *C.*, Henderson, "Challenger" Anomura, vol. xxvii, pt. 69, p. 5.
 1901. *C.*, Alcock, Catal. Indian Brachyura, fasc. i, p. 48.
 1903. *C.*, Borradaile, Ann. Nat. Hist., ser. 7, vol. xi, p. 299.
 1907. *C.*, Stimpson, Smithson. Misc. Collections, vol. xlix, p. 172.
 1907. *C.*, W. H. Baker, Tr. R. S. South Australia, vol. xxxi, p. 180.
 1907. *C.*, Nobili, Ann. Sci. Nat., ser. 9, Zool., vol. iv, p. 145.
 1911. *C.*, Rathbun, Tr. Linn. Soc. London, vol. xiv, p. 194.
 1913. *C.*, Ihle, Siboga Exp., Dromiacea, vol. xxxixb, p. 32.

CRYPTODROMIA MONODOUS, sp. nov. Plate VIII.

The carapace has a depressed, but apically slightly up-turned, tooth in front. To the solitariness of this the specific name refers. Instead of the usual flanking teeth there is on either side a convex prominence constituting the upper border of the orbit. The general surface of the carapace is quite devoid of grooves, finely punctate, with a short pubescence; the antero-lateral border on the right showing eight teeth or tubercles, the two preceding the hindmost very small and without counterparts on the left side. Apart from the rostral depression and depressions adjoining the postero-lateral margins, on which the fifth peræopods rest, the carapace is much inflated, and this character with the strong convexity of the pleon gives the whole structure a globose appearance.

The eyes are small in comparison with the stoutness of the stalk. In the first antenna the third joint is longer than the second. In the second antenna the third joint is clasped by the projections of the second joint; the slender flagellum is about as long as the stout peduncle.

The palp of the mandible is two-jointed, but it is fairly certain that the first joint is composite, having the short first joint coalesced with the true second; the true third is strongly fringed with setæ. The palp of the first maxilla has a broad first joint followed by a narrow piece seemingly two-jointed, perhaps a single joint twisted.

The mouth-organs are very similar to those figured by Ihle for *C. tumidus*. Here the exopod of the second maxilliped is rather less prolonged. The fourth joint of the third maxilliped is of rather irregular shape, and its articulation with the third joint forms an angle so that the two surfaces resist flattening.

The fingers of the chelipeds have their confronting margins denticulate each with eight or nine rounded teeth, the extremity of each finger being tridentate; a smooth margin on a different level borders each row of teeth. The second and third peræopods have the narrow seventh joint terminated by a curved unguis set among rather long setæ. In the fourth and fifth peræopods the short stout sixth joint carries an unguis-like finger and a spine curving towards it so as to form a kind of diminutive chela. The fifth peræopod is very decidedly longer than the fourth. The sternal sulci of the female end widely apart and opposite the coxæ of the second peræopods.

The first pleopods of the female are slender, single-branched; the four following pairs are two-branched, elongate, the outer branch densely setose, the shorter inner one more sparsely. The ova of the present specimen were a bright red. They had not passed the oviduct into the capacious pleon. The narrow transverse plates attached ventrally by the inner corner to the distal part of the sixth pleon segment may be regarded as the sixth pleopods or the uropods, though their function has become problematical.

The carapace measures 21 mm. in breadth by 20 mm. in length, thus being of considerable size for this genus. A red glow remains on various parts of the specimen as preserved. It held about it a broad strip of some composite zoophyte.

Locality: Vetch's pier, Durban, collected in July, 1917, by Mr. Bell Marley.

MACRURA ANOMALA.

TRIBE GALATHEIDEA.

FAMILY PORCELLANIDÆ.

GENUS PETROLISTHES, Stimpson.

1858. *Petrolisthes*, Stimpson, Pr. Ac. Philad., vol. x, p. 227 (65).
 1907. *P.*, Nobili, Ann. Sci. Nat., ser. 9, zool., vol. iv, p. 129.
 1907. *P.*, Stimpson, Smithson. Misc. Collections, vol. xlix, p. 181.

PETROLISTHES SPECIOSUS (Dana).

1852. *Porcellana speciosa*, Dana, U.S. Expl. Exp., vol. xiii, p. 417,
 pl. 26, fig. 8.
 1858. *Petrolisthes speciosus*, Stimpson. Pr. Ac. Philad., vol. x, pp.
 227, 241 (79).
 1907. *P. s.*, Stimpson, Smithson. Misc. Collections, vol. xlix, p. 182,
 pl. 22, fig. 2 (facing p. 184).

Dana writes of this species as having "hand minute granulous, naked," but also as having the hands "granulous on both surfaces." In the Natal specimen the inner side is covered with squamose markings and the outer is conspicuous for a longitudinal ridge; the carpus has several teeth along both margins. The colour is in general agreement with Dana's figure, but with a beautifully symmetrical pattern on the carapace.

Locality: From the sponge *Cerao chalinus*, taken by Mr. Bell Marley, on rocks, Vetch's pier, Durban.

From the same sponge occurred a male specimen of *Porcellana dehaanii*, Krauss.

MACRURA GENUINA.

TRIBE SCYLLARIDEA.

FAMILY PALINURIDÆ.

GENUS PANULIRUS, White.

See Ann. S. Afr. Mus., vol. vi, pp. 372-374.

PANULIRUS ORNATUS (Fabricius).

1793. *Cancer (Astacus) homarus* (part), Herbst, vol. ii, pt. 3, p. 84, pl. 31, fig. 1.
 1798. *Palinurus ornatus*, Fabricius, Suppl. Ent. Syst., p. 400.
 1837. *P. o.*, Milne Edwards, Hist. Nat. Crust., vol. ii, p. 296.
 1891. *Senex ornatus*, Ortmann, Zool. Jahrb., vol. vi, p. 34.
 1897. *Panulirus sp.*, Ortmann, Zool. Jahrb., vol. x, p. 266.

It is clear, I think, that the beautiful specimen obtained by Mr. Bell Marley at Durban belongs to the species represented by Herbst in his plate 31, fig. 1, but his text covers more than one species and the name he gives is here unavailable. The account, however, which Fabricius gives of his *Palinurus ornatus* is quite suitable to the Natal specimen, for which also the specific name is highly appropriate, so that I am unwilling to accept Ortmann's verdict that it ought to be dropped. As Fabricius says, the segments of the pleon are smooth, altogether without a furrow, though this is true also of *P. polyphagus* (Herbst), seemingly near to *ornatus* but distinct from it.

Mr. Bell Marley's account of the colouring in the freshly captured animal is as follows: "The carapace is a really dark turquoise blue, the spines coral red, with bases orange in the larger spines, the [pleon] segments are green (sage) with brown, at the sides are cream spots; about head much pink with white, brown and blue marks; the antennæ light red at head and ending in brown and dark brown; legs marbled brown and yellow, toes red." This description, dated 31st July, 1917, is still in many respects applicable to the specimen as received in Tunbridge Wells, September 21st. But the dark turquoise blue of the carapace has taken something of a greenish

tinge; the legs are marbled brown and yellow in their proximal parts, but distally they have dark blue markings such as Herbst's figure shows for almost the whole extent; the fingers have red spines. Milne Edwards ascribes to *ornatus* alternating rings of green and yellow on the limbs. Fabricius says that the legs are all blue fasciated with white, which Ortmann supposes to mean that they have longitudinal white stripes, but that I think is a misunderstanding of the term *albofasciatus*. Fabricius gives the general colour as green with the sides spotted with white. Milne Edwards expands this into green with little whitish blotches on the thorax, and marblings on the abdomen. Mr. Bell Marley writes as above that the segments (no doubt of the pleon) are sage green, which is no longer applicable to the first five segments, these being pale brown, with a band of dark brown crossing each of the last four of them, each having a narrow oblique bluish green stripe on either side, followed by an oval cream-coloured spot. The frontal horns and surrounding parts of the carapace have elegant zebra markings, in which also the eyes partake. Varieties of tint assigned in different descriptions and illustrations are likely to depend more on the condition of the specimens examined than on any material variation in the living forms.

The specimen here described, a female, measures 363 mm. ($14\frac{1}{2}$ inches) from the front of the plate which carries the first antennæ to the end of the telson, or 248 mm. to that margin from the front of the ophthalmic segment. The third peræopods are the longest.

Mr. Bell Marley considers the species rare, preferring quiet water, generally deep water near sand-banks. It takes fish bait, and "when landed it makes a great disturbance and flounders about with its tail, shooting backwards and forwards its feelers in angry surprise."

TRIBE PENÆIDEA.

FAMILY PENÆIDÆ.

GENUS PENÆUS, Fabricius, 1798.

See Ann. Durban Mus., vol. i, pt. 5, p. 441.

PENÆUS JAPONICUS, Bate.

The synonymy from 1888 to 1906 is supplied in Dr. de Man's valuable work on the Penæidæ of the Siboga-Expeditie, Mon. 39a, p.

107, 1911. Bate, in the "Challenger" Macrura, introduced the species as a variety of *Penæus canaliculatus*, Olivier, 1811.

The specimen sent me by Mr. Bell Marley, from the sand-banks of Durban Bay, measures 116 mm. from apex of rostrum to the tip of the telson. In the central line of the carapace it has eleven dorsal teeth, and there is a single ventral tooth to the rostrum, which itself coincides in extension with the lateral tooth of the antennal scale. For the sulcate acute-ending telson, Mr. Bell Marley gives the colouring when fresh as dark red in the middle, pale brown proximally, and distally white; and for the uropods a succession of white, dark red, white, yellow, pale blue, with a fringe of carmine setæ. The specimen, as preserved, is still suggestive of its decorative appearance when alive.

Date of capture: 26th July, 1917.

TRIBE CARIDEA.

FAMILY PROCESSIDÆ.

GENUS PROCESSA, Leach.

For these systematic divisions see Gilchrist's Marine Invest., S. Afr. Crust., pt. 3, p. 89, 1905, and S. Afr. Crust., pt. 5, in Ann. S. Afr. Mus., vol. vi, pp. 381, 387; 1910.

PROCESSA sp.

Along with numerous other species of small size from the sponge *Cerao chalinus*, was a specimen of the genus *Processa*, measuring only 6 mm. in length. After dissecting and drawing some of the details I gave up the hope of deciding whether this was a young form of *P. canaliculatus*, Leach, or deserving of some other specific designation. The short rostrum has a setule on each side of the acute apex. The telson carries three pairs of dorsal spines, with three pairs on the apical margin, the outermost small, the middle pair shorter and more slender than the intermediate pair. Of the short first peræopods only one is chelate; of the very slender second pair both members are elongate, but unfortunately one had its termination imperfect. In the first antennæ the first joint of the peduncle is longer than the second and third combined, the second is shorter than the third. The palp of the first maxilla is as figured by de Haan for "*Nika edulis*"; the exopod of the third maxillipeds is not one-third of the length of the long antepenultimate joint; the terminal joint is spinose. The figures in de Haan are evidently not to a uniform scale.

ISOPODA ANOMALA OR APSEUDACEA.

FAMILY TANAIDÆ.

GENUS TANAIS, Milne Edwards.

1828. *Tanais*, Milne Edwards, Ann. Sci. Nat., ser. 1, vol. xiii, p. 288.

TANAIS PHILETERUS, Stebbing.

1904. *Tanais phileterus*, Stebbing, Spolia Zeylanica, vol. ii, pt. 5, p. 7, pl. 2.

A specimen about 1.5 mm. long closely agrees with the description and figures given in the report on "Gregarious Crustacea from Ceylon," though in so small a specimen specific distinction must be rather uncertain. It shares the character of a four-jointed uropod with four other species named in the report above mentioned. Small as it is, it suffices to add a genus to the gathering from the sponge *Cerao chalinus*.

GENUS LEPTOCHELIA, Dana.

1849. *Leptochelia*, Dana, Amer. J. Sci., ser. 2, vol. viii, p. 425.

LEPTOCHELIA DUBIUS (Kröyer).

1842. *Tanais dubius*, Kröyer, Naturhist. Tidsskrift, vol. iv, pp. 178, 182, figs. 20-22.
1896. *Leptochelia dubia*, Stebbing, Ann. Nat. Hist., ser. 6, vol. xvii, p. 159.
1905. *L. d.*, H. Richardson, Bull. U.S. Nat. Mus., no. 54, pp. 23, 28, figs. in text.

In the yield of the sponge *Cerao chalinus* were contained two specimens apparently referable to this species of the genus *Leptochelia*, a male about 3 mm. long and a female rather shorter. The first antennæ are very different in the two sexes, especially in the flagellum, which is quite inconspicuous in the female, but in the male has six

setose joints. The first gnathopods also differ considerably, having the carpus and hand much more elongate in the male, the finger strongly upturned at the apex and bidentate on the inner margin. The uropods are not distinctive, having in each sex the endopod five-jointed, with a one-jointed exopod.

In 1896, I overlooked the fact that Krøyer, in speaking of the endopod as *sexarticulatum*, was including the peduncular joint.

GENUS HAPLOCOPE, G. O. Sars.

1880. *Haplocope*, Sars, Archiv. Naturv., vol. vii, p. 51.
 1899. *H.*, Sars, Crust. Norway, vol. ii, p. 34.
 1913. *H.*, Hansen, Danish Ingolf-Exp., vol. iii, Crust. Malac., pt. 2, p. 102.

HAPLOCOPE OCVLATUS, sp. nov.

This species differs from the type by having eyes; the penultimate joint of the second antenna less elongate; the carpus and hand of the first gnathopod broader in proportion to the length; the two joints of the endopod in the uropod much shorter and the exopod one-jointed. The general proportions, first antennæ, second gnathopods, peræopods, and the simple pleopods agree with those parts in *H. angustus*, Sars. The length is about 2 mm.

Locality: Vetch's pier, from the sponge *Cerao chalinus*.

AMPHIPODA.

TRIBE GAMMARIDEA.

FAMILY LYSIANASSIDÆ.

See Das Tierreich, Lief. xxi, Amph. Gamm., pp. 6, 8, 717; 1906.

GENUS MICROLYSIAS, nov.

Terminal joint of peduncle of second antenna in male sex the longest and broadest, the flagellum by degrees attaining a great length, much

of it then being of thread-like tenuity. Mouth-organs and limbs of feeble structure, though in shape the latter show much agreement with those of *Orchomenopsis*, Sars. As in that genus the palp of the mandible is set far back, but its first joint instead of being short is rather unusually long, the whole palp longer than the trunk, on which there is an inconspicuous molar. The branchial vesicles are pleated. The telson is deeply cleft.

The generic name calls attention to the family to which the new genus belongs, and the prefix refers not to the smallness of the specimens, but to the general tenuity of their apparatus.

MICROLYSIAS XENOKERAS, sp. nov. Plate IX.

The seemingly unique character of the second antennæ has suggested the specific name *xenokeras* from the Greek ξένος, strange, and κέρας, antenna. This designation might have been appropriate for the genus, but was precluded by external considerations of nomenclature.

The first side-plate of the peræon is distally produced forward in a rounded lobe, the fourth is deeply excavate. The third pleon-segment has the lower hind angle not extended. The following segment is dorsally arched. The telson (as preserved) is stiffly uplifted, each of the blunt apices carrying a small spine, the sides also being bordered with five or six spinules.

The dark eyes are more or less oval, covering much of the head as the animal increases in size. The first antennæ are normal, with first joint of peduncle and first of flagellum very stout, the first of the accessory flagellum slender. The remarkable second antennæ vary greatly with age and sex. In all the variations observed of the male the terminal joint of the peduncle is the largest, but in small specimens this carries a tapering flagellum shorter than the peduncle, with only a few indistinct joints at the slender termination. In small and large alike the penultimate joint of the peduncle has a tuft of setæ near the end of its upper margin, and the last joint has this margin fringed with setules. In the well developed male the flagellum becomes slender from its commencement, with attachment to the top, instead of the middle, of the broad distal margin of the peduncle. The joints are very small, and in a flagellum about five times as long as the peduncle they were over 60 in number, seemingly unarmed. In a larger animal this length was greatly exceeded, and many of the

proximal joints seemed to be armed with microscopic calceoli and setules, while for a great extent distally the joints were lengthened, unarmed, and of thread-like tenuity. In a female with well filled ovary, while the first antennæ are just like those of the male, the second are very different, except that the peduncle is angularly bent. But here its terminal joint is more than twice as long as broad, not very much longer than the preceding joint and a little narrower, with a slender flagellum of seven or eight joints medially attached in the ordinary manner.

The details of the mandibular trunk are difficult to make out with certainty. There seems to be a small triangular molar, and on one mandible a transparent accessory plate attended by two small spines. There is a little process on the upper margin just behind the small cutting edge. The first maxillæ show a narrow inner plate, the outer plate short with eight serrate spines on its broad top, which is surpassed by the minutely denticulate distal margin of the two-jointed palp. The maxillipeds like the maxillæ are much compressed, resisting attempts to flatten them out. The inner plates appear to be narrowly elongate, the outer broad, with only the minutest armature.

The first gnathopods are sub-chelate, the hand a little narrowed distally, where the small finger fits the slightly excavate distal margin; all the joints of this and the following limbs having a membranaceous appearance. The second gnathopods are microscopically chelate. The first and second pereopods are alike, differing from those which follow by the much narrower second joint and the rather longer fourth. The normal proportions of the third, fourth and fifth pairs are sufficiently shown by the illustrations. The pleopods have several coupling setæ. The exact armature of the uropods requires higher magnification than space on the plate permitted. Length of the largest specimens barely 6 mm.

Locality: Vetch's pier, Durban, from sea-squirt at two fathoms, collected by Mr. Bell Marley, July, 1917.

FAMILY PONTOGENEIIDÆ.

1906. *Pontogeneiidae*, Stebbing, Das Tierreich, Lief. xxi, pp. 356, 729.
1916. *P.*, Barnard, Ann. S. Afr. Mus., vol. xv, pt. 3, p. 183.

GENUS PARAMCERA, Miers.

1875. *Paramcera*, Miers, Ann. Nat. Hist., ser. 4, vol. xvi, p. 75.
 1888. *Stebbingia*, Pfeffer, Jahrb. Hamburg, Anst., vol. v, p. 110.
 1913. *Paramcera*, Chilton, Jahrb. Hamburg, Anst., vol. xxx, Beiheft 2, p. 58.

PARAMCERA SCHIZURUS, sp. nov. Plate X.

This small species between three and four millimetres in length was unfortunately devoid of the third uropods. The specific name refers to the completely divided telson, by which it appears to be separated from the rest of the family. The body is very slender and the shape of the apparently shallow side-plates of the pereon could not be ascertained. The first antennæ are without accessory flagellum; the principal flagellum is well developed, four-jointed, as long as the peduncle, of which the third joint is about three-fourths the length of the second. The rather shorter second antennæ have a seven-jointed flagellum. The palp of the mandibles is not strong, the third joint a little shorter than the second, with few setæ. In the maxillipeds the penultimate and antepenultimate joints of the palp are conspicuously broad.

The first gnathopods have the hand widest at the junction of the slightly convex palm with the hind margin, the carpus nearly as long as the hand. In the second gnathopods the hand, considerably longer than the carpus, has the front and hind margins parallel, connected by an oblique palm. In the pereopods the sixth joint is longer than the fifth, nearly thrice as long as the finger. The telson is not longer than broad.

Locality: from the sponge *Cerao chalinus*, collected at Vetch's pier, Durban, by Mr. Bell Marley.

FAMILY TALITRIDÆ.

See Ann. S. Afr. Mus., vol. vi, p. 458.

GENUS EXHYALELLA, Stebbing.

1917. *Exhyalella*, Stebbing, Ann. Nat. Hist., ser. 8, vol. xx, p. 435.

Distinguished from *Hyalella*, S. I. Smith, by having the second gnathopod constructed on the same plan in both sexes.

EXHYALELLA NATALENSIS, Stebbing. Plate XI.

1917. *Exhyalella natalensis*, Stebbing, Ann. Nat. Hist., ser. 8, vol. xx, p. 435.

The body as preserved smooth, shining, rather obstinately curved. The first four side-plates deep, the first rather expanded distally, the fifth bilobed. Eyes dark, round or oval.

Flagellum of first antenna many-jointed, about twice as long as the peduncle, equal to flagellum of the second antenna, which is sub-equal to its peduncle, that having its last joint longer than the penultimate.

Mandible with cutting edge and accessory plate dentate, spine-row of three moderately long and three short spines; molar strong. Inner plate of first maxilla slender, with two apical setæ, one quite short, outer plate with eight pectinate spines, prominence for palp well marked, but palp itself microscopic. The two plates of second maxilla well furnished with spines. Maxillipeds with inner plates long, the outer short, the palp's first three joints broad, the fourth slender, ending in a distinct unguis.

First gnathopod of male with fifth joint longer than sixth, the distal projection carrying small spines, the hand with squared palm, carrying a strong spine, on which the apex of the short finger impinges. In the female this gnathopod is slighter, the fifth joint not longer than the hand, which is about twice as long as broad. Second gnathopod of male with short fifth joint or wrist, of which a narrow lobe intervenes between the oblong fourth joint and the large piriform hand. The long, oblique, spine-fringed, slightly convex palm leaves a very short hind margin. The finger is strong and curved. In the female this model is followed, though with shorter third and fourth joints, a smaller hand and its hind margin not serrate.

The first and second peræopods are slender, the three following have each an expanded second joint, the following joints, except to some extent the fourth, being slender. The third peræopod is the shortest, the fourth somewhat longer than the fifth.

The first and second uropods have the usual proportions and armature; the third are very small, with the peduncle much larger than the ramus. The telson is about as broad as long, apically obtuse-angled, more obtusely in the female than in the male. The colour as preserved is orange red. The length appears to be about 11 mm. for the male, and a little less for the female. The young are born with their full complement of limbs.

Locality: Durban Beach, where they were collected by Mr. Bell Marley. A small specimen also was obtained from the sponge *Cerao chalinus*, off Vetch's pier.

FAMILY PHOTIDÆ.

See Das Tierreich, Lief. xxi, pp. 603, 737, 1906; and Ann. S. Afr. Mus., vol. vi, pt. 4, p. 460, 1910.

GENUS EURYSTHEUS, Bate.

1857. *Eurystheus*, Bate, Ann. Nat. Hist., ser. 2, vol. xix, p. 143.
 1910. *E.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 460.
 1916. *E.*, Barnard, Ann. S. Afr. Mus., vol. xv, p. 249.

EURYSTHEUS HOLMESI, Stebbing.

1908. *Eurystheus holmesi*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 85, pl. 40A.

In allotting to this species a specimen about 4 mm long, obtained by Mr. Bell Marley from the sponge *Cerao chalinus*, I am relying on the variability which seems to prevail in this genus. Here the second gnathopods, while agreeing with the particular denticulation of the palm previously described, are much wider at the terminal tooth, so that the palm is less oblique and the hind margin longer than in the type. Also the second joint of the third pereopod, though wider proximally than distally, is devoid of the abrupt narrowing remarkable in the form earlier described. The principal flagellum of the first antennæ, imperfect in the type, is here ten-jointed, with accessory of four instead of six joints.

Locality: Vetch's pier, Durban.

GENUS CHEIRIPHOTIS, A. C. Walker. Plate XII.

1906. *Cheiriphotis*, Walker, Herdman's Ceylon Pearl Fish., vol. ii, pp. 234, 283.
 1910. *C.*, Stebbing, Ann. S. Afr. Mus., vol. vi, p. 461.

CHEIRIPHOTIS WALKERI, sp. nov. Plate XIII.

This species is distinguished from *Cheiriphotis megacheles* (Giles) by the first gnathopods, which have a well marked emargination in the oblique, but well expanded, palm, and by the second gnathopods, in which the palm, instead of being cut into four or five well defined teeth, has only two of such a kind, and of these the outermost much

stouter than in the other species. Between this and the tooth near the finger-hinge the border is undulating with two small depressions. This character is uniform in a detached gnathopod, and in both members of the pair in each of two specimens. And here it may be noticed that these limbs of unwieldy size are well matched, not being a giant and a dwarf side by side, as so often happens when a gnathopod is of abnormal magnitude. The wrist appears to be entirely absorbed in the enormous hand. As in the type species, the second joint of the first pereopod is strongly bent proximally, no doubt to enable the limb to get a place in the sun free from its overpowering neighbour. A young specimen of the male shows the emargination of the palm border in the first gnathopods, but in the second the outermost tooth of that border is small, and the remainder nearly the same as in Walker's figure of the hand in the young male of *C. megacheles*. Here there is no more distinction of the wrist than in the adult, and the proportions of length and breadth are similar; the finger is apically acute, the bluntness in adult stages being possibly due to usage.

The small third uropods are single-branched, the endopod being doubtfully represented by what looks like, and may possibly be, a minute spine. The exopod is tipped with a small spine and some setæ, and there are three spines on the inner margin. No stress can be laid on this detail, since Walker shows only one spine on the border in question, while Giles gives it four or five spines in his figure.

The adult specimens had a length between three and four millimetres, but were difficult to measure, the one having the dorsal line very convex and the other having it very concave.

Locality: Mr. Bell Marley reports these and many other specimens "from large *Cerao chalinus* sponge washed up from Vetch's pier rocks during gale, 18th July, 1917 (18 to 20 feet depth), Durban coast."

The species is named out of respect to my valued friend, A. O. Walker, F.L.S., who instituted the genus.

Cheiriphotis durbanensis, Barnard, 1916, published without illustrative figures, had escaped my notice. Upon subsequent comparison I expected to find that it anticipated the species above described from the same locality, but on comparing the details of the antennæ and gnathopods, I think that the species are distinct.

FAMILY PODOCERIDÆ.

See Das Tierreich, Lief. xxi, pp. 694, 741; 1906,

GENUS PODOCERUS, Leach, 1813.

PODOCERUS INCONSPICUUS (Stebbing).

1888. *Platophium inconspicuum*, Stebbing, "Challenger" Amphipoda, vol. xxix, p. 1194, pl. 131.
 1906. *Podocerus inconspicuus*, Stebbing, Das Tierreich, Lief. xxi, pp. 701, 702.

A specimen of this minute species was included in Mr. Bell Marley's gathering from the sponge *Cerao chalinus*.

LEPTOSTRACA, Claus.

See Encyclopædia Britannica, ed. 10, vol. xxviii, 1902, and ed. 11, under Entomostraca.

FAMILY NEBALIIDÆ.

See G. O. Sars, Fauna Norvegiæ, vol. i, p. 6, 1896.

GENUS NEBALIA, Leach.

1815. *Nebalia*, Leach, Zoological Miscellany, vol. i, p. 99.
 1896. *N.*, Sars, Fauna Norvegiæ, vol. i, p. 7.
 1900. *N.*, Stebbing, Willey's Zool. Results, pt. v, p. 659.
 1914. *N.*, Barnard, Ann. S. Afr. Mus., vol. x, p. 443.

NEBALIA BIPES (O. Fabricius).

1780. *Cancer bipes*, O. Fabricius, Fauna Grœnlandiæ, no. 223.
 1896. *Nebalia bipes*, Sars, Fauna Norvegiæ, vol. i, p. 9, pl. 1, figs. 1-3, pls. 2, 3, pl. 4, figs. 1-8, pl. 5.

A small specimen from the sponge *Cerao chalinus* appears to belong to this species, and to be distinct from that which Mr. Barnard has recently described as *Nebalia capensis*. It is interesting as an addition to the group of crustaceans which the above-mentioned sponge has yielded.

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Ocypodidæ - - -	54	speciosus (Petrolisthes) -	58
Oxyrrhyncha - - -	48	spinifer (Pilumnus) - - -	53
Palinuridæ - - -	59	squinado (Mamaia) - - -	47
Panulirus - - -	59	Stebbingia - - -	66
Paramœra - - -	66	Talitridæ - - -	66
Penæidæ - - -	60	Tanaidæ - - -	62
Penæidea - - -	60	Tanais - - -	62
Petrolisthes - - -	58	tetraodon (Blastus) - - -	50
philetærus (Tanais) - - -	62	Thiidæ - - -	53
Photidæ - - -	68	tumidus (Cryptodromia) -	57
Pilumnus - - -	53	walkeri (Cheiriphotis) pl. XII	68
Platophium - - -	70	Xanthidæ - - -	51
Platyonichus - - -	54	Xantho - - -	51
Podoceridæ - - -	69	xenokeras (Microlysias) -	64

EXPLANATION OF PLATES VIII–XII,

illustrating paper by the Rev. T. R. R. Stebbing on
"Some Crustacea of Natal."

PLATE VIII.

Cryptodromia monodous, sp. nov.

- n.s. Lines indicating natural size of carapace shown in the adjoining dorsal view of a female specimen, with limbs and part of pleon in attachment.
- St., c.o. Sternum with coxæ of the limbs on left of the figure, the coxa of the third peræopod perforated by the oviduct.
- Pl. Dorsal view of the pleon incompletely flattened.
- urp. Ventral view of the sixth pleon-segment with its appendages (uropods or sixth pleopods) and the telson with opening of alimentary canal.
- oc. The eye; this with the first and second antennæ, mandible, and distal portion of fourth peræopod more highly magnified than the other details.
- mx. 1, mx. 2, mxp. 1, mxp. 3. First and second maxillæ, first and third maxillipeds; on a higher scale than the limbs.
- a.s., a.i., m. First and second antennæ and mandible.
- prp. 1, 2, 4, 5. First, second, fourth, and fifth peræopods; fingers of the cheliped (prp. 1) as seen from the inner side at a different angle. The figures of the third maxilliped and the peræopods are all from the unexposed surfaces.

PLATE IX.

A. *Leptocheilia dubius* (Kröyer).

- a.s., a.i. First and second antennæ of the male.
- a.s., a.i. ♀. First and second antennæ of the female.
- gn. 1. First gnathopod of male.
- prp. 5. Fifth peræopod of male.
- urp., urp. ♀. Uropods of male and female.

B. *Haplocope oculus*, sp. nov.

Figure on the left a profile view of specimen much enlarged.

- a.s., a.i. First and second antennæ.
 gn. 1, gn. 2. First and second gnathopods.
 urp. Uropod.

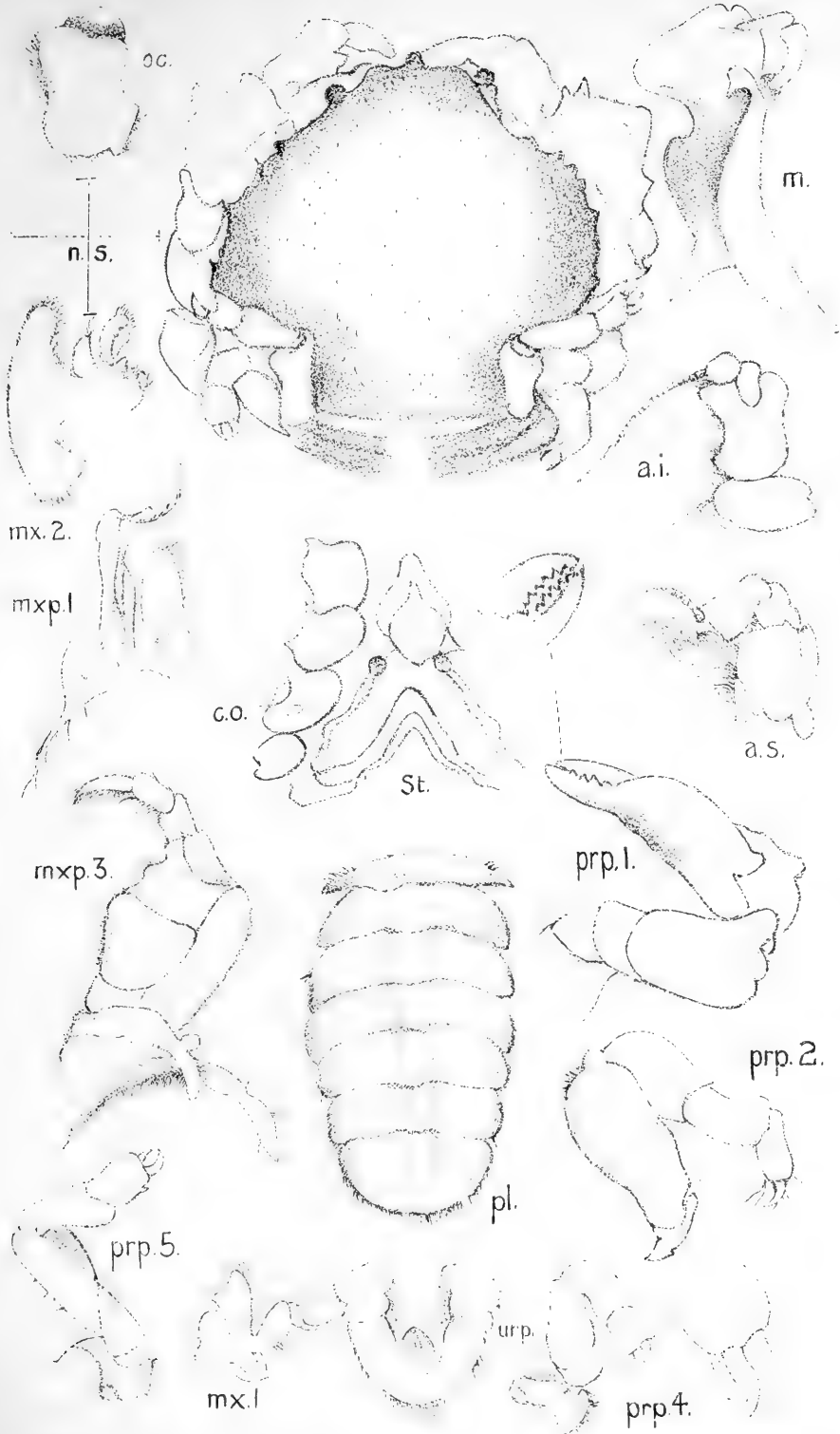
C. *Paramera schizurus*, sp. nov.

- n.s. Line showing length of specimen enlarged in profile view below.
 a.s., a.i. First and second antennæ more magnified.
 mxp. One of the maxillipeds.
 gn. 1, gn. 2, prp. 2, prp. 5. First and second gnathopods, second and fifth peræopods.
 urp. 1, urp. 2, T. First and second uropods and telson.

PLATE X.

Microlysias xenokeras, gen. et sp. nov.

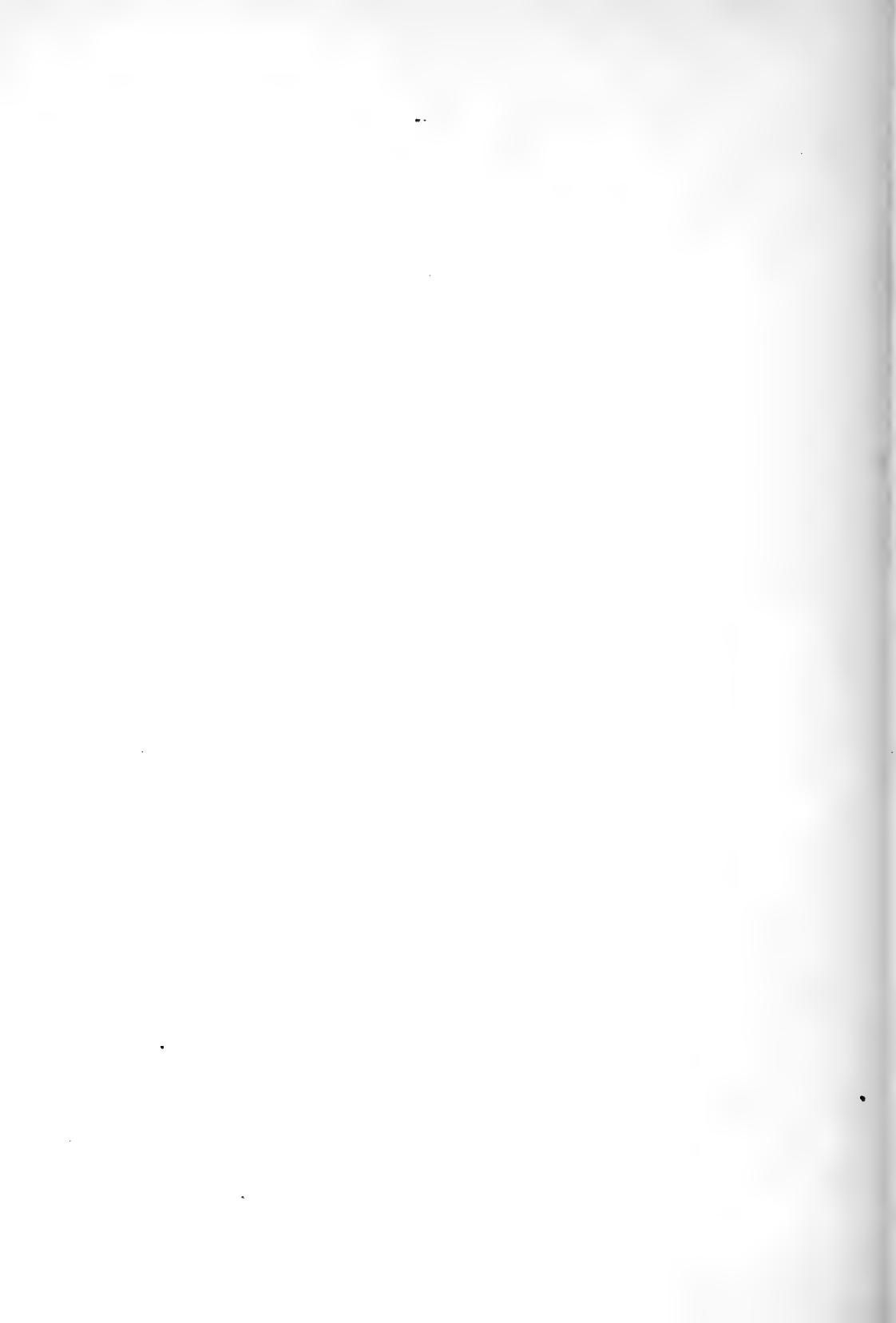
- n.s. Line indicating actual length of male specimen figured below.
 a.s. First antenna of male, with the flagellum more highly magnified.
 a.i. ♂, a.i. ♀. The second antenna of male in three stages of growth, that of the young with the distal part more highly magnified, that of the fully developed male incomplete for want of space, with three joints more highly magnified; the second antenna of a fully developed female to the same scale as the first and second of the male.
 m., m. A mandible. the upper figure from a female, the lower from a male specimen.
 mx. 1, mx. 2, mxp., mxp. ♀. First and second maxillæ of a male with higher magnification for part of outer plate of the first; maxilliped of male, somewhat distorted; maxilliped of female partial.
 gn. 1, gn. 2. First and second gnathopods, each with higher magnification of distal portion.
 T., urp. 1, 2, 3. Telson of male in dorsal view, and the first, second, and third uropods.

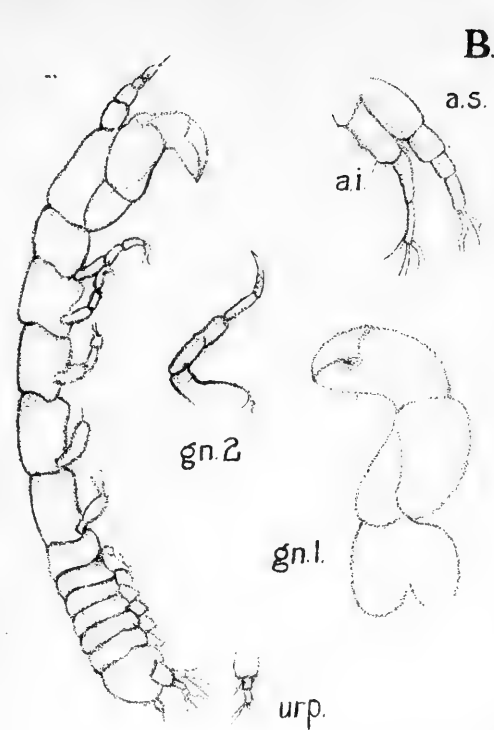
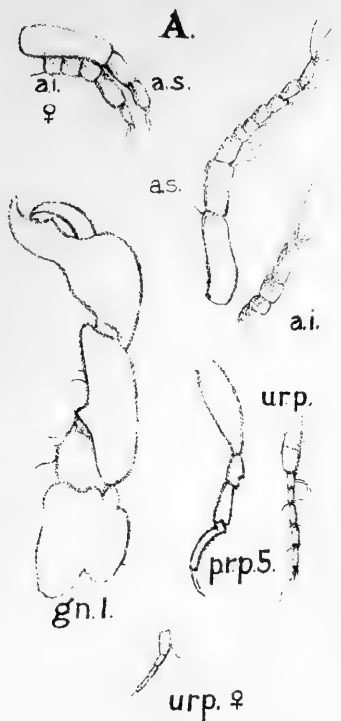


T. R. R. Stebbing del.

John Singleton & Sons lith.

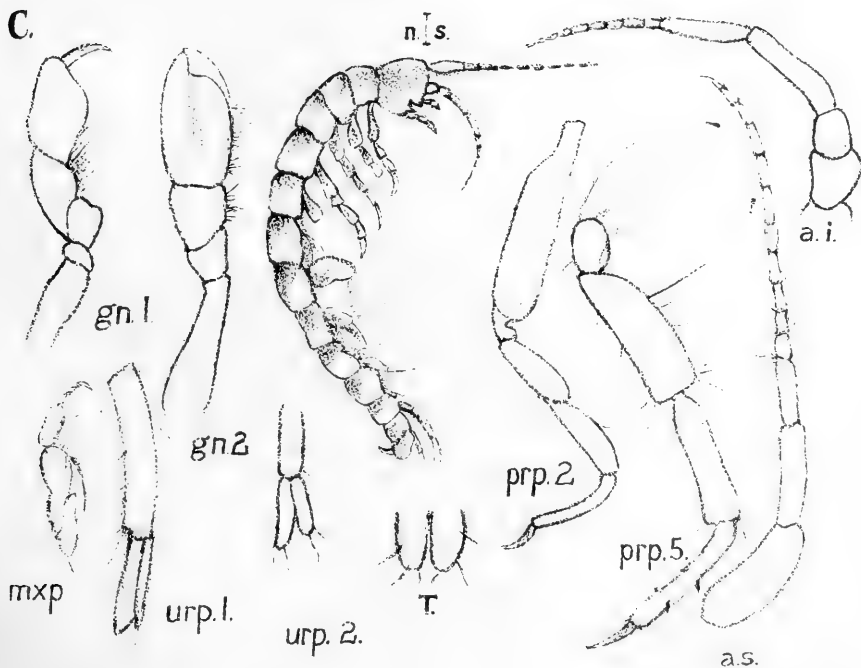
CRYPTODROMIA MONODOUS, sp. nov.





LEPTOCHELIA DUBIUS
(Kröyer).

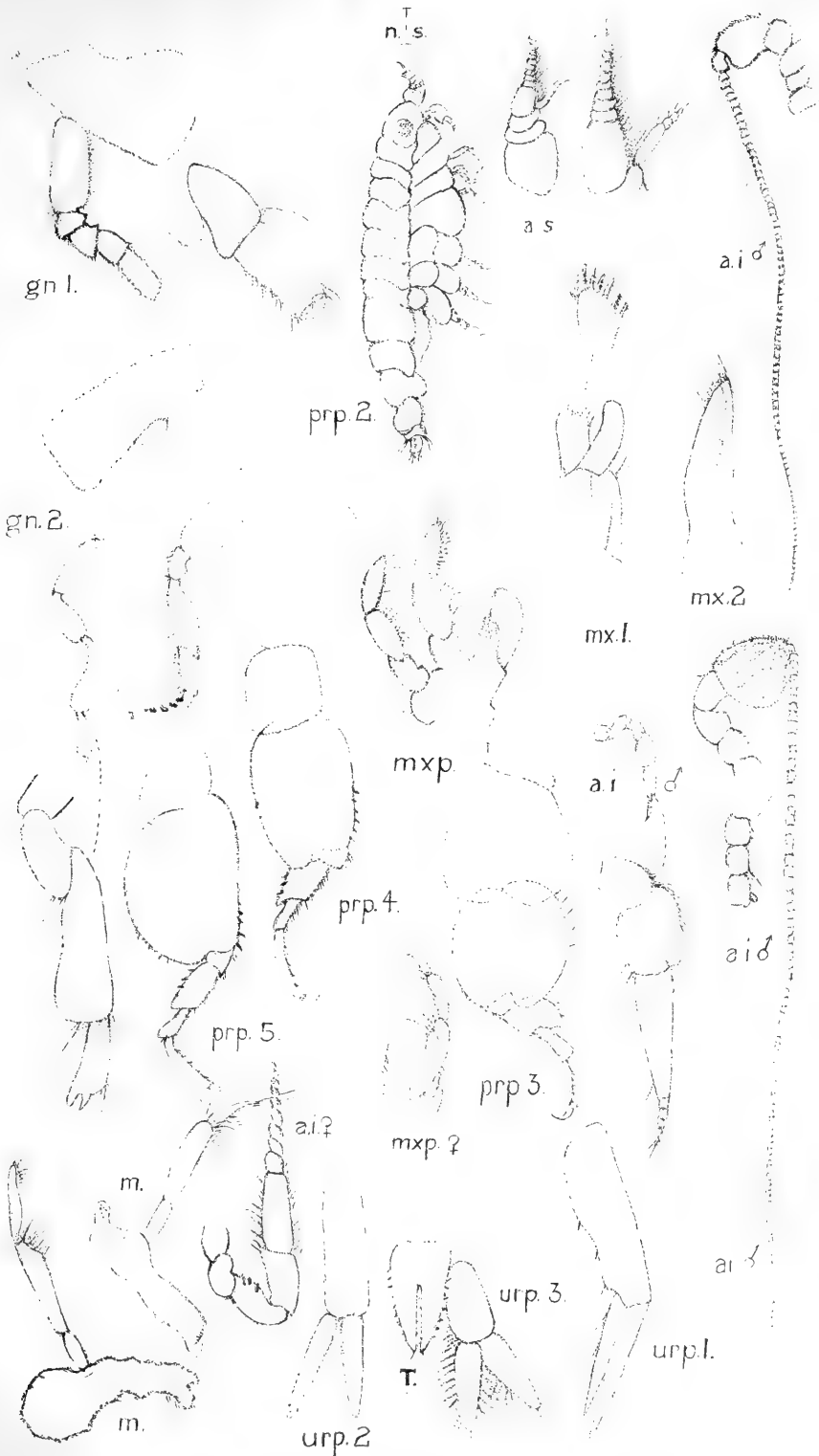
HAPLOCOPE OCULATUS, sp. nov.



T. R. R. Stebbing del.

John Singleton & Sons lith.

PARAMERA SCHIZURUS, sp. nov.

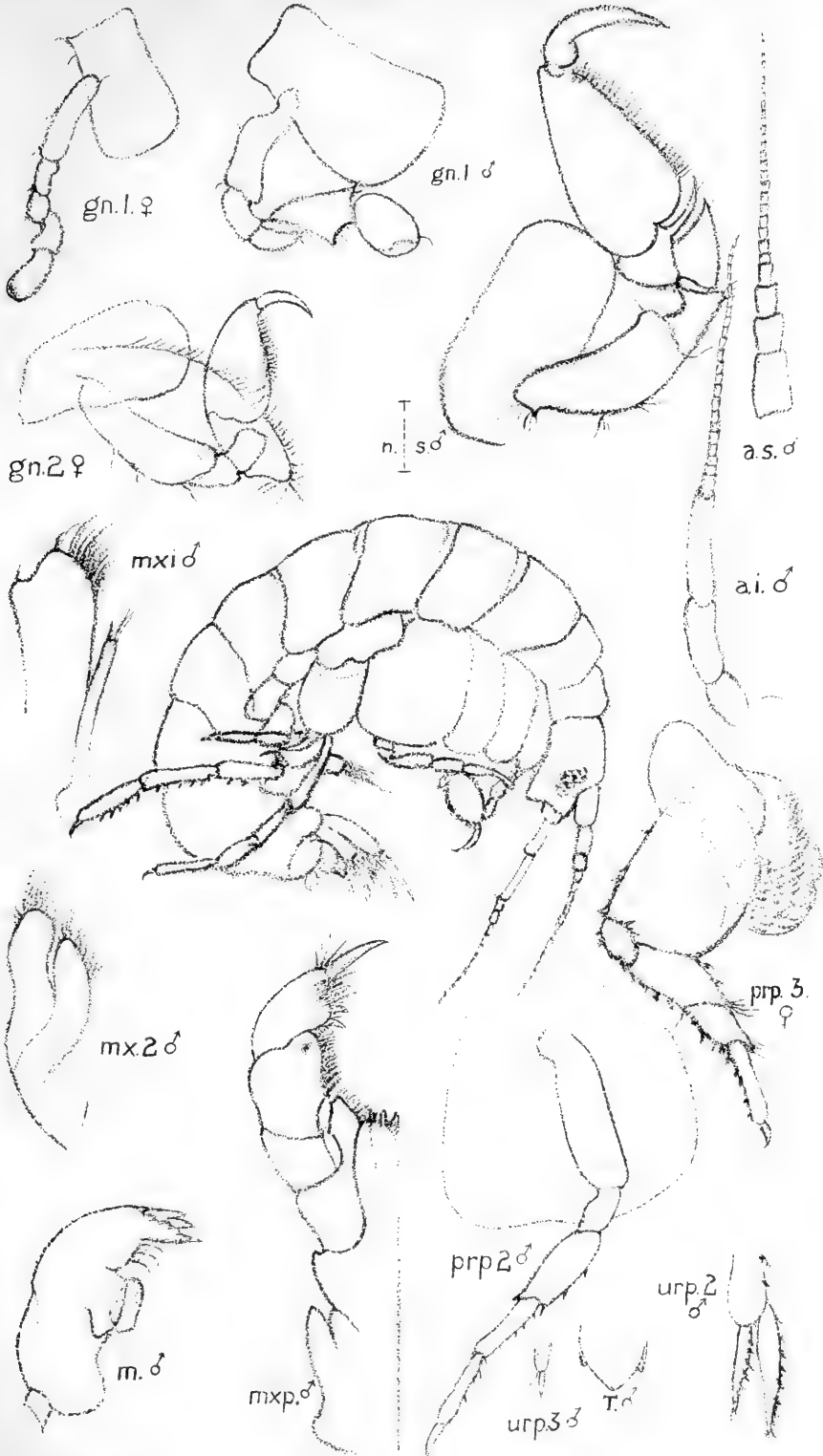


T. R. R. Stebbing del.

John Singleton & Sons lith.

MICHELYSIAS XENOKERAS, gen. et sp. nov.

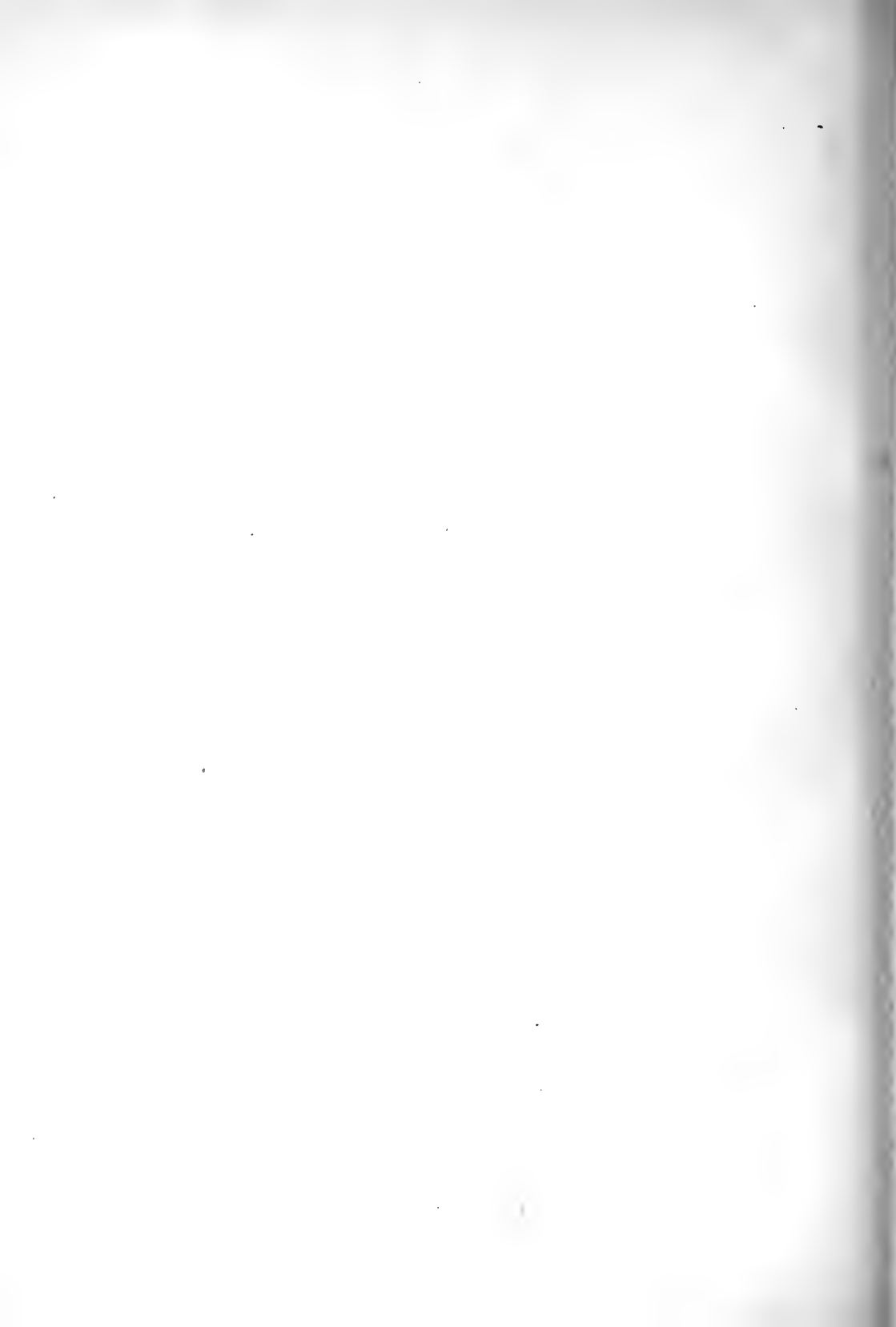


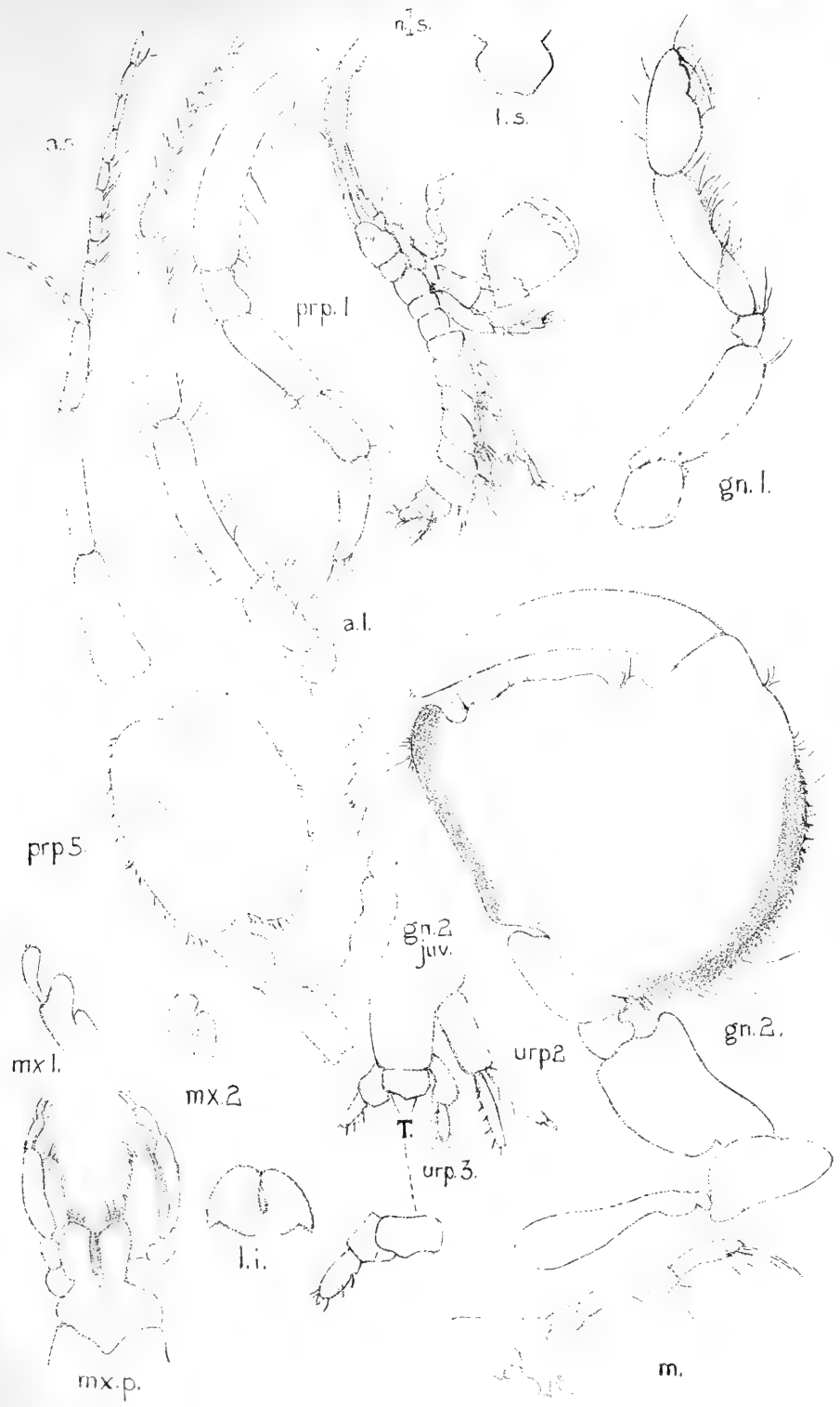


T. R. R. Stebbing del.

John Singleton & Sons lith.

EXHYALELLA NATALENSIS, Stebbing.





T. R. R. Stebbing del.

John Singleton & Sons lith.

CHEIRIPHOTIS WALKERI, sp. nov.



PLATE XI.

Exhylaella natalensis, Stebbing.

- n.s. Line indicating approximate length of a male specimen ; a female of nearly the same size figured below.
- a.s., a.i. First and second antennæ of the male.
- m., mx. 1, mx. 2, mxp. Mandible, first and second maxillæ, and maxilliped of the male, more highly magnified than the other details.
- gn. 1. ♀, gn. 2. ♀ ; gn. 1. ♂, gn. 2. ♂ ; prp. 2. ♂, prp. 3. ♀. First and second gnathopods, and third peræopod of female ; first and second gnathopods, and second peræopod of male.
- urp. 2, urp. 3, T. Second and third uropods, and telson of the male.

PLATE XII.

Cheiriphotis walkeri, sp. nov.

- n.s. Line indicating natural size of the specimen roughly sketched below, outline of head and side-plates obscure, peræopods 2, 3, 4 not shown.
- a.s., a.i. First and second antennæ.
- gn. 1, gn. 2 ; gn. 2, juv. The first and second gnathopods of adult male ; finger and palm of second gnathopod of young male.
- prp. 1, prp. 5. First peræopod and proximal joints of fifth.
- l.s., l.i., m., mx. 1., mx. 2., mxp. Upper and lower lips, mandible, first and second maxillæ, and maxilliped.
- T., urp. 2., urp. 3. Telson, with one second uropod and the third pair. The telson and uropod 3 are further magnified, uniformly with the mouth-organs. The other details are to a different but also uniform scale.

V.—Further Additions to the Fish Fauna of Natal,

by

C. Tate Regan, M.A., F.R.S.

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COLLECTIONS of fishes made at Durban by Messrs. Romer
Robinson and H. W. Bell Marley, include the following :

Family SYNODONTIDÆ.

Synodus varius, *Lacép.*

Saurida undosquamis, *Richards.*

Family EXOCETIDÆ.

Exocetus mento, *Cuv. & Val.*

Family CENTRISCIDÆ.

Centriscus punctulatus, *Bianconi.*

Family CARANGIDÆ.

Caranx hippos, *Linn.*

Family LUTIANIDÆ.

Cæzio cæruleus, *Lacép.*

Family KYPHOSIDÆ.

Kyphosus fuscus, *Lacép.*

Family GERRIDÆ.

Gazza minuta, *Bloch.*

Family POMACENTRIDÆ.

Glyphidodon leucozona, *Bleek.*

Family SPHYRÆNIDÆ.

Sphyræna acutipinnis, Day.

Family CALLIONYMIDÆ.

**Callionymus cooperi*, Regan.

Family GOBIIDÆ.

†*Gobius natalensis*, Günth.

Family BLENNIIDÆ.

Salarias meleagris, Cuv. & Val.

Family CLINIDÆ.

‡*Tripterygium obtusirostre*, Klunz.

Family BALISTIDÆ.

Alutera scripta, Osbeck.

Family TETRODONTIDÆ.

Tetrodon stellatus, Schneid.

Family ANTENNARIIDÆ.

Antennarius bigibbus, Lacép.

* Trans. Linn. Soc. XII, 1908, p. 247.

A female, with the rays of the anterior dorsal fin not prolonged, but otherwise similar to the male described from the Maldives.

† Ann. Mag. Nat. Hist. (4), XIV, 1874, p. 453.

‡ Verh. Zool. Bot. Ges. XXI, 1871, p. 498.

VI.—Some apparently undescribed Heterocera
and five species hitherto unrecorded from South Africa,

by

A. J. T. Janse, F.E.S.

FAMILY CITHERONIIDÆ, Dyar. (Saturniidæ).

SUB-FAMILY BUNÆINÆ, Pack.

NUDAURELIA CARNEGIEL, sp. nov.

♀. Head, prothorax, whole thorax on under-side, and upper hairs of femora mars orange (II)*; thorax above, some hairs at base of antennæ, abdomen above, ground-colour of both wings on upper-side and fore-wing on under-side light cadmium, ranging into empire yellow (IV); antennæ mars yellow (III); hairs on inner-side of femora, tibiæ and tarsæ light cadmium, on outer-side dark mouse gray (LI); abdomen on under-side light cadmium, broadly ringed with dark mouse gray especially the last two segments, on the side the cadmium hairs are mixed with mars orange hairs: at base of both wings on upper-side tufts of rather long grenadine-pink (II) hairs.

Fore-wing sub-triangular; costa well arched; apex somewhat rounded; outer-margin nearly straight, slightly concave between veins 3 to 6; tornus well rounded; inner-margin straight; costa edged with mouse gray (LI) for two-thirds up to vein 11; anti-medial line almost straight, erect, from costal edging to inner-margin, mouse grey on inner-side, followed by light mouse gray (LI) and gradually becoming pinkish; ocellus large oval, as broad as disco-cellular, outer ring light mouse gray, then a narrow black ring, then a light cadmium ring, leaving a large hyaline patch in middle which has on inner-side a straight edge and on outer-side a well rounded edge; an almost straight post-medial line from costa to inner-margin, not touching the ocellus, somewhat parallel to outer-margin and a little curved between veins 1b and 2, on inner-side this line is broadly light mouse gray and on outer-side rather narrow mouse gray; space between anti-medial and post-medial line irrorated with cinnamon-brown (X) mixed

* The numerals following the names of colours indicate the number of the plate in Ridgway's "Color Standards and Nomenclature," 1912.

with some grenadine pink scales from vein 2 to costal edging, apical part of this area with a large number of grenadine pink scales mixed with some whitish and light mouse gray scales; sub-terminal and terminal area thickly, but narrowly near apex and broadly towards middle and tornus, irrorated with brownish-olive (XXX) scales, at the terminus of the veins this irroration is rather slight; cilia mouse gray.

Hind-wing with the anti-medial line less defined and more curved inwards than in upper-wing; outer ring of ocellus much larger and more diffused, outer ring deep mouse gray, then a rather broad mouse gray ring, followed by a broad almost round black ring, then a broad empire yellow almost round ring leaving a hyaline spot of about one-fourth of ocellus, this spot is almost round, somewhat flattened to disco-cellular side but with no sharp corners as on the ocellus of fore-wing; post-medial line as in fore-wing, but excurved between veins 7 to 4, incurved between 4 and 1*b*, and a little more oblique; ground-colour of area beyond post-medial line more empire yellow; terminal area rather less densely irrorated with brownish olive than in fore-wing and only from tornus to vein 5; cilia as in fore-wing; costa well arched especially at one-third; apex somewhat rounded, outer-margin well rounded, tornus somewhat lobed at 1*b*, inner-margin nearly straight.

Under-side of wings as above, but anti-medial line absent in both wings; in fore-wing basal area and space between lower-medial and costal edging as far as two-thirds of costa covered with carrot red (XIV) hairs, getting darker above the ocellus; area beyond ocellus to post-medial line salmon colour (XIV) mixed with whitish scales; sub-terminal area less heavily irrorated than on upper-side; hind-wing as a whole, except inner-marginal fringe and beyond post-medial line (which are yellow), carrot red irrorated with whitish hairs and scales; ocellus smaller than on fore-wing and only with black and yellow rings, which are sharply defined; sub-terminal irroration as heavy as in fore-wing on upper-side.

Exp. 166 mm.; ♀ type from Umvuma (Southern Rhodesia) collected on 15th February, 1916, by Mr. A. A. Carnegie and received by me from the Rhodesia Museum, Bulawayo.

Mr. L. B. Prout, who kindly compared this species and a specimen of *Holocera rhodiensis* with specimens in the different collections in England, informed me that there are single female examples of this fine *Nudawrelia* in the British Museum, Tring Museum and the

Joicey collection; and, with the exception of that in the last-named which is from West Africa, they were taken at Selukwe, which is near Umvuma. As far as I am aware, it has not been found in any other localities in Southern Rhodesia.

Lord Rothschild, in describing the genus *Nudaurelia*, Nov. Zool. II, p. 41 (1895) states that this genus differs from *Antheræa* in the second, third and fourth joints of the feet being together longer than the first joint alone, and in having the tarsi cylindrical and not flattened as in *Antheræa*.

In *N. oubie*, *herselia* and *carnegiei* these joints are certainly cylindrical, but the three mentioned joints are as long as the first joint or even a little longer. Packard in Mem. Nat. Acad. of Sciences, XII, p. 45, makes a similar remark and suggests that Lord Rothschild's specimens must have been imperfect. Lord Rothschild also states that the abdomen in the male of *Nudaurelia* reaches the anal angle of the hind-wing and in the female even beyond it, but in the three species mentioned above the abdomen in both sexes is shorter and does not reach the anal angle, though it is longer than in *Antheræa*.

NUDAURELIA HERSELIA, Westw.

Proc. Zool. Soc. Lond. 1849, p. 42, pl. ix, fig. 1.

This species is recorded from the Congo, and as far as I know has now been found for the first time in South Africa. I caught three males at Untali in January, 1918, and I also saw a female from the same locality. It resembles the next species very much, but is at once distinguished by the absence of the black irroration on the fore-wing, the smaller and rounder ocelli on both wings, the red irroration on the hind-wing and the more crenulated post-medial lines which in the hind-wing is also very remote from the ocellus.

NUDAURELIA OUBIE, Guèr.

In Lefebvre Voy. in Abys. p. 387, pl. xii, ff. 1, 2 (1849).

The type specimen, a female, came from Abyssinia, and, as far as I know, this species has not been recorded from any intermediate places, suddenly turning up in Salisbury. The following is a description of the South African form which differs in several respects from the figure of the Abyssinian specimen. I have little doubt, however, that they are co-specific.

Fore-wing: both lines reach the costa, anti-medial line widens a little at the costa, and has a black inner band from inner-margin to upper-medial, it is curved outwards between lower-medial and *1a* and inwards between *1a* and inner-margin. Rings of ocellus, beginning from the outside, are as follows: thin red ring, broader pinkish white ring, very faint ring of red, rather narrow black ring, very broad brown ring, leaving a small hyaline rounded spot. Post-medial band less curved, slightly incurved between inner-margin and vein 3 ending near tornus, light colour of both bands more pinkish white, the black band well-defined and broad.

Hind-wing: anti-medial line present, black most prominent of the three colours, white more pinkish than in fore-wing and the red more diffused; basal- and medial-area more yellow, only base diffused with pink; in the ocellus the red and black rings are broader; post-medial line in colour as on upper-wing, but red and black more diffused and red band touches the red ring of the ocellus, it is roundly curved outwards between veins 2 to 5 and curved inwards between vein 2 and the inner-margin.

Under-side: ground-colour orange-yellow, hardly any black irroration except costa of hind-wing, which is black; base of both wings shaded with pink; markings same as on upper-side except that the ocellus of the hind-wing has hardly any red outside the white and no red ring before the black, black ring more narrow.

Thorax with more black, reaching head and abdomen.

The two specimens in my collection were bred by the Rev. Father J. O'Neil at Salisbury in December, 1916, and kindly presented to me.

BUNÆA ARABELLA, sub-sp. *JACKSONI*, Jord.

Nov. Zool. XV, p. 255 (1908).

An example of this fine form from Umvuma (Southern Rhodesia) was kindly given to me by Mrs. A. A. Carnegie. It was caught by her at night in December, 1917.

BUNÆA HEROUM, Oberth.

Et. Lép. IV, p. 678, t. liii, fig. 446 (1910).

This fine species has, I think, up to now only been recorded from C.-E. Africa (Kuyambi, Ubemba), and only females are mentioned.

Mr. L. B. Prout, who kindly compared one of my specimens, the female, sent me the following information on the South African specimen: "The pale parts are whiter (less pink), the proximal band of hind-wing more angulated, the distal less lunulate; proximal red part of eye-spot of fore-wing broader, eye-spot of fore-wing somewhat more elongate. Beneath there are similar differences and the medial line of hind-wing as well as fore-wing crosses the middle of the eye-spot (or rather is interrupted by it). Oberthur's figure has wing-length 80 mm."

My two specimens, male and female, were bred by the Rev. Father J. O'Neil at Salisbury; the male pupated on 7th March, 1915, and emerged on 12th December, 1915; the female emerged on 7th December. Both were kindly given to me by Father O'Neil.

Length of fore-wing in male 85 mm., female 70 mm.; but I know that bigger females have been bred.

In the male the fore-wing is more produced on the apex, the outer-margin is more concave and the lobe on the hind-wing more pronounced. The post-medial line does not cross the ocellus as in the female, but just touches it.

IMBRASIA EPIMETHEA, Drury, sub-sp. *ERTLI*, Rebel.

Imbrasia epimethea, Drury, Ill. Exc. ent. III, t. 13, f. 1 (1773).

„ „ sub-sp. *ertli*, Rebel, Ann. K. K. Naturhist.
Hofmus. XIX, p. 67, pl. iii (1904).

The typical form is from West Africa, the sub-species from Nyassaland, but two specimens, a male and female, bred at Salisbury, were presented to me by Father J. O'Neil.

The South African specimens are much smaller, the lines of both wings are more white, less pinkish and the stigma in both wings less pronounced, but present; the anal angle of the hind-wing is more produced but less than in the typical form; the legs are not brown, but dark brown; in the ♀ the costa of the fore-wing is more straight, median costal patch more broadened basally, and in the hind-wing the anti-medial line is less angled at 1α , while the ocellus does not touch the anti-medial line.

FAMILY HEMILEUCIDÆ (Pack).

SUB-FAMILY HOLOCERINÆ (Pack).

HOLOCERA RHODESIENSIS, sp. nov.

♂. Thorax in front and on under-side, abdomen above, ground colour of both wings on upper- and under-side, hairs on femora and tibiæ purple-drab (XLV); hairs on head, upper-side of thorax and hairs on second and third segment of abdomen on upper-side, hairs on thorax near origin of second and third pair of legs, and lateral hairs on abdomen on under-side mars orange (II) with a tinge of orange-chrome (II); shaft of antennæ warm buff (XV), branches fuscus-black (XLVI) thickly ciliated with cartridge buff (XXX) hairs; tarsi with cream-buff (XXX) hairs mixed with fuscous hairs especially on fore-tarsi.

Fore-wing with basal area below lower-median and as far as origin of vein 2 suffused with dusky brown (XLV); medial line begins at costa as a chestnut-brown (XIV) macula, angled outwardly in middle of cell, then evenly curved to inner-margin just before middle, this line forms the inner border of a broad post-medial band of a dull violet-black (I) colour; post-medial line forming a rather confluent boundary of post-medial band, beginning at two-thirds of costa, then curved round at vein 6, then almost evenly curved inwardly below vein 3 and ending just beyond two-thirds of inner-margin; a hyaline mark beyond disco-cellular between veins 4 and 6, this mark is narrower than in *H. smilax* and the lower portion is straight, not curled as in that species, at vein 5 there is a small dent inwardly; an ill-defined pear-shaped mark in upper part of post-medial band, consisting of orange-rufous (II) scales and continued inwardly beyond hyaline mark as far as lower angle; on costa beyond post-medial line some white scales as far as vein 10, and an ill-defined sub-triangular costal dull violet-black patch beyond it; terminal area from apex to vein 2 suffused with dull violet-black; at tornus an ill-defined rounded patch of orange-rufous scales.

Hind-wing with lower basal half covered with rather long dusky brown hairs; post-medial band continued from upper-wing, slightly indented on inner-side at vein 1c and with some orange-rufous scales at lower angular area; terminal area with orange-rufous scales from

tornus till a little beyond vein 6; only a faint indication of a mark at disco-cellular; cilia of both wings of ground-colour, but somewhat whitish between the veins especially in the female.

Under-side: ground-colour of both wings as on upper-side, but less covered with scales of other colours; post-medial band in fore-wing only indicated on outer side by a rather sharply defined post-medial line; costal post-medial orange-rufous patch as on upper-side, but no orange-rufous at tornus and the costal scales beyond the post-medial line not white but ecru-drab (XLVI); hind-wing with medial and post-medial lines well defined, medial line beginning below vein 8 near the base; terminal area as on upper-side.

The ♂ of this species differs from the ♂ of *H. smilax* in colour of wings, less defined and differently shaped post-medial band, different shape of hyaline mark and the more concave costa, in the outer-margin of hind-wing not being concave at veins 2 to 4, but being even somewhat projected at vein 3.

♀. Differs from the ♂ in its larger size and in the fore-wing having a less concave costa and less falcate apex, while the outer-margin of both wings is much more crenulate; the general pattern of both wings is as in the ♂, but the ground-colour is coral pink (XIII); the hyaline mark in the fore-wing is larger and the terminal area from apex to beyond vein 2 is orange-rufous; in the hind-wing is a well defined hyaline curved streak beyond disco-cellular between vein 3 and 4 and extended to vein 5 as a dark line; the abdomen has on the upper-side four transverse rows of cream-buff, elongate scales, apparently at each corresponding segment; terminal segment above and all segments on under-side orange-rufous; under-side of both wings as in ♂ but ground-colour coral pink, medial line of hind-wing orange-rufous and terminal area orange-rufous from tornus to apex; costa of fore-wing and hind-wing, and the hind-wings here and there at other places, sprinkled with cream-buff elongate scales and a series of lateral cream-buff elongate scales on the abdomen between the hairs.

The venation of this species is as in *H. smilax*, the type of the genus, but the ♂ has the fore-wing more falcate and the costa more concave, while the tornus is more rounded.

Expanse: ♂ 56.6–58 mm.; ♀ 75 mm.

Four specimens from Salisbury; ♂ type 23rd Jan., 1917; co-type 22nd Jan., 1917; ♀ type 27th Feb., 1917; co-type 19th Jan., 1917; all bred by the Rev. Father J. O'Neil, who kindly gave them to me.

FAMILY SATURNIIDÆ.

EPIPHORA VERA, sp. nov.

♂. Head and legs old gold (XVI); head above mixed with a few burnt lake (XII) hairs; thorax above, a little over half of each abdominal segment, costal area of fore-wing to post-medial line, post-medial area to near costa, and the whole of post-medial area of hind-wing burnt lake, freely sprinkled with white hairs on the thorax and white scales on the wings; abdomen above ringed with white, last two segments almost entirely white, on the under-side the white rings are narrower and are crossed by eight white lines over the whole length; shaft of antennæ mustard yellow (XVI), branches sulphine yellow (IV).

Fore-wing with the costa somewhat concave, apex well rounded and much more produced than in *E. mythimnia*, outer-margin very concave between vein 4 to 6, from vein 4 straight to tornus, which is only a little rounded and the outer-margin forming almost a right angle to inner-margin which is straight; inner-marginal area till two-thirds of inner-margin and up to lower-median and lower part of ocellus as far as vein 4, and a streak slightly indicated in the ocellus and continued till costa, white; anti-medial line indicated by a faint white patch from origin of vein 2 to upper-median; ocellus sub-ovate, oblique, with the hyaline patch elongate kidney-shaped and situated on costal side of ocellus; a black ring on outer-side of ocellus beginning and ending at post-medial white line beyond which it is continued as a bordeaux (XII) line; from the black line at vein 3 a narrow, inwardly oblique, burnt lake line to near vein 2; inside the black line and bordering the hyaline patch a line of white scales mixed with some green scales, this line is continued along outer half of hyaline patch, but is more faint and followed by a buff-yellow (IV) line; the remainder of the ocellus is filled up with dull yellow-green (XVIII) with a slight indication of the post-medial line passing through it and with some buff-yellow scales where it is bordered by the bordeaux line; the post-medial white sprinkling goes as far as about half the width of the burnt-lake-coloured area and extends from inner-margin to the costa where the scaling becomes more dense and gradually gets a blue colour so as to form a costal pale amparo blue (IX) edging as far as sub-terminal line, below this costal blue area the apical- and outer-marginal area till near sub-terminal line and up to vein 3 filled with roman green (XVI) which becomes lighter at apical terminal part; a whitish-blue much dentated sub-terminal line from near apex till a

little beyond apical ocellus, obliquely inwards to vein 9, then outwards to vein 8, then inwards and running along 8 to fork of 8-9, then zigzagging outwards till half-way 7 and 8, then forming a large curve and running some distance along vein 7, then running back along under-side of vein 7 and then at a sharp angle outwards again, touching the black apical ocellus, then forming a semi-circular light blue line, remote from the inner-side of the black ocellus and with the space filled up with pale amparo blue scales so as to form a crescent mark, then the line becomes faint and goes inwardly oblique across vein 6, there joining the black sub-terminal line, then it goes inwards again forming a very irregular faint deep-chrome (III) boundary to the post-medial band; a rounded black sub-terminal ocellus between vein 6 and 7; apical half beyond the white sub-terminal line ecru-olive (XXX) from vein 7 to 8 and from vein 7 obliquely to apical ocellus; terminal area from apex to tornus and cilia pale chalcedony yellow (XXII); a second sub-terminal ecru-olive line from vein 8 to 6 parallel to outer-margin and gradually becoming mixed with black, beyond vein 6 curving inwards to join the first sub-terminal line, then becoming quite black and very sharply defined and separated from first sub-terminal line and more or less parallel to outer-margin, this line undulates very much, sharply curving inwards at each vein and forming a rounded inward curve between the veins.

Hind-wing white till post-medial line, with burnt lake medial line from costa to ocellus and from ocellus to above tornus, incurved at vein 1b; ocellus well rounded, large and about as broad as two-thirds of its length, a black ring all round it, on basal third a narrow white ring against it, which forms a boundary around the almost round hyaline patch, between the black and the white ring is a space left on the outer two-thirds of the ocellus, which is filled in with dull yellow-green; post-medial burnt lake band irrorated with white scales for basal half, this irroration having a pointed shape towards tornus; a rather broad, distinct, deep chrome (III) boundary line just beyond the burnt lake band, irregularly curved between the veins; beyond this a series of usually triangular black spots; terminal space and cilia lime-green (XXXI); a sub-terminal irregular well-defined black line, incurved at and between the veins, very deeply between vein 5 and 6; a series of sub-terminal, semi-transparent elongated patches covered with a few loose scales only, the patches are situated in pairs on each side of veins 2, 3, 4 and 5.

Under-side: fore-wing as on upper-side, but white scaling of post-medial band extended further; hind-wing with white only on costa

at basal half, and this white is continued on the thorax between second and third pairs of legs; a white inner-marginal area as far as from near base to median line, white scaling of post-medial band also further extended.

♀. Fore-wing less produced at apex, ocellus rounder and broader; green terminal area broader; apical black ocellus a little larger.

Hind-wing with ocellus broader and rounder, nearly circular; yellow sub-terminal line broader and spots following it larger.

Under-side: fore-wing with medial line directed to medial line of hind-wing and both bordering on the ocelli; white post-medial line well outside the ocelli of both wings; abdomen terminating in a white patch.

This species differs from *E. mythimnia* in the fore-wing being more falcate and the tornus being less rounded; ocellus less prolonged, hardly concave on side of anal angle; white inner-marginal band extended towards tornus becoming confluent with the white post-medial band, which passes *through* the ocellus in *E. vera* and not beyond the ocellus as in *E. mythimnia*; the apical black ocellus is smaller in the last species and the blue crescent mark forms part of the circle, while in *E. vera* it makes the ocellus more oval; the post-medial white sprinkling is extended further in *E. mythimnia* and its ground-colour of both wings is more dull; there is also a difference in the dentition of the sub-terminal lines of both species. Hind-wing of *E. vera* more rounded, less prolonged at anal area; no sub-basal white band, but instead the whole medial area is white; the ocellus is larger and well rounded, not angular as in *E. mythimnia*, while the rings around the hyaline patch is totally different in colour and position; the post-medial white band is a continuation of the one on the fore-wing, runs well against the black ring of the ocellus, is not angled outwards between veins 2 to 4 and is hardly angled inwards between vein 2 and anal angle; white post-medial sprinkling is not extended till yellow line; sub-terminal black patches are better defined and the black sub-terminal line is more indented, thinner and sharper in *E. vera*; the peculiar semi-transparent sub-terminal spots on hind-wings are absent in *E. mythimnia*, in fact they are not mentioned in any other species of *Epiphora*; colour of head, legs, antennae and terminal abdominal patch is capucine yellow (III) in *E. mythimnia*, not old gold as in *E. vera*. Under-side of both wings of *E. vera* have more white.

The cocoon is suspended from the branches by a long silky stalk, and not fixed sideways to a branch as in *E. mythimnia*.

This species is perhaps most closely related to *E. bauhiniae*, from West Africa (Senegal), with which it agrees in the stalked cocoon and in the considerable amount of white on both wings. The ocellus of the fore-wing is, however, much more elongate in *E. vera* and less round in the hind-wing, while *E. bauhiniae* has the post-medial white band of the fore-wing well beyond the ocellus and a different dentition in the black terminal line, especially in the hind-wing. In *E. vera* the anal angle of the fore-wing is much less round, the apex is more falcate, while *E. bauhiniae* is considerably smaller.

I have much pleasure in naming this beautiful species after Miss Vera Coffin, who first found the interesting cocoon and bred the moth. The specimens from which the descriptions are made were bred by me from cocoons kindly given to me by Mr. G. W. Redfern, who spent many days in search of the cocoons after the first one had been found. The larva feeds on *Zizyphus mucronatus*, the same tree as that on which I found the larva of *E. mythimnia* at Barberton.

Expanse: ♂ 125 mm.; ♀ 130 mm. One ♂ type from Salisbury, 8th Feb., 1918; ♀ type, Salisbury, 6th Feb., 1918. One ♀ co-type, rather in poor condition, Salisbury, 26th Nov., 1917, bred from the cocoon found by Miss V. Coffin and kindly presented to me by Mr. Rupert Jack.

VII.—Some Observations upon Whales captured at Durban,

by

E. C. Chubb, F.Z.S., Curator, Durban Museum.

WITH PLATES XIII–XVI.

RECOGNISING the favourable opportunity of making observations upon whales which presented itself whilst whaling operations were being conducted at Durban, I arranged for my assistant, Mr. D. R. Boyce, during the whaling season of 1914 to visit the slipways at the Bluff from time to time and there measure some of the whales and photograph them as they were landed. It was my intention that this work should be continued through successive seasons, in the hope that in the course of time some information of interest would be thus accumulated. But, unfortunately, the intervention of the War has practically extinguished the whaling industry here, for the time being at any rate, and consequently the work we had commenced was brought to an early conclusion.

In spite of the fact that what has so far been accomplished is of a very scanty nature, it is deemed advisable to place it on record here.

MEGAPTERA NODOSA LALANDII, Fischer. Humpback Whale.

Plate XIII.

Measurements of a female and two males, captured at Durban in July, 1914:

	A. ♀	B. ♂	C. ♂
	3rd July, 1914	21st July, 1914	21st July 1914
	feet inches	feet inches	feet in.
Total length, from tip of snout to notch of tail	46 0	37 6	43 6
Tip of snout to posterior insertion of dorsal fin	32 6	26 0	30 0
Tip of snout to anterior insertion of dorsal fin	28 0	24 0	27 4
Tip of snout to eye centre	10 9	10 2	12 0
Tip of snout to blow-hole	—	8 0	10 0
Tip of snout to anterior insertion of pectorals	15 0	13 0	15 8
Tip of snout to axilla	—	15 0	18 0

Measurements of Humpback Whales—*continued.*

	A. ♀	B. ♂	C. ♂
	3rd July, 1914	21st July, 1914	21st July, 1914
	feet inches	feet inches	feet in.
Vertical height of dorsal fin	1 6	—	9
From notch of flukes to anus	9 6	9 0	10 0
From notch of flukes to root of penis	—	10 2	14 6
From notch of flukes to clitoris	11 0	—	—
From notch of flukes to navel	20 0	16 8	17 9
Length of pectorals from head of humerus	15 0	—	—
Length of pectorals from posterior insertion	12 0	—	—
Depth of caudal peduncle at insertion of flukes	3 4	—	1 9
Depth of flukes at root	1 8	—	2 6
Length of longest whalebone without bristles	2 6	1 6	1 6
Length of dorsal fin	4 0	—	2 0
Length of orifice of eye	—	4	5
Circumference of body opposite navel... ..	18 6	—	—
Length of protuberances on upper jaw	3	3	3
Breadth of protuberances on upper jaw	2½	2	2½

Coloration : A.—bluish-black above, white below ; sides irregularly marked black and white. B.—black above, bluish-black below ; pectorals black above, white below ; ventral furrows speckled with white. C.—Black above, white below including anterior tip of upper jaw.

Although not strictly within the limits of the present paper, the opportunity may here be taken to record the following particulars of a female fœtus taken from a Humpback at Linga Linga, Portuguese East Africa, on 2nd August, 1914, which were supplied me shortly afterwards by Mr. Johan Bryde.

Measurements of fœtal Humpback (figured on Plate XIII):

Total length	5'11 metres
Tip of snout to blow-holes	'72 "
Tip of snout to angle of mouth	'98 "
Tip of snout to anterior insertion of flipper	1'41 "
Tip of snout to anterior end of dorsal fin	2'78 "
Height of body at flippers	'98 "
Height of dorsal fin	'18 "
Length of flippers from axilla	1'19 "
Greatest breadth of flipper	'38 "
Number of ventral furrows	28
Number of baleen plates	580
Greatest length of baleen	'06 metres
Length from notch of flukes to anus	1'28 "

Colour : pale grey, under surface white.



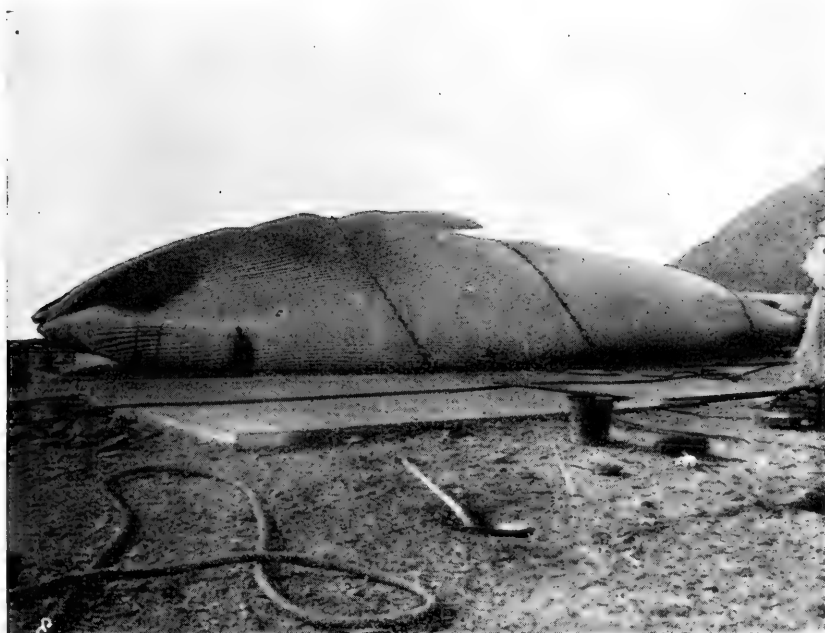
Photo by D. R. Boyce.

HUMPBACK WHALE. *Megaptera n. lalandii*, Fischer. Female. A.

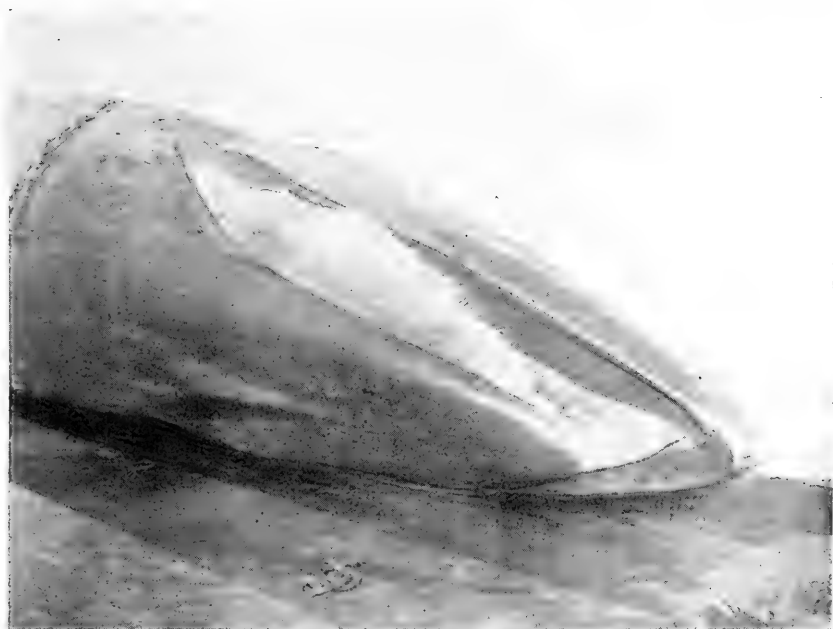


FÆTUS OF HUMPBACK WHALE.





COMMON RORQUAL OR FINNER. *Balenopectera physalus*, Linn.



Photos by D. R. Boyce.

HEAD OF SAME.



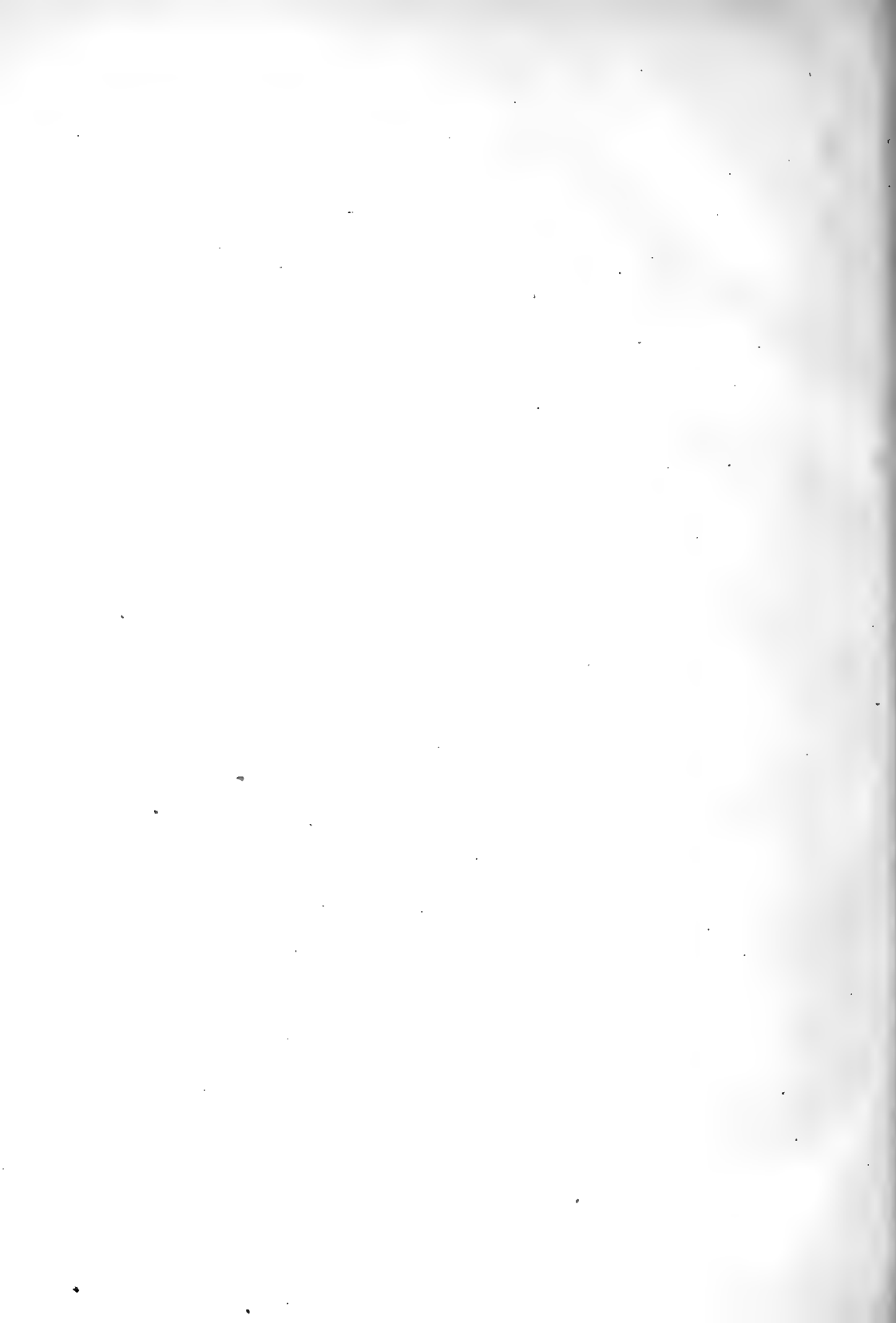


BLUE WHALE. *Balænoptera musculus*, Linn. Female, 90 feet in length.



Photos by D. R. Boyce.

MAMMÆ OF SAME, SHOWING EXUDING MILK.



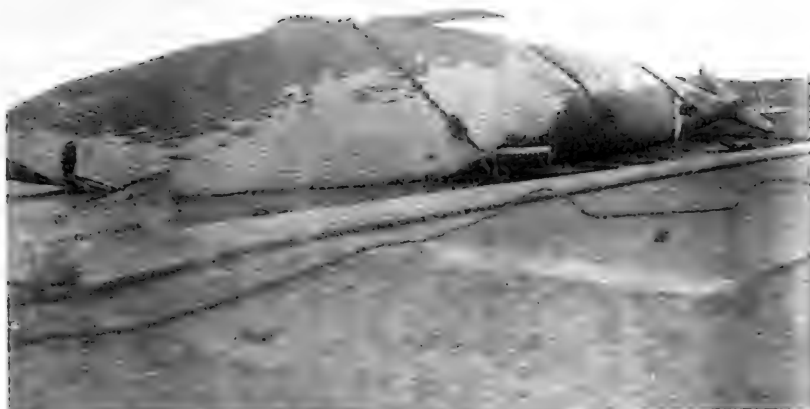


Photo by D. R. Boyce.

RUDOLPHI'S RORQUAL. *Balenoptera borealis*, Less.



Photo by E. C. Chubb.

SPERM WHALE BEING FLENCED.



BALÆNOPTERA PHYSALUS, Linn. Common Rorqual or Finner.

Plate XIV.

Measurements of a female captured at Durban on 25th June, 1914 :

	feet	inches
Total length from tip of snout to notch of tail	50	0
Tip of snout to eye centre	7	9
Tip of snout to blow-hole	7	4
Tip of snout to anterior insertion of pectorals	14	6
Tip of snout to axilla	12	0
Vertical height of dorsal fin	1	3
From notch of flukes to anus	15	0
From notch of flukes to clitoris	19	0
Length of pectorals from head of humerus	6	0
Length of longest whalebone without bristles	1	3
Length of dorsal fin		10
Length of orifice of eye		4
Length of iris		1½
Circumference of body opposite navel	13	6
Length of protuberances on upper-jaw		3
Breadth of protuberances on upper-jaw		2

BALÆNOPTERA MUSCULUS, Linn. Blue Whale.

Plate XV.

Measurements of a male and female captured at Durban in June and July, 1914 :

	♂ 25th June 1914		♀ July, 1914	
	feet	inches	feet	inches
Total length from tip of snout to notch of tail	71	0	90	0
Tip of snout to posterior insertion of dorsal fin	—	—	69	0
Tip of snout to anterior insertion of dorsal fin	—	—	66	0
Tip of snout to eye centre	—	—	18	9
Tip of snout to blow-hole	—	—	17	6
Tip of snout to anterior insertion of pectorals	24	0	27	9
Tip of snout to axilla	26	0	—	—
Tip of snout to ear	24	0	—	—
Vertical height of dorsal fin	1	1	1	0
From notch of flukes to anus	22	0	24	6
From notch of flukes to root of penis	27	0	—	—
From notch of flukes to clitoris	—	—	26	0
From notch of flukes to navel	—	—	38	6
Length of pectorals from head of humerus	—	—	13	3
Length of pectorals from posterior insertion	—	—	8	0
Depth of caudal peduncle at insertion of flukes	—	—	4	9
Depth of flukes at root	—	—	2	3
Length of longest whalebone without bristles	1	8	—	—
Length of dorsal fin	1	1	3	0
Length of orifice of the eye		4	—	—
Length of iris		1½	—	—

Notes regarding female: a few short, white hairs present on lower lips in two rows. Coloration, above dark grey with slate coloured patches, fewer on head; lower surface coloured like the upper, except for a few white patches near the navel. Mammæ protruding and quantities of milk flowing from them.

BALÆNOPTERA BOREALIS, Less. Rudolphi's Rorqual or Seiival.

Plate XVI.

Measurements of a male captured at Durban on 20th August, 1914:

	feet	inches
Total length from tip of snout to notch of tail	45	0
Tip of snout to posterior insertion of dorsal fin	32	6
Tip of snout to anterior insertion of dorsal fin	30	4
Tip of snout to eye centre	9	7
Tip of snout to blowhole	8	0
Tip of snout to anterior insertion of pectorals	14	4
Tip of snout to axilla	16	0
Vertical height of dorsal fin	1	5
From notch of flukes to anus	12	0
From notch of flukes to root of penis	15	0
From notch of flukes to navel... ..	21	0
Length of pectorals from head of humerus	6	0
Length of pectorals from posterior insertion	4	0
Depth of caudal peduncle at insertion of flukes	2	4
Depth of flukes at root	1	2½
Length of dorsal fin	2	4
Length of orifice of eye	3	¼
Length of iris	1	¾

Notes. Coloration, very dark grey with irregular patches of white on various parts of body. Form, very slender. A few short white hairs on point of lower jaw.

In view of the fact that in describing *Balenoptera brydei*,* Mr. Orjan Olsen stated that *Balenoptera borealis* "had been only known until then as inhabiting the eastern parts of the North Atlantic," and appeared to infer that all the so-called "seiivals" obtained in South African waters were *Balenoptera brydei*, I was led to write him on 26th January, 1915, as follows, regarding the above whale:

"I am puzzled about the identity of a whale which was captured by the Premier Whaling Company last August and which the whalers said was a "Seiival." You will see from the sample of whalebone I am sending that it is not *Balenoptera brydei*. It

* Proceedings of the Zoological Society of London, 1913, p. 1073.

appears to me to agree more with *Balænoptera borealis*. I should be glad to know what species you consider it belongs to. The following are measurements and descriptions of the creature taken by my Assistant on the slipway, and I also give sketch with measurements of the dorsal fin."

To this Mr. Olsen replied as follows :

"This whale really seems to be a seiqual (*Balænoptera borealis*). It is very interesting to find it in the hot Mozambique current outside Durban, and, as far as I know, it is the first *B. borealis* that has been captured so far to the east as there. A single specimen was recognised at Saldanha Bay (on the west coast of Cape Colony) and, if the whalers are right, others have been obtained there since I left South Africa. Outside Portuguese West Africa they are said to be not so rare, but, unfortunately, not a single specimen has been examined, and therefore the occurrence of *B. borealis* in those waters is somewhat uncertain. Many of them may, perhaps, prove to be *B. brydei*."

PHYSETER MACROCEPHALUS, Linn. Sperm Whale or Cachalot.

The following measurements apply to a male captured at Durban on 3rd July, 1914 :

	feet	inches
Total length from tip of snout to notch of tail	54	0
Tip of snout to posterior insertion of dorsal fin	38	0
Tip of snout to anterior insertion of dorsal fin	34	0
Tip of snout to eye centre	17	6
Tip of snout to anterior insertion of pectorals	21	3
Tip of snout to axilla	22	8
Tip of snout to ear	19	0
From notch of flukes to anus	13	0
From notch of flukes to root of penis	18	6
From notch of flukes to navel... ..	22	0
Length of pectoral from head of humerus	4	10
Depth of caudal peduncle at insertion of flukes... ..	2	8
Semi-circumference of body opposite navel	14	0

It is of interest to record that a sperm whale obtained at Durban by the South African Whaling Company in January, 1913, was found to contain in its stomach a shark, intact, measuring 10 feet in length.

VIII.—Some Records of Predaceous Insects and Their Prey
in the Durban Museum,

by

C. N. Barker, F.E.S.

IN a paper entitled the "Bionomics of South African Insects" by G. A. K. Marshall, read before the Entomological Society of London and published in the "Transactions" of November, 1902, Professor E. B. Poulton gives an instructive tabular statement (p. 232) of the cases up till then recorded of the attacks of Asilidæ upon insects of various orders. He lays stress upon the necessity of acquiring further data to illustrate the attacks of predaceous insects on other insects and especially on aposematic butterflies. I have much reason to regret not having, at an earlier date, recognised the importance of keeping notes of the many occurrences of this nature that have come under my observation in the course of many years devoted to field work. Those tabulated below are principally the result of two seasons' collecting and are now in the Durban Museum.

In the Natal Coast areas, the most active and voracious enemy of the butterfly is, in my opinion, the Asilus fly "*Alcimus perlongus*." So far I have come across no other species of this numerous group of flies which preys on butterflies. I have the recollection of many cases in which the mantis is the aggressor and the butterfly the victim; but unfortunately, have kept no notes of these occurrences. The last that remains on my memory happened in the summer of 1913. In that case a medium sized green mantis was devouring a *Spindasis masilikazi*, Wallengr. There were quite a number of *Spindasis* and a few *Dendorix* upon the bush and these appeared quite oblivious or unconcerned at the tragedy being enacted in close proximity to them. I have often sought for evidence of dragonflies preying upon butterflies, but so far without success. There is, however, in the Museum a single record of a butterfly, *Colias electo*, L., taken in the clutches of a dragonfly, *Podogomphus prætorius*, Selys?

In this part of the world the Asilus fly is probably the most active and successful enemy of butterflies, though lizards of various kinds are undoubtedly also responsible for many victims.

Predaceous insects and their prey in the Durban Museum.

INSECT.	PREY.	LOCALITY AND DATE.	COLLECTOR.
ASILIDÆ. <i>Alcimus pèrlongus</i> , Walk.	Butterfly : <i>Belenois gidica</i> , Godt. ♂	Durban, 13 ii. 16	E. E. Platt
„ „ „	Butterfly : <i>Eurytela hiarbas</i> , Drury.	Bluff, Durban 17 v. 17	C. N. Barker
„ „ „	Butterfly : <i>Belenois hellicè</i> , L.	Durban, 1 iv. 17	E. C. Chubb
„ „ „	Butterfly : <i>Eurytela hiarbas</i> , Dry.	Durban, 17 v. 17	C. N. Barker
„ „ „	Butterfly : <i>Crenis boisdu-</i> <i>valli</i> , Wallengr.	Durban, 23 ii. 18	„
„ „ „	Butterfly : <i>Eurytela hiarbas</i> , Drury.	Durban, 16 iii. 18	„
„ „ „	Butterfly : <i>Teracolus erone</i> , Angas. ♂	Durban, 16 iii. 18	„
„ „ „	Butterfly : <i>Mylothris ag-</i> <i>athina</i> , Cr.	Durban, 20 iv. 18	„
? <i>Promachus</i> sp. ...	Tachinid fly : <i>Sarcophaga</i> <i>hæmorrhoidalis</i> , Mg.	Bluff, Durban 11 v. 17	„
? <i>Promachus</i> sp. (same as above)	Ant-like Spider.	Bluff, Durban 19 v. 17	„
? <i>Promachus</i> sp. (two taken in coitu)	Winged Termite.	Durban, 1 xi. 17	„
<i>Praonistes præceps</i> , Wall.	Sphegid Wasp : <i>Sceliphron</i> <i>chalybeus</i> .	Bluff, Durban 23 ii. 17	„
<i>Laxenecera nigrocuprea</i> , Wlk.	Bee : <i>Halictus jucundus</i> , Sm.	Durban, 23 iii. 18	„
Large Asilid ? ?	Beetle : <i>Sphenoptera</i> sp.	Lindi, E. Afr., 10 xii. 17	G. S. Gregory
Dragonfly, <i>Podogomphus</i> <i>pretorius</i> , Selys	<i>Colias electo</i> , L.	Karkloof, Jan. 1918	E. E. Platt
Wasp, <i>Pompilus</i> ? about to enter its nest in ground	Spider : <i>Cærostris</i> sp.	Durban, 7 iv. 17	C. N. Barker
Bug, immature (Pentato- mid)	Feeding upon pupa of <i>Acræa</i> sp.	Durban.	E. E. Platt

Prey of a BEMBEX Wasp.

Illustrative of the remarkable voracity of a species of *Bembex* wasp, a series of sixteen examples and their prey (Diptera) is of interest and some biological value. They were collected in two days, with the help of two or three natives, by Mr. J. D. Casey at Liliwandis Drift, Shire River, between Zomba and Fort Johnstone, Nyasaland.

Eleven of the victims are *Asilidæ* of seven distinct species, graduating in size from large to small. The two largest, a male and female of the same species are as robust and considerably longer than the *Bembex*. Three are flies of the genus *Tabanus*, and the two last are *Glossina morsitans*, Westw. (Tsetse fly) and *Sarcophaga hæmorrhoidalis*, Mg. (*Tachinidæ*).

It will be noted that the majority of the prey are *Asilidæ*, themselves the most voracious of flies, many of them even preying on Sphegid wasps or bees (instances being included in the table above). The *Bembæidæ*, unlike the majority of the Sphegidæ, feed their larvæ on fresh food daily, instead of storing up live insects stung into a comatose state upon which to deposit their eggs. Their hunting is, therefore, kept up for a much longer period and the open sand banks in which they nest afford good opportunities for observation.

Though not strictly applicable to the subject, the aggressors being web-less spiders, I am adding the two following occurrences as interesting. Many butterflies also fall victims to spiders of the active running types as well as to those that snare their prey in webs.

CAPTOR.	PREY.	LOCALITY AND DATE.	COLLECTOR.
White hairless Spider, on a sugar-bush. Prey held firmly by head and thorax, dead but quite fresh.	Acridian: <i>Zonocerus elegans</i> Thunb.	Springvale, nr. Durban, 14 iv. 18	E. E. Platt
Yellow Spider, smaller than above, but probably of same genus.	Syrphus fly	Durban, 20 iv. 18	C. N. Barker

Contents of previous issues (*continued*).

Vol. I, Part 4. Published 21st May, 1917. Price 5/- nett.

- XIX.—Catalogue of Natal Marine Fishes (2), by Messrs. GILCHRIST & THOMPSON.
XX.—A new Silurid Fish from Natal, by G. A. BOULENGER.
XXI.—A new Bat (*Otomops icarus*), by E. C. CHUBB. (Plate XXI).

Vol. I, Part 5. Published 25th July, 1917. Price 5/- nett.

- XXII.—Malacostraca of Durban Bay by T. R. R. STEBBING. (Plates XXII & XXIII).
XXIII.—Melanic Aberrations of Butterflies, by C. N. BARKER. (Plates XXIV and XXV).
XXIV.—Additions to the Fish Fauna of Natal, by C. TATE REGAN.
XXV.—New Records of Natal Bees, by T. D. A. COCKERELL.
XXVI.—New South African *Heterocera*, by A. J. T. JANSE.

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- I.—Malacostraca of Natal, by T. R. R. STEBBING. (Plates I—VI).
II.—Varieties of *Papilio d. cenea*, by C. N. BARKER. (Plate VII).
III.—New Records of Natal Bees, by T. D. A. COCKERELL.

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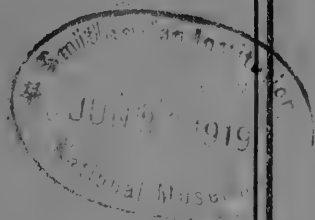
PART 3.

ANNALS
OF THE
DURBAN MUSEUM

EDITED BY THE CURATOR,
E. C. CHUBB.

Issued 31st March, 1919.

PRICE 5/- NETT.



PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.

The Annals of the Durban Museum is devoted principally to South African Zoology and is issued from time to time as circumstances permit.

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IX.—A Skeleton of the Dodo (*DIDUS INEPTUS*)

by

E. C. Chubb, Curator of the Durban Museum.

WITH PLATE XVII.

THE Durban Museum has recently acquired a practically complete mounted skeleton of Dodo, *Didus ineptus*, Linn. It was purchased from the heirs of the late Mr. E. Therioux of Mauritius, through the assistance of Mr. Geo. Antelme, who takes an interest in the Museum at Port Louis, Mauritius. In the possession of tail bones, certain bones in the wings, and a rib on the second pelvic vertebra, the Durban Museum skeleton appears to be more complete than any of the others that have been figured or described, and consequently furnishes some additions to our knowledge of the osteology of this most interesting bird.

It may be as well to recall that the remains of Dodo preserved in museums consist of four other mounted skeletons, in the British Museum (Natural History), the Cambridge University Museum, the Paris Museum and the Mauritius Museum respectively; a foot and head in the Oxford Museum (relics of a complete stuffed specimen which, unfortunately, was attacked by insects and in consequence destroyed in 1755); a foot in the British Museum (Natural History) and a head in the Copenhagen Museum. It is possible that there are also some odd bones in various museums, for the Durban Museum has for about ten years been in possession of an incomplete pelvis and a number of vertebræ and leg-bones. Not one of the five existing skeletons is that of an individual bird. They have been reconstructed at different times from bones that have been found on the Island during the last sixty years, the chief source being a certain marsh, the Mare aux Songes. This site has been very thoroughly explored, and it is highly improbable that any considerable number of Dodo bones will in future be obtained there or elsewhere.

Although the general attitude of the Durban Museum skeleton might be improved upon, there is no doubt that it has been very carefully put together, and it is evident that considerable knowledge has been brought to bear upon the work.

In a paper read before the Zoological Society of London in 1892, and published in the "Transactions," vol. xiii, Sir Edward Newton and Dr. Gadow described and figured a skeleton, reconstructed by

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themselves, which is now in the Mauritius Museum. They pointed out that it contained the following bones which were previously unknown, viz., atlas and prepelvic (18th) vertebræ, complete pubic bones, and metacarpals; and they referred to it as doubtless the most complete skeleton in the world.

In the skeleton which forms the subject of the present paper, not only are the bones which were described by Sir Edward Newton and Dr. Gadow for the first time present, but, as mentioned above, several additional bones are represented. These are referred to below.

The atlas vertebra in the Durban Museum skeleton agrees very well with the figure given by Sir Edward Newton and Dr. Gadow.

In the 13th vertebra the spinous process is more strongly developed than is indicated in their figure, and in this respect it agrees more with that in the British Museum skeleton.

The 18th vertebra, which was described by Sir Edward Newton and Dr. Gadow for the first time, is more complete than that figured by them. There are considerable portions of spinous and transverse processes, indicating that in the complete vertebra these processes are strongly developed.

The tail vertebræ, which are apparently lacking in both the British Museum skeleton and in that described by Sir Edward Newton and Dr. Gadow, are present in the Durban Museum skeleton. They consist of six free caudal vertebræ, with an elongated and rather pointed pygostyle, as shewn in text-fig. 1.

The arrangement of the ribs in the Durban Museum skeleton differs from the conclusions arrived at by Sir Edward Newton and Dr. Gadow, which, being based upon the examination of various normal (not domesticated) pigeons, are, with one exception, no doubt correct. In their opinion, the Dodo possessed short ribs to the 14th and 15th vertebræ, sternal ribs to the 16th, 17th, 18th and 19th vertebræ and *no rib* to the 20th vertebra. The Durban Museum skeleton bears a short rib on the 14th vertebra, sternal ribs on the 15th, 16th, 17th and 18th vertebræ, an almost sternal rib on the 19th vertebra and *a rib on the 20th*, the second pelvic vertebra. This rib on the 20th vertebra is lacking on the left-hand side, but the articulating facet is clearly visible, and, moreover, in an odd pelvis which the Durban Museum has possessed for some years these facets, for the articulation of a pair of ribs to the second pelvic vertebra, are also present. In this respect, the Dodo agrees still more closely with *Pezophaps*, the Solitaire, with which Sir Edward Newton and Dr. Gadow specially compared it.



Skeleton of
DODO, *Didus ineptus*.

The right wing of the Durban Museum skeleton is slightly more complete than that of the left-hand side, and bears the following elements which do not appear in any of the other skeletons that have been figured or described, viz., a radiale, and a phalanx each to the 1st and 3rd digits.

The legs bear patellæ.

TEXT-FIG. 1.



TAIL BONES OF DODO.

X.—On Some Rare Beetles in the Barker Collection of the Durban Museum, with descriptions of new species, Part I,

by

C. N. Barker, F.E.S.

THIS collection of Coleoptera includes a considerable number of unique specimens which have remained as such after the lapse of many years in spite of every endeavour to obtain further examples. I am fully alive to the inadvisability of describing species from single examples and have long refrained from doing so, but the evident rarity of some of them, which, on account of the opening up of the country and consequent destruction of their favourite haunts, is likely to increase until they are quite lost sight of, has induced me to take the present course. An additional reason for describing these rarities is that other collectors may have the luck to come across specimens of them, the value of which they might be quite oblivious of had they not the descriptions and history to refer to.

I have to thank Dr. L. Péringuey for his great kindness in comparing my types with insects in his collection and that of the South African Museum. Indeed, without his help in this respect, I should not have felt justified in making this my first contribution to descriptive classificatory work.

My thanks are also due to the Rev. J. O'Neil, S.J., of Salisbury, Rhodesia, for kindly lending me some valuable unique species from his collection for comparison. As two amongst these prove to be new, I have included descriptions of them below. With these exceptions, all the types are contained in the collection of the Durban Museum.

FAMILY CARABIDÆ.

SUB-FAMILY CARABINÆ.

HILETUS OXYGONUS, Chaud.

A small, black beetle having the appearance of a Harpalid, but with powerfully developed broad mandibles and geniculate antennæ. The two examples in the collection were taken by me in wet alluvium, under river weeds, at the Umhlatuzana River, near Malvern, in November, 1900. I have come across no further specimens in the course of many years collecting both at this spot and other favourable localities.

SUB-FAMILY HARPALINÆ.

TRIBE HEXAGONINI.

HEXAGONIA NATALENSIS, Chaud.

Species of this genus appear to exclusively harbour in the interstices of the leaves of reeds and rushes. Two species, *H. præusta*, Chaud. and *H. terminalis*, Gemm. are common; *H. immaculata*, Chaud. considerably less so in the coastal areas of Natal. *H. natalensis*, Chaud. is seemingly rare wherever it is met with, and I have only taken about half a dozen during many years collecting. It is found in association with the three other species, and all are occasionally attracted to light.

TRIBE ODONTOCANTHINI.

CASNONIA RUFOPICEA, Chaud.

Two examples; one taken flying at dusk at Malvern in September, 1900, the second at light, Mavern, 29th May, 1910. I have quite failed to come across this insect in the natural haunts of species of this genus, i.e., in damp places under herbage, river banks or marshes.

STENIDIA ABDOMINALIS, Chaud. and *S. APPROXIMANS*, Pér.

The habits of these species are the same as in the genus *Casnonia*, but, with the exception of a single example of the former taken by me at Malvern in 1896, I have only met with them at the electric lights in Durban. *S. abdominalis* was captured at light in December, 1907, and again on 21st April, 1908. The records of capture of *S. approximans*, Pér. are two examples taken in December, 1907, and a further specimen during the same or following month; all at the electric lights Durban, by Mr. H. W. Bell Marley.

TRIBE GALLERITINI.

DENDROCELLUS AUSTRALIS, Pér.

This appears to be a very rare insect. Though much sought for, I have taken a single example only, in July, 1898, under bark of the 'Ndohni (Waterboom) tree at Malvern. In appearance it is hardly

separable from *Drypta ruficollis*, Desj., but its pectinated claws demonstrate its arboreal habits and differentiate it from all the species of *Drypta*.

EUNOSTUS GUENZII, Chaud.

This is another rare insect, and I have only obtained it on two occasions, each time at light, viz., at Lower Umkomaas in November, 1898, and at Malvern on 30th December, 1901. Only one other species of this genus, *E. latreillei*, Casteln. from Madagascar, has so far been recorded, and nothing I believe is known of its habits beyond what may be surmised from its simple claws.

TRIBE HELLUONINI.

MACROCHILUS APPROXIMUS, Pér. and M. DORSALIS, Klug.

These are closely allied species, doubtfully distinct from one another. The example of *M. approximus* in my collection is larger than *M. dorsalis*, agreeing in this respect with the dimensions given by Dr. Péringuey in "Catalogue of Coleoptera of S. Africa" (1896)*, page 167. *M. dorsalis*, Klug. is there recorded from Cape Town only. In the Munich Catalogue its habitat is given as *India orientalis*, which Dr. Péringuey considers erroneous. The two examples (one of each species) were taken at Malvern, Natal; *M. dorsalis* at light in October, 1913, and *M. approximus* under stone on 16th October, 1908. Many species of this genus appear to have a wide range, but to the best of my knowledge are infrequently met with.

MACROCHILUS VARIANS, Pér., var. ?

A single example received from the Rev. J. A. O'Neil, on loan, who captured it at Salisbury, Rhodesia, 22nd December, 1917. It agrees in all essential points of shape and sculpture with Dr. Péringuey's description, except that no mention is made of the broad medial longitudinal groove to the prothorax, and its very fine central line.

In details of coloration the species shows considerable differentiation. Dr. Péringuey mentions having two examples before him "in one of which the elytra are concolorous and in the other there is a yellowish red band beginning near the base and extending, on the fourth and fifth intervals, to a short distance from the median part of the disk." The

* Trans. S. Afr. Phil. Soc. VII.

size of the humeral patch can therefore be safely estimated as a very variable factor. In the specimen before me, the shoulder patch extends from the base to below middle, and covers at its widest part the intervals 3 to 7, and is longest on the fifth and sixth intervals. The head and metasternum are not wholly black. The former is reddish from near vertex to base and the latter is wholly red. It is also fairly densely pubescent; the pubescence of the elytra rather long and decumbent. Length $10\frac{1}{2}$ mm., width $3\frac{3}{4}$ mm.

PLANETES QUADRICOLLIS, Chaud., var.

The single example belonging to the collection has been submitted to Dr. Péringuey (September, 1918), who has compared it with typical "*quadricollis*," and considers it a melanic variety of this species. He adds that the dorsal patch of *P. quadricollis* is very evanescent. It was taken at the electric lights, Durban, by Mr. H. W. Bell Marley in the summer of 1907-8.

TRIBE BRACHININI.

The Brachinini, though homogeneous as a group, are extremely difficult to determine specifically, on account of the great variability and the evanescent nature of their patterns.

The genus *Pherosophus* is particularly difficult on this account, and with further knowledge many of those at present recognised as species will probably be sunk as synonyms.

The examination of the genitalia of large series may afford some guidance later in their determination, though I have no personal evidence as to its reliability in this group.

Two of the commonest species of *Pherosophus* in the Natal coast regions are *P. fastidiatus*, L. and *P. capensis*, Chaud. These two species, and varieties graduating from the one to the other, are frequently found together, sometimes quite gregariously, under the same stone or shelter. The elytral markings vary from large to the smallest traces, and the ground colour from yellow to deep red. The sculpture varies but little, and these slight modifications bear no relationship to the colour or pattern of the insects.

It is, therefore, with some hesitation that I venture to add yet another species to this difficult genus. There are, however, in the following form some distinctive points that I have not met with in any other species of the genus with which I am conversant.

PHEROSOPHUS UBOMBOENSIS, sp. nov.

Head, prothorax, legs and underneath (except the abdomen which is more or less infuscated) dull yellow. The prothorax is margined with black exactly as in *P. bohemani*, Chaud. and the knees are infuscated. Elytra black, with a broad marginal band, commencing in a humeral spot and extending to the outer apical angle. The black ground immediately above the apex shades off into brownish; the tips of the costæ pallid. A little below middle a narrow yellow discal patch extends diagonally downwards from the middle of the sixth to the fourth intervals where it broadens upwards; elytra nearly parallel with the shoulders, only slightly sloping; narrowly costate, with both costæ and intervals rugosely, irregularly punctate, giving the surface a coriaceous appearance, especially towards the apical declivity; the intervals densely clothed with a short pubescence. Head faintly aciculate, longitudinally plicate near eyes.

Length 15 mm. Width 6 mm.

Hab. Ubombo, Zululand. Collected by H. W. Bell Marley.

The distinctive characteristic of this species is the punctuation of the costæ of the elytra and its more quadrate shape. The setæ of the legs and underneath are denser and longer than usual.

BRACHINUS MARLEYI, sp. nov.

Head, prothorax, palpi, and beneath reddish-yellow. The four basal joints of the antennæ reddish-yellow, with the third and fourth sub-apically banded with fuscous; terminal joints ferruginous and pubescent excepting the first two. Legs reddish-yellow, a shade lighter than the prothorax. Elytra black with the margins broadly yellow from base to outer apical angle where they widen into an irregularly rounded spot. The scutellum, and a large sub-triangular patch enveloping it, yellow, narrowly connected basally with the marginal band. On each side of the scutellar spot, and only separated from the humeral angles by a narrow strip of the black ground colour, a large elongate patch extends transversely from the fourth interval to its coalescence with an inward extension of the marginal band. The combined patch though widely joined is deeply indented by the ground colour above and beneath, at the points of juncture. The discoidal part of the patch extends to below middle. The apical declivity bears a large ovate spot which inclines diagonally towards the suture and apex, and covers the fifth to second intervals. It is narrowly separated from the spot at the outer apical angle. The

surface of the elytra is shagreen punctate, with shallow striæ and a somewhat dense reddish pubescence. Vertex of head nearly smooth, faintly aciculate. Prothorax shallowly plicate punctate, sparsely pubescent, sub-cordate, margins recurved and with a strongly defined median groove.

Length $8\frac{1}{2}$ mm. Width $3\frac{1}{2}$ mm.

Hab. Ubombo, Zululand. Collected by H. W. Bell Marley. One example.

A robust looking insect of the Armiger group.

CREPIDOGASTER MATONGA, sp. nov.

Head, prothorax and antennæ light brick red. Prosternum, legs and basal joint of antennæ of a lighter testaceous colour. Elytra black without markings; abdomen reddish fuscous laterally darker; exposed dorsal segments nearly black. Antennæ long about 11 mm. or nearly as long as the insect. Prothorax elongate cordate, much drawn in at base which is truncate and broadly grooved on either side; the lateral margins briefly reflexed; immediately below the apex a fine carinate, slightly sinuate transverse line, which does not quite reach the apical angles and is intersected in the middle by the median line. Both head and prothorax are finely shagreened. Elytra closely shagreened; striæ shallow, but clearly defined; briefly pubescent; the pubescence black. Shoulders narrow but very prominent; ovately, but not largely, amplified; the apex deeply emarginate.

Length $11\frac{1}{2}$ mm. Width, a trifle over 5 mm.

Hab. Ngxwala Hill, Zululand. Collected by L. Bevis.

CREPIDOGASTER MARGINICOLLIS, sp. nov.

Head, palpi, first two joints of antennæ, legs and beneath testaceous yellow; legs a shade lighter than head and prothorax. The lateral margins of the prothorax, elytra and the second and third joints of the antennæ infuscated. The remaining joints of the antennæ light red. The elytra are of the same testaceous ground colour clouded over the whole surface with fuscous brown, except only ill-defined basal and sub-apical patches. The basal or scutellar patch is composed of coalescing inter-striæ rays, and on either side of it are two further narrow ill-defined rays, all of which reach from base to about one-third of the length of the elytra. Close to the lateral margins and a short distance above apex, a small transverse ray-like yellowish spot, also somewhat ill-defined. Exposed dorsal segments of abdomen dark brown. Head, prothorax and elytra very closely punctulate and

briefly pubescent. There are no striæ to the elytra. Prothorax elongate cordate with a shallow median groove.

Length 5 mm. Width $2\frac{1}{2}$ mm.

Hab. Salisbury, Rhodesia. Captured by, and type in the collection of, the Rev. J. A. O'Neil.

CREPIDOGASTER OBSCURA, sp. nov.

Vertex of head and prothorax reddish-brown; antennæ, epistome and mandibles light red, the latter with the tips infuscated. Palpi flavescens with bases of terminal joints ringed with brownish. Elytra pectus and abdomen fuscous brown. The elytra is a shade darker than the abdominal segments. Vertex of head longitudinally convex, finely and closely aciculate punctate. The eyes small and depressed. The prothorax a little more finely punctulate than the head and with a narrow median line interrupted in the centre. It is very little amplified anteriorly and not much wider than the head; obliquely narrowed to basal angle which is rounded and not prominent; lateral edges narrowly marginate. Elytra very short, and very closely aciculate punctate, with the striæ only faintly indicated; very briefly pubescent. There is a line of spaced punctures above the epipleuræ; the apex not deeply emarginate.

Length 6 mm. Width 3 mm.

Hab. Malvern, Natal. Taken by me under leaf detritus in garden, March, 1913.

This is a very distinct species with narrower head than usual, small, non-prominent eyes, and slender prothorax which is not sinuated laterally above the basal angles.

TRIBE LEBIINI.

Of the genus *Callida*, Déj. the collection contains no less than sixteen, thirteen of which are described and determined species and sub-species. The remaining three are probably new, but the great similarity of facies of the majority of this group enjoins caution in dealing with very limited material. *Callida marginicollis*, Chaud. a beautiful and very distinct species appears to have a very wide range, though I have only met with it once, i.e., in July, 1900, on the Upper Umlazi River, Natal, when two examples were taken on 'Ndohne or waterboom tree. Hitherto it has only been recorded from Cape Colony (Knysna) and the Transvaal (Potchefstroom). Most of the species of the group, however, appear to be local in their incidence.

METALLICA sp. ?

This is a splendid little insect, black with metallic purplish-red elytra. A single example was found by me on the 14th June, 1907, dead on a leaf in my garden at Malvern. It must either be a straggler from the north-eastern fauna, or an extraordinary rare insect. It is evidently allied to *M. purpuripennis*, Chaud. but differs from the description in many essential details. It has, unfortunately, lost some of its members.

Length about 9 mm.

PLAGIOPYGA TRANSVAALENSIS, sp. nov.

Head, prothorax, palpi and beneath rich chestnut red; mandibles black. Antennæ: first three joints red like the head, glabrous, the remaining joints ferruginous and pubescent. Elytra black, opaque, but showing an underlying reddish tinge in very strong light; epipleuræ red. Legs reddish; the femora except the knees a shade lighter. Head: epistome elongate; labrum broader than long, truncate; vertex smooth, without punctures. Prothorax slightly broader than long; lateral margins gently rounded from apex to above middle, thence gradually narrowed to the rounded basal angle; disc convex finely plicate, and with a median groove; margins briefly recurved and somewhat rugose within. Elytra depressed, finely striated, intervals plane.

Length 10 mm. Width 4 mm.

Hab. Pilgrim's Rest, Transvaal. Collected by A. Galloway.

More depressed and less elongate than *P. cyclogona*, Chaud. The colour of the elytra different to any of those previously described from S. Africa.

DEMETRIAS NATALENSIS, Chaud. and PELIOCYPAS NATALENSIS, Chaud.
(in litt.).

I cannot refrain from referring to the confusion caused by the use of the same name for these two closely allied insects. In colour and general appearance they are almost identical; in size alone is there any differentiation (and that is only as $4\frac{1}{2}$ mm. is to 6 mm.) so far as the outer skeleton is concerned. The generic characters of *Demetrias* and *Peliocypas* only differ in that the former has the paraglossæ a little longer and the latter much longer than the ligula. Where the facies and habits are the same, as they are in the case of these two insects, the generic characters appear very insufficient to justify their separation.

The description of *Peliocypas natalensis* as given in Péringuey's Catalogue of S. African Coleoptera is copied from de Chaudoir's manuscripts and was not published by him. I would therefore suggest that the name be altered to *Peliocypas chaudiroidi*.

XENITENUS MARSHALLI, sp. nov.

Fulvescent. Head, mouth-parts and antennæ reddish fulvous. Elytra fulvescent with the whole discoidal area covered with a diffuse fuscous brown band, leaving only a somewhat ill-defined space, on either side of the suture and the lateral margins, of the ground colour. Head smooth and very shiny without punctulation; on either side between and extending below the eyes an irregular plicated groove. Prothorax a little wider at apex than at base; angles, both anterior and posterior, sharply rounded; outer sides straight, narrowly recurved; apex emarginate; base truncate. The disc very shiny with faint transverse plications; a well-defined central groove intersected sub-basally by a short transverse impression. Elytra sub-parallel; shoulders broadly rounded; surface shiny and faintly aciculated; striæ shallow, especially towards sides where they become hardly defined; spaced punctures on the third, fifth and seventh intervals.

Length $7\frac{1}{2}$ mm. Width $2\frac{1}{2}$ mm.

Hab. Salisbury, Rhodesia. Taken under bark in October, 1898, by my friend, Dr. G. A. K. Marshall, after whom I propose to name it.

KLEPSIPHERUS MALVERNENSIS, sp. nov.

Head, prothorax, elytra and underneath pitch black, shiny. Antennæ, palpi and tarsi red. Legs piceous red; the femora a shade darker than the tibiæ. Vertex smooth, very shiny; neck shallowly transversely grooved and narrowed basally; on either side between the eyes an elongate rugose groove which reaches down as far as the clypeus. Apex of prothorax deeply emarginate; angles sharply rounded; lateral sides gently amplified for a short distance, then nearly straightly narrowed to the posterior angle which is rounded, base truncate; a well-defined median groove reaches from centre of the apical emargination to a short distance above base, where it deflects outwardly into elongated sub-marginal impressions on either side, the whole surface of the disc strongly transversely plicate. Elytra more than double the width of the prothorax at base, short; basal and apical angles broadly rounded, sides nearly straight, drawn in a little towards apex and sinuate between the outer and inner angles; deeply punctate, striæ with the intervals almost carinate.

Length $8\frac{1}{2}$ mm. Width $3\frac{1}{2}$ mm.

Hab. Malvern, Natal. A single example taken by me under bark in July, 1898.

Closely allied to *Klepsipherus crenato-striatus*, Pér., from which it differs in its shorter, more convex form, more rounded shoulders, its strongly plicated and grooved prothorax and the much deeper striation of the elytra. The coloration is also quite different.

PHLÆOZETUS DORSALIS, Pér. var. ?

Two examples taken at light at Isipingo in March, 1898. These were submitted to Dr. Peringuay and pronounced by him as "hardly distinguished from *P. dorsalis*."

I have not seen *P. dorsalis*, which in the Catalogue of the Coleoptera of S. Africa (1896)* is recorded only from Cape Town, but judging by the description and by the figure of the elytron (Plate V., no. 15) my species differs in the dorsal black patch being broadly truncate in the anterior part instead of being produced triangularly from the suture. In this respect it agrees exactly with the description of *P. ambulans*, Pér. from Salisbury, Rhodesia.

LEBIA UMTALIA, Pér.

A single example taken by me in reeds, river bank, 'Mhlatuzan, Natal, February, 1899. Regarding this Dr. Péringuey says, "Slightly more massive but same species."

Judging by the description of *L. umtalina* (sic) in "Annals of S. African Museum," vol. iii, p. 179, it differs materially from my species as follows :

	<i>Lebia umtalia.</i>	<i>Lebia sp. mihi.</i>
Length	$6\frac{1}{2}$ mm.	8 mm.
Width	3 mm.	$3\frac{1}{2}$ mm.
Clypeus	Black.	Red.
Antennæ	Rufescent, with 4-6 joints deeply infusate.	Rufescent (all the joints).
Supra apical band	—reaches margin and is connected by a narrow black band along the suture with the basal patch.	does not reach margins and is connected by a broad band (covering 1st and 2nd intervals) with the basal patch.

* Trans. S. Afr. Phil. Soc. VII.

It appears to be more closely allied to *L. fortuita*, Pér., in which the elytral pattern and the colour of the antennal joints are identical. It is, however, a more massive insect and differs in the shape of the prothorax, which is more transverse and not sinuate above the basal angle. The striae also are quite devoid of punctuation which is present in *L. fortuita*.

LEBIA NATALIS, Pér. and LEBIA VERISIMILIS, Pér. (in litt).

As the result of correspondence on the subject, subsequent to the publication of the description of *L. natalis* (Trans. S. Afr. Phil. Soc., vol. x, p. 323, 1898), the name *L. verisimilis*, in litt. was submitted to me by Dr. Peringuey for the smaller of the two species, but so far no description has been published.

Unfortunately, the description of *L. natalis* requires revision as it confounded (probably from want of sufficient material for comparison) two very distinct species as one. The description, however, can only apply to the larger species as the metasternum is described as being black, which is correct for *L. natalis* but not for *L. verisimilis*, in which the whole of the pectus is red.

The extreme measurement, 8 mm., is correct for *L. natalis*, which appears to be constant in size. *L. verisimilis*, per contra, varies a good deal in size from $5\frac{1}{2}$ –7 mm. The coloration above is the same in both species, but in shape they differ considerably. *L. natalis* bears the general facies of *L. (Liopeza) thoracica*, Boh., i e., long slender filiform antennae; elongate legs and tarsi, wide shoulders which with almost parallel sides give it a more quadrate appearance. *L. verisimilis* has shorter sub-filiform antennae and the more oval convex shape of *Lebia fraterna*, Pér. In *L. verisimilis* the prothorax is more transverse, the elytra more amplified beyond middle; less depressed with deeper and punctulated striae. In *L. natalis* the striae are not, or scarcely perceptibly, punctured; the intervals are less raised and the surface colour duller. The space between and below eyes in *natalis* is coarsely longitudinally plicated. In *verisimilis* it is confusedly punctured, the plications, if perceptible, are immediately adjacent to the eyes.

Both species are not uncommon if sought for under bark in damp spots during the dry (hibernating) season. The waterboom ('Ndohne) tree is the favourite resort of these and large number of our *Lebiides*.

LEBIA MONTICOLA, sp. nov.

Head black. Prothorax, mouth-parts and the first three joints of the antennae red. The remaining joints ferruginous. Legs flavescent.

Elytra rich yellow with a black sutural band covering the two first intervals from base to about middle, whence it widens outwards (at the commencement obliquely) into a broad transverse band which covers the eighth interval but does not reach the margin. The band is irregularly sinuous above and below. Underneath reddish-brown darker laterally and on the anal segments. Vertex of head and frontal parts closely punctured and longitudinally plicate between the eyes. Prothorax: anterior part to about one-third its length widely rounded; thence to posterior angle (which is sharp and recurved) nearly straight; rugosely, transversely plicate over the whole disc, which is divided by a well-defined median groove. Elytra nearly twice the width of the prothorax at base, shoulders rounded, sides very slightly amplified, nearly parallel in fact; punctate striate, intervals plane. Antennæ filiform, long and slender; the first three joints excepted, pubescent and bearing a long seta towards the apex of each articulation. Legs and tarsi elongate; claws quadripectinate.

Length 8 mm. Width $3\frac{1}{2}$ mm.

Hab. Van Reenen, Natal. A single example taken by me in December, 1907.

The antennæ, legs and tarsi are even relatively longer than those of *L. natalis*, Pér. and *L. thoracica*, Boh. It should precede *L. insidiosa*, Pér. which is a sort of connecting link with species of the *L. fortuita*, *L. umtalia* class characterised by nearly straight outer sides, antennæ moderately long, sub-filiform.

LEBIA.

Without venturing to attempt a re-grouping of the large numbers of S. African species of this genus, for which the material at my disposal is quite insufficient, I would suggest placing the *Nematopeza* section at the end of the list, for in their more robust convex forms they distinctly approximate to *Astata*. Species which I take to belong to this group are *L. dregei*, Chaud., *L. nobilis*, Boh., *L. invicta*, Pér., *L. evicta*, Pér., *L. modesta*, Boh., *L. fraterna*, Pér., *L. verisimilis*, Pér. in litt., *L. bicolor*, Pér., etc. *L. natalis*, Pér., I think takes its most suitable place after *L. thoracica*, Boh., with which it has in common filiform antennæ and elongated tarsi. *L. immaculata*, Boh., I have not yet come across, but judging by its description "outer sides nearly straight," it may find its place next to *L. natalis*.

ASTATA TETRAGRAMMA, Chaud.

Dr. Péringuey, on page 337 of his 2nd Supplement of the Coleoptera of S. Africa (1898)*, refers to the melanic form of the above as allied to *Astata cognata*, Pér. He has, however, entirely omitted to describe these melanic forms in his description of the species, pages 265-6 of the Catalogue. His only mention of a melanic form of this species, is his denial of Chaudoir's assertion that *Lebia immaculata*, Boh., is a variety of *A. tetragramma*, Chaud. The Barker collection contains a good series of the varietal forms of the species. The four-spotted type form appears to be fairly constant in the size and shape of the spots.

Var. A. with an inclination to a darkening of the ground colour has quite lost the anterior dorsal spots, and the sub-apical spots are much reduced in size; in one example the spot is sub-evanescent on the outer side, and only two intervals show the colour clearly.

Var. B. The spots have entirely vanished leaving the elytra of a unicolorous black.

ASTATA COGNATA, Pér.

This varies considerably, as the description shows, from a deep flavus central space with defined borders to the extreme melanic type showing no trace of a lighter discoidal area.

ASTATA CONSORS, Pér.

The dark forms with unicolorous black or very faint traces of piceous red on the discoidal area, appear to be the commonest, as they are also the typical form of this interesting species. One example, however, shows a fairly well diffused rounded spot of piceous red on either side, a little above the middle, whence it is narrowly produced basally and reaches the shoulder.

The habits of this species differ somewhat from the other *Astata* known to me. I have only taken it harbouring in reeds on river banks. The other species appear to affect, like most of the true *Lebia*, the bark of trees.

ASTATA PICEIPENNIS, Motsch.

This fine species shows no disposition towards variation.

* Trans. S. Afr. Phil. Soc. X.

LEBISTINIDA PULCHRA, Pér.

This appears to be an extremely rare, as well as a very beautiful, species. The type was taken by my friend, Dr. G. A. K. Marshall at the Lower Umkomaas River, under bark, about the year 1896 or 1897. I believe that the only specimen since obtained is a single example taken by me in November, 1902, near the mouth of the Ifafa River. Both these localities are on the Natal south coast and only a few miles apart.

ARSINOE NITIDA, sp. nov.

Head black, with an ill-defined space on vertex reddish. Labrum, palpi, terminal half of mandibles and first two joints of antennæ deep red; third and fourth joints of the antennæ piceous, the remainder ferruginous. Prothorax black, narrowly piceous red about apical angles. Elytra black with sub-humeral, and deeply sinuated, supra apical patches. The anterior patch extends diagonally from the third to eighth intervals, commencing narrowly on the third, produced a little downwards on the fourth and fifth intervals and a little upwards on the sixth interval but not reaching the base. It is of about the same width and widest on the fourth and sixth intervals. The supra-apical patch extends from the suture to the sixth interval. It is produced sharply upwards on the third and fifth, and is sinuate towards apex on the first and fourth intervals. It is widest on the third and fifth intervals. Legs and abdomen piceous red. Head deeply punctulated, a little scrobiculate on either side of the epistome. Discoidal part of prothorax nearly smooth, faintly transversely wrinkled; lateral margins sharp, recurved and rugose within. Elytra punctate-striate with the intervals plane and finely punctulated.

Length $8\frac{1}{2}$ mm. Width $3\frac{3}{4}$ mm.

Hab. Northdene, Natal. A single example taken by me under bark in May, 1900.

Judging by the description it is very nearly allied to *A. plausibilis*, Pér., and may only prove a varietal form with a less developed pattern. The most important difference lies in the incidence of the sinuation of the respective patterns. In *A. plausibilis* the anterior patch is described as produced downwards on the third interval and upwards on the fourth and fifth where it connects with the base. In *A. nitida* it is very narrow on the third, produced downwards on the fourth and fifth and upwards only on the sixth where it does not nearly reach the base. It is also considerably smaller than *A. plausibilis*, and comparatively broader.

ARSINOE O'NEILI, sp. nov.

Head, palpi (tips lighter) and first three joints of antennæ red, the remaining joints darker. Prothorax, underneath and the legs fulvescent. Elytra black, with on either side an elongate spot reaching from base to about one-quarter of its length, covering the intervals 4-7; a smaller sub-apical rounded spot near to, but not reaching, suture. Head and prothorax deeply punctulated. The vertex of head and sides of the prothorax more coarsely so. The prothorax is of the usual shape, but the lateral margins above the basal angles are less sinuated and recurved than in *A. quadri-guttata*. Elytral-striæ hardly perceptible, and the intervals finely punctulated.

Length $7\frac{1}{2}$ mm. Width 3 mm.

Hab. Salisbury, Rhodesia. Received from my friend Rev. J. A. O'Neil, S.J., whose correspondence and help through a long term of years has been of much encouragement and the greatest interest to me.

In coloration, pattern, and in the lesser constriction of the prothorax at the basal angles, this species approximates to the facies of *Lobodontus gentilis*, Pér., which also occurs in the same neighbourhood.

LOBODONTUS CONJUNCTUS, sp. nov.

Head black, with centre of vertex, frontal, and mouth parts piceous red; mandibles tipped with black. Antennæ, legs and underneath red; the abdomen piceous marginally. Prothorax black, very narrowly margined with reddish. Elytra black, with on either side of the base an elongate sub-quadrate reddish flavescent patch, reaching from the shoulder to about one-third its length and covering the intervals from the fourth to their junction with a reddish marginal band. On either side of the suture above the apex two small laterally rounded spots which coalesce and form an ovate patch a little indented anteriorly. Vertex and base of the head smooth and shiny. Prothorax: apical angles sharply produced forward; lateral sides gently rounded to about middle and thence sinuately narrowed to the basal angle which is sharp; margins narrowly recurved. Elytra shiny; punctato-striate with the intervals slightly convex. Two punctures on the third interval, and the lateral margins foveately punctured from shoulder to apex.

The pattern and coloration are almost identical with those of *L. trisignatus*, Chaud., but in the narrower, more sinuate shape of the prothorax and the more robustly formed head it approximates to species of the genus *Arsinoe*. But for the palpi, which are those

of a *Lobodontus* (not abruptly truncate), I should have attached it unhesitatingly to this genus. It is an interesting connecting link between these two genera and makes it doubtful whether *Lobodontus* is other than a synonym of *Arsinoe*.

Length $7\frac{1}{2}$ mm. Width 3 mm.

Hab. Salisbury, Rhodesia.

HAPLOPEZA UMTALIA, sp. nov.

Head and prothorax metallic greenish-blue. Elytra dark metallic purplish-blue; antennæ black, the first three joints glabrous, the other joints pubescent and setose. The basal joint more or less reddish at base. Palpi and mouth-parts rufescent. Legs clear flavus with the tarsi and apex of the tibiæ infuscated. Prosternum and pectus blue-black, abdomen and pygidium flavous. Of the same size and shape as *H. violacea*, Boh. Head and prothorax identical, but the elytral striæ are deeper and punctulated; the intervals decidedly convex instead of plane. It may be only a local race of *H. violacea* which in some examples shows a disposition towards reddish in the posterior femora and about the knees, but the sculpture of the elytra is distinctly different and the antennæ are more pubescent.

Length 7 mm. Width 3 mm.

Hab. Umtali, Rhodesia.

PENTAGONICA O'NEILI, sp. nov.

Head black to piceous-red; mouth-parts and first three joints of antennæ dark brown; terminal joints of latter redder and lighter. Thorax flavus; legs and pectus pale flavescent; abdomen brownish. Elytra dilute fuscous brown, broadly margined with pale flavescent.

Head and prothorax smooth; the latter transverse, widest at about middle where it is sharply angled and setose. Thence it contracts rapidly to base, which is very narrow, with scarcely a trace of sinuation at outer basal angle. The disc convex, with a narrow median groove which deflects outwardly a little above base; the lateral margins sharp and recurved. Elytra shallowly punctato-striate with the intervals plane; shoulders squarely rounded; sides nearly straight to beyond middle and gently rounded to apex.

Length $4\frac{1}{4}$ mm. Width 2 mm.

Hab. Salisbury, Rhodesia. Four examples received from my friend the Rev. J. A. O'Neil, S.J., to whose generosity I am indebted for a great many new and interesting species included in my collection.

PENTAGONICA ANTENNATA, sp. nov.

Head fulvescent; prothorax, mouth-parts and legs flavus; antennæ (excepting the first four joints which are pitchy brown) very pale flavescens. Elytra pale fuscous brown with the outer margins broadly flavescens. Prosternum and pectus flavus; abdomen brownish.

Size and sculpture almost identical with that of *P. o'neili*, but the prothorax is broader and a little more sinuate below the outer basal angles. The elytra also are shorter giving it a more quadrate appearance. The narrow space at base below the median line of the prothorax, as well as the scutellum and immediately round it, is coarsely punctured. In *P. o'neili* these parts are nearly smooth. The most distinctive feature of this species, however, is the sharp contrast between the pitchy first four joints and the yellowish-white of the succeeding joints of the antennæ.

Length $4\frac{1}{4}$ mm. Width 2 mm.

Hab. Malvern, Natal. A single example found on the bark of a fallen tree on 19th October, 1913.

ORTHOGONIUS DUBIUS, sp. nov.

Head, prothorax and elytra piceous red; the prothorax a shade redder than head and elytra. Palpi, first three joints of antennæ, legs, pygidium and beneath of a rich chestnut red. Terminal joints of antennæ piceous and pubescent. Head finely transversely plicate. Prothorax gently rounded from apical angle to above middle, thence nearly straight to basal angle, which is moderately sharp and narrowly recurved. Sparsely punctulate and rugosely plicate over the whole disc and with a shallow median groove. Elytra elongate; four times as long as the prothorax; shoulders squarely rounded, twice as wide as the prothorax at base, deeply striate, very faintly punctulate with the intervals carinate. Both intermediate and posterior tibiæ straight and slender as in *O. capucinus*, Boh.

Length $16\frac{1}{2}$ mm. Width 7 mm.

Hab. Salisbury, Rhodesia.

Evidently a near ally of *O. æmulus*, Pér., with the description of which it agrees in most respects, but the posterior tibiæ are not in the least incurved. The four examples before me show no variation in size.

Dr. Péringuey states of this genus that the fourth tarsal joint of the anterior tarsi are bilobate. This is evidently an error, as none of those in my possession, i.e., *O. caffër*, Boh., *O. brevicornis*, *O. capucinus*, and the present species, show anything more than broad incisions.

XI.—A new Bee from Natal,

by

T. D. A. Cockerell, University of Colorado.

I HAVE just received from Mr. E. C. Chubb, specimens of a bee of such extraordinary beauty that it deserves to be recorded without delay. It reaches me on the very day that we have received word of the complete triumph of the allied armies in Europe, and the cessation of fighting. Because of its splendid blue colour of the abdomen I call it *caelestina*, heavenly; may it be an omen of better days to come!

ANTHOPHORA CÆLESTINA, sp. nov.

♀. Length about 13 mm., anterior wing 9 mm.; robust, black, with white markings on the head as follows: a reversed T-shaped mark on clypeus, the arms very long, the stem not reaching upper border of clypeus; a transverse supra-clypeal band; a very broad crescentic mark on labrum; and nearly all of base of mandibles. Hair of head and thorax above pale fulvous mixed with black, of lower part of cheeks pure white, of under side of thorax yellowish-white; antennæ entirely black, third joint very long; tegulæ brownish ferruginous; wings strongly dusky, nervures piceous; legs black, the hair on outer side white, but hind tibiæ with a band of black hair running down in the midst of the white, and brush at end of hind basitarsi black; inner face of tibiæ with black hair; inner face of hind basitarsi with reddish-black hair; abdomen with pale fulvous hair at extreme base, and black hair at extreme apex; black patches also at the sides of the first four segments, and much white hair at sides, especially of fifth; otherwise the abdomen above is covered with splendid bright blue shining scale-like hairs, from the apical band of first segment to the apex of fourth, segments two to four with bands where the blue is thin across the middle.

♂. Similar but somewhat smaller; the sides of the face with large white triangular areas; the labrum nearly all white; scape with a white mark in front; third antennæ joint not as long as the next three together; hair of thorax more strongly fulvous; no black stripe on the white hair of outer side of hind tibiæ; base of second abdominal segment nude and therefore black; apex of abdomen bi-dentate, the teeth wide apart.

♀ (type) from Durban, Natal, 2nd April, 1918 (*C. N. Barker*).
 ♂ with same data, except that it is 16th March, 1918.

There are in Africa several species of *Anthophora* with more or less blue colour on the abdomen, namely :

- Anthophora cincta*, Fabricius. Congo, etc.
 „ *cærulea*, Friese. Central Africa.
 „ *vivida*, Smith. (with variety *guinea*, Strand). Congo.
 „ *analis*, Dours. Congo, etc.
 „ *aerizusa*, Vachal. Sierra Leone.
 „ *expleta*, Vachal. Belgian Congo.
 „ *vividula*, Strand (with variety *conradsi*, Strand).
 Central Africa.

Of these, I possess the first four, and all are quite distinct from *A. cælestina*. The remaining three, known to me only by descriptions, are also very distinct. From all of these, *A. cælestina* is especially known by the almost entirely blue abdomen, and the brilliance of the blue. Friese (*Deutsch. Ent. Zeitschr.*, 1915, p. 290) states that he has seen a female, *A. cærulea*, from Natal, collected at Durban, and belonging to the Cape Museum. Does *A. cærulea* occur at Durban, or did he possibly see a worn specimen of *cælestina*? As Friese gives a very wide distribution for *cærulea*, it is possible that it is composite; I will therefore designate Sierra Leone, the first locality cited, as the type locality.

The following key will assist in the separation of the species :

- Hair of thorax mixed green and black ; abdominal bands shining emerald green (Tero Forest, Uganda, July, 1912, *C. C. Gowdey*; compared with type by Meade-Waldo) . . . *cincta* (Fabr.).
 Hair of thorax mixed blue and black, posteriorly all black ; abdomen with blue bands, not shining, on hind margins of segments, but only a vestige on first (Bugoma and Budongo Forests, Uganda, *S. A. Neave*; compared with type by Meade-Waldo) . . . *vivida*, Smith.
 Similar to *vivida*, but hair of thorax mixed whitish and black, the effect gray ; abdomen with dull pale blue bands, and scattered blue scale-like hairs over the surface, first segment with a band ; tegulæ piceous (my specimens from the interior of Benguela) . . . *cærulea*, Friese.
 Large and dark, abdomen bluish or bluish-white when fresh, but easily denuded ; hind legs of female with black hair, except a white pencil at end of tibiæ (Cameroons, *A. Diehl*) . . . *analis*, Dours.

XII.—Some Crustacea of Natal,

by the

Rev. T. R. R. Stebbing, M.A., F.R.S., F.L.S., F.Z.S.

WITH PLATES XVIII-XX.

A COLLECTION of Crustacea made recently by Mr. H. W. Bell Marley on the coast of Natal, though consisting chiefly of species already known to occur there, is interesting for the careful notes which he proposes to publish on the colours of freshly taken specimens. These may prove very useful to other collectors for prompt identification of their captures, in place of the minute scrutiny often exacted by museum students when original hues have faded or completely changed. Apart from this, some examples of the *Caridea* seemed to call for fuller discussion, and in one instance even to claim specific distinction. At the same time attention is directed to the increasing difficulty in naming specimens within the family *Alpheidae*, partly from the variability of some features in the species themselves, partly from imperfect descriptions in the original institution of the species, but partly, on the other hand, one might venture to suggest, from over reliance on differences of measurement, such as among mankind would justify a bewildering specific diversity.

TRIBE CARIDEA.

FAMILY HIPPOLYTIDÆ.

For a valuable key to numerous genera of this family, see Kemp, Records of the Indian Museum, vol. x, pt. 2, no. 4, p. 82, 1914.

GENUS HIPPOLYSMATA, Stimpson.

1860. *Hippolysmata*, Stimpson, Pr. Ac. Sci. Philad., p. 95 (26).
1914. *H.*, Kemp, Rec. Ind. Mus., vol. x, pt. 2, pp. 83, 112.
1916. *H.*, Kemp, Rec. Ind. Mus., vol. xii, pt. 8, p. 401.

In the key, *Lyсмata* has "Upper antennulæ flagellum unequally biramous." *Hippolysmata* has it uniramous, that is, the shorter inner ramus is wholly, instead of only partially, coalesced with its companion. As Mr. Kemp observes, the distinction is so slight that any distinction of genera depending on it may have to be relinquished.

HIPPOLYSMATA MARLEYI, sp. nov. Plate XVIII.

This species makes an approach to *Lysmata chiltoni*, Kemp, 1914, by the dentation of the carapace and by having a second peraeopod in which the movable finger is decidedly longer than the fixed one, but in our specimen this only applies to one member of the pair. Here, as in *Nauticaris unirecedens*, Bate, which is identified with Stimpson's *Hippolysmata vittatus*, the hindmost tooth on the carapace is well separated from the tooth next before it. This latter is behind the orbit and in common with the three teeth which precede it carries a dorsal setule. Such a setule occurs on the level which produces the rostrum beyond the eye, in front of which it has two small ventral denticles. There is a carinate tooth over the base of the first antenna; the antero-lateral angle is rounded, without denticle. The triangular telson, about thrice as long as its breadth at the base, narrows gradually to a slightly obtuse apex with a small median spine, the distal half laterally fringed with plumose setae; of the two pairs of dorsal spines, the proximal is above the centre.

In the first antennae the thickened part of the outer flagellum is as long as the peduncle, the whole flagellum being more than twice the length of the carapace, with the inner flagellum not much shorter. The second antenna is considerably longer than the whole body, the scale narrowing distally, the small lateral tooth not extending beyond the slightly convex apex.

The mandibles show no sign of a palp and in other respects appear to agree with those which I have described and figured for *Exhippolysmata tugelæ* (Ann. S. Afr. Mus., vol. xv, p. 94, pl. 89, 1915), "the molar comprising a broad spinuliferous band and by its side a projecting dentate plate." The other mouth-organs are in near agreement with those of the species just mentioned, but not showing the small conical joint at the apex of the endopod in the first maxilliped and having a shorter exopod in the third.

The first peraeopods have the fifth joint or wrist shorter than the palm of the chela, the fingers of which close completely and are definitely more than half the palm's length. The slender second peraeopods have about twenty divisions to the wrist, the two preceding joints not annulate. In the third peraeopods the finger has two spines in advance of the apex, while in the fourth and fifth it is rather stouter and carries three spines.

In the first pleopods the short inner ramus is produced into a long retinaculum ending in eight minute hooks. The uropods are broad,

rather longer than the telson, the outer and longer ramus showing a faint diæresis.

The length of the carapace is 12 mm., of the pleon about 23 mm., including 5 mm. for the telson. Mr. Bell Marley reports the colour in life as "golden-brown on white with irregular lines and curves, antennæ red, legs brown and white."

Locality: Isezela.

GENUS ALOPE, White.

1847. *Alope*, White, Pr. Zool. Soc., p. 123.
 1903. *A.*, G. M. Thomson, Tr. Linn. Soc., vol. viii, p. 440.
 1904. *A.*, W. H. Baker, Tr. R. Soc. S. Australia, vol. xxviii, p. 154.
 1909. *A.*, McCulloch, Rec. Austral. Mus., vol. vii, p. 313.
 1914. *A.*, Kemp, Rec. Ind. Mus., vol. x, pp. 83, 89.

Kemp, whose valuable treatise supplies other references, incidentally remarks that "Filhol's *Hippolyte spinifrons*, as is shown by the figure, is undoubtedly synonymous with White's *Alope palpalis*; he refers to the supra-orbital spines as 'épines sus-orbitaires' following Milne-Edwards' mistake in terminology." It is true that in the description of *H. spinifrons* by Milne Edwards (Hist. Nat. Crust., vol. ii, p. 377) we find printed "épines suborbitaires." But undoubtedly it was the printer and not Milne Edwards who made the mistake, which Filhol corrects instead of following, since the prefix "sus" signifies *supra* not *sub*. Thomson also, it will be seen (loc. cit., p. 445) misconstrues Filhol. In the two species of the genus now accepted, *A. palpalis*, White, and *A. australis*, Baker, the latter author supposes the first maxillæ to differ in a marked but very improbable manner. He has evidently been led to this conclusion by the circumstance that according to Thomson's figure and description the first maxilla of *A. palpalis* is devoid of the customary inner plate. It is, I think, practically certain that the supposed loss is due to an accident in dissection.

ALOPE AUSTRALIS, Baker. Plate XIX.

1904. *Alope australis*, Baker, Tr. R. Soc. S. Australia, vol. xxviii, p. 154, pl. 30.
 1909. *A. a.*, McCulloch, Rec. Austral. Mus., vol. vii, p. 313, text-fig. 17.
 1914. *A. a.*, Kemp, Rec. Ind. Mus., vol. x, p. 91, pl. 1, figs. 3-5.

Baker's description of the carapace suffers somewhat from the loss of a line for which one already given is substituted. In Kemp's account, what is said of "the first pair of peræopods" must refer to the first pair of maxillipeds. Our specimen from Isezela, Natal, a female 30.5 mm. long, laden with eggs, does not essentially differ from Baker's account of the Australian form. The rostrum does not reach beyond the eyes and there are only four median teeth as in some of McCulloch's specimens, and in that which Haswell refers to *A. palpalis*. The telson has the dorsal spines and setæ as described by Baker, but the truncate apex carries four spines. The three joints of the palp of the mandibles are equal, all setose; no cutting plate could be perceived. As shown in the figure, the inner plate of the first maxilla appears reversed, and such a position of it in the other species may have caused Thomson to overlook it. Both of the second peræopods have the wrist composed of seven jointlets, with the two preceding joints showing only the faintest signs of subdivision into two parts each, as proved to be the case with Baker's specimen (see McCulloch, loc. cit.). Yet this is of no use for specific distinction, since Kemp finds that exactly the same character may occur in *A. palpalis*. The second antennæ agree well with Baker's account, as also the third maxillipeds.

Mr. Bell Marley records the colour in life as "red speckled on pale brown, legs banded red, antennæ white," and says that it was found "under large rocks near water's edge."

In another specimen from the same locality, colour "brown-red speckled on grey," a male, with carapace 13 mm. long and pleon twice that length measured round the curve to the apex of the telson, the rostrum reaches slightly beyond the eyes. The dorsal teeth are four. The endopod of the first maxilliped is apically simple, not bifid. The third maxillipeds are very unequal in length. The second peræopods show obscurely nine jointlets to the wrist, with the two preceding joints pretty clearly subdivided.

FAMILY ALPHEIDÆ.

See Ann. S. Afr. Mus., vol. xv, p. 79, 1915.

GENUS ALPHEUS, Fabricius, 1798.

When drawing up the description of *Alpheus notabilis*, sp. nov., for the above-mentioned Annals, p. 80, pls. 84, 85, I overlooked Dr. de Man's account of his *acutocarinatus* in Siboga Exp., Mon. 39a, p. 401,

1911, and had probably not seen his figures in the same work, pl. 21, fig. 94, 1913. The imperfection of the single specimen on which *A. notabilis* was founded leaves its separation from de Man's earlier species somewhat doubtful.

ALPHEUS GRACILIS, Heller. Plate XX.

1861. *Alpheus gracilis*, Heller, Sitz. K. Ak. Wiss. Wien, vol. xliv, p. 271, pl. 3, figs. 19, 20.

1811. *A. g.*, de Man, Siboga Exp., Mon. 39a, pp. 341, 342.

The female specimen here referred to *A. gracilis*, Heller, has the feature on which alone Coutière establishes var. *alluaudi* (Mald. and Lacc. Archip., vol. ii, pt. 4, p. 882 (1905), namely, that the finger in the third, fourth and fifth peræopods is simple, instead of having its apex bidentate. But as his only available specimens are said to be males without the first pair of peræopods, identification seems too indefinite. In var. *luciparensis*, de Man (Siboga Exp. Mon. 39a, pp. 337, 338; 1911; pl. 14, figs. 66, 66a; 1913) the accessory claw or tooth appears to be "somewhat smaller than the type," thus bridging the interval towards its disappearance.

The front of the carapace and the two pairs of antennæ are in good agreement with de Man's figures. In the first antennæ the thickened part of the flagellum has about half a dozen distal joints free. In the first peræopods the smaller chela on the right, though much narrower is not very considerably shorter than its companion on the left. The delicate second peræopods have the chela and the divisions of the wrist in agreement with the type species. This flexible apparatus is no doubt one of the many modifications of a "cleanser foot" found in different groups of Crustacea. The distal margin of the telson is convex, the median tooth described by Heller being due to an error of observation, as explained by de Man. Such an error was easy to make, since between the two pairs of spines at the angles there is a dense fringe of about twenty long plumose setæ. The length of the specimen obtained by Mr. Bell Marley at Isezela was about 30 mm., the ova small, the colouring "a deep white line down back, with chocolate-brown each side, claw lighter, tail a mixture of brown and yellow."

ALPHEUS LOTTINI, Guérin.

1837. *Alpheus lottini*, Guérin, Voy. de la Coquille, vol. ii, Crust., pl. 3, fig. 3, 1838, *A. lottinii*, p. 38.

1837. *A. lothinii*, Milne Edwards, Hist. Nat. Crust., vol. ii, p. 353.

Among the very numerous species of *Alpheus* discussed in the elaborate treatises of de Man and Coutière I have failed to find any notice of Guérin's species, although I should suppose that it properly takes precedence of *A. ventrosus*, M. Edwards, by the acknowledgment which Milne Edwards himself awards to the excellence of Guérin's figure.

The specimen which I name above is a very small one, with carapace 8 mm. long and pleon 13 mm. It is a female laden with eggs, unfortunately without the smaller chela of the first pair, but with the large chela on the left and the second peræopods agreeing well with Guérin's figure. The peduncle of the second antenna just reaches the extremity of the scale. The finger, however, in the last three peræopods is apically duplex, a feature not shown in Guérin's figure, that author writing of these limbs that they are without spines, perhaps from an oversight due to insufficient magnification. The specimen was taken by Mr. Bell Marley at Vetch's pier. He describes the colouring as "pale olive yellow, claw white, nippers black."

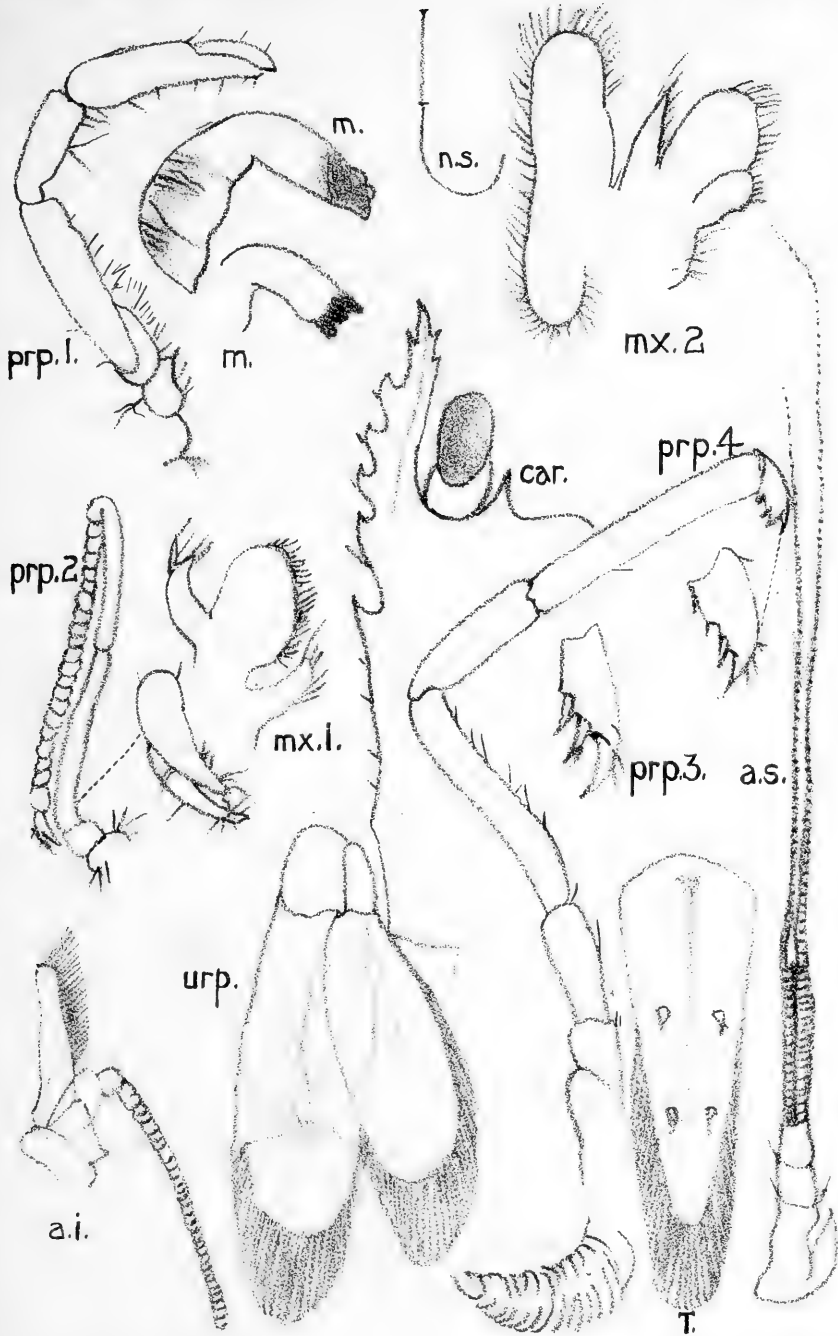
EXPLANATION OF PLATES XVIII-XX,

Illustrating paper by the Rev. T. R. R. Stebbing on
"Crustacea of Natal."

PLATE XVIII.

Hippolysmata marleyi, sp. nov.

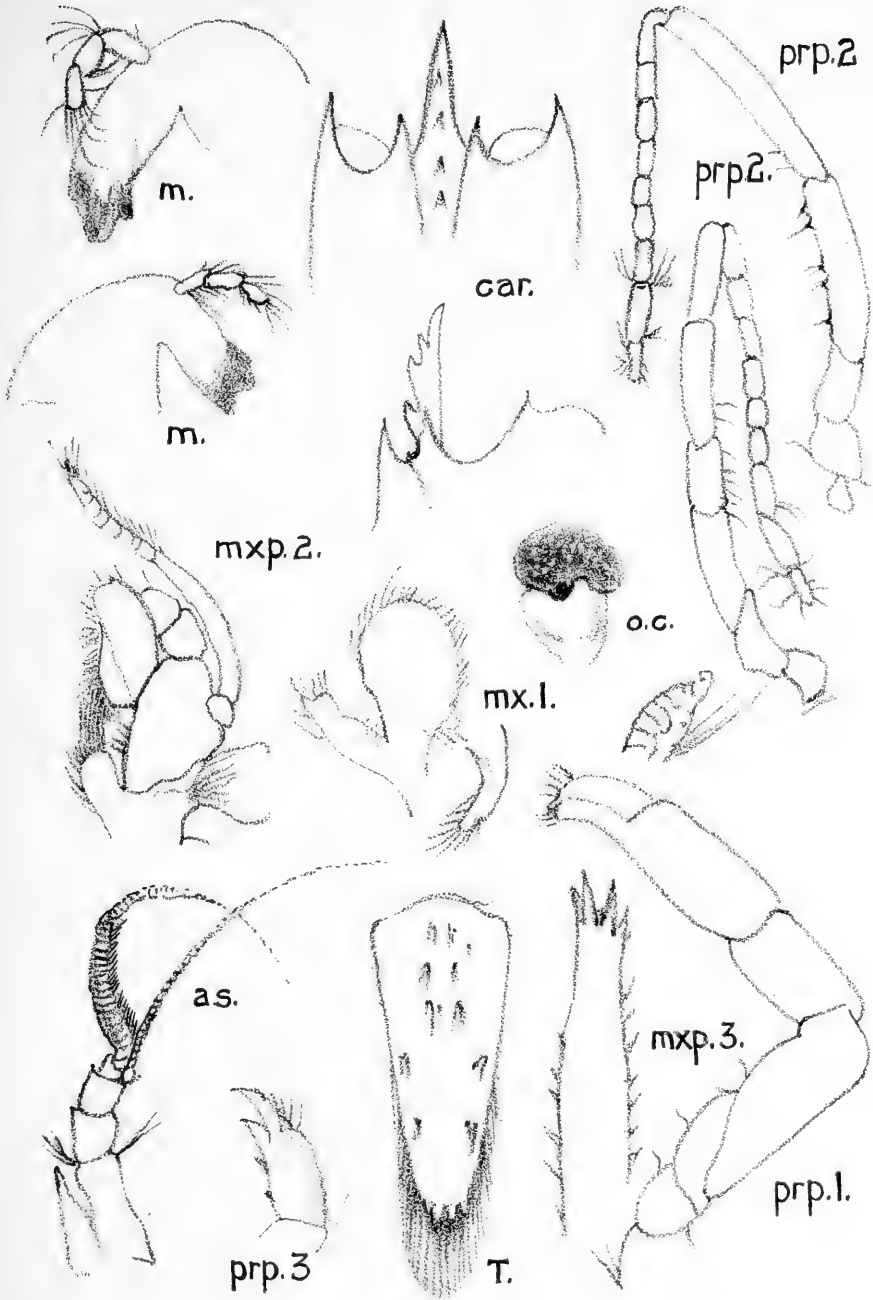
- n.s. Line indicating natural size of the specimen of which the details are here figured.
- car. Carapace partly figured in profile, with the eye.
- T. Telson in dorsal aspect.
- a.s., a.i. First antenna and part of second.
- m., m., mx. 1., mx. 2. The mandibles, one in part; the first and second maxillæ.
- prp. 1, 2, 3, 4. First and second peræopods, with chela of second further enlarged; finger of third much magnified; fourth with finger further magnified in agreement with that of the third.
- urp. Uropod, uniform in scale with the telson,



T. R. R. Stebbing del.

John Singleton & Sons lith.

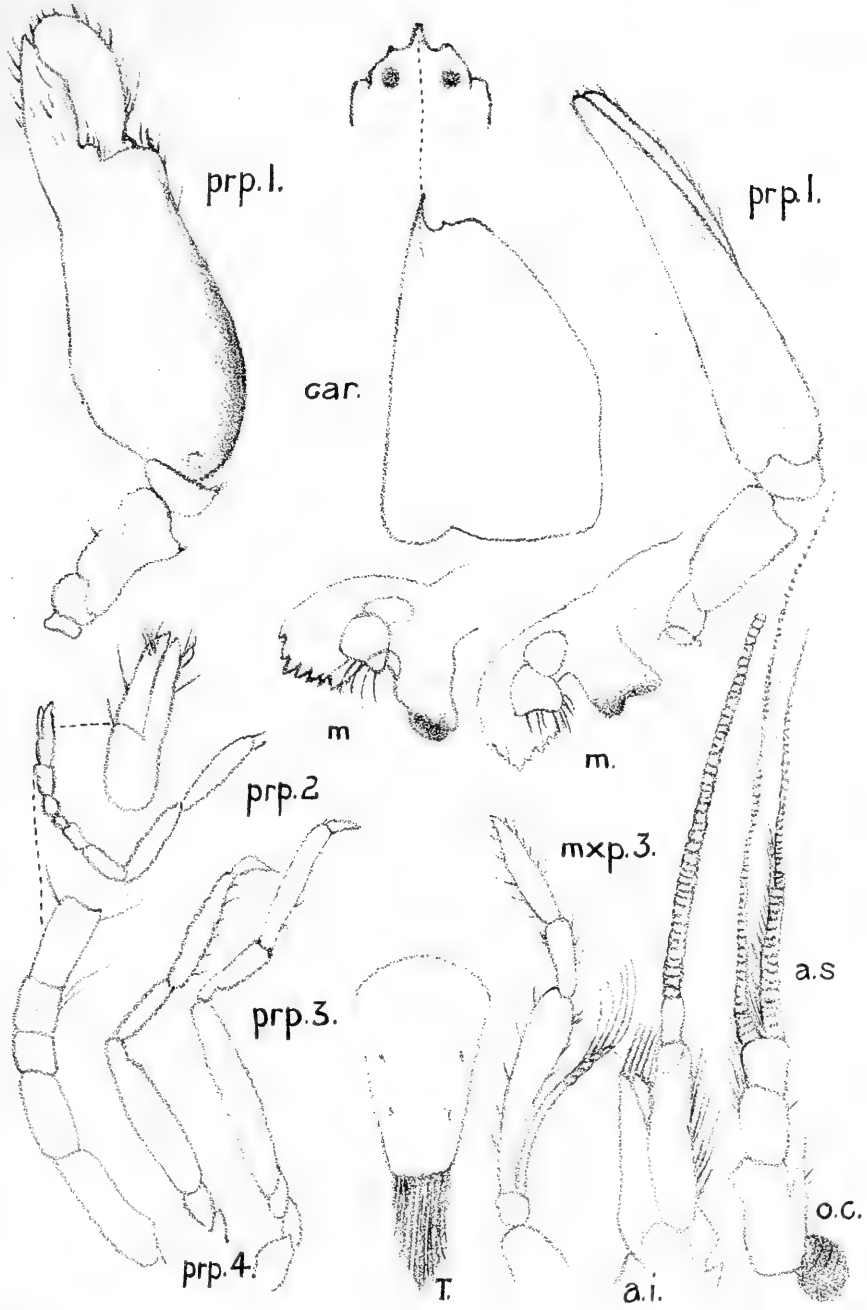
HIPPOLYSMATA MARLEYI, sp. nov.



T. R. R. Stebbing del.

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ALOPE AUSTRALIS, Baker.



T. R. R. Stebbing del.

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ALPHEUS GRACILIS, Heller.

PLATE XIX.

Alope australis, Baker.

- car. Front of carapace in dorsal aspect, and nearly in profile.
T. Telson in dorsal view.
oc. Eye.
a.s. First antenna.
m., m., mx. 1, mxp. 2, mxp. 3. Mandibles, first maxilla, second maxilliped,
and apical portion of the third.
prp. 1, 2, 2, 3. First peræopod, second pair, dactyl of third (on higher scale).

PLATE XX.

Alpheus gracilis, Heller.

- car. Carapace in lateral view, and front in dorsal aspect.
T. Dorsal aspect of telson.
oc., a.s., a.i. Eye, first and second antennæ, the flagella incomplete.
m., m., mxp. 3. Mandibles, and (on lower scale) the third maxilliped.
prp. 1, 1, 2, 3, 4. First pair of peræopods; one of second, with further
magnification of the wrist and chela; and the third and
fourth peræopods.

XIII.—A South African Elephant from the Addo Bush,

by

E. C. Chubb, Curator, Durban Museum.

WITH PLATES XXI and XXII.

IN 1917, the Durban Museum received by exchange with the Port Elizabeth Museum the skin of a male elephant which had been killed a short time previously at the Addo Bush. The mounting of it was completed a few months ago, and it is now on exhibition in the Mammal Room.

Elephants have been preserved for some years past at Knysna and Addo Bush in Cape Colony, while South of the Zambesi River they still exist in a wild state in parts of Southern Rhodesia and Portuguese East Africa, and possibly also in Ovamboland, South West Africa. A solitary male existed in Zululand until February, 1916, when it was shot by a Native. Its skeleton is now to be seen in the Museum at Pietermaritzburg.

Considerable interest has been aroused of late in the elephants at the Addo Bush on account of their threatened destruction. Through scarcity of water in the Reserve, the elephants are prone to break out and make their way to the dams on farms in the vicinity, causing damage to property and danger to life. The farmers consequently petitioned the Cape Provincial Council for their extermination, or alternatively, to devise some means of rendering them harmless. A select committee was accordingly appointed, which in due course presented its report to the Provincial Council. It is satisfactory to note that Government is fully alive to the fact that the extermination of these elephants, which constitute but a small survival of the great numbers which less than a century ago roamed over a large part of South Africa, would be viewed as nothing short of a great calamity by zoologists throughout the world. Paragraph 5 of the report reads as follows :—"Your Committee is extremely averse to recommending extermination. The South African elephant now apparently restricted to a small remnant in the Knysna forests, and to those in the Addo Bush, while not specifically distinct from the Central Africa elephant, does constitute a distinct variety, the extinction of which would be a loss to the world. The deliberate extermination of these elephants would upon grounds of deeply felt general sentiment,

and in the interests of science be received by not only very high and influential circles in South Africa but by the general feeling of the civilised world with condemnation as a step reflecting no credit upon South Africa." The recommendations of the Committee are summed up in the following words in paragraph 11 :—" If, as your Committee believes, the preservation of the animals is a national matter, the Union Government should be invited to undertake the task. If it should not see its way to do so, your Committee can only express its conviction, which it does with the most extreme regret, that there is no alternative but extermination." As far as the writer is aware, no decision has been arrived at yet.

In a paper published in the "Proceedings of the Zoological Society of London" for 1907, p. 380, Mr. R. Lydekker endeavours to show that the African elephant, *Elephas africanus*, Blum, may be divided into a number of local races, relying mainly upon the form and size of the ear as a character for their differentiation. He recognises no less than twelve sub-species, three of which are allocated to South Africa viz. : *Elephas a. capensis*, Cuv. of Eastern Cape Colony, *E. a. toxotis*, Lyd. of Western Cape Colony, including the Knysna Forest, and *E. a. selousi*, Lyd. of Mashonaland. One or two further sub-species have been described since.

In the course of the paper referred to, Mr. Lydekker remarks upon the scarcity in museums of complete stuffed specimens or even mounted heads. No excuse, therefore, is needed for the publication of illustrations and particulars regarding the recently acquired Durban Museum elephant, and I shall take the opportunity of showing to what extent it agrees with Mr. Lydekker's contentions.

The Addo Bush elephants are referred by Mr. Lydekker to the Eastern Cape race, *E. a. capensis*, Cuv. (the type locality of which was the Upper Orange River district), on the evidence of photographs of the heads of specimens in the Grahamstown Museum. This race is said to be characterised by the large size of the ears, their somewhat square shape, with rounded corners and a small, distinct, sharply pointed angular lappet in front ; also the fact that the forehead falls away towards the temples, so as to appear highly arched. Proportionately short fore-legs, the horizontal position of the ventral line of the body, and the presence of a dense coat of hair on many parts of the body, are also said to be characteristic of elephants from the Addo Bush.

No dimensions were furnished of the ears of the two elephants from the Addo Bush referred to by Mr. Lydekker, but a photograph of one of them appears on page 383, and he quotes the measurements given by

Livingstone of the ear of a female standing 8 feet 8 inches, which are 4 feet 5 inches in vertical depth and 4 feet in horizontal depth, and says that "while indicating the large size of the ears characteristic of South African elephants generally, these dimensions are suggestive of the Addo Bush type.

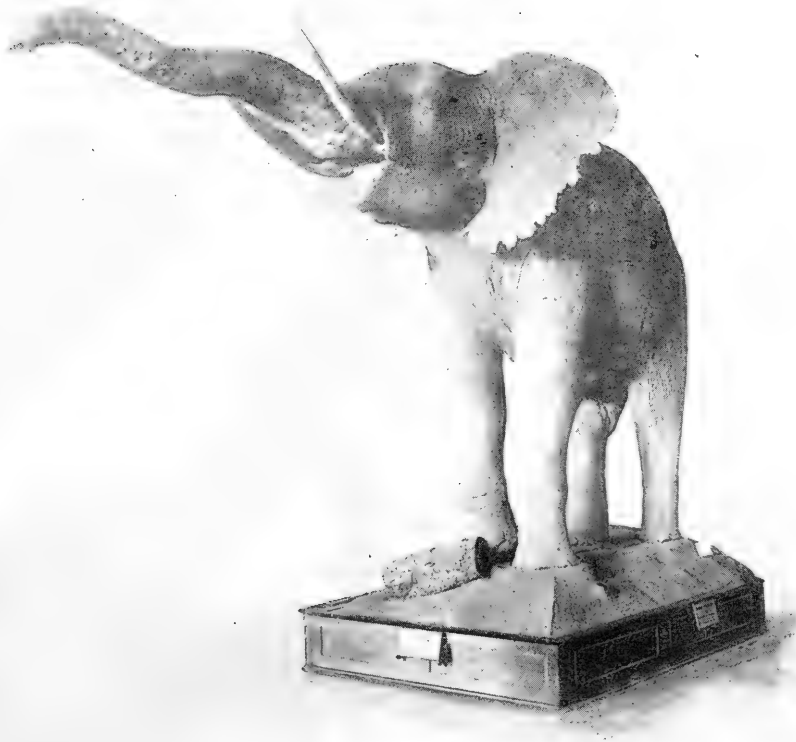
The Durban Museum specimen although an immature male is said by Mr. F. W. FitzSimons, the Director of the Port Elizabeth Museum, to have been the leader of a herd, and to be the finest elephant obtainable there.

The exposed portions of the tusks measure 3 feet 2 inches in length, and the greatest circumference is $11\frac{1}{4}$ inches. The measurements taken immediately after death are as follows: height at shoulders 9 feet 9 inches, girth 14 feet, length from between the eyes to root of tail 9 feet 5 inches, girth of hind-leg at thinnest part 34 inches, girth of fore-leg at thinnest part 40 inches.

As will be seen from the photographs on plates xxi and xxii, the ear is by no means square. It measures 3 feet 10 inches in depth as mounted, but there is a flap at the top of 7 inches, hanging down behind, making it 4 feet 5 inches in total vertical depth: the width is 2 feet 7 inches. It will be noted that although the vertical depth agrees exactly with Livingstone's measurement, the width, or horizontal depth as he calls it, is considerably less.

The ventral line of the body is very far from horizontal. The whole skin is scantily covered with short hair, which is thicker under the chin and around the entrance to the ear, where it is also longer.

One cannot resist being forced to the conclusion that this splitting of the African elephant into so many local races has been done upon insufficient material. Not only so, but the character chiefly used is to a great extent unreliable in stuffed specimens, for anyone intimately acquainted with the art of taxidermy will understand that, when properly relaxed and thinned down, the skin of a large animal, in the hands of a taxidermist is like clay in the hands of a potter. And the ears of a elephant can be stretched enormously or, on the other hand, allowed to shrink to very much less than their original size, while their ultimate form is not necessarily the natural shape, but what the taxidermist conceives it to be.



MALE ELEPHANT FROM ADDO BUSH.



EAR OF ADDO BUSH ELEPHANT.

Front view.

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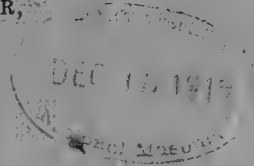
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OF THE
DURBAN MUSEUM

EDITED BY THE CURATOR,

E. C. CHUBB.



Issued 20th October, 1919.

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**XIV.—Further Contributions to the Anatomy of the
Sperm Whale (PHYSETER MACROCEPHALUS) based upon an
examination of two additional Fœtus,**

by

Frank E. Beddard, M.A., D.Sc., F.R.S.

WITH PLATE XXIII.

THE present communication is a continuation of an earlier Memoir* published in this Journal in 1915. Since then, Mr. Chubb has been so very kind as to entrust to me two fœtus†, both of which are much smaller than that which I originally described. This has given me the opportunity of adding some further facts to the known natural history of this Cetacean, and I have also taken the chance thus offered of making a more comparative study of the growth of this whale than was possible in my earlier paper, when only one, and that a very much larger fœtus, was known to zoologists—in addition of course to that which I myself described. In that earlier paper, however, I did not refer to a short account by Prof. Kükenthal of a comparatively young fœtus, but only to that dealt with‡ by Messrs. Pouchet & Beauregard. Kükenthal's paper§ had not reached my hands until my own notes upon the fœtal Cachalot had been despatched to Durban.

The fœtus dealt with by Kükenthal was only studied by him with reference to its external characters, and it is represented in his memoir by a considerably reduced, but still large, figure, in which most of the details are indicated; other figures are included on one of his plates which will be duly referred to in the proper place. The specimen in question was 740 mm. in total length, i.e. about thirty inches; it is thus considerably smaller than the fœtus originally treated of by myself in this Journal¶, which has a total length of only twenty inches,

* Ann. Durban Mus., Vol. I, pt. 2, 15th May, 1915, p. 107.

† Of them the smaller was presented to the Durban Museum by the Premier Whaling Co. and the other by the Union Whaling Co.

‡ Nouv. Arch. Mus. (3), IV, p. 24. The authors of this paper, however, speak of a much smaller fœtus (30 cm.) of which they give no figures or description—save only of the developing teeth (ib. [3] I, p. 84).

§ Jen. Zeitschr., LI, 1914, p. 84. This paper deals with a number of fœtal whales including one example of a Cachalot.

¶ loc. cit.

according both to my own measurements and to those of Mr. Chubb (in litt.). This being the case it is remarkable perhaps to note in Prof. Kükenthal's figure a more strongly marked likeness to the usual dolphin form as evidenced not only by the proportions of head to trunk but by the form of the head. This likeness is duly noted by the author. One would imagine that likenesses to the more generalised Cetacean shape and proportions would be more apparent in the younger and die away in the older fœtus. This resemblance is, however, as I believe, deceptive, and merely due to the state of preservation of the actual specimen. It will be noted that it lies mainly in the form of the head; there is in Prof. Kükenthal's embryo more of a snout as contrasting with the rest of the head than in both of the smaller fœtus described in the present paper, and in the earlier one examined by myself. The line of the head at first rises abruptly as in the three younger fœtus but then forms a sloping forehead gradually rising to its greatest altitude. In the two largest fœtus in my possession, and even in the youngest to some extent, there is not so marked a slope. The outline is more that of the adult Cachalot. I imagine, however, from my examination of my own fœtus that this is simply due to the collapse, by contraction, of the oil containing upper half of the head, more distinct in the older than in the younger specimens.

THE HEAD.

Of the two fœtus which I describe in the present communication figures are given on Plate XXIII which may be compared with that of the older fœtus formerly described by me* and with that of Kükenthal just referred to.† Several differences in general outline are at once apparent on a comparison of these several figures. The younger fœtus have the head either slightly bent downwards or very markedly so in the youngest of the series. The characteristic form of the adult Cetacean, already arrived at in the fœtus measuring 20 inches, and naturally also in the larger one studied by Prof. Kükenthal, is not quite established in the two younger specimens, and least of all in the youngest, where the long axis of the head is at right angles, or nearly so, to the long axis of the trunk. It is important to notice, however, how very early this coincidence of the long axis of the head and trunk is established in this Cetacean. In whales generally the

* This Journal, t.c., Pl. VIII, fig. 1.

† loc. cit., Taf. III.

likeness to the adult in this particular is soon formed in the course of development. But there are differences in different genera of which I shall not attempt an exhaustive analysis. I may point out, however, that in the Dolphin *Lagenorhynchus acutus*, Guldberg & Nansen figure* fœtus of 110 mm. and 170 mm., in which, respectively, the head was either bent or in the same straight line with the body. Thus in comparing the sizes of this dolphin and *Physeter macrocephalus*, it becomes clear that the adult form is attained at a considerably earlier age in the Sperm Whale. *Balænoptera borealis* is another example which agrees with the Dolphin referred to, and not with the Sperm Whale. For a fœtus of this whale, which reaches in the adult condition a length of 50 feet or exceptionally† even rather more, the fœtus has the head bent down at a length of 15 inches. It does not therefore acquire the adult condition in this respect until a later date than is seen to be the case in *Physeter macrocephalus*. On the other hand, the remarkable series of *Megaptera* embryos described by Kükenthal seem to show that this Cetacean rather resembles *Physeter* than its nearer allies. So, at any rate, I judge from the figures and measurements of two fœtus at, or near, the critical age which demonstrate the change under discussion. For in an embryo‡ of about $3\frac{1}{2}$ inches in length the head was set at quite a right angle to the long axis of the body, while in one of about twice that length the head was very nearly in the same straight line with the body. More detailed comparisons are unnecessary to accentuate this general similarity between the two remotely allied genera in the particular under discussion, which is therefore clearly of but little systematic importance.

A second important feature in which the two new fœtus may be compared with the older fœtus concerns the proportion of the head to the trunk. The actual measurements which I made of the two fœtus are as follows:

Smaller fœtus, total length 114 mm. (= $4\frac{1}{2}$ inches about); head 32 mm.

Larger fœtus, total length 241 mm.; length of head 65 mm.

* On the Development and Structure of the Whale. Pt. 1. On the Development of the Dolphin, Bergen's Mus., 1894, Taf. III, figs. 1 and 2.

† Monographs of the Pacific Cetacea. II, The Sei Whale (*Balænoptera borealis*, Lesson). 1, History, Habits, etc., by R. C. Andrews, and 2, Anatomy of a Fœtus of *Balænoptera borealis* by H. von W. Schulte.

‡ Loc. cit., Taf. 2, fig. 20, showing a young embryo with head bent on body and fig. 21, an older embryo in which the head has nearly—if not quite—straightened out.

Thus in both cases the head is rather less than one-quarter of the total length of the body, a proportion which is also that of the older fœtus which I examined, and furthermore of that examined by Kükenthal.

I should mention that the measurements given above of the younger fœtus are taken along the long axis of both head and body. The length if taken from snout to tail, without regarding the flexure of the head upon the trunk, is only 97 mm., which agrees with the measurements taken by Mr. Chubb, i.e. 4 inches. These proportions, as I have already pointed out in my earlier paper, are different from those of the adult Cachalot, where the head is about one-third of the total length of the animal. It is noteworthy, however, that although in these younger fœtus the head is not smaller than in the older fœtus, their general aspect is distinctly less like that of the adult Sperm Whale than is the fœtus of 20 inches. This appears to me to be due to the fact that the top of the head is more sloping in the younger fœtus and that the body is rather deeper in proportion to its length than in the older fœtus.

I shall now proceed to describe in greater detail the several features which characterise the two fœtus which form the subject of the present communication. The younger of the two (Pl. XXIII, fig. 1) is seen from the right side and the general appearance can be gathered from the figure referred to. The head is bent down at an angle approaching a right angle. The length of the head is 32 mm. or about $1\frac{1}{4}$ inches. The great flexure of the head is shown by the fact that a line between the snout and the base of the flipper is only 22 mm. The side view of the head shows three features particularly worthy of comment. In the first place, the head rises abruptly in a straight line at right angles with the long axis of the head as in the other fœtus and in the adult at times.* Secondly, attention may be drawn to the relatively large size of the eye, a feature which has been noted in other fœtus of Whales, which seems to argue their descent from the more usual type of terrestrial mammal. Thirdly, the blow-hole and adjacent area is extremely obvious.

EYE.

With reference to the eye, its large size is seen to be due to the fact that the actual eye itself is more conspicuous than in the older fœtus.

* I have already commented upon the form of the head in the fœtus and adult in my earlier paper and need not again enter into the matter.

The pigment is to some extent visible through the not yet pigmented skin. And the size of the bulb is striking. In the other fœtus no such view of the eye is to be obtained and only the slit between the lids is visible. The length of this slit is, in the small fœtus under discussion, 2.5 mm. This length, although appearing to be minute, is really not so when we compare its proportions with that of the adult Cachalot. Hentschel* gives 9 cm. as this length and sees no reasons for distinguishing as to size between the right and left eye opening. The proportions are therefore in the large adult which Hentschel examined, 9 cm. to 1,740 cm., total length of the animal, i.e. very nearly one-two hundredth. In the fœtus before me, the proportions are (after "straightening" the head) 2.5 to 114 mm., i.e. about one-forty-fifth. The difference is enormous, the fœtus possessing what may be fairly termed a very large eye as compared with the adult. In the rather larger fœtus, the eye slit remains at about the same proportionate size. Its length is 241 mm., and the length of the eye slit 5 mm., i.e. one-forty-eighth. I may take this opportunity of mentioning that in the largest fœtus of all those which are known to me through my own examination, the one recently described by me in this Journal, the eye has distinctly commenced to be proportionately reduced in size. In that fœtal whale the total length is 500 mm. and the eye slit only 7 mm., which is therefore but one-seventy-first of the total length of the animal. I may also take this opportunity of referring to the alleged asymmetry in the eyes of this Cetacean, which Hentschel denies in the adult, but which has been affirmed. In the largest fœtus, where the considerable length of the eye slit renders measurements easier, and thus more reliable for minute comparison, I found that both right and left eye slits were exactly 7 mm. in length.

It may be perhaps permissible to refer to another difference between the two eyes of this the oldest fœtus, which may have a bearing upon the questions just dealt with. On the left side only, the eye slit was continued anteriorly by a much shallower groove upon the skin. Whether this can be looked upon as a trace of a formerly larger eye or not there is no other evidence to prove or disprove. There is no doubt, however, about the fact thus briefly described. It should be noted, however, that furrows in the skin of an alcohol preserved animal with a smooth skin like this fœtus, as might be expected, occur elsewhere and are thus not impossibilities in a given situation quite apart from any meaning to be attached to their occurrence.

* Zool. Anz. Bd. XXXVI, 1910, p. 417.

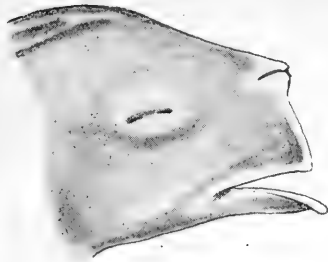
BLOWHOLE.

The obvious character of the blowhole of the smallest fœtus, as shown in Pl. XXIII, fig. 1, is by no means shared by the two older specimens. In the former, the tissues surrounding the orifice project considerably from the level of the general body surface, just at the angle which the straight "forehead" makes with the upper surface of the head. This is quite well shown on Plate XXIII, and almost suggests the snout of a dog or other terrestrial animal. The accompanying text-figures (figs. 1-4) represent this region of the head in more magnified views. When examined thus more closely, there is a distinct nasal projection to be seen raised above the general surface. The bulk of this is seen (text-figs. 3, 4) to lie on the right side. When viewed from the upper surface this projection is seen also to be more conspicuous on the right side of the head. It is here to be noted that it projects further forward. In neither of the two remaining fœtus have I been able to observe any corresponding elevation of the skin. It is a point, perhaps, which requires settlement by observations upon the fresh fœtus before preservation. In my earlier paper I have described and figured the apparent rudiment of a right blowhole forming a more or less continuous furrow with the more obvious and only permanent blowhole of the adult. This state of affairs is also to be seen in the young fœtus now under description. The outline of the furrow is also much the same. The deep left blowhole shallows suddenly but is still, though very faintly,* directed forward gradually altering its direction until it passes in a more backward direction, where it again becomes deeper, the entire groove having thus much the shape that it has in the fœtus already described by me. Figs. 1, 2, show the two sides of the head; the nostril on the right is distinctly shorter and straighter than the crescentic left nostril. It will be noted that the concavity of the entire blowhole furrow is directed as in the Rorquals, and not forwards as in the *Delphinidæ* and *Mesoplodon*. It is important to note that the convexity is also directed anteriorly in the ally of *Physeter*, *Cogia* (*Euphysetes*). In the latter whale the blowhole has lately been figured by Prof. Benham†;

* So faintly indeed that the median region may be regarded as partly defective.

† Proc. Zool. Soc., 1901, p. 109, pl. VIII, figs. 1, 2, v. Haast, in the same species, according to some—though others agree with this author in his description of it as new (Proc. Zool. Soc., 1874, p. 260) under the name of *Euphysetes pottsii*, states that the single blowhole measures two inches, of which half inch is on the right side and the much larger half on the left side of the median line of the head. There is thus, as it would appear, a closer likeness to the embryo *Physeter*.

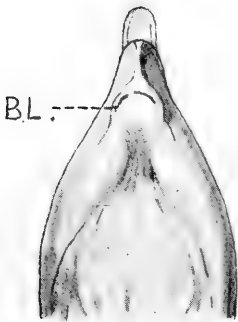
TEXT-FIGS. 1-4.



1.



2.



3.



4.

YOUNGER FŒTUS.

1. Right side of head. The right half of the blowhole is to be noted and the prominent area upon which this is placed.
2. Left side of head. The left region of the blowhole is seen to stop short just before the median line of the snout. It is really continued into the right half by a very shallow funnel in the median area of the snout.
3. Head viewed from the dorsal aspect showing the sharp narrowing into the snout and the projection of the lower jaw beyond the upper. The two halves of the blowhole are seen upon the nasal prominence; they are separated by a short and very shallow furrow. The curved left half as compared with the straighter right half of the blowhole is also to be noted.
4. Front view of head. BL. = blowhole (in this figure and in 3).

and in his figure it is to be seen that, although the blowhole lies upon the left side of the head and is thus asymmetrical, as in the adult *Physeter*, the line of the furrow just crosses over the median line of the head, and, furthermore, there is a division in the actual orifice between a larger left and a minute right aperture. Both these, however, occur in the same continuous furrow and there is no hint of two completely separated blowholes. It must be remembered, however, that in other toothed whales the single orifice, although originally double, are very early fused into a single opening. It is, therefore, perhaps not to be expected that an actual separation of the two halves of the blowhole could be found in so comparatively old a fœtus as even the youngest of those which I have examined. But although there is no separation, it seemed to me that the furrow representing the future blowhole, admittedly deeper on the left side than in the median region of the "nose," where it was continuous over to the right side, again became deeper on the right side. This matter, however, must be left until the blowhole in all three fœtus have been compared.

In the intermediate fœtus, measuring ten inches or so in length, the blowhole is extremely conspicuous and easy to study. It appears indeed to have been partly everted since the dorsal and ventral lips are quite wide apart. The general direction of the cleft is almost at right angles to the longitudinal axis of the head and is much at the same angle as in the youngest fœtus. On the other hand, in the fœtus of 20 inches, as I have already described, the left blowhole has moved so as to be much more parallel to the long axis of the head. The change of position is very marked; and in the oldest fœtus it has nearly, if not quite, gained the relations which it shows in the adult. The form of this slit-like orifice in both these fœtus has certainly acquired the characteristic *f* shape of the adult *Physeter macrocephalus*. The proportionate length is more nearly acquired in the fœtus of 20 inches than in that of 10 inches. In the adult *Physeter*, according to measurements of Hentschel*, the blowhole is 50 cm., while the length of the whale itself is 1,740 cm., the proportions being thus 1:35. In the older fœtus at my disposal the blowhole measured 15 mm. in a straight line not allowing for the curves, giving therefore a proportion of 1:33, while in the smaller fœtus of ten inches the length of the blowhole was 11 mm., giving the proportions of only 1:22. In my already quoted paper upon the older fœtus I have given the length of the left blowhole as 17 mm. but this allowed (I presume) for the curvature of the same. So much then for

* Zool. Anz. t. cit.

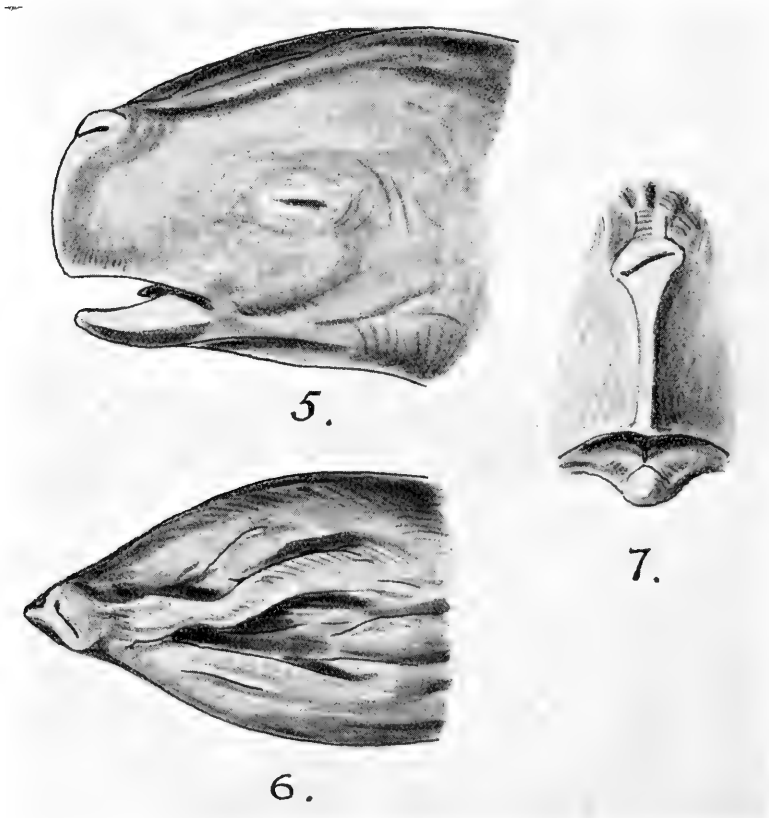
the shape, size, and proportions of the left complete blowhole in the two older fœtus. We now come to the evidence of the original double character of both. While the small fœtus shows clear evidence of a double (right as well as left) blowhole, there is very slight evidence of this in the middle sized fœtus. The single blowhole in fact reaches but a short way on to the right side. It is to be noted, therefore, that the peculiar / shape of the left blowhole in the older fœtus and in the adult indicate, by the anterior curve of the slit, the former presence of a second blowhole; it is precisely this lower region of the blowhole which appears to be really a vestige of the otherwise missing right slit. There is, however, in the fœtus of ten inches nothing further to be observed in the way of a prolongation on to the right side. On again scrutinizing carefully the blowhole in the largest fœtus, which I have figured on p. 113 of the memoir already quoted, I can find no fault with the drawing which was made under my supervision. But on showing the actual fœtus to a colleague, it was suggested that the alleged right blowhole of that figure was merely a crack in the skin such as undoubtedly occur in this fœtus and to which reference has already been made in the case of the eye. This may be the case with this other organ too; but the matter is difficult to decide. In favour of this suggestion is the certain absence of a conspicuous right blowhole in the intermediate sized fœtus. Against it, the undoubted presence of a similar furrow in the youngest embryo whose skin was nowhere furrowed accidentally. Indeed, I think that no one will hesitate to allow that in this youngest fœtus there is plain evidence of two separate or nearly separate nostrils which are inequized, the right being actually the longer, and which are only slightly connected in front by a very shallow furrow. However the matter is to be looked at, there are evidently missing stages in the development of the nostrils culminating in the / shaped organ of the adult animal. There are, as I think, two possible views which are now to be considered. As already mentioned, the, as it would appear, decidedly single blowhole of the individual of ten inches in length has the form of that of the adult whale. When it is closely examined and the two lips of the slit divaricated, a kind of septum or projecting pad is seen to divide it into two fairly equal parts. I take this projection to be the septum described and figured by Prof. Benham in the Pygmy Sperm Whale *Euphysetes*.* The same structure is also figured by Dr. Murie†

* Proc. Zool. Soc., 1901, Pl. VIII, figs. 1, 2.

† On the Organisation of the Caaing Whale, *Globicephalus melas*, Trans. Zool. Soc. VII, Pl. XXXII, fig. 27, *Sp.*

in the Caaing Whale. If this identification is correct there would appear to be no vestige in this fœtus of a separate right nostril. There is here but one orifice, which is, without question, on the left side. It is a further conclusion that in an older fœtus still (that of 20 inches) there is still less reason for the persistence of a right

TEXT-FIGS. 5-7.



OLDER FŒTUS.

5. Left side of head. The conspicuousness of the eye is somewhat exaggerated.
6. Head viewed from above. The folds of the partly collapsed upper surface are to be noted.
7. Front view of anterior region of head showing the blowhole. The latter appears to be in the middle, but the whole region is slightly pressed over to the right.

blowhole, so that the alleged rudiment of the right orifice in that fœtus is without such significance and a mere skin furrow of no meaning. On this view there is but one external orifice, divided from the very first by a septum. I believe, however, that this is incorrect. The right blowhole of the youngest fœtus cannot be ignored. In this fœtus the right blowhole is already smaller on the right side of the head (figs. 1, 2) than that of the left side on the left, and it is also in the form of a straight line, while the left blowhole is crescentic, the concavity being downwards. Obliterate still further the right hand section of the entire area of the formation of the blowholes, leaving the median portion attached to the anterior extremity of the left blowhole, which would naturally curve to the right and later on upwards, and the \int shaped left blowhole of the adult is acquired. The median septum would then represent the shallow furrow of the youngest fœtus connecting the two nostrils. But, as already mentioned, I have no stages to show that this course has been taken. We might therefore regard the apparent right blowhole of the oldest fœtus as an exceptional remainder; and it will be noted that it is straight in direction in contrast with the curved left blowhole. This is what we find also in the youngest fœtus.

LOWER JAW AND SOME OTHER FEATURES OF THE HEAD.

Another feature characteristic of the smallest fœtus, which is, however, very transitory, is evident in fig. 1 of Plate XXIII. This is the extension of the lower jaw beyond the upper, and the fact that it is rather bent down at the free extremity. There is no trace of such extension in the next oldest fœtus, the lower jaw of which is roughly equal in length to the upper jaw. It might appear possible to make some comparison of this fact with the conditions obtaining in the adult *Berardius*, and others of the Ziphiid whales, where the prominent lower jaw is figured, for instance, by True*, especially when the projecting lower jaw of *Megaptera*† is seen to be plainly indicated in the young fœtus. I may also remark that in this fœtus and the older ones the line of the mouth is faintly prolonged by a shallow furrow on the skin some way beyond, and of course below, the

* An Account of the Beaked Whales of the Family *Ziphiidæ*, etc., Smiths. Inst. U.S. Nat. Mus., Bull., 73, Pl. 42, fig. 3; and of *Ziphius*, Pl. 41, fig. 4.

† Brit. Mus. (Nat. Hist.), British Antarctic Exped., 1910, Nat. Hist. Rep. Zoology, Vol. I, no. 3. Cetacea by D. G. Lillie, Pl. I and Pl. IV, fig. 4. This character, however, is hardly or not at all shown in the figures of Kükenthal (loc. cit.).

eye. This character has been noted by Schulte in the embryo of a porqual, who points out its "remote and specious resemblance to that of the sauropsid embryo." It is at any rate not without interest to find that this character is to be found in two whales so far apart, as are *Physeter* and *Balænoptera*, in the scheme of the Cetacea. The Plate shows this continuing line in the two youngest embryos, but it is not so pronounced as the figures given by Schulte*. Hentschel† has given an elaborate mapping of no less than seven throat grooves in the adult Cachalot. Of these, two are especially pronounced, and have been described as the only ones by other observers. I have already mentioned that I can find no such throat furrows in the older fœtus reported upon by myself in this Journal. I have carefully inspected the two new fœtus dealt with in the present communication and can find in them no trace of any such grooves. It seems clear, therefore, that this character is one of late appearance.

A final point with reference to the head is the general shape of the same when seen from above. I have described and figured that of the oldest of the three fœtus in my former memoir in this Journal. I have now to point out that the ten-inch fœtus of the present communication shows no differences from the older one. In the smallest fœtus, however, the head, when seen from above, as is represented in the accompanying illustration (fig. 3), is rather different. I have already dealt with the nasal prominence to be seen on that aspect and to the line of the nasal furrows. There is, furthermore, a great contrast between the head generally and the fore-part of the same. It suddenly narrows a little way in front of the nasal prominence to form what looks like a beak in this aspect. The contours, when seen from above, are much like those of a sharp beaked dolphin, and the diameter of the beak is only some 4 mm., as contrasted with 10 mm. or so at the middle of the head. It is thus a stage lower than the two more mature fœtus which are themselves intermediate between the smallest fœtus and the adult whale, where the diminution in breadth of the head anteriorly is quite gradual, as shown, for instance, in Hentschel's figure of the same.‡

The upper surface of the head of this small embryo is smooth and rounded, suggesting a bird's head. The older fœtus on the other hand is much folded longitudinally into a few thick folds (see fig. 6), which seem to be responsible for the slope of the head upwards

* loc. cit., figs. 1, 2. p. 400.

† Zool. Anz., Bd. XXXVI, 1910, p. 422, fig. 5.

‡ Zool. Anz., t. cit., p. 418, fig. 1.

posteriorly, a feature not shown in the older fœtus which, as I have figured it, is almost straight on the upper surface. I believe this to be due merely to collapse of the soft spermaceti containing head. I have little doubt that the same state of affairs accounts for the shape of the head in the fœtus examined by Kükenthal which, being older, should be straight on the surface like my oldest fœtus.

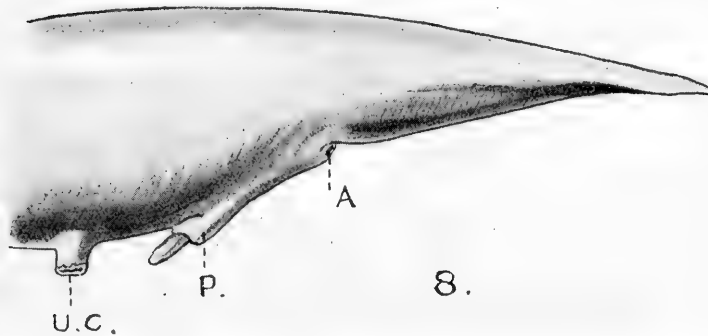
THE TRUNK.

We shall now proceed to consider and compare the trunk of the two fœtus. The following measurements apply to the two fœtus described in the present paper.

	(1) Fœtus of 4½ inches.	(2) Fœtus of 9½ inches.
Tip of lower jaw to front edge of umbilicus (in a straight line)	- 47 mm.	115 mm.
Front edge of umbilicus to end of tail	57 mm.	123 mm.
Front edge of umbilicus to anus	- 22 mm.	54 mm.
Anus to end of tail	- 35 mm.	75 mm.

It will be noticed that the above measurements are not always exactly and collectively equal to the total measurements of the fœtus given above. It is difficult to be exact; but it will be seen that there are no great discrepancies. These measurements bring out the

TEXT-FIG. 8.

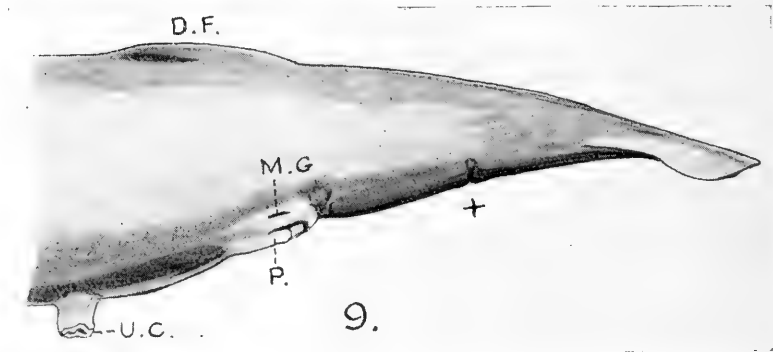


YOUNGER FŒTUS.

Lateral view of posterior part of body. U.C. = umbilicus (cut off in the specimen, but restored to emphasise its position with reference to other parts). P. = penis. A = anus.

fact that there are no great disproportions between the two fœtus. The umbilicus is fairly exactly in the middle of the body. The length of the tail region is a little less than one-third of the total length of the animal. But the tail is proportionately rather shorter in the older fœtus. The interest of this fact is that in the adult Cachalot, according to the measurements of Henschel* (total length of whale 1,740 cm., anus to tail end 512 cm.), the proportionate length of the tail region is still less. This is doubtless due to the great increase in the size of the head in passing from fœtal to adult life upon which we have already commented. The navel of the adult is also pretty nearly exactly in the middle of the length of the body (measured along the ventral side).

TEXT-FIG. 9.



OLDER FÆTUS.

Side view of posterior part of body. D.F. = dorsal fin. + = notch of unknown significance. M.G = mammary groove. Other letters as in fig. 8.

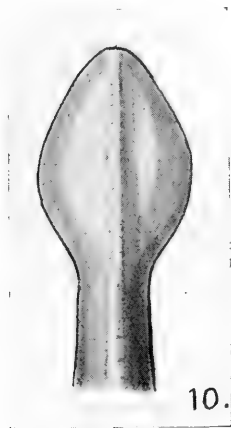
I think that a comparison of the two figures on Plate XXIII with fig. 1 on Plate VIII of my memoir upon the older fœtus shows that the two younger—and especially the youngest—fœtus may be said to possess a distinct “neck,” which has disappeared in the oldest of the three. The existence of a neck in other whale fœtus has been remarked upon, and it occasionally persists in the adult (for example *Mesoplodon mirum*).

* Zool. Anz. loc. cit., p. 420.

DORSAL FIN.

In the fœtus described by me in an earlier number of this journal, I found it difficult to differentiate the dorsal fin. This structure, however, is quite conspicuous in the two younger individuals whose characters I have more recently examined. It is very obvious in the larger of these two as a sharpish ridge 32 mm. in length, which begins and ends quite distinctly and hardly fades away into the general line of the back. It ends some way between the root of the penis and the umbilicus, nearer to the umbilicus, as can be ascertained on a lateral view, and as is just to be made out in the photograph on Plate XXIII,

TEXT-FIG. 10.



YOUNGER FÆTUS.

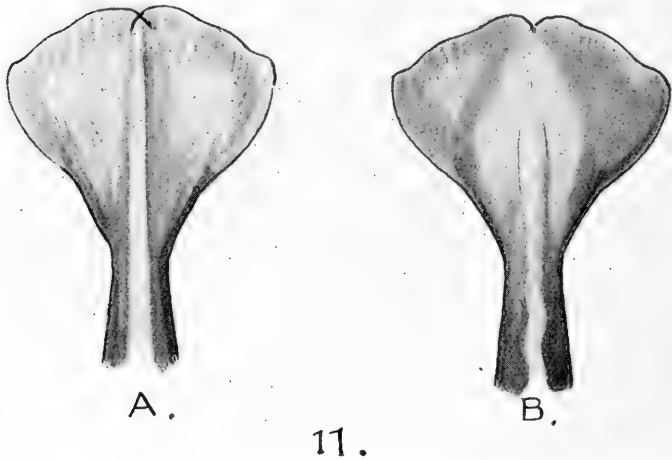
Tail showing dorsal surface.

fig. 2 and (more clearly) in text-fig. 9, D.F. There is a slightly marked ridge, both in front and behind, which is smoother, not so sharp-edged to the touch and not so elevated.

In the small fœtus the fin is also quite obvious, but not so clearly defined posteriorly. Its end is plain enough anteriorly and is seen to be at a point corresponding to about the middle of the penis on the ventral side; posteriorly it emerges into a sharp line which forms the back in this region and which suggests the conditions obtaining in other whales in the tail region. The fin itself and the back ridge near to it is crossed by a series of furrows quite narrow and at right angles

to it, thus dividing it into a series of "segments." The ridge of the back in this youngest fœtus runs to the very end of the body between the flaps of the tail. And on the ventral surface there is in the posterior region of the body a sharp edge which similarly runs to the end of the tail. In the older fœtus, the ventral ridge alone reaches the very end of the tail; the dorsal ridge terminates about half way between the two flukes. As to the latter, the youngest fœtus shows an embryonic condition of the tail flukes, indicating its youth, which has been noted in other whale fœtus. It is represented in the accompanying figure (fig. 10). In the older fœtus the flukes (fig. 11)

TEXT-FIG. 11.



OLDER FŒTUS.

Tail fin. A, from ventral surface. B, from dorsal.

have not yet attained to the proportions of the adult. As was the case with Hentschel, I could find no asymmetry in these flaps which has been asserted to exist.

ANAL FIN.

There are two remaining features about the tail which require mention. I think that it will be admitted from an inspection of Plate XXIII, fig. 1, and a comparison of that figure with the corresponding one of

the older fœtus upon the same plate and with my earlier illustration of a still older fœtus, that the tail is more distinctly marked off from the body in the very young fœtus, thus emphasising the mammalian character, and not nearly so well marked in the older fœtus, whence they agree with the adult in possessing a fish-like symmetry. The second matter concerns an anal fin, the existence of which Kükenthal asserts and figures in the genus *Megaptera**, quoting other authorities. Whether the ventral ridge which I have referred to above in the youngest fœtus of the Cachalot is to be placed in this category or not I do not know. It might also be held that the "continuation" of the dorsal fin which I have also referred to in that small fœtus presents evidence of a former more extensive dorsal fin. And in considering this possibility it must be borne in mind that in *Delphinapterus*, where the dorsal fin is absent in the adult whale, there is a distinct ridge in the fœtus which later in development disappears.

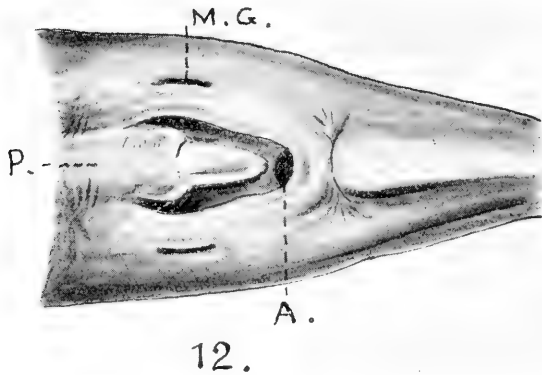
GENITAL REGION.

The fœtus described in my earlier paper is a female; the two dealt within the present communication are both males. In the larger of these latter the penis (see text-fig. 12) is directed backwards and lies within the ventral gutter which terminates posteriorly with the anus. This is most suggestive of a cloaca. The length of the cloacal gutter is 6 mm. and the penis is a trifle shorter, not quite occupying the whole of the space available. The two mammary grooves are plainly visible, lying quite parallel to the gutter, rather nearer to the anterior end of the same, but extending back to the middle. These grooves measure, each of them, 2 mm. They are thus one-third of the length of the cloacal groove. In the youngest fœtus the arrangement of these various parts (see text-fig. 8) was different owing to the eversion of the gutter which was thus apparently a part of the penis, which latter is directed forwards and not backwards as in the older fœtus. I could find here no mammary grooves; the distension of the genital region has perhaps temporarily obliterated them. In the larger female fœtus formerly described by me the cloacal or vulvo-anal groove was 18 mm. in length; and it is noteworthy that the mammary grooves—in spite of the fact that the animal is a female—are 6 mm. in length and thus no longer proportionately than in the younger male animal. In both cases the

* Jen. Zeitshr. Bd. LI.

length is one-third of the cloacal groove. Here, too, the mammary grooves are parallel with the cloacal groove. I lay stress upon this position since Kükenthal represents the mammary grooves in his female fœtus as lying at an oblique angle with the median genital groove. As, however, the adjacent areas are rather contorted in appearance in his figure, it is possible that this contortion—the result perhaps of contraction during preservation—has affected the mammary grooves. They are only 4 mm. long in this fœtus and have thus a different proportion to those seen by myself.

TEXT-FIG. 12.



12.

OLDER FÆTUS.

Ventral surface of cloacal region. M.G. = mammary groove of one side.
P. = penis. A. = anus.

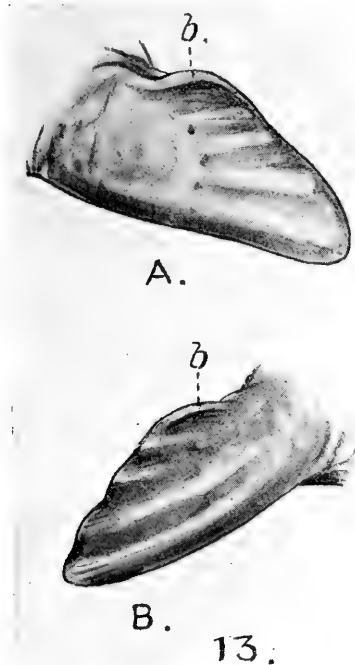
PECTORAL FINS.

The position and general shape of the fore limbs can be understood from an inspection of Plate XXIII. The lower anterior border of the limb is longer than the upper; it is also straighter—the upper border is a curve of nearly one-quarter of a circle. The two fins of the adult whale are stated by Henschel to be strongly asymmetrical in shape and both are incidentally figured by him in illustration of this difference.* Furthermore, there is ascertainable from the measure-

* *loc. cit.*, figs. 1 and 3.

ments given by that authority an asymmetry between the lengths of the fins of each side. I could detect no marked difference in form between the two fins of the younger of the two embryos studied by myself; but I find (see text-fig. 13) that the left fin of the larger fœtus has a straighter lower border than the right fin. I also agree with Hentschel in finding some difference in size. As the matter depends upon very minute differences I obtained through the kindness of Miss

TEXT-FIG. 13.

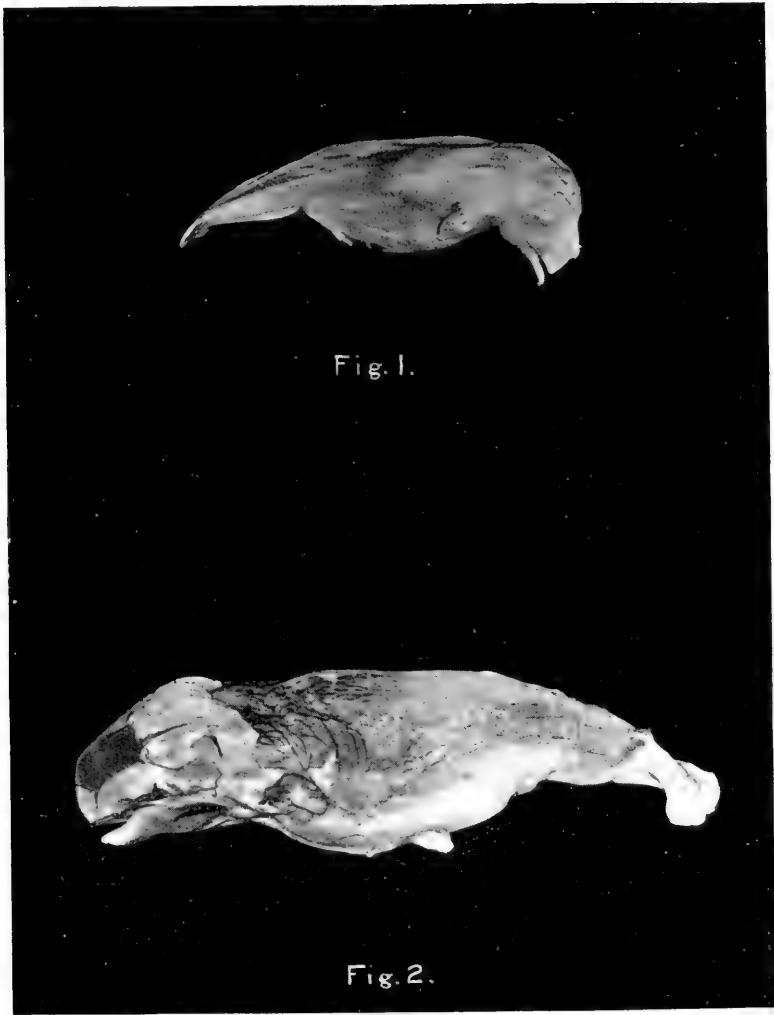


OLDER FÆTUS.

Right (B) and left (A) pectoral fins. This shows the slight asymmetry of the two. The outline of the digits, with the exception of the small pollex, are seen. The fifth longitudinal fold near the edge *b* does not represent a digit.

Kathleen Lander, M.Sc., Lond., Acting Prosector of the Zoological Society, additional measurements to check those made by myself. In the youngest fœtus I found the greatest length of the free region of the fore limb to be 12 mm. in the case of the right limb and 11 in the

case of the left. The corresponding measurements made by Miss Lander give 12 mm. for the right limb and 11·9 for the left. There is thus an agreement as to the fact that the right limb is rather, but very slightly, the larger. In the larger fœtus the greatest length is 28·5 to 29·2 mm. and there is a difference of only ·7 mm. between the two sets of measurements. This only just affords a basis for differentiating the two limbs by their length. Indeed, the entire question does not seem to be capable of settlement by the facts at my disposal, especially when it is considered that, by an exact reliance upon the measurements, the older fœtus shows a faintly greater length of the lower margin of the fin as compared with the upper margin (measured in a straight line) as compared with the smaller fœtus. The proportions of the paddle to the body length bear out what I mentioned in my earlier paper, viz., that while in the adult the fin is only one-tenth of the body length, the fœtus has a relatively larger fin. I find that in the larger of the two described here the length is as much as $8\frac{1}{3}$ of the total length, much as in the older fœtus first described by me. But in the youngest the fin is shorter, being $9\frac{1}{4}$. A longer series is clearly desirable.



E. C. Chubb photo.

Butterworth sc

PHYSETER MACROCEPHALUS

Fig. 1. Foetus $4\frac{1}{2}$ in. in length.

Fig. 2. Foetus 10 in. in length.

Plate XXIV to follow.

Plate 24 missing



XV.—Notes on some Rhodesian Moths of the family Saturniidae
and their Larvæ,

by

Rev. J. A. O'Neil, S.J., F.E.S.

WITH PLATE XXIV.

IN no part of South Africa is the Family Saturniidae more richly represented than in Southern Rhodesia. In the immediate neighbourhood of Salisbury alone, no fewer than twenty-eight different species have been found or bred from their larvæ, and I know of eleven others that have been captured in the Bulawayo, Gwelo, Hartley and Melsetter districts. Several of those that I have taken or bred at Salisbury are considered great rarities outside the territory, and the following notes on them and their larvæ may prove of interest to collectors.

I have included in the notes a crude and merely provisional description of three species that are probably new, and have pointed out in what respects the male (hitherto unknown) of the beautiful *Nudaurelia carnegiei*, described by Janse in these Annals last year,* differs from the female.

With the exception of *Lobobunæa* sp. nov.?, *Nudaurelia carnegiei* and *N. arabella* sub-sp. *jacksoni*, all the Salisbury Saturniidae are represented in the collection of the Durban Museum.

IMBRASIA EPIMETHEA, Drury, sub-sp. ERTLII, Rebel.

This is an abundant moth round Salisbury and on the Chilimanzi Reserve between Umvuma and Victoria; and I have seen numbers of the larvæ on their food-plant at Umtali. These caterpillars, which are gregarious, are known to the Mashonas as "madora," and are highly esteemed by them as an article of diet. They are found on two leguminous trees, *Brachystegia randii* and *Brachystegia* sp., as many as two to three hundred being sometimes seen on a single tree. They are much parasitised by ichneumon flies and a great many fall victims to ants and other enemies when they leave the tree to go to earth.

* *Supra* p. 78.

The moth is also common about Victoria (Fort Victoria, not Victoria Falls) and the Makaranga of the Victoria district call the caterpillar "arati." They eat it with as much avidity as the Mashonas about Salisbury do.

Unlike all other large moths of the family Saturniidae, this species rests with both wings erect and folded together.

The caterpillar in the last two instars is black, very soft, and rather thickly covered with long white downy hairs. It usually pupates in March or April, and the moth as a rule emerges in November. I have known one or two instances in which the imago did not leave the pupa-case until the middle of February.

The male of this Saturniid varies much in both size and colour. Small examples have a wing expanse of only 95 mm. or thereabouts, while large specimens expand as much as 135 mm. The ground-colour of both wings may be light greyish-buff, grey with a pink flush, tawny, or ochreous-red. The light markings of the fore-wing are white in the buff and grey specimens, light pink in the reddish examples.

The female is much less variable in colour, the ground-colour of the fore-wing and very broad hind-marginal band of the hind-wing being nearly always chocolate-brown or reddish-chocolate. The white bands of both wings and white sub-apical patch of the fore-wing are much larger and better defined than in the male: the wing expanse ranges from 130 mm. to 145 mm.

BUNÆA ALCINOE, Stoll.

This widespread moth is extremely abundant in the Salisbury district, its conspicuous larvæ often completely denuding a tree (*Cussonia spicata*) with very large leaves. In this district both males and females are markedly variable in colour, some of the former being beautifully tinted with pink or lilac. The Mashonas call the caterpillars "mashondjgwa" and devour them in great numbers. These caterpillars feed rapidly and are easy to rear, and bred specimens of the moth are usually as large as those that have fed in the open, expanding from 160 mm. to 175 mm. across the wings. A dwarf male, the pupa of which I kept in a hot, dry place, has a wing expanse of only 104 mm. and is of exceedingly light colour.

BUNÆA HEROUM, Oberth.

This very large and beautiful Bunæa is by no means uncommon around Salisbury, and I have heard of its occurrence at Victoria.

Both sexes, the male especially, show great variability in the amount of white scaling on the wings.

As the moth is little known in South Africa, a short description of the wing upper-side may be useful.

Fore-wing. A broad basal bright ochreous-yellow patch, bounded on the costa and outwardly by a narrow black band, occupying the basal two-fifths of the cell, projecting triangularly into area 1c, and narrowest in 1b and 1a. Apex and hind-margin with a dull ochreous-yellow band from 6 to 8 mm. wide, narrowest between nervules 6 and 4, and broadening towards the hind-angle where it is sometimes as much as 10 mm. wide. Beyond the basal ochreous patch the wing is densely covered with white scales, the white extending on the costa as far as the hind-marginal band, reaching the inner edge and middle of the lower margin of the large ocellus, then narrowing slightly to the inner margin. In the post-median and sub-apical areas the scales are dark reddish-purple or magenta. In many examples the outer part of the wing is thinly dotted with white scales, and in two males the pure white area reaches from the basal patch to the hind-marginal band. Ocellus broadly oval; hyaline patch outwardly rounded, inwardly rectangular. Outer ring of ocellus white or (rarely) light pink and very narrow, then a much broader dark crimson ring, and within this a narrow black ring bounding the hyaline patch. Across the wing, and interrupted by the ocellus, there is a sinuous dark reddish-purple transverse band, inwardly angulated between nervules 2 and 1b.

Hind-wing. Dark or lighter mouse-grey, with a broad ochreous hind-marginal band similar to that of the fore-wing and bounded inwardly by a narrow and well defined or broader and diffused band of the ground-colour, on the inner edge of which is a white band, usually narrow, but sometimes moderately broad, and in one male example reaching as far as the ocellus. An irregular, somewhat diffused, narrow or moderately broad ante-median white band, bent inwardly at nervule 2 and wider thence to inner margin. Ocellus large, usually round but occasionally slightly oval, consisting of an outer narrow white (rarely pink) ring, and an inner, much broader ring of bright crimson within which is a large round black patch, sometimes slightly hyaline about its centre, owing to reduction of scales.

In the fore-wing of the male the costa is more rounded towards the apex and the outer margin much more deeply concave between nervules 6 and 3 than in that of the female.

Wing expanse: ♂ 168–200 mm.; ♀ 150–206 mm.

The average wing expanse is from 185 to 190 mm. Bred specimens are usually smaller, but last summer I bred a male and female that expanded, respectively, 200 and 206 mm. across the wings.

Egg. Large, round and pure white in colour. These eggs are laid on the leaves of the food-plant, *Brachystegia randii*, the native name of which is “musasa,” in batches of from three to eight. Owing to their white colour and large size they are very conspicuous, and they are much parasitised by a fairly large Chalcid. They generally hatch out between the middle and end of January.

Larva. First instar. Black, with rows of black tubercles closely set with long black upright setæ.

Second instar. Immediately after the first moult the caterpillar has much the same appearance as before, but the wart-like tubercles are larger and more conspicuous. As it fills out both colour and pattern undergo a considerable change. The body and tubercles become brick-red, and on each segment there is a moderately broad black transverse band dotted with minute cream-coloured spots, while the head and tubercles bear long white setæ.

Third instar. Body mottled with black and yellow, or greenish-yellow spots. Each segment with eight red setigerous tubercles. Head dark chocolate-brown.

Fourth instar. Each of the segments light green in the middle, pale mauve or lilac anteriorly and posteriorly, and armed with six long upright lilac-red spines, strongly set with whitish bristles, the dorsal spines simple, the lateral ones barbed near the tip. Legs, abdominal feet and claspers strongly setigerous. Head, shield and claspers brownish-lilac.

Fifth instar. Similar to last, but the spines are of a deeper red colour. Stigmata dark red.

In the two final instars the caterpillar is a very handsome object, and, owing to its stout setæ, decidedly unpleasant to handle. Probably for this reason it is not eaten by the natives. It usually pupates in March or April, and the moth emerges in November and December.

During the daytime the moth remains motionless, with partly expanded wings, on the leaves of its food-plant, the rather dull under-side alone showing. Hence, despite its great size, it is quite inconspicuous and can only be found by careful searching.

BUNÆA ANGASANA, Westw.

This fine moth has been bred at Salisbury in some numbers from larvæ found feeding on *Uapaca kirkiana*, a tree that grows on stony hillsides all over Mashonaland and is known to the natives as the "mahobahoba." The males vary much in colour, some being light pearly-grey, while others are very much darker, with a fuscous, slightly ante-median, transverse band in the fore-wing, reaching from the costa to near the inner-margin. Specimens that have emerged in my boxes vary in wing expanse from 156 mm. to 170 mm.

BUNÆA sp. nov. ?

Of this large and very beautiful *Bunæa* nearly a dozen specimens have been bred by my friend, Mr. A. W. Redfern, to whom I am indebted for three fine examples. Mr. Redfern, informs me that he looked in vain for the moth in the collection of the British Museum, so it is probably an undescribed species. I have seen three examples in the Bulawayo Museum, two of which were captured at Que Que, twenty miles north of Gwelo, some years ago; the third has no locality label.

The adult larva is very like that of *Lobobunæa macrothyris*, but differs from it in several points. The colour is yellowish-green; the dark green minute spots are much more sparse on the dorsal surface, but dense below the lateral band. Cephalic plate yellowish-brown; dorsal, strongly impressed band light grey; stigmata salmon-coloured. Abdominal feet without setæ inferiorly, except for a very narrow brush in the middle. Anal plate triangularly bright yellow; lateral inferior band flavous; head light green.

A brief description may help collectors to recognise the moth, should they be fortunate enough to come across it.

♂. Head, under-side of prothorax, antennæ and legs mouse-brown. Meso- and meta-thorax white beneath; pronotum mouse-grey with anterior margin white. Abdomen light mouse-grey above, whitish beneath.

Fore-wing. Costa nearly straight to beyond ocellus, then sharply curved. Apex very acuminate; outer-margin deeply concave between nervules 7 and 4, thence slightly sinuous to hind angle. Colour of wing light mouse-brown, darker in median and post-median areas between nervules 6 and 2. A somewhat diffuse broad ante-median

white patch between costa and median nervure, and a similar post-median patch reaching from costa to nervule 7 or 5. Hind margin with a white or light pink border, narrowest at apex, widening gradually to nervule 2 where it is from 10 to 14 mm. broad, below that inwardly diffused with brown, and bounded on its inner edge by a narrow dark-brown band. Ocellus large, oval. Outer ring narrow, pink; inner ring broad, bright red, enclosing a black round mark in the centre of which is a minute hyaline spot.

Under-side. Much lighter; hind-marginal border narrower between nervule 4 and hind angle, inwardly edged by a broad and rather indistinct dark-brown band.

Hind-wing. Slightly angled at nervule 2. Light mouse-grey with a large dark-brown sub-triangular patch enclosing the ocellus; costa and hind-margin greyish-white. Ocellus very large, oval or nearly round. Central part black with a very small hyaline space in the middle; then a broad bright-red ring; next to this a moderately broad deep-pink ring; outer ring narrow, crimson.

Under-side. Basal and median areas pink or pinkish-white. Hind-margin broadly greyish or pinkish-lilac, inwardly suffused between the nervules with dark lilac-grey. Inner-margin light ochreous-brown from base to near anal angle. A very large, almost retort-shaped, dark yellow-brown mark enclosed by a narrow dark-red band, occupying the whole of the cell except the upper basal half, the base of areas 2, 3, 4 and 5, and invading area 6 near its base. A small quadrate dark brown mark at base of area 7, and a narrow dark brown band, outwardly edged with yellowish-brown scales and extending across the wing from the apex to the inner-margin.

♀. Similar to ♂, but apex of the fore-wing even more acuminate, hind-margin much less deeply concave between nervules 7 and 4, and antennæ only slightly pectinated.

Wing expanse. ♂ 167-186 mm.; ♀ 156-178 mm.

LOBOBUNÆA NATALENSIS, Aur. (= *PATRUELIS*, Dist.).

This Saturniid is very variable in colour. The fore-wing may be light olive-ochreous, light mouse-grey, sometimes with a greenish tinge sometimes flushed with orange-red, greyish-ochreous, orange ochreous, deep or bright orange-red. When the fore-wing is greyish or ochreous the hind-wing is of the same colour, with a large discal orange patch between the costa and post-median band which runs almost parallel to

the hind-margin. Examples with orange-red fore-wing have the hind-wing entirely red, turning to light olive-buff or, rarely, pale mauve near the outer-margin. Both wings have a narrow, or very narrow, olive-brown or reddish-brown hind-marginal border.

In typical examples the fore-wing has a sub-basal, median and post-median wavy transverse band; but in many specimens, one, two or all of these bands are very faint, and the two inner ones are sometimes obsolete. Very rarely all three are wanting.

Wing expanse. ♂ 125-166 mm.; ♀ 150-175 mm. Common at Salisbury.

L. natalensis is very closely allied to *L. macrothyris*, Roths. & Jord., and a good many people have been very sceptical about the specific difference of the two. Having bred a large number of both moths from the egg, I am in a position to state that there is not the slightest doubt that the two are quite distinct, and can demonstrate this by setting down in parallel columns the points of difference that may be noted all through from the ovum to the imago. The larvæ of both species feed on *Brachystegia randii*.

L. natalensis.

Egg. Light green with a few reddish spots.

Larva.

1st instar. Head and body black.

2nd instar. Head black. Thorax and abdomen grass-green. Thoracic segments mottled with dark green spots; abdominal segments with no dorsal, and only a few lateral dark green spots.

3rd instar. The dark green spots much more numerous than in previous instar, covering both dorsal and lateral surfaces. Stigmata very light red-brown. On second abdominal segment there is a silvery-white, oblique carina, interrupted near its lower extremity. Abdominal feet with only a few setæ inferiorly.

L. macrothyris.

Light ochreous-yellow, speckled with brick-red spots.

Head and body dark brick-red.

Head light green. Thorax and abdomen emerald green, mottled all over with dark green round spots.

Dark green spots cover only the dorsal and part of the lateral surface, stopping short at some distance from the stigmata, which are dark crimson. No silvery-white carina on second abdominal segment, but, instead, a silvery-white post-cephalic plate or ridge. Abdominal feet closely set with setæ inferiorly.

4th instar. Similar to preceding instar, but tubercles comparatively smaller and not armed with terminal setæ.

5th instar. Oblique silvery-white carina on second abdominal segment very large. Entire body closely covered by dark green round spots. Stigmata green. Inferior lateral whitish band raised. Abdominal feet with only a very few setæ. Segments distinctly angulated superiorly.

Pellets of frass of the caterpillar in its final instar of normal size.

Caterpillar easy to rear in first two instars. Is found at Salisbury from early in November to middle of January.

Imago.

Upper-side. Fore-wing light olive-ochreous, light mouse-grey, orange-ochreous to bright orange-red, much paler near the outer-margin. Transverse sinuous bands distinct or faint, very rarely altogether wanting; the post-median band distinctly angled at nervule 7.

Similar to third instar, but no lateral dark-green spots.

No oblique carina on second abdominal segment. Dorsal area only with dark green spots; hence the caterpillar looks much lighter than that of *natalensis*. Stigmata very dark red purple. Whitish inferior lateral band not raised. Abdominal feet rather closely set with setæ inferiorly. Segments all evenly rounded, not angulated superiorly.

Caterpillar in final instar drops pellets of frass of enormous size, which at once indicate that the larva of *macrothyris* is feeding on the tree.

Caterpillar delicate and very difficult to rear in first two instars. Is found at Salisbury from about the middle of January to the middle of March.

Fore-wing much darker mouse-grey or mouse-brown, often with a greenish, more rarely, reddish or lilac flush; mauve or lilac near outer-margin. Very rarely the entire wing is deep orange-red, bright lilac near the outer-margin. No trace of any transverse sinuous band in nearly all examples. Very rarely a faint post-median band, hardly sinuous and not angled at nervule 7.

Hind-wing. Red discal patch large or very large, its inner edge some distance from the black ocellus. Sub-marginal area pale olive-green or olive-buff; rarely pale red-lilac or mauve.

Under-side. Ground colour of both wings pale olive-green or olive-ochreous, sometimes with an orange or pinkish flush.

Size. 125–175 mm.

Moth emerges (at Salisbury) from end of September to end of October.

Hind-wing. Red discal patch rather smaller than in *natalensis*, its inner edge very close to the black ocellus. Sub-marginal area mauve-lilac or lilac-grey.

Ground colour of both wings nearly always light to very light grey; very rarely (in females only) light olive-buff.

Rather larger. Well-grown males expand 165–170 mm.; females 175–180 mm.

Moth emerges (at Salisbury) from early in November to about middle of December.

Bred specimens of *macrothyris* are often undersized, as the larva, especially in its early instars, feeds badly in captivity. A dwarf male in my collection, that emerged on 29th November, 1917, has a wing expanse of only 98 mm.

The full-grown larva of *macrothyris* is thicker and more stumpy than that of *natalensis*, and its colour is wonderfully procryptic, identical with that of the leaves on which it feeds. Hence, though certain of its presence from the monstrous pellets of frass, one may hunt for it for a long time in vain. For three years I frequently saw the frass under the *B. randii* trees but could never detect a caterpillar, and I was under the impression (shared by Mr. R. W. Jack) that it must be a nocturnal feeder that hid itself during the daytime. It, as well as the larva of *natalensis*, is (when found) eaten by the natives, to some of whom it is known as "chinyinanegore." But the fact that most natives, despite their keen sight, are unacquainted with the caterpillar, and also that it is seldom parasitised by ichneumon flies, is eloquent testimony to the protection afforded it by its procryptic colour.

Distant's *Bunœa patruelis* is supposed to be identical with *L. natalensis*, Aur., but neither his description nor coloured figure (v. "Insecta Transvaaliensia," pl. vii, fig. 14) agree with any of the numerous examples of *natalensis* that I have seen. On the other hand, his fig. 13 on the same plate, which is supposed to be an illustration of *epithyrena*, var., is in everything except the colour of the marginal

light band of both wings, an exact representation of the red variety of *natalensis* found at Salisbury.

LOBOBUNÆA sp. nov.?

Of this species, which differs in many respects from *natalensis* and *macrothyris*, I have bred one male and captured a second at Salisbury. The two specimens differ much in colour, and as the moth is probably a new species I shall give a short description of each.

Example 1.

Head, legs and under-side of thorax dark mouse-grey; pronotum orange-ochreous with the anterior margin light grey. Abdomen dull orange-ochreous above, lilac grey on under-side.

Fore-wing. Costa, basal two-thirds straight, thence strongly curved to apex which is rather acuminate. Hind-margin moderately concave between nervules 7 and 4, hind angle rounded. Orange-ochreous, turning to bright lilac near the outer-margin; base with a lilac tinge. A post-median violaceous sinuous band angled at nervule 7, and a very small subquadrate hyaline spot on the discocellulars.

Hind-wing dull orange. Base, to about middle of cell, densely covered with long lilac-pink hairs; inner-margin with similar hairs of mouse-brown colour. Hind-margin with a linear olive-brown band and a rather broad bright lilac inner-band. Separated from this by a band of the ground-colour is a narrow slate-grey fascia, parallel to the hind-margin as far as nervule 5, then bent upwards towards the costa. Ocellus round, rather large, consisting of a greyish-black round spot in the centre of which is a very small hyaline space, and an outer broad black ring.

Under-side. Fore-wing dull pinkish-lilac, with the basal three-fourths of areas 2, 1c, 1b, and 1a, pale salmon-pink; a sub-apical ill-defined fuscous patch between costa and nervule 7, and a black sub-quadrate mark enclosing the hyaline spot.

Hind-wing entirely lilac-pink, with a faint indication of the post-median slate-grey band.

Wing expanse 126 mm.

Example 2.

Differs from the preceding in the following respects: pronotum and abdomen bright brick-red; fore-wing bright brick-red, turning to light grey near the hind-margin. Post-median transverse band greyish-

lilac. Hind-wing deep orange-red, with the post-median and broad juxta-marginal band light slate-grey.

Under-side. Both wings light grey with a pinkish flush. Inner-margin of fore-wing bright pink. A well-defined median sinuous dark brown fascia in both wings, not visible on upper-side.

Wing expanse 134 mm.

The adult larva is very like that of *macrothyris*, but smaller and of yellow-green colour. The small dark green spots cover the entire body except on the ventral surface; the stigmata are crimson and the segments distinctly angulated, like those of *natalensis*. Food-plant, *Brachystegia*, sp.

The caterpillar went to earth on 24th February, 1917, but the moth (Ex. 1) did not emerge till 3rd March in the following year.

NUDAURELIA CARNEGIEI, Janse.

In describing this very large and brightly coloured *Nudaurelia* last year, Mr. Janse stated that, as far as he was aware, it had been found in S. Rhodesia only at Umvuma and Selukwe. He had quite forgotten a female, bred by me at Salisbury, that he had seen in my collection a few months before. A fine example of the male (hitherto unknown) emerged in one of my breeding boxes on 18th February last year. In colour and markings it is almost identical with the female; but the shape of the fore-wing is quite different, the costa being more strongly arched, the apex much more rounded and the hind-margin rather deeply concave between nervules 7 and 3. The hind-wing is considerably broader than that of the female, with the outer-margin less rounded and more strongly lobed at 1b.

Wing expanse 165 mm

Larva. Final instar. Black, with inter-segmental dark brick-red rings. In the middle of each segment there is a narrow and deep transverse groove, interrupted in the centre on the last five abdominal segments. Segments closely mottled with minute white spots, except in the middle of the dorsal area, where they are very sparse or wanting. Each segment bears six small black setigerous tubercles, the setæ long and white. Stigmata salmon-coloured; ventral surface black. My caterpillars were found on the "munondo" tree (*Brachystegia* sp.) on 13th May, 1917, and went to earth the following day. The female moth emerged on 14th December, and the male two months later. The moth is evidently a rare one in this district, for the caterpillar was quite unknown to several natives to whom I showed it.

NUDAURELIA OUBIE, Guér.

This very pretty moth is fairly common about Salisbury, but most of the specimens captured here are injured or faded. The larva feeds on various grasses, but in its final instar is very difficult to rear in captivity, hence fresh specimens of the moth are scarce. Out of over thirty caterpillars that I have attempted to rear I have succeeded in getting only five moths. These caterpillars are eaten by the natives, who style them "masininiruskwa."

Some examples of the moth have all the black areas of the fore-wing irrorated with bright yellow; in others these areas are intensely black without any yellow scales. The inner-margin of the hind-wing is dark mouse-grey, and its sub-terminal area black in some specimens; in others both these areas are bright yellow.

Wing expanse. ♂ 115-120 mm.; ♀ 110-130 mm.

Egg. Spherical; greyish-brown; usually laid about end of December.

Larva. First instar. Totally black; densely setigerous.

Second instar. Ochreous-yellow, each segment bearing six black setigerous tubercles. Head and post-cephalic plate black.

Third instar. Light bluish-green; each segment with eight black setigerous tubercles, at the base of which is a bright yellow spot. Post-cephalic plate bright yellow.

Fourth instar. Grass-green. Segments bright yellow in the middle and bearing eight dark purplish-red spines.

Fifth instar. Similar to fourth, but bright orange-yellow at base of spines. Head and post-cephalic plate black. Stigmata dark purplish-black. Inferior spines strongly barbed at tip, others simple. Legs, abdominal feet and lower half of claspers black.

The caterpillar usually pupates in March, and the moth emerges between the middle of November and middle of December.

NUDAURELIA ARABELLA, sub-sp. JACKSONI, Jord.

This handsome moth is rarer than the last at Salisbury, but examples are occasionally taken at light. It differs from the typical *arabella* in having the entire basal and median areas of both wings deep carmine or crimson lake instead of yellow, and the ante-median black band of the fore-wing is entirely wanting. The size is smaller than that of *arabella*.

A gregarious caterpillar, that feeds on a rush-like grass in very swampy spots, is probably the larva of *N. jacksoni*; but all attempts made by Mr. Redfern and myself to rear it have hitherto been unsuccessful, as the caterpillar absolutely refuses to feed when removed from its natural habitat. The segments are bright yellow in the middle, black anteriorly and posteriorly, and are armed with six short black spines. The whole of the ventral surface and the abdominal feet are deep carmine.

ATHLETES SEMIALBA, Sonth.

On first receiving from me a pair of this magnificent Saturniid, Janse wrote that he believed it would be the finest moth in his collection for years to come. *A. semialba* is unquestionably a remarkably striking moth, and hardly anything more beautiful could be imagined than a freshly emerged specimen settled with partly expanded wings on the foliage of its usual food-plant, *Brachystegia randii*. The moth is not very uncommon about Salisbury in late November and December, though, curiously enough, very few people have ever seen it. It sometimes remains during the daytime on the trunk of a tree and in this case it is sure to escape notice, the fore-wings looking very much like a piece of bark crowned with white lichen, and they hang down slightly so as to cover the large ocelli of the hind-wings which would at once draw attention to the insect.

The eggs are laid in December on the upper-side of the leaves, in batches of from two to eight, usually at a height of only three to six feet from the ground. They hatch out in about three weeks, and the caterpillars are to be found from January to late in March. In normal seasons the moth emerges between the middle of November and early in December; but when the rainy season starts late their emergence is retarded till the middle of the latter month.

Some description of the moth and its larva may be useful to collectors.

Male. Head, thorax and abdomen as in *Gynanisa maia*, but the pronotum is black, the tegulæ either black or, more often, chocolate-red; abdomen covered with white or tawny hairs; branches of antennæ much shorter than in *G. maia*.

Fore-wing. Costa straight for two-thirds of its length, then strongly arched to apex, which is rather acuminate. Hind-margin very sinuous, deeply concave between nervules 7 and 3; posterior angle rounded. Whole of costa, and base as far as dark median

transverse band, densely covered with white scales. Outer half of wing pale or darker ochreous varied by bands and spots of reddish- or chocolate-brown. Hind-margin with an outer wavy black band leaving internervular marginal flavous streaks, and an inner band of blackish- or chocolate-brown. Three transverse dark bands across the wing, the first sub-basal and crossing the white area, zigzag and sometimes broadly interrupted on its upper half; the second median, very broad at the costa and strongly sinuate; the third, post-median, linear, only slightly sinuate and elbowed at nervule 2. Just beyond discocellulars a rather small sub-triangular hyaline space, edged on its inner- and lower-margin with black.

Hind-wing. Outer-margin sinuous, very strongly lobed between nervules 5 and 3, giving the wing a broad spatulate "tail." Entire discal area claret-coloured or magenta, bounded outwardly by a narrow or moderately broad dark pink or pinkish-white band, and an outer band of black or purple-brown, between which and the broad black hind-marginal border the wing is tawny, mottled with blackish or brown scales. Ocellus exactly like that of *G. maia*, except that its black ring is narrowly linear.

Under-side. Fore-wing. Costa and base as far as median band white. Pink, with a few whitish scales, between median and post-median band. Hind-marginal area dark chocolate-brown, lighter on outer edge of post-median band and near apex. Inner-margin dark pink as far as nervule 2.

Hind-wing. Costa, and base to median band, white. Brownish-pink between the transverse bands; dark umber-brown from outer band to hind-margin.

♀. Similar to ♂, but shape of wings different.

Fore-wing. Costa only moderately arched towards apex; hind-margin but slightly concave between nervules 7 and 3.

Hind-wing slightly lobed between nervules 5 and 4.

Wing expanse. ♂ 140-198 mm.; ♀ 150-185 mm.

The average wing expanse of examples found in the open is about 180 mm. Bred specimens are usually undersized as the caterpillar is a slow feeder and will not eat unless its food-plant is perfectly fresh.

Egg. Broadly oval; whitey-brown with dark-brown longitudinal stripes.

Larva. First instar. Totally black, covered with long black bristles; each segment with six setigerous blunt tubercles.

Second instar. Light ochreous or creamy-yellow; head brick-red. In the middle of each segment a transverse shining blue-black band, bearing six erect strongly setigerous tubercles of the same colour. Segments smooth.

Third instar. Similar to preceding after the moult; but as the caterpillar grows the ground-colour becomes nearly white with a light bluish tinge, and the tubercles grow longer and more slender.

Fourth instar. Light blue above, light bluish-green on lateral surfaces, each segment armed with six upright burnished gold spines, the two dorsal much longer and more slender than the four lateral ones. Head, post-cephalic plate and two large triangular patches on the claspers chocolate-brown. Several small golden-yellow granules on each side of the post-cephalic plate. Stigmata black.

Fifth instar. Similar to preceding, but the golden spines are longer and curved backwards and the stigmata are dark red. Just before going to earth the whole body becomes pale milky blue.

The caterpillar feeds on our two local species of *Brachystegia* and also on *Cassia*, sp.

CYRTOGONE BILINEATA, Roths. & Jord.

This is a dark-coloured, but handsome, moth, the female of which looks very much like a *Lasiocampid*. It is common at Salisbury, where the gregarious caterpillars may be seen feeding in numbers on *Brachystegia*. When adult they are ringed with broad crimson and black bands, separated by narrow rings of bright yellow. Each of the crimson bands bears six short black tubercles densely set with long black setæ, and the entire body is covered with long downy white hairs. If the caterpillar is touched it causes a burning sensation on the hand. It feeds rapidly and pupates about the end of January. The moth sometimes emerges three weeks later, but more often remains in its pupal state until the following summer. It always emerges during the daytime.

The fore-wing of the male moth is acuminate at the tip and strongly sinuate along the hind-margin; very dark-purple in the basal and median areas, turning to light ochreous mottled with light reddish-brown in the outer half. Hind-wing fuscous, with the basal half of the costa deep pink, and the inner- and outer-margins light or dark ochreous, mottled with brown. The female has the wings of normal shape. The whole of the fore-wing is dark blackish-purple, with two narrow black transverse bands and a small median flavous patch. The hind-

wing is greyish-black, with the basal third or half of the costa deep pink. Occasionally nearly the whole of the wing has a pink flush.

CINABRA HYPERBIUS, Westw., var.

The Rhodesian variety of this Saturniid is a very handsome moth, the upper-side of the hind-wings being bright yellow instead of red, with a narrow red hind-marginal band, and a sub-marginal bright lilac, mauve or slate-blue band, moderately broad in the male, twice as wide in the female. Separated from this by a band of the yellow ground colour is a rather narrow dark grey post-median band parallel to the outer-margin. Base and inner-margin covered with pinkish hairs. A few female examples have the whole of the fore-wing tinted with bluish-grey or slate-blue.

Wing expanse. ♂ 88 (dwarf)–120 mm. ; ♀ 114–128 mm.

Average size 110–125 mm.

C. hyperbius is an abundant moth at Salisbury (and is also found at Bulawayo), the larva feeding in considerable numbers on a small *Protea*, on whose succulent leaves it thrives and is very easy to rear. It is not infrequently found on *Brachystegia randii*, but more difficult to rear on this food-plant. The eggs, which are broad and depressed at one end and narrow, rather pointed, at the other, are light olive-brown and are laid in even rows, from two to seven in a row, sometimes about the end of October, more often in the first half of November, and they hatch out in about three weeks.

Larva. First instar. Bright yellow above, with a lateral row of large black confluent spots. Each segment with six small yellow tubercles covered with long black setæ. Head black.

Second instar. Dark ochreous-yellow turning to brick-red three or four days after the moult, with inter-segmental black rings. A central black longitudinal band from head to last abdominal segment and a narrow black lateral band interrupted on each segment. Head black.

Third instar. Entire body bright salmon-pink without black rings. Black dorsal, and lateral interrupted bands as in preceding instar. Tubercles bright salmon-red, black at apex, each bearing three or four stout black setæ. On vertex of head a row of six small black setigerous tubercles. Head yellowish-olive. Towards the end of this instar the colour of the body becomes grass-green.

Fourth instar. Head and body grass-green. The two posterior thoracic segments have six large orange-red tubercles each bearing a

small black setigerous spine ; abdominal segments with six small black setigerous spines. Stigmata purplish-red with an outer ring of white.

Fifth instar. Head and body emerald green. On vertex of head a narrow silvery-white transverse carina. Post-cephalic and anal plates bright purple-red. Two posterior thoracic and all abdominal segments armed with eight long simple (non-setigerous) black spines which become shorter as the caterpillar fills out. On each side of claspers a triangular purple-red patch. Stigmata as in fourth instar.

As with most *Saturniidae*, the males of this moth can be obtained by sembling with unfertilised females. One evening a female emerged in one of my breeding boxes and two hours later a dozen males flew into the room in quick succession.

CINABRA PYGMÆA, Maas. & Weym.

This is a rare moth at Salisbury, and I have seen only one example captured in this neighbourhood. The colour of the wings is very different from that of the specimen figured by Distant in his "Insecta Transvaaliensia." The fore-wing is deep carmine-red turning to lilac-pink near the outer-margin, and the hind-wing is deep orange-red with a broad pink outer border. The moth is not uncommon at the Victoria Falls.

EPIPHORA VERA, Janse.

Of this very beautiful moth I have bred three examples from cocoons found at Salisbury by Mr. A. W. Redfern. A male that emerged 22nd November and a female that came out on 1st December last summer are considerably larger than the types, the former having a wing expanse of 132 mm., and the latter of 138 mm. There is a specimen of this moth in the Bulawayo Museum, captured some years ago at the cement works, nine miles from Bulawayo on the Salisbury line, and Mr. Redfern informs me that he lately saw three examples in the British Museum. He has found one adult larva, which he describes as being light green with red spines.

LUDIA sp. nov.?

♂. Head and antennæ orange-ochreous. Sternum and pronotum bright orange-red, the anterior margin of the latter mouse-grey with some white scales. Abdomen tawny-orange or pale pink, usually with a narrow light-grey band on apical portion of each segment. Eye and legs light mouse-grey.

Fore-wing. Shaped rather like that of male *delegorguei*, but outer half of costa more strongly arched, and hind-margin very deeply concave between nervules 7 and 3. Costa and apex rather densely covered with white scales; basal three-fourths of cell pale tawny-ochreous or light grey; basal area below cell tawny-orange. A broad transverse deep orange-red band (about half as wide as the dark band in *delegorguei* male) edged inwardly and outwardly by a dark linear band, the outer of which is crimson and dotted with white scales. Beyond this band the wing is light tawny-orange between nervules 7 and 3; much paler from 3 to inner-margin. Hyaline mark like that of *delegorguei*, but twice as broad, the upper half deeply bisinuate outwardly and the whole narrowly bounded by dark crimson.

Hind-wing. Pink, with the inner-margin and lower half of outer-margin broadly pinkish-orange or light orange-ochreous. Two narrow sinuous dark grey transverse bands, very faint or obsolete between costa and nervule 3. Between these bands, on an orange-yellow ground is a small discal, very curiously-shaped, black mark, strongly suggestive of a black cat in a sitting posture.

Under-side. Forewing. Costa, to inner edge of hyaline mark and upper part of cell light mouse-grey sparsely covered with white scales. Lower part of cell, basal and lower median areas, bright pink. Just beyond hyaline mark a sub-quadrate orange-red patch between costa and nervule 6. Apex covered with orange, white and greyish-green scales; hind-margin broadly orange-red to nervule 3, narrowly thence to posterior angle.

Hind-wing. Orange-pink or pale tawny-orange. Costa and hind-margin narrowly light mouse-grey. Discal mark grey and rather faint.

♀. Fore-wing shaped like that of female *delegorguei*, but apex more acuminate and hind-margin more concave between nervules 7 and 5. Pattern as in female *delegorguei*. Costa, from base to inner edge of median band, and cell covered with white scales. Base deep tawny-orange. Median transverse band twice as broad as in male, outwardly deep orange-red near costa, below hyaline spot dark tawny-orange. Sub-marginal area pale orange. Hyaline spot larger and broader than in male.

Very rarely the whole wing is coloured exactly as in *delegorguei*, except for a small costal dark red patch above the hyaline spot.

Hind-wing. Shaped as in female *delegorguei*. Colour similar to that of male; the black discal mark is much broader and looks just like a cat standing, and there is a small hyaline spot on its lower

inner extremity. A broad transverse discal band, either outwardly dark purple and inwardly dark pinkish-orange, or entirely dark grey, between lower edge of costal pink and inner-margin.

Under-side. Forewing. Costal and basal areas mouse-grey with long whitish hairs. Inner-margin and basal half of area 2 bright pink. A broad orange-red costal patch just beyond hyaline spot. Apex dark grey with a few white scales. Hind-margin broadly light tawny-orange, with a row of dark orange-red inter-nervular spots, that in area 2 much larger than the others. Hind-wing as in male.

Wing expanse. ♂ 52-58 mm.; ♀ 62-75 mm.

This very pretty *Ludia* may prove to be identical with the East African species described by Hampson several years ago (the description of which I have not seen), or it may be a new species. It does not seem to occur outside the Salisbury district. The larva feeds on *Uapaca kirkiana*, rarely on *Protea sp.*, and is a wonderfully variable caterpillar. I have taken no fewer than ten different varieties of this caterpillar, each of which was quite unlike any of the others. It is covered with long glandular hairs, a slight touch of which causes a very painful blister. In one form there is a very broad dorsal band extending from behind the head to the anal plate, the lateral surfaces are light greyish-olive, and each segment bears eight bright yellow strongly setigerous tubercles. A second form has the dorsal and lateral surfaces black, mottled with small yellow and white spots, and on each segment is a band of eight large contiguous crimson tubercles. A third form is pure white with the rings of tubercles bright orange-red. A fourth, pale creamy-ochreous, with ochreous-brown tubercles and marks, and in a fifth the colours are bright yellow and magenta. I have mislaid the short descriptions I made of the other vars. The moth is double-brooded, the adult larva being found in October or April. When about to pupate it spins a very hard cocoon. The early brood of moths emerges at the end of October, or, more commonly, in November, and the late summer brood in March. The discal mark on the hind-wing is wonderfully suggestive of a black cat, as is remarked by nearly everybody who sees the moth.

HOLOCERA RHODESIENSIS, Janse.

This beautiful moth is fairly common at Salisbury; the larvæ feed on *Cussonia spicata* and are gregarious.

The caterpillar is dimorphic. In the more common form the body and tubercles are black with long downy hairs and an inferior double row of salmon-red marks. In the second form the segments are ringed with black and white. Like the larva of the *Ludia* described above, this caterpillar is an awful thing to touch. The moth emerges between the beginning of December and the latter end of February.

Wing expanse. ♂ 44-58 mm. ; ♀ 68-76 mm.

In addition to the *Saturniidae* enumerated above, we have at Salisbury: *Cirina similis*, *Cirina forda*, *Gyanisa maia*, *Heniocha appolonia*, *Pseudaphelia apollinaris*, *Goodia kuntzei*, *Ludia delegorguei*, *Tagoropsis flavinata*, the curious *Decachorda pomona*, and another small species the genus of which is as yet undetermined. All of these, with the exception of the last, *G. maia* and *D. pomona*, are common in this neighbourhood.

Gonimbrasia zambesina is found at Hartley. *Argema mimosae* occurs throughout Matabeleland and has been taken in the south-west of Mashonaland, but so far it has not been recorded near Salisbury. The fauna of Bulawayo includes, among other species, *Nudaurelia arata*, *Gonimbrasia lelina*, *Heniocha terpsichore* and *H. flavida*.

Finally, in the Melsetter district the following species, all of them unknown to me, have been captured by Mr. C. F. M. Swynnerton: *Imbrasia obscura*, Butl., *Gonimbrasia* near *irisio*, F., *Tagoropsis hanningtonii*, Butl., *Gyanisa ethra*, Westw., and *Brahmaea ocelligera*, Butl.

XVI.—CICINDELA BERTOLONII, Horn, and the
South African members of the BREVICOLLIS Group.

by

C. N. Barker, F.E.S.

WITH PLATES XXV and XXVI.

THE very considerable number of geographical races or forms among the *Cicindela*, of more than one group, which over a very wide area of distribution have a similar pattern of markings in common, has led to much confusion in their synonymy. In none has the difficulty of determination and classification been greater than in the group bearing the *brevicollis* type of pattern. The stability of this pattern, within very circumscribed limits of variation, is evidenced by its wide range over Africa, Madagascar and India. A complete review of all the species and varieties inhabiting the whole of this extensive range is beyond my knowledge to deal with satisfactorily, but within South African limits I propose to try and clear up some of the uncertainty as to identities and affinities of the races found therein, and to claim for one of these recognition as a distinct species. One of the commonest of the forms that occur in Natal has the peculiarity in the males of possessing a secondary sexual badge, in the form of a fascicle of bristles on the fourth joint of the antennæ. As far back as 1901, I wrote expressing my views as to its specific distinctness from *C. clathrata*, Dejean, with which it was then, and I believe still is, confounded; and I proposed for it the name *fasciculicornis*. In 1907, with some further data added, I forwarded my paper to my friend Prof. Poulton, who referred it to Dr. Walther Horn of Berlin. At that time I was unaware of the existence of *C. bertolonii* (Chd. in litt.) Horn, except for a brief reference to it made by Dr. L. Péringuey in his catalogue of the Coleoptera of South Africa* as a variety of *C. monteiroi*, Bates, a species which belongs to an entirely different group. Subsequently, I received from Dr. Horn cotypes of his species, taken in late German East Africa, an examination of which at once demonstrated to me, that my *fasciculicornis* could, at most, claim only to be a variety or sub-species of his *C. bertolonii*.

In the last letter I received from Dr. Horn dated 18th April, 1908, he says: "I have more than once still (sic) thought of the question of

* Trans. Phil. Soc. S. Africa, vol. vii, p. 44.

Cicindela brevicollis, etc., and am comparing all material I can get for it. Quite lately I studied generally feelers of *Cicindelidæ* and found interesting features. Am now making some drawings of them and hope to be able to let you have some of them within some months."

Unfortunately, I have received no further communication from him on the subject.

Dr. Horn in his "Systematischer Index der Cicindeliden" 1905, gives *bertolonii* as a sub-species of *C. brevicollis*, Wied. and his arrangement of sub-species *clathrata*, Dej. immediately below it, leads me to infer that my *fasciculicornis* is the form referred to under that name. In this I think he errs as Dejean makes no allusion to the males of that species possessing the antennal appendages peculiar to *bertolonii* and its sub-species or variety. The true *clathrata* of Dejean is, to my mind, the race of *C. brevicollis* that inhabits most of the country south of the Vaal river and the coastal regions of the Cape provinces beyond the limits of *brevicollis*, which intercalates with it, however, at several points and gradually merges into it at other points.

My aim in this paper is to demonstrate the claims of *C. bertolonii*, Horn to specific rank, as the representative head of a separate section of the *brevicollis* group. Among the S. African *Cicindelæ*, there are two species, very distinct from one another and from *C. bertolonii*, which possess identically similar fascicles of bristles on the 4th joints of the antennæ. These are *C. regalis*, Dej. and *C. capensis*, L. Several species of the allied genus *Ophryodera* have similar male appendages.

It would be difficult to account for the analogy of these widely separated species, shewing identically similar appendages, as secondary sexual characters, except on the supposition that they are ancestral relics and therefore I consider the possession of them of the greatest classificatory importance and sufficient alone to separate *C. bertolonii* Horn as a species distinct from *brevicollis* and its various races.

Discussing the importance of descent in classification, Darwin has the following: "We have no written pedigrees; we have to make our community of descent by resemblance of any kind. Therefore we choose those characters which as far as we can judge are the least likely to have been modified in relation to the conditions of life, to which each species has been recently exposed.

Rudimentary structures on this view are as good as or even sometimes better than other parts of the organization."*

* "Origin of Species," Chap. XIII, p. 170.

I fully recognise the undesirability in classification of relying on sexual characters alone in the determination of species, of which the general facies is so similar as in that of *C. bertolonii*, Horn, race *fasciculicornis*, Mihi, and the true *clathrata* of Dejean.

Distribution and habits are in such relationships of great importance, and further on I propose to provide some data on this subject. First I will refer to some minor points which will aid identification—*C. bertolonii*, Horn, race *fasciculicornis*, Mihi, differs from *C. brevicollis*, Wied. race *clathrata*, Dej. as follows :—

(1) The labrum is longer; more sub-triangularly produced (especially in the females*).

(2) The joints of the antennæ are a little shorter, and the 5th is shorter in relation to the 4th.

(3) The elytra are linear and parallel in both sexes; the females of *clathrata* are always more or less explanate beyond middle and the humeral angles more declivous.

These points of difference are very slight and, unfortunately, are not always strictly reliable, for they are subject to some modifications according to their geographical distribution. There appears to be considerable correlation between the various parts of the structure. Thus, with elongation of prothorax and elytra there is generally an equivalent elongation of the antennæ and labrum, and as a whole the South-east African types are more linear than the western. Per exemplum, the labrum and antennæ of typical *bertolonii* are more elongate than in its sub-sp. *fasciculicornis*. It must be admitted that it is not always possible, without the help of locality labels, to determine the females of *clathrata* from *fasciculicornis*, but fortunately the two forms, to the best of my knowledge, do not occur within near proximity to one another, each having its well defined geographical limits. I make this assertion confidently on the strength of the considerable mass of material, from all parts of S. Africa, that I have had under review, for which I am indebted to the courtesy of the directors of S. African museums and other correspondents.

C. bertolonii, Horn appears to be limited to the Eastern and North-eastern areas from Inhambane northwards. It only differs from its widely distributed sub-species in its larger, slightly more elongate form and in the elytral pattern which, in very variable degrees, shows a disposition to the separation, attenuation or evanescence of the bands and rami that compose it. Examples from Inhambane and Beira are extreme forms in which the rami of the pattern are in some cases reduced to mere dentitions.

* The labrum is invariably more developed in the female than in the male sex among all the forms of the group.

The sub-species or race *fasciculicornis* has a very extended range of distribution in the S. African sub-regions. It inhabits all the well vegetated uplands and valleys east of the Drakensberg, probably the North-east mountainous portion of the Orange Free State; the whole of the Transvaal; the outskirts of Bechuanaland, north of the Vaal River; the eastern portion of Rhodesia, at least as far west as Bulawayo, and the coastal belts of Natal and Zululand, up to and perhaps beyond Delagoa Bay. Throughout this large area it shows only a moderate variation in the width of the dorsal bands and rami of the pattern, which is analogous in every detail with that of *brevicollis-clathrata*. It is worth noting that some examples from Delagoa Bay, which is the nearest point to the range of typical *bertolonii*, show the widest *clathrata*-like pattern of markings.

In habits it differs from *brevicollis-clathrata*, which is purely a riverain species, in that its haunts are spread widely over the open veldt and hillsides as well as the valleys. In the coastal areas of the whole of Natal and at least as far north as Delagoa Bay, it is frequently met with in association with *intermedia*; in the uplands of Natal and Transvaal with *neglecta* and in some riverain spots also with *intermedia*.

As I have said above, I cannot presume to attempt a revision of all the forms of this difficult pattern group, for I have no acquaintance with many of the closely related exotic forms, such as *C. discoidea*. Dej. from North Africa, *C. abbreviata*, Klug. from Madagascar and *C. catena*, F. from India, so I must limit myself to some further suggestions and remarks on the South African types of the various forms. I have under review a very large mass of material, loaned to me through the courtesy of the directors or curators of our South African museums and other correspondents, and the annexed Table of Distribution shows that they represent the forms of the group over a very comprehensive area of the South African sub-region. Unfortunately, I have been unable to obtain the extreme types of *neglecta*, Dej. and its variety (*teste* Horn) *damara* Per. The figure of the latter, on Plate I of the author's "Descriptive Catalogue of the Coleoptera of S. Africa," represents a short broad figure with the general facies of *C. candida*, Dej., near to which it is placed by Dr. Peringuey, but the description contraverts this by the following—"Elytra elongated nearly plane on the upper part." The figure represents a female, which is always more transverse than the male. No mention is made of the supra-orbital striæ being strongly defined, which is an important feature in *neglecta* and *vivida*. The type of *neglecta*, Dej., recorded by Dr. Walther Horn from Sandwich harbour, is probably a broader banded form than those with which I am familiar, from the uplands

of the Transvaal and Natal. Dejean's description of *neglecta* (Sp. Gen. Coleopt. I. p. 114) does not mention the very marked supra-orbital striation which is referred to by Peringuey in his corrected table of the group, vide Trans. Phil. Soc. S. Afr. Vol. X, p. 304, and which I have found a most constant feature in the form which I attribute to *neglecta*. In the author's description of his type, which he records as received from Senegal, he refers to the elytral pattern as follows: "The humeral sub-hamate lunule is connected with the upper end of the juxta-sutural and only very narrowly interrupted at the lower half of the band."

In all the forms of *neglecta*? that I have had under review from Natal, Transvaal and Orange Free State: (1) the hamate lunules and the upper and lower halves of the juxta-sutural bands are widely interrupted and form three distinct elongate spots on either side of the suture. This is one of the points which separates it from *brevicollis*, to which Dejean's typical *neglecta* seems to more nearly approximate. Further compared with *brevicollis* and others of the group. (2) The median rami are given off from the lateral bands with a more diagonal downward trend and are less sharply elbowed near the suture. (3) The lateral margins of the prothorax are slightly rounded and of even width at apex and base and, in all unrubbed specimens, there is a somewhat dense narrow fringe of white decumbent hairs on the lateral margins of the prothorax instead of hairs sparsely distributed over the disc. (4) The labrum is more sub-triangularly produced and less sinuate above the outer angles than in the corresponding sexes of *brevicollis-clathrata*. In this respect they approximate to *C. bertolonii-fasciculicornis* but are generally more inwardly inclined at the outer angles, which makes them appear narrower. (5) The supra-orbital striae are more coarsely developed than in any other form of the group except its nearest relative *vivida*, Boh. The race *intermedia* Klug. also has supra-orbital striation, but it is always finer and less widely extended and the shagreening of both head and prothorax is smoother. The articulations of the antennae are similar to those of *brevicollis-clathrata*, but shorter and stouter than those of *intermedia*. They are, therefore, slightly differentiated from those of *bertolonii-fasciculicornis* whose terminal joints in the males, at least, are shorter.

The pattern of the race *vivida*, Boh., is that of *neglecta*, except that the rami and sub-apical bands are disconnected from one another by lesser or greater intervals of the black ground colour. A considerable percentage have the humeral and median rami narrowly connected, but the sub-apical marginal band is invariably separated by a considerable interval from the median ramus. The juxta-sutural

spots are broader and less elongate than in *neglecta*. Some of the varieties of *C. brevicollis* can hardly be differentiated from those of *vivida* in pattern.

The race as a whole appears to be more robust, and a little more convex than *neglecta*. The fringe of white hairs on the lateral margins of the prothorax is as thick as in *neglecta* and rather more distributed inwardly.

There is no perceptible difference in the labrum and antennæ between this race and *neglecta*.

I am unaware on what grounds Dr. Horn has discriminated between *neglecta* as a sub-species and *vivida* as a variety of *C. brevicollis*. There is no greater approximation to the head of the group, in the one form than in the other. The slightly modified pattern of each is reproduced among the varietal forms of *brevicollis* that occur together in certain local areas of the Cape Peninsular, but the details that separate *neglecta* from *brevicollis* are identically the same as those that separate *vivida* from this species. The geographical range of each of these forms is fairly strictly defined in the South African sub-region, and the only difference in this respect is, as far as I am aware, that *neglecta* has a very extended range over the uplands of the interior, and that *vivida* is more restricted to a comparatively limited eastern, principally coastal, belt. They do not, I believe, occur together in any one locality of their respective ranges.

The difficulty of apportioning the relative values to the affinities of the closely allied and sometimes intermingled forms of this group, leads me to prefer the use of the term *race* rather than that of sub-species and varieties, as being less committal with our present knowledge of their relationships.

C. brevicollis, Wied., the oldest recorded form of the group, whose range is purely south-western (almost exclusively limited to the Cape Peninsular and adjacent districts), is characterised by its abbreviated form, its transverse prothorax and short elytra. In pattern it shows considerable variation, between examples without sub-marginal band as in *vivida*, to others in which this band is narrowly continuous from base to apex. The *vivida*-like form, however, never has the humeral comma-like patch and juxta sutural band widely divided up into three separated spots as in *vivida*. The indumentum of the pattern is pale testaceous yellow. The supra-orbital striæ are absent or very faintly defined. The prothorax and labrum are very short and transverse. In shape the sexes differ more than in the corresponding sexes of *vivida*. The lateral margins of the males are straight and a little explanate beyond middle; the females are amplified about middle.

The transition, from the sub-marginal banded form of *brevicollis* to *clathrata* of Dejean, is by a graduated disposition towards elongation of the prothorax and elytra, and larger size. There is nothing else to separate them. The bands and rami are more broadly developed and their coloration is of a richer yellow. The markings are at their widest in specimens from Bechuanaland, which on account of their very transverse prothoraces are, in this respect, nearer to *brevicollis* than to *clathrata*. As a generalization, the further from the Cape Peninsular, either to the northward or eastward, the species is met with, the greater the disposition to elongation, which however does not go beyond making the prothorax less transverse, without making it longer than broad. The furthest point east I have yet been able to trace the form to, is at Committees Drift on the Great Fish River. Northward it occurs at Bothaville and Parys just south of the Vaal. Outside the S. African sub-region, it occurs at Mossamedes on the west coast and at Fort Machakos in British East Africa. In the S. African area it does not appear to occur north of the Vaal river, being replaced on that side by its analogously patterned ally *C. bertolonii*, Horn, race *fasciculicornis*, Mihi.

The race *intermedia*, Klug., which replaces and at some points overlaps *clathrata* at its eastern limits, has, so far as our South African forms go, sufficient claims to entitle it to specific rank. Dr. Horn, however, considers it a geographical race of *discoidea*, Dej., a North African form which he ranks as a sub-species of *C. brevicollis*, Wied., and with which, unfortunately, I am not familiar. In shape, coloration and in details of pattern it is remarkably stable over its very extended range, which to my knowledge, includes the Fish River near Grahamstown on to the western side, to Beira on the eastern. It also occurs inland on the Upper Tugela River, Natal, and the Victoria Falls, Rhodesia, where it has followed up the courses of the big rivers.

From *clathrata* Dej., *intermedia*, Klug., differs in its narrower more elongate facies. The prothorax is longer than broad, straight sided and of nearly equal width at apex and base. The antennæ are longer and more slender than in any of the preceding forms. The elytra are narrowly parallel in the males and elongate oval in the females. Supra-orbital striation is always present but fine, and the sculpture of head and prothorax is of a finer shagreen. The labrum in both sexes is narrow and moderately sub-triangularly produced. The elytral pattern narrow but complete; of a light testaceous colour, which in life shows dusky and contrasts but little with the light bronze ground. The punctuation of the elytra is coarse and more spaced than in

clathrata and *fasciculicornis*, the two forms with which it sometimes associates. The rami of the dorsal pattern are at their finest in this race and are more sharply angled; the median is given off at right angles to the sub-marginal band and is bisinuate below the elbow; the humeral rami are produced at their termini upwards to a sharp point. The pattern is narrowly margined by dark lines, which give off shades of purple and green in strong lights. The suture is usually glowing metallic, but in some examples with darker ground colour the suture is of a dark metallic blue-green. I have a single example from Malvern, Natal, and another from the Victoria Falls which in the greater width and brighter coloration of the dorsal pattern approximate to that of *fasciculicornis* and *clathrata*, but in shape and other details they are not modified from typical *intermedia*. These are the only cases of slight modification of markings I have met with in this race.

The habits of *intermedia* are those of a moisture-loving insect, preferring low lands and banks of streams. In the rainy season, however, it may be met with in damp locations at some distance from water.

C. differens, Horn, is another distinct race of the group that has a very extended, but a strictly local range. The only time I have personally met with it, was on the sandy banks of the upper Tugela River, running in company with *C. regalis*, Dej. I have, however, received examples from the Umfuli River (Mashonaland), from Waterval (Transvaal), Beira (Mozambique) and Namaqualand. In markings this species approximates towards that of *C. candida*, Boh., inasmuch as the light yellow pigment of the pattern has invaded the larger half of the dorsal area, thus making the dark ground colour appear to be the pattern. This is, however, not always the case, for a female example from Beira has the bands and rami no wider than in *clathrata*. The Namaqua forms are the lightest, and approximate to *C. candida* both in shape and markings. The mandibles are like those of *C. candida*, Boh., being longer and straighter than in any of the preceding forms. The labrum is moderately produced medially, with a conspicuous central tooth in the female. The antennæ and tarsi are longer and more slender than usual, and the chief distinguishing feature is the possession of a dense fringe of white decumbent hairs on either cheek.

In *C. candida*, Boh. the elytral pattern is formed by the black ground which has been largely effaced by the invasion of the yellow pigmented surface. In some examples from the neighbourhood of Algoa

Bay, the black pattern is evanescent, leaving only more or less rounded dots and spots to represent a pattern.* The elytra are short, sub-oval and a little convex in both sexes. The mandibles are long and cross one another at some distance above the labrum. The labrum is short and but little produced medially in either sex. The antennæ are of medium length; the ultimate joint sharply truncated at tip. The prothorax is robust, nearly straight, almost as long as broad and profusely covered with white hairs. It frequents the sand dunes of the foreshore and is not generally found far inland. I have, however, a male of a slightly modified *candida* which is labelled as from Caledon, Cape Province. It is a little more elongate and hardly convex, but in other respects a typical *candida*.

There are four examples (two males and two females) before me of a form from Okahandja, Damaraland, which I tentatively assign to *C. herero*, Per. They agree fairly well in regard to colour and pattern with the author's description, which is far too brief and does not say whether it was taken from one or more specimens, or whether both sexes were represented.

C. candida, Boh. (as a sub-species of which Dr. Horn has placed *C. herero*), shows but little difference in the shape of the sexes. In this form *herero*? the females alone are much amplified medially. The place of their capture which is in the centre of Hereroland, a little north of Windhuk, suggests the probability of its being identical with "*herero*," but, whether it be this form or some other, its affinities lie between *C. differens* Horn and *C. candida*, Boh. This form *herero*, Per? recurs, but slightly modified, at Willowmore and vicinity, Cape Province, from which place I have received, through the courtesy of Dr. Brauns, some twelve examples.

The following is a description of the race *herero*? and the Willowmore form of it. It should be remembered that nearly a thousand miles separate Okahandja from Willowmore, and, so far, I have no record of its occurrence in the intervening country, though I think there is little doubt but that it will be found later in those parts of the Karroo and the fringes of the Kalahari which are traversed by river systems.

Race *herero*, Pér. Mandibles as long as those of *differens* crossing one another at some distance above the labrum. Labrum short sub-quadrate in the males and briefly sub-triangular in the females.

Inter ocular striation absent or very feeble.

Antennæ; male short; articulations beyond the 4th of even width except the ultimate, which is depressed, and spatulate truncate; in the female normal.

* Variety *mixta*, Chd.

Prothorax short transverse, of even width at base and apex; sparsely covered with white decumbent hairs except for the usual small denuded spaces on either side of the median suture. Legs setose; the sides of the abdomen, the sternæ and coxæ densely clothed with decumbent white hairs.

Prothorax and head glowing bronze with bright metallic green interspersed in the depressions and about margins. First four joints of the antennæ, the denuded space below the lateral margins of the prothorax, the suture and the legs above glowing metallic red. The sternal parts and the abdomen bright metallic green.

Elytra; ground colour greenish bronze with coppery reflections; the pale testaceous markings are disposed as in *clathrata*. Prothorax short as in *brevicollis*, but not constricted at base, a little wider and more hairy. Elytra; short, plane above; males nearly straight, a little widened about middle; females sinuate below the shoulders and considerably amplified about middle.

The Willowmore form of this race is a little more elongate, otherwise the shape in either sex is identical with that of the Okahandja form. The marginal bands and rami are finer and in some examples the median rami are attenuated and interrupted near the point of junction with the marginal band.

The juxta sutural band is shorter and sometimes briefly interrupted at the point where it is strangulated.

The ground colours of the prothorax and elytra are the same as in the Okahandja form, but darker and less brilliant.

The distinguishing feature, the spatulate ultimate joint of the male antennæ, is the same, though in some examples it is not so evident as in others.

The races that I have attempted to portray have mostly a very extended range within South African limits, which roughly may be taken as that of the 16th parallel of S. latitude. Over the whole of this area they display remarkably little variation or modification of the distinctive points that characterize them, considering how intimately they are related to one another and how often they overlap.

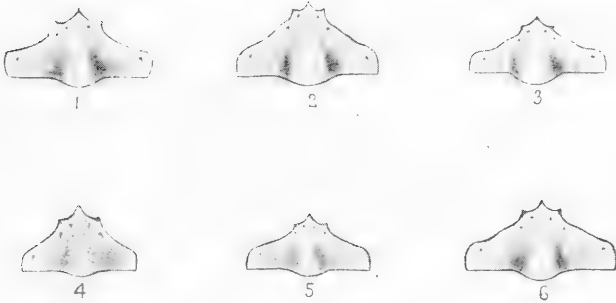
On reference to the Table of Distribution it will be noticed that in many localities two or more of these races occur in association or in near proximity to one another, and yet in these spots the distinctions between them are fully maintained and show no signs of merger. Per exemplum, at Committee Drift on the Great Fish River *clathrata* and *intermedia* have been taken together on the same day and at a spot which is very near the limits of both their respective ranges to the eastward and westward. Nevertheless neither of these races show any modification of their distinctive characters.

The few cases I have noted of irregularity are the following :—

Neglecta shows some instability in the direction of *brevicollis* in some parts of its range, and varies much in size even amongst specimens collected in the same district. Nine examples from the Umvuma River, Rhodesia, are all more transverse than usual ; three (one male two females) are of normal size and six males are veritable dwarfs and in all these the labrum is as short as in *brevicollis*. The supra-orbital striation is a little finer and one of the number, a male, has the median ramus of the pattern given off more rectangularly from the margin than usual. A single male form from Bembesi River above Bulawayo (unfortunately the only example I have received from that locality) in markings, shape and size is a typical *neglecta*, as described by Dejean, who makes no reference to the presence or absence of supra-orbital striation. In this insect it is totally absent, which differentiates it entirely from *neglecta* as I have defined it in this paper.

What appears to be a pauperised and very narrowly patterned *clathrata* (a single example unfortunately), labelled Weenen, Natal (Haviland), which I received with several *neglecta*, points to the possibility of a modified form of this insect having penetrated to the eastward of the Drakensberg.

TEXT-FIG. 1.



LABRA OF FEMALES.

1. *Cicindela bertolonii fasciculicornis*. 2. *C. brevicollis neglecta*. 3. *C. b. clathrata*. 4. *C. b. intermedia*. 5. *C. candida*. 6. *C. differens*.

In the female sex the labra show greater development.

SUMMARY OF CHARACTERS.

ANTENNÆ WITHOUT MALE APPENDAGES.

SUPRA-ORBITAL STIATION ABSENT OR HARDLY APPARENT.

MANDIBLES LONGER, CROSSING WHEN CLOSED AT SOME DISTANCE ABOVE LABRUM.

1. *C. candida*, Boh.*

Antennæ moderately long; ultimate joint broadly truncate.

Labrum short; a little sub-triangularly produced in both sexes.

Form robust; prothorax about as long as broad, of equal width at base and apex; elytra short sub-oval and slightly convex in both sexes.

Pattern; nearly the whole surface of the elytra covered with a yellow indumentum leaving only two (one discal and one postical) zig-zag bands of the black ground to represent a pattern on each elytra.

2. *C. candida*, race *herero*, Per?

Antennæ shorter and articulations stouter, last joint in males spatulate and truncate at tip.

Labrum transverse and but little produced medially.

Prothorax short, broader than long, of nearly equal width at base and apex.

Elytral margins; males nearly straight, a little explanate about middle, females sinuate below shoulder, ampliate medially and broadly rounded to apex.

Bands and rami of pattern moderately broad, pale testaceous with narrow dark edgings prismatic in strong light. Ground colour green and coppery bronze; that of prothorax bright green and coppery bronze. Legs and cheeks glowing metallic red.

* The variety *mixta*, Chaudoir, represents forms in which the ground colour has been still further encroached upon, leaving only disconnected spots instead of irregular bands.

3. *C. candida*, race *herero*, form *braunsi*, Mihi.

Mandibles a trifle shorter than in *herero*?

Labrum, antennæ and contours identical, elytra a little more elongate.

Pattern, the bands and rami narrower and in some examples the median rami are narrowly disconnected from the sub-marginal bands and the humeral rami are evanescent.

Ground colour of elytra darker greenish-bronze. Coloration generally as in *herero*? but less brilliant.

4. *C. differens*, Horn.

Antennæ long, slender, last joint narrowly truncate. A dense fringe of white hairs on either cheek.

Labrum longer, male moderately, female considerably sub-triangularly produced and a little convex.

Form, more or less elongate, elytral margins; males nearly straight, females a little ampliate and both broadly rounded to apex.

Prothorax about as long as broad, slightly rounded laterally and of nearly even width at base and apex.

Pattern, bands and rami very broad pale testaceous.

MANDIBLES NORMALLY ELONGATE.

5. *C. brevicollis*, Wied.

Antennæ normal, not broadened at tip.

Labrum and prothorax short, the latter a little more constricted at base than in preceding races.

Form more transverse and less depressed, sexual differentiation of contours the same as in *herero*, but females less sinuate below shoulders.

Pattern variable, lateral bands sometimes wholly absent, sometimes narrowly connecting the humeral with the median rami, but leaving a more or less wide interval between the latter and the postical bands, or with narrow sub-marginal bands from shoulders to apices.

The humeral comma-shaped basal patch is usually connected with, but occasionally narrowly divided from the juxta-sutural band below it.

The ground colour is very dark bronze, showing up the yellowish-white pattern in sharp contrast.

6. *C. brevicollis*, race *clathrata*, Dejean.

Larger, more elongate and more depressed than *brevicollis*.

Prothorax less transverse, about as long as broad, wider at apex than at base.

Elytral margins straight, and in both sexes more or less explanate beyond middle.

Pattern, sub-marginal and postical bands broad and always connected, the humeral comma-shaped patch continued as a juxta-sutural band a little strangulated about middle, the rami more or less broadly developed. Colour of markings a warmer yellow.

SUPRA-ORBITAL STRIÆ ALWAYS PRESENT.

7. *C. brevicollis*, race *intermedia*, Klug.

Labrum narrow, sub-triangularly elongate and convex in both sexes.

Antennæ very long and slender.

Supra-orbital striæ and shagreen of head and prothorax very fine.

Prothorax longer than broad, sides straight and hardly constricted basally.

Elytra; males long narrow, very little widened beyond middle; females elongately sub-oval.

Bands and rami of pattern very narrow, rami rarely evanescent.

Ground colour usually dull light bronze, sometimes darker with narrow dark edgings showing purplish in bright light; markings in life dull testaceous, brighter in well dried specimens.

Shows very little variation throughout its range.

SUPRA-ORBITAL STRIÆ COARSE, INNER OCULAR SPACE
PLICATE.8. *C. brevicollis*, race *vivida*, Boh.

Antennæ medium length and normal.

Form robust a little convex, slightly ampliate about middle in both sexes.

Sub-marginal band of pattern absent or very narrowly connecting the humeral and median rami. The median rami given off more obliquely from sides than in preceding species. Basal comma-like patch and juxta-sutural band broken up into three widely disconnected oval spots.

9. *C. brevicollis*, race *neglecta*, Dejean.

Antennæ as in *vivida*.

Form variable, but usually narrower, more elongate and more depressed.

Prothorax as in *vivida*, a little rounded, laterally margined with a fringe of decumbent white hairs.

Elytral pattern narrow, but variable in width*, sub-marginal bands connect the rami and postical bands. Median rami narrow, but little elbowed and given off diagonally downwards instead of rectangularly from the sub-marginal bands. The basal and juxta-sutural spots as in *vivida* but narrower and more elongate.

Size varies much.

ANTENNÆ WITH A FASCICLE OF BRISTLES ON THE
4TH JOINT OF ALL MALES.

SUPRA-ORBITAL STRIATION ABSENT OR NEARLY.

10. *C. bertolonii*, Horn.

Labrum elongate sub-triangularly produced, convex and with median tooth large; less developed in males as usual.

Form parallel-sided in both sexes; females a little more transverse than males.

Prothorax as long or longer than wide, sides straight, a little wider at apex than at base.

Size larger but variable.

The bands and rami of pattern narrow, some or all of the rami often evanescent. The juxta-sutural band divided into two elongate spots.

11. *C. bertolonii*, race *fasciculicornis*, Mihi.

Labrum as in *bertolonii* but less extremely developed.

Size smaller.

Form as in *bertolonii* but generally shorter relatively.

* The S.W. African races, including the form *damara*, Pér., are unknown to me, and therefore are not included here.

Pattern, bands and rami usually broad but sometimes finer.

The humeral comma-shaped patch and juxta-sutural band usually connected, occasionally narrowly divided at the point where strangulated.

Shows but little variation over a very extended range.

It is almost undistinguishable from *clathrata* in the females, but the epipleural purplish border is generally wider and brighter.

TABLE OF DISTRIBUTION,

based upon material examined by the Author.

C. candida, Boh., including var. *mixta*, Chd.

Natal coast, Algoa Bay,
East London, Knysna,
Caledon.

The variety *mixta* from Algoa Bay, I have not taken in Natal. The Caledon form is less ovate and plane above, and the antennæ are shorter.

race *herero*, Pér.

Okahandja (Damaraland),
Willowmore (Cape Province).

Willowmore form, *braunsi*, Mihi. 12 examples, have the bands and rami of pattern narrower and ground darker.

C. differens, Horn.

Beira, Upper Tugela (Natal)
Waterval (Transvaal), Um-
fuli River (Rhodesia), and
Namaqualand.

Markings vary from black ground with light testaceous bands and rami, as in *clathrata*, to a light ground with narrow black markings as in *candida*. The Namaqualand forms are lightest.

C. brevicollis, Wied.

Cape Peninsular, Stellen-
bosch, Kraaifontein, Touws
River (Cape Province).

Both with and without marginal bands and intermediate. The bands and rami are light testaceous.

race *clathrata*, Dej. (intermediate).

Colesberg, Bushmanland,
Specktakel.

Have the broad bands of a more yellow colour, but the short thorax is that of *brevicollis*. The Colesberg examples are as small as *brevicollis*, the Bushmanland examples as large as typical *clathrata*.

race *clathrata*, Dej. (typical).

Bothaville, Parys, Smithfield (O.F.S.), Algoa Bay, Uitenhage district, Albany to Great Fish River, Kowie, Addo, Sunday River (Cape Province).

These examples have the thorax about as long as broad, vary in width of pattern, those from Bothaville narrowest pattern, with dark green ground colour instead of black.

race *intermedia*, Klug.

Committees Drift, Great Fish River, East London, Port St. Johns, Natal Coast, Umfongosi (Zululand), Delagoa Bay, Beira, Upper Tugela (Natal), Victoria Falls (Rhodesia).

Shows remarkably little variation. Confined principally to coastal areas, but follows the large rivers inland.

race *neglecta*, Dej.

Pretoria, Waterberg, Platriver, Lichtenberg (Transvaal), Bothaville, Heilbron (O.F.S.), Weenen and Umvoti counties, Maritzburg (Natal), Umvuma River (Rhodesia).

Varies considerably in size. Examples from Pretoria district largest and most elongate.

race *vivida*, Boh.

Delagoa Bay, Beira, Umvoti (Rhodesia).

Varies little, some examples have the upper rami of pattern narrowly connected. Penetrates but a comparatively short distance inland to the westward.

C. bertolonii, Horn.

Inhambane and Beira.

Outside South African limits occurs near mouth of Rovuma River, Mozambique Province, and ex-German East Africa. Specimens from Inhambane and Beira have the bands and rami often evanescent.

race *fasciculicornis*, Mihi.

Pudimöe (Bechuanaland), Pretoria district, Waterberg, Blauwberg, Zoutzbanberg, Lydenburg, Barberton, Kaapmuiden, Tzaneen, Plaatriver, Methlapitsi, White River (Transvaal), Natal coastal areas), Zululand, Delagoa Bay, Bulawayo (Rhodesia).

Has an enormous range over the Eastern side of South Africa, and varies but little.

N.B.—I have not thought it advisable, at present, to interfere with Dr. Horn's apportionment of sub-specific rank to *hereo* as a race of *candida* and to *intermedia* as a race of *brevicollis*, but in my opinion both these forms are distinct species. *Intermedia* we know is found in association with *brevicollis clathrata* in some, and with *brevicollis neglecta* in other localities, and it is against reason that two or three sub-species of a species should thus occur.

CORRIGENDUM.

The opportunity may be taken of correcting an unfortunate mistake in the description of *Arsinoe o'neili* in my paper "On some rare beetles in the Barker Collection of the Durban Museum," which appeared in the previous part of these Annals, page 114. Line 10 should read:—

Elytra deeply punctate, striate and intervals punctured.

EXPLANATION OF PLATES XXV AND XXVI,

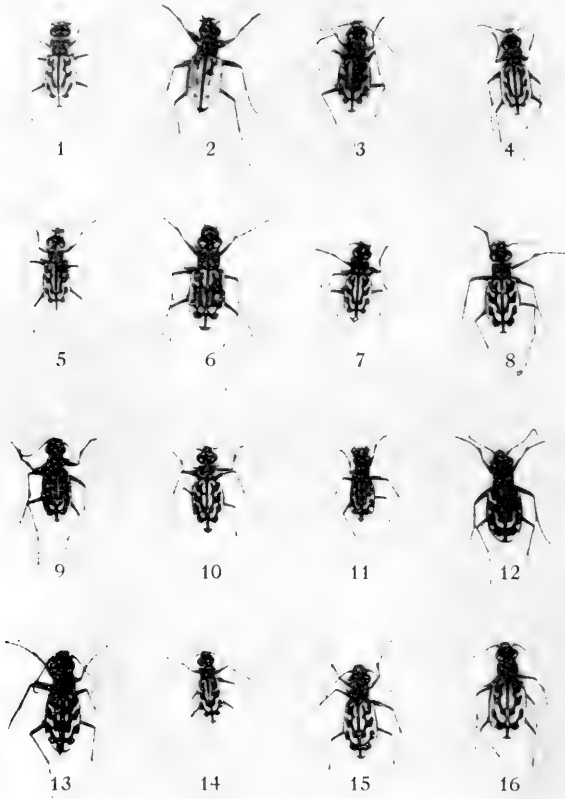
illustrating paper by C. N. Barker on
 "Beetles of the *Cicindela brevicollis* group."

PLATE XXV.

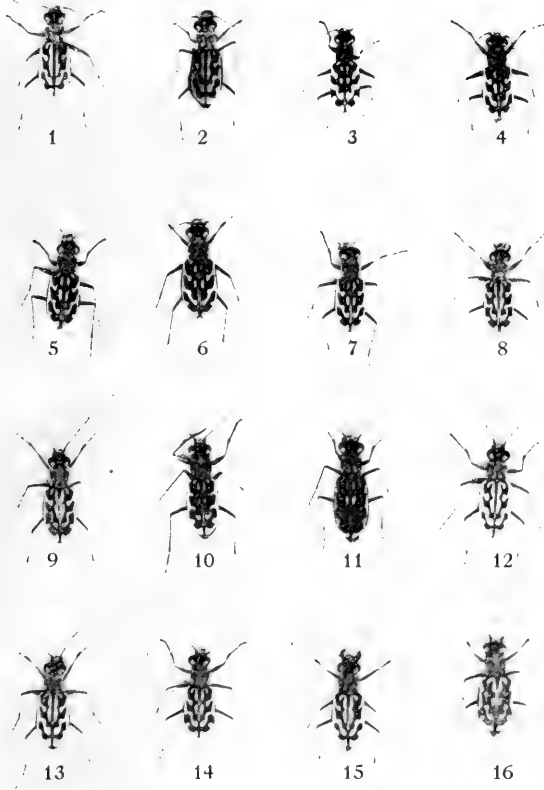
1	<i>Cicindela candida</i> , Déj.	♀		Durban, Natal.
2	"	"	var. <i>mixta</i> , Chd.	♂ Algoa Bay, Cape Province.
3	"	"	"	♂ Knysna, Cape Province.
4	"	"	"	♂ Caledon, Cape Province.
5	"	<i>differens</i> , Horn.	♂	Umfuli River, Rhodesia.
6	"	"	♀	Tugela River, Natal.
7	"	<i>candida</i> , Déj., race <i>herero</i> , Pér.?	♂	Okahandja, Damaraland.
8	"	"	"	♀ " "
9	"	"	"	form <i>braunsi</i> , Mihi. ♂ (Willowmore
10	"	"	"	♀ Cape Prov.
11	"	<i>brevicollis</i> , Wiedm., typical	♂	Cape Town.
12	"	"	♀	Cape Town.
13	"	"	race <i>vivida</i> , Boh.	♀ Delagoa Bay.
14	"	"	variety	♂ Cape Town.
15	"	"	"	♀ Stellenbosch, Cape Province.
16	"	"	transitional to race <i>clathrata</i> , Déj.	♀ Bechuanaland, Cape Province.

PLATE XXVI.

1	<i>Cicindela brevicollis</i> , Wiedm., race <i>clathrata</i> , Déj.	♂		Blue Cliff, Cape Prov.
2	"	"	"	♀ Bothaville, O.F.S.
3	"	"	race <i>vivida</i> , Boh.	♂ Delagoa Bay, P.E.A.
4	"	"	race <i>neglecta</i> , Déj.	♂ Estcourt, Natal.
5	"	"	"	♂ Weenen, Natal.
6	"	"	"	♀ Pretoria, Transvaal.
7	"	"	"	♂ Lydenburg, Transvaal.
8	"	"	race <i>intermedia</i> , Klug.	♂ Pinetown, Natal.
9	"	"	"	♀ 'Mbogotwini River.
10	"	<i>bertolonii</i> , Horn.	♂	Inhambani, Lorenzo Marques.
11	"	"	♀	Beira, Lorenzo Marques.
12	"	"	race <i>fasciculicornis</i> , Mihi.	♂ Gilletts, Natal.
13	"	"	"	♀ Johannesburg.
14	"	"	"	♂ Pinetown, Natal.
15	"	"	"	♀ Durban, Natal.
16	"	"	"	♀ Durban, Natal.



Beetles of the *Cicindela brevicollis* group.



Beetles of the *Cicindela brevicollis* group.



XVII.—Natal Bees

by

T. D. A. Cockerell, University of Colorado.

MORGANIA CHUBBI, sp. nov.

♀. Length about 6·5 mm., expanse 13·5 mm.; black, including legs, mandibles, antennæ and tegulæ, except that the fourth antennal joint is red on outer side; wings long, dusky hyaline, the apex broadly infuscated, stigma and nervures black; face with appressed silver-white hair; antennal basin depressed; front strongly punctured, but shining between the punctures; mesothorax shining, very strongly but not very densely punctured; scutellum elevated, bigibbous, strongly punctured; metathorax bare in middle, but laterally clothed with white hair; pleura with a very broad transverse band of silvery hair, prolonged downward anteriorly and posteriorly; tegulæ large; tibiæ and tarsi with silvery hair; spurs ferruginous; abdomen sub-globose, shining, the first segment impunctate; a patch of silvery hair on each side of first segment, and hind-margins of second to fourth with bands of silvery hair, that on second broadly interrupted in middle; pygidial plate coarsely punctured and irregularly longitudinally ridged.

Bellair, Natal, 13th January, 1919, "visiting hole in vertical bank on side of road" (E. C. Chubb).

MORGANIA BARKERI, sp. nov.

♀. Length about 7·5 mm.; black, with the apical half of mandibles dark reddish. Similar to *M. chubbi*, but differing thus: face narrower; antennæ somewhat longer, entirely black, the joints very distinct; mesothorax more finely and closely punctured; metathorax hairy almost to middle; pleura thinly hairy, but without a distinct transverse band; tarsi longer; spurs black; wings uniformly fuliginous; second recurrent nervure joining second sub-marginal cell some distance before end (meeting second transversocubital in *M. chubbi*); abdomen rather narrower.

Durban, Natal, 9th March, 1918 (C. N. Barker).

The species of *Morgania* are described by Friese under *Omachtes*, but F. Smith's generic name *Morgania* has priority. The species now described differ from the majority by the black abdomen and legs.

M. gabonensis (Vachal) is a somewhat similar insect, nearest to *M. chubbi* by the colour of the wings and the venation. It has the anterior legs and the base of the venter more or less dilute reddish. Unfortunately, Vachal's unique type was without a head.

The species of *Morgania* at present known, all African, are as follows:

<i>M. dichroa</i> (Spinola).	<i>M. graenicheri jenseni</i> , Friese.
syn. <i>carnifex</i> , Gerstaecker.	<i>M. appletoni</i> , Cockerell.
<i>M. gerstaeckeri</i> (Schulz).	<i>M. capicola</i> (Strand).
syn. <i>dichroa</i> , Smith.	<i>M. nigrithorax</i> , Strand.
<i>M. gabonensis</i> (Vachal).	<i>M. nigripes</i> (Friese).
<i>M. histrio</i> (Gerstaecker).	<i>M. capensis</i> (Friese).
<i>M. villosa</i> (Friese).	<i>M. abessinica</i> (Friese).
<i>M. graenicheri</i> (Brauns).	<i>M. rufipes</i> (Friese).

M. graenicheri is a comparatively large species, 12 mm. long. All these insects are parasitic, but so far as I know, their biology has not been elucidated.

ANTHOPHORA BIPARTITA, Smith.

Females collected by A. L. Bevis, 6th and 20th June, 1916, at Durban.

The pale stripe on the clypeus may be reduced to a spot just above the margin. There is a little white or pale hair on each side near the end of the abdomen. The species was described from Natal.

COLLETES, Latr.

Nine specimens of South African *Colletes* before me belong to five different species, none of which agree with any published descriptions. One species was sent to me by Dr. H. Brauns as *C. martini*, Vachal, but I cannot discover that Vachal published it, and it is not mentioned in Friese's great work on African bees.

The species may be separated thus:

Hair of mesothorax white or whitish, contrasting with the orange-fulvous of scutellum *martini*.

Hair of mesothorax (♀) pale ochraceous mixed with fuscous, that of the scutellum similar; first abdominal segment strongly punctured *fusconotus*.

Hair of mesothorax and scutellum (♀) ferruginous mixed with fuscous; first abdominal segment polished and feebly punctured *seminitens*.

Hair of mesothorax and scutellum ferruginous (♂); first abdominal segment strongly punctured 1.

1. Basal area of metathorax with a strong transverse keel
marleyi.

Basal area of metathorax without such a keel *durbanensis*.

COLLETES MARTINI, sp. nov.

♂ (type). Length about 9 mm.; black, the mandibles at apex, last joint of tarsi, and base of hind basitarsi red; head and thorax with abundant long pure white hair, except that on scutellum and post-scutellum it is clear orange-ferruginous; head very broad, facial quadrangle broader than long; antennæ black, the flagellum dark coffee-brown beneath, flagellar joints much longer than broad; malar space conspicuously longer than broad; mesothorax closely and rather finely punctured, the surface hard to see because of the hair; scutellum anteriorly bare, polished and impunctate; area of metathorax with extremely short basal plicæ, followed by a rugose area, but the apical part smooth and polished; tegulæ testaceous; wings clear hyaline, stigma ferruginous, nervures fuscous, second submarginal cell very broad; legs with white hair on outer side, anterior tibiæ and all the tarsi with pale golden on inner; abdomen with the first two segments closely and finely punctured; first segment thickly covered with long ochreous-tinted hair, the apical band pale reddish, white at sides; segments 2 to 5 with very dense broad white hair-bands.

♀. Length about 11 mm.; the general appearance like the male; middle joints of flagellum a little broader than long; malar space large, slightly broader than long; vertex with pale fuscous hair; hair of mesothorax slightly yellowish, mixed with very pale fuscous, but still contrasting with the orange-fulvous of scutellum; hind legs mainly red, and the other legs with red stains; first abdominal segment with dense creamy-white hair, the apical band narrow; second segment with similar but much shorter hair; segments 2 to 5 with broad white apical bands; segments 4 and 5 with scattered black hairs before the bands.

Willowmore, Cape Colony (Dr. H. Brauns). Male, 15th March, 1903; female, 15th October, 1899. Apparently nearest to *C. schultzei*, Friese, but smaller, and with very conspicuous abdominal bands. *C. fasciatus*, Smith has orange abdominal bands.

COLLETES FUSCONOTUS, sp. nov.

♀. Length about 9.5 mm.; black, robust, mandibles obscurely reddened in middle, hind tarsi stained with red; hair of head and thorax greyish-white, dorsally pale ochreous, strongly mixed with fuscous on vertex, mesothorax and scutellum; clypeus densely rugosopunctate all over; labrum smooth and polished, the median pit very small; malar space very short, much more than twice as broad as long; flagellum short, dark reddish beneath; sides of vertex shining, but deeply excavated by the broad foveæ; mesothorax densely punctured, except the posterior middle; area of metathorax coarsely reticulate, the apical part polished; tegulæ rufotestaceous; wings brownish-hyaline, stigma ferruginous, nervures fuscous; middle femora produced to a sub-basal triangular tooth beneath; first four abdominal segments with broad greyish-white hair-bands; first segment hairy at base and sides, shining strongly and rather closely punctured; second segment minutely and densely punctured; hind margins of segments reddish.

Winklespruit, Natal, 31st December, 1918, two (C. N. Barker).

Known by the black legs, colour of hair on thorax, and short malar space. It runs out at 3 in Friese's table. *C. negligendus* (Dalla Torre), from Natal, has testaceous nervures and black stigma.

COLLETES DURBANENSIS, sp. nov.

♂. Length, 8.5-9 mm.; black, only the mandibles and tarsi red apically; head and thorax above with clear orange-fulvous or ferruginous hair, otherwise with pale ochreous tinted hair, white on cheeks; antennæ black; malar space short, about twice as broad as long; mesothorax and scutellum dull, the latter with a shining line in middle; area of metathorax coarsely reticulate, without a transverse keel; tegulæ ferruginous; wings hyaline, faintly dusky, nervures fuscous; legs with pale ochreous-tinted hair; spurs pale reddish; first abdominal segment very distinctly punctured, with thin long pale ochreous hair all over; second segment with fine but distinct punctures; segments 1 to 5 with dense light ochreous apical hair-bands; apical segment broadly rounded.

Durban, Natal, 11th March, 1917, and 1st April, 1917 (E. C. Chubb).

Distinguished from *C. malma* (Cameron) by the ochreous hair-bands and the almost entirely black tarsi.

COLLETES MARLEYI, sp. nov.

♂. So similar to *C. durbanensis* that I at first thought it identical, but readily distinguished by the very strong transverse keel on the metathoracic enclosure, the clearer (yellow) hair of thorax above, and the broader abdominal hair-bands. The ventral abdominal segments are fringed with very abundant and long hair, whereas in *C. durbanensis* they have dense short even fringes.

Krantz Kloof, 4th April, 1917 (H. W. Bell Marley).

COLLETES SEMINITENS, sp. nov.

♀. Length about 9 mm.; black, mandibles with a red band, tarsi red only at apex; hair of head and thorax pale ochreous, dorsally ferruginous mixed with fuscous; clypeus densely punctured; labrum smooth, without ridges; malar space very short, at least twice as broad as long; flagellum faintly reddish beneath, the last joint distinctly so; mesothorax and scutellum dull, the latter with a smooth median line; area of metathorax above reticulate, below smooth, with a moderate transverse keel; tegulae rufous; wings brownish-hyaline, nervures fuscous; middle femora with a prominent sub-basal tooth beneath; legs with pale ochreous hair, middle and hind basitarsi with a brilliant copper-red apical brush; abdomen thinly hairy, with pale hair-bands; first segment polished, with very minute inconspicuous punctures, more distinct at the sides; second segment extremely finely and densely punctured.

Durban, Natal, 11th March, 1917 (E. C. Chubb).

Possibly the female of *C. durbanensis*, but the base of metathorax differs, and the first abdominal segment is remarkably smooth and feebly punctured in the middle. For the present they must be regarded as distinct.

SPHECODES AFRICANUS, Friese.

Females, Stella Bush, Durban, 31st December, 1916, 2nd January, 1917. Both collected by C. N. Barker. Durban, 11th March, 1917 (E. C. Chubb).

Lower Umkomaas, 18th December, 1914 (L. Bevis).

Male, Durban, 31st March, 1913 (W. Haygarth).

S. africanus was described by Friese in 1908 from a single female from Ukami in Usambara. In 1911 Strand recorded a female from Delagoa Bay, and as it differed somewhat from Friese's type, he called it var. *delagoæ*, Strand. The two forms were separated thus :

Tegulæ black or nearly so, with a yellow spot anteriorly ; thorax black ; antennæ black. . . . *africanus*, Friese.

Tegulæ pale yellowish anteriorly and brownish-yellow posteriorly, only the inner side posteriorly blackish ; lateral margins of mesothorax, prothorax and tubercles red ; scape and under-side of flagellum reddish *delagoæ*, Strand.

The Natal females have reddish tegulæ, with a pale area in front. The antennæ are black. Only one, that marked "Lower Umkomaas," has the tubercles and upper part of prothorax bright ferruginous, and the lateral areas of metathorax suffusedly dark reddish.

The male, not before known, is about 9 mm. long ; wings fuliginous, but paler than in the female ; mandibles red, simple (with an inner tooth in female) ; face with long white hair, but lower half of the densely punctured clypeus bare ; first abdominal segment black, with the posterior margin very broadly red ; second red ; third red, with a large black stain in middle ; remaining segments black, but apical plate red ; legs black, the knees red and the anterior tibiæ red in front. The antennæ are black, the flagellum moniliform. This is considerably larger than the male of *S. capensis*, Cameron, and also differs by the darkened wings and greater amount of red on abdomen. The thorax shining between the punctures and the darkened wings separate it from *S. punctatus*, Sichel.

The Natal specimens are not precisely typical *africanus*, nor are they typical *delagoæ*. Possibly a third race is indicated ; but since the forms previously described are known from single specimens, and our material shows the insect to be variable, it is impossible at present to be sure that we are dealing with races rather than individual variations. Superficially, these insects resemble those species of *Nomia* in which the abdomen is red.

XYLOCOPA CARINATA FULVOPILOSA, Friese.

♂. Bluff, Durban, 8th November (C. N. Barker).

XYLOCOPA RUFITARSIS, Lepeletier.

♀. Impendhle, January, 1916 (E. C. Chubb). The mandibles have a tubercle on the upper-side toward the base, and the fourth abdominal segment has a black opaque mark on each side basally. The wings are somewhat more pointed than in *X. carinata*, and the punctures of the mesothorax are smaller. The flagellum is black.

MESOTRICHIA BEVISI, Cockerell.

The type has only two sub-marginal cells, but two males now before me, collected by Mr. Bevis, at Umbilo, have three sub-marginals. Evidently the insect varies in this respect, but the other characters amply distinguish it.

CROCISA CALCEATA, Vachal.

♀. Bellair, Natal, 13th January, 1919 (E. C. Chubb).

CROCISA CYANESCENS, sp. nov.

♀ (type). Length about 12 mm.; markings very pale blue; scutellum deeply incised, but sides of incision flexuose; long white hair projecting from beneath incision; disc of scutellum with black hair, but no light spots; axillæ with spots of light hair; hind femora not toothed; hair-markings on each side of first abdominal segment U-like; bands on each side of second segment thick, a little longer than the interval between them, and with no lateral anterior lobe; hind tibiæ with less than basal half white-haired; hind basitarsi white-haired posteriorly; ventral surface of thorax with white hair. General appearance and markings as in *C. calceata*, but larger, with the marginal cell distinctly longer, scutellum more deeply incised.

♂. Length about 12 mm.; axillar spots very small; rather more than basal half of hind tibiæ light-haired; end of abdomen with two prominent, widely separated teeth, much better developed than those of *C. calceata*. Scutellum and mesothorax shining.

Type from Malvern, Natal, 16th January (Barker). Male from Umbilo, 22nd March, 1913 (A. L. Bevis).

This looks just like the Indian *C. ramakrishnae*, Ckll., the only obvious superficial difference being that the wings are not so dark.

It is not quite certain that the male belongs to the same species, but without more material it seems hazardous to separate it. The character which especially suggests doubt as to identity is the smooth shining scutellum, that of the female being conspicuously black haired. If the male is separable, it must represent another new species.

CROCISA CANDIDA, sp. nov.

♀. Length 10-12 mm.; markings pure white; margin of scutellum \sim -like; long white hair from behind notch; disc of scutellum with short black hair, but no light spots; axillæ with white hair on margin next to scutellum; anterior wings very dark; hind femora not toothed; hind tibiæ with white hair on basal two-thirds; hind basitarsi with thin white hair on outer side; marks at sides of first abdominal segment C-like, the interval between the apical bands at least as great as length of bands; bands of second segment very broad, broadest laterally, where the anterior margin is obtusely more or less angular; sternum not hairy, but small tufts of white hair on the coxæ. In Friese's table runs near *C. meripes*, Vachal, and *C. calceata*, Vachal, from which it is easily separated by the pure white hair. There is a strong general resemblance to *C. braunsiana*, Friese, but the interval between the abdominal bands is greater, and the scutellum is not spotted. It is also related to *C. alfkeni*, Brauns, from Willowmore, but with darker wings. It is possibly a local race of *C. alfkeni*, the ♀ of *C. alfkeni* is 7 to 10 mm. long.

Bellair, Natal, 13th January, 1919 (E. C. Chubb). Two specimens.

PROSOPIS BRAUNSI, Alfken.

Dr. Brauns (litt., 1918) now states that *P. braunsi* is a valid species. He adds that it varies in the red on base of abdomen; the red may even be absent. The colour of the legs also varies. Dr. Brauns saw the type of *P. rubriplagiata*, Cameron, and found it to be *P. heraldica*, Smith.

PROSOPIS HERALDICA, Smith.

♀. Umbilo, February, 1917 (L. Bevis); Durban, 31st July, 1916 (C. N. Barker).

**XVIII.—Fishes from Durban, Natal,
collected by Messrs. H. W. Bell Marley and Romer Robinson,**

by

C. Tate Regan, M.A., F.R.S.

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COLLECTIONS of fishes from Durban received in 1918 include examples of seven new species and of sixteen others not previously recorded from Natal.

Family CLUPEIDÆ.

Engraulis holodon, *Bouleng.*

Family MURÆNIDÆ.

Gymnomuræna xanthoptera, *Bleek.*

Family SYNGNATHIDÆ.

Syngnathus spicifer, *Rüpp.*

Family HOLOCENTRIDÆ.

Holocentrum diadema, *Lacép.*

Holocentrum sammara, *Forsk.*

Family SERRANIDÆ.

Epinephelus cæruleopunctatus, *Bloch.*

Epinephelus fuscoguttatus, *Rüpp.*

Family CHILODIPTERIDÆ.

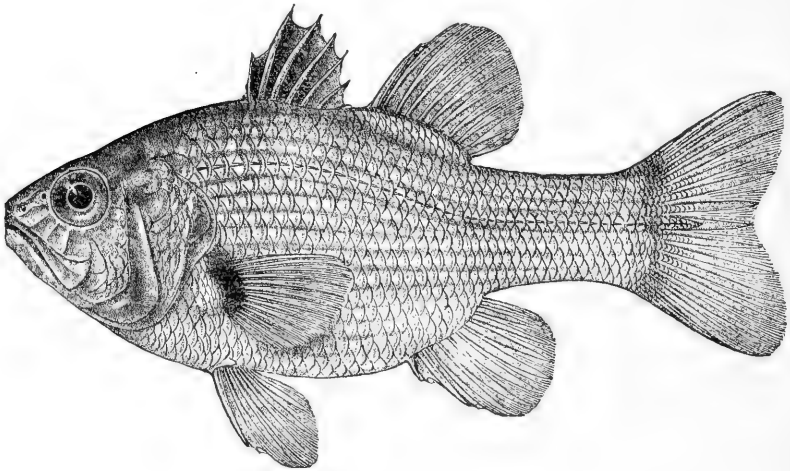
Apogon bifasciatus, *Rüpp.*

Apogon polylepis, *sp. nov.*

Depth of body $2\frac{2}{5}$ to $2\frac{3}{5}$ in the length, length of head $2\frac{2}{3}$ to 3. Snout as long as diameter of eye, which is $3\frac{2}{3}$ to 4 in length of head; interorbital width $3\frac{1}{3}$ to $3\frac{1}{2}$ in length of head. Jaws equal anteriorly;

maxillary extending to below posterior $\frac{1}{4}$ of eye. Præopercular margin finely serrated; ridge entire. 13 or 14 gill-rakers on lower part of anterior arch. 36 to 38 scales in a longitudinal series, 4 or 5 between middle of spinous dorsal and lateral line. Dorsal VII–VIII, I 9–10; first spine minute, third and fourth longest, $\frac{2}{5}$ length of head; eighth spine small or absent; longest soft rays more than $\frac{1}{2}$ length of head; margin of soft fin convex. Anal II 8–9. Pectoral $\frac{2}{3}$ length of head. Caudal emarginate with rounded lobes. Caudal peduncle $1\frac{1}{2}$ as long as deep. Dark longitudinal stripes on body at the edges of the series of scales; spinous dorsal blackish; a dark spot at base of pectoral.

TEXT-FIG. 1.



APOGON POLYLEPIS.

A specimen of 190 mm. from Durban, collected by Mr. H. W. Bell Marley, and another of 120 mm. from Kurrachee. The latter had been determined as *A. noordzieki*, Bleek., a species that is distinguished by having only three series of scales between lateral line and spinous dorsal, the third dorsal spine longer than the fourth, no dark spot at base of pectoral, etc.

Family CARANGIDÆ.

Scombroides lysan, *Forsk.*

Family POMADASIDÆ.

Diagramma griseum, Cuv. & Val.

A specimen with the coloration of *D. reticulatum*, Günth., which is a synonym of *D. griseum*.

Diagramma chubbi, sp. nov.

Depth of body $2\frac{2}{3}$ in the length, length of head $3\frac{1}{4}$. Diameter of eye 3 in length of head, a little longer than snout or interorbital width; maxillary barely reaching vertical from anterior margin of eye. 22 gill-rakers on lower part of anterior arch. 110 scales in a longitudinal

TEXT-FIG. 2.

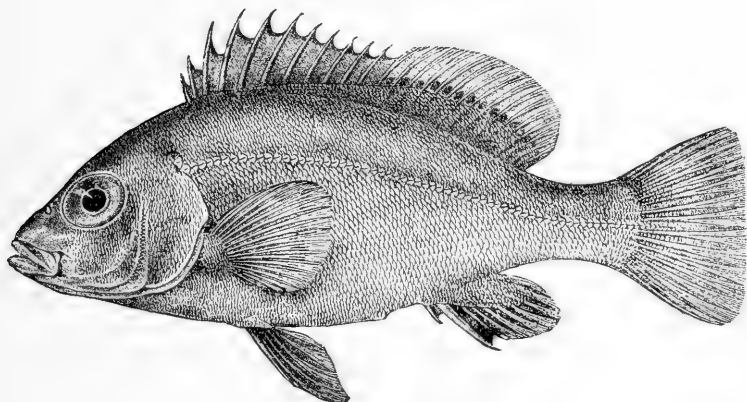


DIAGRAMMA CHUBBI.

series, 15 between spinous dorsal and lateral line; 60 pierced scales in lateral line. Dorsal XI 16; fourth to sixth spines longest, $\frac{2}{5}$ length of head, a little shorter than longest soft rays; margin of soft fin convex. Anal III 8; second spine a little longer than third, nearly $\frac{1}{2}$ length of head. Pectoral $\frac{2}{3}$ length of head; pelvics reaching vent. Caudal truncate. Caudal peduncle longer than deep. Greyish; a series of dark spots along middle of soft dorsal.

A single specimen, 123 mm. in total length; collected by Mr. H. W. Bell Marley. Named in honour of Mr. E. C. Chubb, Curator of the Durban Museum.

Family MULLIDÆ.

Upeneoides tragula, *Richards*.

Family SIGANIDÆ.

Siganus albopunctatus, *Schleg*.

Family GOBIIDÆ.

Gobius albopunctatus, *Cuv. & Val*.

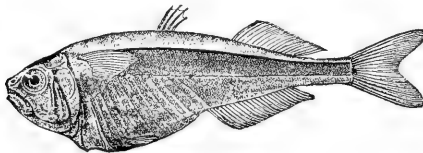
Gobiosoma diadematum, *Rüpp*.

Family ATHERINIDÆ.

Iso natalensis, *sp. nov.*

Depth of body $3\frac{1}{4}$ in the length, length of head $4\frac{2}{3}$. Snout shorter than diameter of eye, which is as long as postorbital part of head. Maxillary extending to below anterior $\frac{1}{4}$ of eye; lower jaw shorter than upper. Dorsal IV, I 16. Anal I 22. A broad bluish-silvery lateral band, margined above with a blackish stripe.

TEXT-FIG. 3.



ISO NATALENSIS.

A single specimen, 52 mm. in total length, collected by Mr. H. W. Bell Marley.

The genus *Iso* was established for the Japanese *Iso flos-maris*, *Jord. & Starks*,* which has the depth of body 5 in the length, but is very similar in other characters to the species here described. The occurrence of a second species of this curious specialized genus on the coast of Natal is of interest.

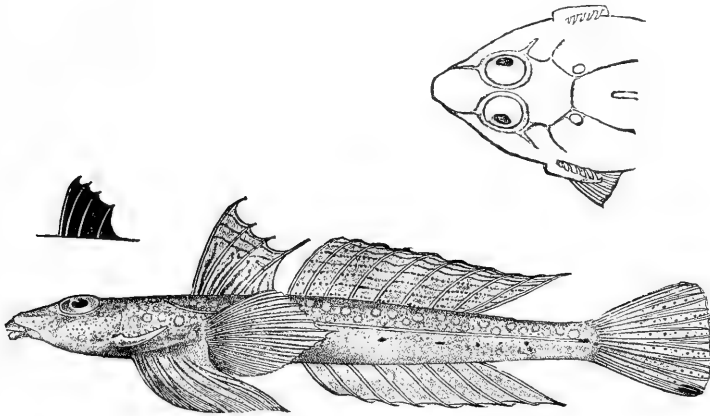
* *Proc. U.S. Nat. Mus.*, vol. XXIV, 1901, p. 205, fig.

Family CALLIONYMIDÆ.

Callionymus marleyi, sp. nov.

Length of head, to gill-opening, $3\frac{1}{2}$ to 4 in length of fish. Eyes narrowly separated; diameter $3\frac{1}{2}$ to 4 in length of head. Mouth small; præmaxillary band of teeth with lateral horns diverging slightly backwards and nearly equal in length to the transverse anterior portion of the band. Præopercular spine straight, with curved tip, with 3 to 5 tooth-like processes on inner edge and with an antrorse process at base externally. Gill-openings small, superior. Lateral line single. Dorsal IV, 9; male with spinous dorsal rather elevated, with the tips of the spines only slightly projecting beyond the membrane, and the first and last spines longest, a little shorter than head; female with first and second spines longest, $\frac{1}{2}$ length of head, last ray of soft dorsal produced, but not reaching caudal. Anal 9. Caudal not longer than head. Head and body with scattered

TEXT-FIG. 4.



CALLIONYMUS MARLEYI.

dark dots and pale spots enclosed in dark rings; a lateral series of dark spots; spinous dorsal, in male, with linear markings, in female blackish; soft dorsal with longitudinal lines or series of small spots; caudal spotted.

Previously, I identified a female of this species, 85 mm. long, as *Callionymus cooperi*, Regan.* Examination of a male of 95 mm.

* *Annals Durban Museum*, Vol. II, pt. 2, p. 77.

collected by Mr. Bell Marley shows that this was incorrect, as males of *C. cooperi*, have the first three dorsal spines produced into very long filaments. Careful comparison of the two species reveals another difference, *C. cooperi* having a somewhat wider mouth, with the præmaxillary band of teeth evenly curved and not produced backwards at the sides.

Family BLENNIDÆ.

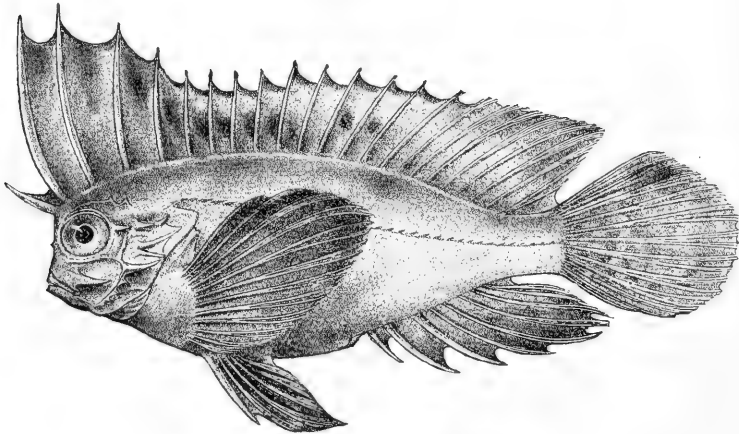
Blennius cornutus, Linn.

Family SCORPÆNIDÆ.

Amblyapistus marleyi, *sp. nov.*

Depth of body $2\frac{4}{5}$ in the length, length of head $3\frac{2}{5}$. Diameter of eye 3 in length of head; maxillary extending to below anterior $\frac{1}{4}$ of eye; anterior profile of head nearly vertical, slightly concave; præorbital and præopercular spines strong; when laid back the former reaches to below the posterior edge of the eye and the latter to the opercular margin. Dorsal XV 8; first spine short, above anterior margin of eye; second and third longest; $\frac{1}{3}$ the length of the fish (without caudal) and twice as long as the sixth and seventh, which are the shortest and about $\frac{3}{4}$ as long as the last. Anal III 6. Pectorals 12-rayed, extending a little beyond origin of anal. Brownish, spotted and marbled with blackish.

TEXT-FIG. 5.



AMBLYAPISTUS MARLEYI.

A single specimen, 130 mm. in total length, collected by Mr. H. W. Bell Marley. The long præorbital and præopercular spines distinguish this species from its nearest allies, *A. tænianotus*, Cuv. & Val. and *A. crista-galli*, Günth.

Family BALISTIDÆ.

Monacanthus melanocephalus, Bleek.

Family TETRODONTIDÆ.

Tetrodon pleurospilus, *sp. nov.*

Length of head $3\frac{1}{3}$ in length of fish. Lower teeth $\frac{2}{3}$ as broad as upper. Nasal tentacle bilobed, apparently formed as in *T. palembangensis*. Eyes above level of mouth. Diameter of eye nearly $\frac{1}{4}$, interorbital width a little more than $\frac{1}{3}$ length of head. Body smooth except for a patch of spines on abdomen, extending from below the eyes to within a short distance of the vent. Dorsal with 9 rays, anal with 7, pectoral with 15. Caudal subtruncate, its posterior margin slightly convex. Back brownish, abdomen white; sides with dark spots forming about three irregular longitudinal series, the spots of the lowest series confluent anteriorly to form a stripe from mouth to lower end of base of pectoral.

A single specimen, 200 mm. in total length, from Durban, collected by Mr. H. W. Bell Marley.

Family DIODONTIDÆ.

Diodon orbicularis, Bloch.

Family CYNOGLOSSIDÆ.

Plagusia robinsoni, *sp. nov.*

Depth of body $3\frac{1}{2}$ in the length, length of head $3\frac{5}{6}$. Snout obtusely pointed, nearly $\frac{1}{2}$ length of head. Eyes one diameter apart; $\frac{2}{3}$ of upper in advance of lower; diameter 14 in length of head. Angle

of mouth below middle of lower eye; rostral hook extending to vertical from middle of upper eye. Scales ctenoid; two lateral lines on eyed side, with 17 rows of scales between them; no lateral line on blind side. Dorsal fin with 107 rays, anal with 82. Greyish.

A single specimen, 240 mm. in total length, collected by Mr. Romer Robinson. *P. africana*, Gilchrist, differs in the rounded snout, the longer rostral hook, and the cleft of the mouth extending further back.

TEXT-FIG. 6.



PLAGUSIA ROBINSONI.

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VOL. II.

PART 5.

ANNALS
OF THE
DURBAN MUSEUM

EDITED BY THE CURATOR,

E. C. CHUBB.

Issued 25th March, 1920.



PRICE 5/- NETT.

PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.

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XIX.—Catalogue of Natal Marine Fishes (1), by MESSRS. GILCHRIST & THOMPSON.

Vol. I, Part 4. Published 21st May, 1917. Price 5/- nett.

- XIX.—Catalogue of Natal Marine Fishes (2), by MESSRS. GILCHRIST & THOMPSON.
XX.—A new Silurid Fish from Natal, by G. A. BOULENGER.
XXI.—A new Bat (*Otomops icarus*), by E. C. CHUBB. (Plate XXI).

(continued on third page of cover).

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XIX.—A Revision of the Flat-fishes (HETEROSOMATA) of Natal,

by

C. Tate Regan, M.A., F.R.S.

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THE Flat-fishes differ from all other fishes in having both eyes on the same side of the head. The scheme of classification given below differs slightly from mine of 1910 (*Ann. Mag. Nat. Hist.* [8], VI, pp. 484-496) in the recognition of the Pleuronectoidea and Soleoidea as equal in rank to the Psettidoidea and in making *Paralichthodes* the type of a new family. Specimens of this interesting genus now received from Durban have enabled me to examine its structure and it proves to be unique amongst dextral Pleuronectoidea in the structure of the nasal organ, which is like that of the sinistral Pleuronectoidea and of *Psettodes* and the Soles.

ORDER HETEROSOMATA.

SUB-ORDER 1. PSETTIDOIDEA.

Psettodes. W. Africa; Indo-Pacific.

SUB-ORDER 2. PLEURONECTOIDEA.

Family 1. BOTHIDÆ.

Sub-family 1. PARALICHTHINÆ. Tropical and Temperate Seas.

„ 2. BOTHINÆ. Tropical and Temperate Seas.

„ 3. PSETTINÆ. N. Atlantic.

Family 2. PARALICHTHODIDÆ.

Paralichthodes. S. Africa.

(205)

Family 3. PLEURONECTIDÆ.

Sub-family 1. PLEURONECTINÆ. Northern Seas, with three genera from the Indo-Pacific.

„ 2. SAMARINÆ. Indo-Pacific.

„ 3. RHOMBOSOLEINÆ. South Australia ; New Zealand ; Patagonia.

SUB-ORDER 3. SOLEOIDEA.

Family 1. SOLEIDÆ. Tropical and Temperate Seas.

Family 2. CYNOGLOSSIDÆ. Tropical and Temperate Seas.

The Paralichthinae, Bothinae, Paralichthodidae, Soleidae and Cynoglossidae are represented on the coast of Natal.

ORDER HETEROSOMATA.

SUB-ORDER PLEURONECTOIDEA.

Dorsal fin extending forward on head. Mouth terminal ; lower jaw prominent. Præoperculum with free margin.

Family 1. BOTHIDÆ.

Eyes on the left side.

In all five genera represented in Natal waters the mouth is nearly symmetrical, and the lateral line has a strong curve anteriorly.

Synopsis of Genera.

I. Pelvic fins equal, short-based. (PARALICHTHINÆ).

Mouth moderate or large ; eyes separated by a ridge ; lateral line developed on both sides.

Pelvic fins symmetrical ; teeth universal.

1. PSEUDORHOMBUS.

Left pelvic fin median, right lateral ; teeth pluri-serial.....2. PARACITHARUS.

II. Left pelvic fin median, with base much longer than that of right. (BOTHINÆ).

Mouth rather small ; interorbital region concave ; lateral line on left side only ; teeth equal, uni- or bi-serial.

Gill-opening extending upwards to lateral line ; scales large.....3. ENGYPROSOPON.

Gill-opening ending a short distance above pectoral fin ; scaling of head and body continuous below lateral line ; scales large....4. CROSSORHOMBUS.

Gill-opening ending a short distance above pectoral fin ; membrane connecting operculum with shoulder scaleless ; scales small.....5. BOTHUS.

1. PSEUDORHOMBUS.

Pseudorhombus, Bleek., C.R. Acad. Amsterdam, XIII, 1862, Pleuron. p. 5.

Eyes on the left side, separated by a ridge. Mouth moderate or rather large ; teeth in jaws conical, pointed, uniserial ; palate toothless. Gill membranes united. Dorsal fin originating above posterior nostril of blind side. Pelvic fins short-based, symmetrical. Scales small or of moderate size, ctenoid on left side. Lateral line developed on both sides, with a strong curve anteriorly and with an accessory branch running upwards to or towards the eighth to eleventh ray of dorsal fin.

Several species from the Indo-Pacific ; two known from Natal.

1. PSEUDORHOMBUS RUSSELLI.

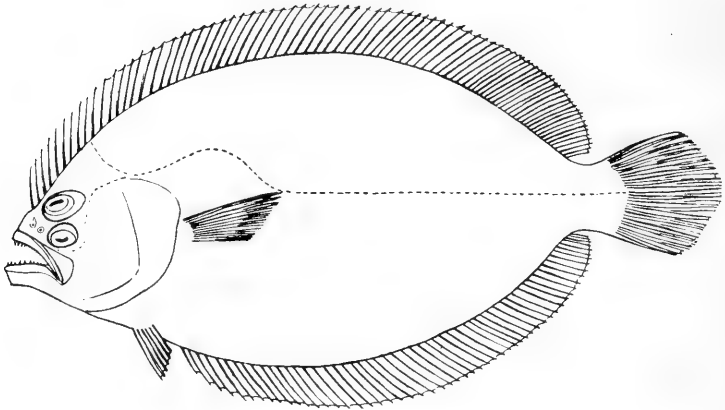
Pseudorhombus russellii (Gray), Günth. Cat. Fish. IV, p. 424 (1862);
Bleek., Atl. Ichth. VI, p. 6, Pleuron. pl. ii, fig. 2 (1866).

Pseudorhombus arsius (Ham. Buch.) Day, Fish. Ind., p. 423, pl. xci,
fig. 5 (1878).

Pseudorhombus andersoni, Gilchr., Mar. Inv. S. Afr., III, 1905, p. 9,
pl. xxvi.

Depth of body $1\frac{3}{4}$ to 2 in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$.
Diameter of eye 4 (young) to $5\frac{1}{2}$ in length of head. Maxillary
extending to below middle (young) or posterior part of eye. On each

TEXT-FIG. 1.



PSEUDORHOMBUS RUSSELLI.

side 2 or 3 strong anterior teeth in upper jaw and a series of 5 or more enlarged teeth in lower. Dorsal 70-81. Anal 54-61. Scales ctenoid on left side, cycloid on right, 74 to 85 in a longitudinal series. Accessory branch of lateral line reaching base of eighth to eleventh ray of dorsal fin. Body usually with spots and rings; often a conspicuous dark spot surrounded by a ring of white dots at beginning of straight part of lateral line; fins spotted.

Total length 250 mm.

E. Africa to the Pacific.

P. andersoni, is evidently based on an ambicolorate example of this species. Complete ambicoloration in Flat-fishes is usually correlated with other variations towards symmetry, such as the delayed or arrested migration of the eye, which interrupts the extension forward of the dorsal fin, and the similar structure of the scales on both sides of the fish.

2. PSEUDORHOMBUS NATALENSIS.

Pseudorhombus natalensis, Gilchr., Mar. Inv. S. Afr., III, 1905, p. 8, pl. xxv.

Depth of body 2 in the length, length of head $3\frac{3}{8}$. Diameter of eye $3\frac{1}{2}$ in length of head. Maxillary extending to below anterior $\frac{1}{3}$ of eye. Teeth small, forming a close set series in the jaws. Dorsal 70. Anal 52. Scales ctenoid on left side, cycloid on right, 60 in a longitudinal series. Accessory branch of lateral line extending only a little more than half way to dorsal fin. Large dark ring-shaped spots symmetrically arranged on body; a series of conspicuous spots along dorsal and anal fins.

Natal.

Here described from a specimen of 135 mm. from off Cape Natal, 54 fathoms (Gilchrist).

2. PARACITHARUS, gen. nov.

(type ARNOGLOSSUS MACROLEPIS, Gilchr.).

Eyes on the left side, separated by a ridge. Mouth wide; teeth small, pointed, in bands in the jaws; no canines; palate toothless. Gill-membranes separate. Dorsal fin originating immediately behind right posterior nostril, which is large and is covered by a valve that extends forward nearly to the mouth. Pelvic fins short-based; left median in position. Scales of moderate size, ctenoid on left side, cycloid on the right; lateral line developed on both sides, with a strong curve anteriorly; tubules forked, Y- or T-shaped.

Citharus, Bleek., with a single species from the Mediterranean, differs from *Paracitharus* especially in the dentition; the teeth in the jaws are uniserial except anteriorly, canines are well developed and the vomer is toothed. Also in *Citharus* the dorsal originates below the posterior nostril and the lateral line tubules are simple.

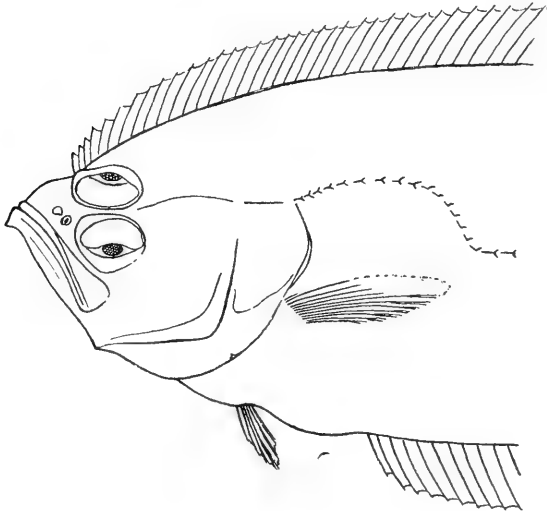
PARACITHARUS MACROLEPIS.

Arnoglossus macrolepis, Gilchr. Mar. Inv. S. Afr. III, 1905, p. 12, pl. xxxi.

Depth $2\frac{1}{2}$ in length, length of head $3\frac{1}{3}$. Diameter of eye $4\frac{1}{2}$ in length of head. Lower jaw prominent; maxillary extending a little beyond middle of eye. 43 (47) scales in lateral line, to base of caudal. Dorsal 69 (72). Anal 47 (50). Left pectoral a little more, right a little less than $\frac{1}{2}$ length of head. Caudal rounded or doubly truncate. A blackish spot at base of last dorsal rays; a similar one at end of anal. Natal.

Here described from a specimen of 195 mm. taken 22 miles N. of the mouth of the Tugela at a depth of 63-73 fathoms.

TEXT-FIG. 2.



PARACITHARUS MACROLEPIS.

3. ENGYPROSOPON, Günth.

Cat. Fish. IV, p. 431 (1862).

Scæops, Jord. and Starks, Bull. U.S. Fish. Comm. XXII, p. 627 (1904).

Eyes on the left side; interorbital region concave. Mouth small; teeth in jaws small, pointed, uni- or bi-serial; palate toothless. Gill-

membranes united; gill-opening extending upwards to lateral line. Dorsal fin originating in advance of eye. Left pelvic fin median, with long base; right lateral, base shorter. Scales large, rather weakly ctenoid on left side, cycloid on right. Lateral line with a strong curve anteriorly.

Several species from the Indo-Pacific; one from Natal.

ENGYPROSOPON NATALENSIS, sp. nov.

Depth of body 2 in the length, length of head $3\frac{3}{4}$. Diameter of eye $3\frac{1}{2}$ in length of head and 3 times interorbital width. Maxillary extending to below anterior $\frac{1}{3}$ of eye; lower jaw $\frac{1}{2}$ length of head. Teeth uniserial. 6 gill-rakers on lower part of anterior arch. Dorsal 85. Anal 64. Left pectoral $\frac{3}{5}$ right $\frac{2}{5}$ length of head. 40 scales in a longitudinal series. Traces of small dark spots on the fins.

Described from a female 76 mm. in total length; a male of 55 mm. has a spine on the snout, interorbital width $\frac{1}{2}$ diameter of eye, pectoral fins as in the female.

Natal, off mouth of Amatikulu River; depth 26 to 27 fathoms.

E. latifrons, Regan, (Trans. Linn. Sec. XII, 1908, p. 233 pl. xxv, fig. 3) from the Indian Ocean, is very near *E. natalensis*, but has the interorbital region broader ($\frac{2}{3}$ diameter of eye in a female of 75 mm.). There are other closely related species, including the Japanese *E. grandisquama*, Schleg., under which name this species has been recorded from Natal.

4. CROSSORHOMBUS, gen. nov.

(type PLATOPHRYS DIMORPHUS, Gilchr.).

Eyes on the left side; interorbital region concave. Mouth small; teeth small, pointed, uniserial in the jaws; palate toothless. Gill-membranes united; upper angle of gill-opening a short distance above pectoral fin; scaling of head and body continuous below lateral line. Dorsal fin originating in advance of eye. Left pelvic fin median, with long base; right lateral, base shorter. Scales large, strongly ciliated on left side, weakly ciliated or cycloid on right. Lateral line developed on both sides, with a strong curve anteriorly.

One species from Natal.

Scaeops kobensis, Jord. and Starks, from Japan, and *Engyprosopon xenandrus*, Gilbert, from Hawaii, belong to this genus.

CROSSORHOMBUS DIMORPHUS.

Platophrys dimorphus, Gilchr. Mar. Inv. S. Afr. III, 1905, p. 10, pl. xxvii.

Depth of body $1\frac{3}{4}$ to 2 in length, length of head 4. Diameter of eye $3\frac{1}{2}$ in length of head, less (male) or greater (female) than interorbital width. Snout short; mouth small; maxillary not or barely reaching vertical from anterior edge of eye. Male with a spine on the snout and with spines on the orbital margins. Dorsal 85-88. Anal 68-72. Upper pectoral ray produced in adult male. 50 scales in a longitudinal series. Greyish, spotted with darker.

Natal; off mouth of Umhlanga River; depth 22-26 fathoms.

Two specimens examined, 110 and 120 mm. in total length.

5. BOTHUS.

Bothus (Rafinesque, 1810), Kyle, Rep. Danish Ocean. Exped. II, A. 1 (1913), p. 94.

Platophrys, Swainson, Nat. Hist. II, p. 302 (1839).

Rhomboidichthys, Bleek. Act. Soc. Sci. Ned. Ind. I, 1856, Manadô and Macassar, p. 67.

This genus differs from *Crossorhombus* only in the smaller scales and in having the membrane joining the operculum to the pectoral arch scaleless.

Mediterranean, Tropical Atlantic and Indo-Pacific.

One species from Natal.

BOTHUS PANTHERINUS.

Rhomboidichthys pantherinus (Rüpp. 1828), Günth. Cat. Fish. IV, p. 436 (1862).

Platophrys pantherinus, Bleek. Atl. Ichth. VII, p. 11, pl. cccxxxiii, fig. 3 (1866); Day, Fish. India, p. 425, pl. xcii, figs. 3, 4 (1878).

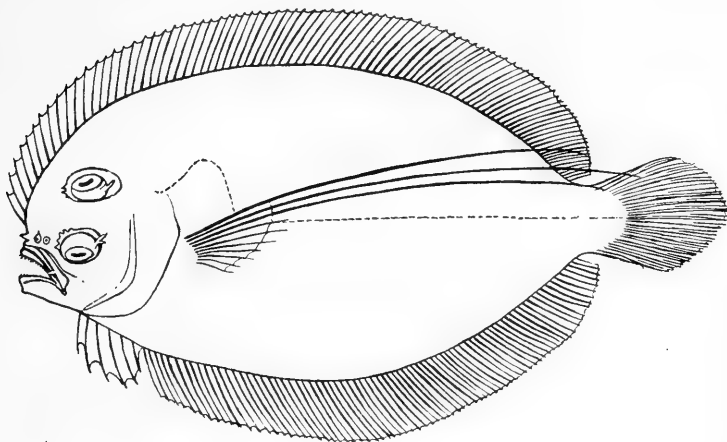
Depth of body $1\frac{3}{4}$ to 2 in the length, length of head $3\frac{1}{2}$ -4. Interorbital width nearly equal to diameter of eye (adult male), or less; eye $3\frac{1}{2}$ to 4 in length of head. Anterior profile of head convex. Maxillary extending to below anterior $\frac{1}{2}$ of eye. Males with rostral and supraocular spines. Dorsal 85-93. Anal 65-70. Pectoral, in

adult male, with the upper rays prolonged, even reaching the caudal fin. About 90 scales in a longitudinal series. Body with spots and rings; often a large dark spot on lateral line.

Total length 200 mm.

East Africa to the Pacific.

TEXT-FIG. 3.



BOTHUS PANTHERINUS. ♂.

Family 2. PARALICHTHODIDÆ.

Eyes on the right side; olfactory laminae arranged transversely to or radiating from a central rachis.

The absence of spinous fin-rays, the extension forward of the dorsal fin on the head, the emarginate urohyal, the absence of a supra-maxillary and of palatine teeth, show that *Paralichthodes* is a true Pleuronectoid; but it differs from the Bothidae in having the eyes on the right side and from the Pleuronectidae in the arrangement of the olfactory laminae.

PARALICHTHODES.

Paralichthodes, Gilchr. Mar. Inv. S. Afr. II, 1904, p. 108.

Eyes on the right side. Mouth rather large, nearly symmetrical; teeth small, pointed, in 2 or 3 series in the jaws; palate toothless.

Gill-membranes separate. Dorsal fin extending forward on snout above nostrils of blind side. Pelvic fins short-based, symmetrical, the right nearly median and further forward than left. Scales small, cycloid. Lateral line developed on both sides, with a strong curve anteriorly. Left pelvic bone running upwards to cleithrum behind right; pectoral radials present; lower part of hypocoracoid slender. Vertebrae 31 (10 + 21); last five præcaudals with parapophyses, of which the last pair are connected by a bridge; caudal vertebrae without transverse apophyses.

A single species.

PARALICHTHODES ALGOENSIS.

Paralichthodes algoensis, Gilchr. Mar. Inv. S. Afr. II, 1904, p. 108, pl. viii.

Depth about $2\frac{1}{2}$ in the length, length of head 4 to $4\frac{1}{2}$. Diameter of eye $4\frac{1}{2}$ to 5 in length of head; interorbital width less than $\frac{1}{2}$ diameter of eye. Lower jaw strongly projecting; maxillary extending to below middle or posterior part of eye. Dorsal 72-74; anterior rays much branched. Anal 51-54. Right pectoral $\frac{3}{5}$, left $\frac{2}{5}$ length of head. Brownish or grayish, with small darker spots.

South Africa (Durban, Algoa Bay).

Three specimens, 180 to 250 mm. in total length.

SUB-ORDER SOLEOIDEA.

Dorsal fin extending forward on head. Præopercular margin not free. Mouth small: lower jaw not prominent; jaws of the blind side toothed, curved, jaws of the eyed side not or but feebly toothed.

Family 1. SOLEIDÆ.

Eyes on the right side.

Synopsis of the Genera.

I. Caudal fin free.....1. SOLEA.

II. Vertical fins continuous.

A. Both pectoral fins well developed, unconnected with opercular membrane.

Lower lip strongly fringed; anterior nostril of blind side surrounded by a fringed flap.

2. SYNAPTURA.

Lower lip not fringed; nostrils simple.

3. AUSTRGLOSSUS.

B. Pectoral fins small, especially on blind side; opercular membrane joined to upper edge of pectoral fin.

Scales ctenoid; first dorsal ray not enlarged.

4. ZEBRIAS.

Scales cycloid; first dorsal ray enlarged, free.

5. ÆSOPIA.

1. SOLEA.

Solea (part.), Günth. Cat. Fish. IV, p. 462 (1862).

Form oval or elongate. Scales small, ctenoid; lateral line straight, single. Dorsal and anal fins free from the caudal; pectorals well developed; pelvic fins equal, short-based. Nostrils of blind side not dilated.

Eastern Atlantic and Indian Ocean; one species from Natal.

SOLEA TURBYNEI.

Solea turbynei, Gilchr. Mar. Inv. S. Afr. III, 1905, p. 10, pl. xxviii.

Depth of body $2\frac{1}{5}$ to $2\frac{3}{5}$ in length, length of head 4 to $4\frac{1}{2}$. Eyes small, separated by a scaly interspace. Angle of mouth below middle of lower eye. Dorsal 62-67. Anal 49-53. Right pectoral $\frac{1}{3}$ to $\frac{2}{5}$,

left $\frac{2}{7}$ length of head. 100 to 110 scales in a longitudinal series. Grayish, with numerous small dark spots; a black spot on right pectoral.

S. Africa.

Two specimens, 100 and 135 mm. in total length from Mossel Bay and Durban; the latter had been recorded by me as *Solea bleekeri*.

2. SYNAPTURA.

Synaptura, Cantor, Cat. Malay Fish. p. 222.

Form oval or elongate. Scales small, ctenoid on right side, cycloid or feebly ctenoid on left. Dorsal and anal fins continuous with the caudal; pectorals well developed. Lower lip fringed. Anterior nostril of eyed side at end of a tube which folds backwards; posterior nostril covered by a flap. Anterior nostril of blind side surrounded by a fringed flap, much developed behind and covering a naked groove.

Indian Ocean; one species from Natal.

SYNAPTURA MARGINATA.

Synaptura marginata, Bouleng. Mar. Inv. S. Afr. I, 1902, p. 11, pls. ii and iii, fig. 1.

Synaptura ciliata, Gilchr. Mar. Inv. S. Afr. III, 1905, p. 14, pl. xxxiv.

Depth of body $2\frac{1}{3}$ to $2\frac{2}{3}$ in the length, length of head 5. Eyes small, separated by a scaly interspace; upper in advance of lower; angle of mouth below middle of lower eye. Dorsal 71-76. Anal 57-60. Pectorals equal, or the right a little longer, $\frac{1}{4}$ to $\frac{2}{7}$ length of head. Small filaments scattered on body. 100 to 110 scales in a longitudinal series. Grayish or brownish, uniform or with small dark spots; fins with a white edge.

S. Africa.

Here described from the type of the species from Algoa Bay, an example of *S. ciliata* (Durban, Gilchrist) and two more from Durban, 165 and 225 mm. long.

I have compared this species with *S. commersoniana*, Cant. the type species of the genus and I regard them as strictly congeneric. It has been stated that in *S. commersoniana* the right posterior nostril is tubular, but the so-called tube has no aperture and the nostril opens at its base on the under side.

3. AUSTROGLOSSUS, gen. nov.

(type SYNAPTURA PECTORALIS, Kaup).

Form elongate, tapering posteriorly. Scales very small, ctenoid. Dorsal and anal fins continuous with the caudal; pectorals well developed. Lips not fringed; mouth strongly curved on blind side. Anterior nostril of eyed side tubular; posterior patent, between the eyes. Anterior nostril of blind side in a short tube, not surrounded by a flap.

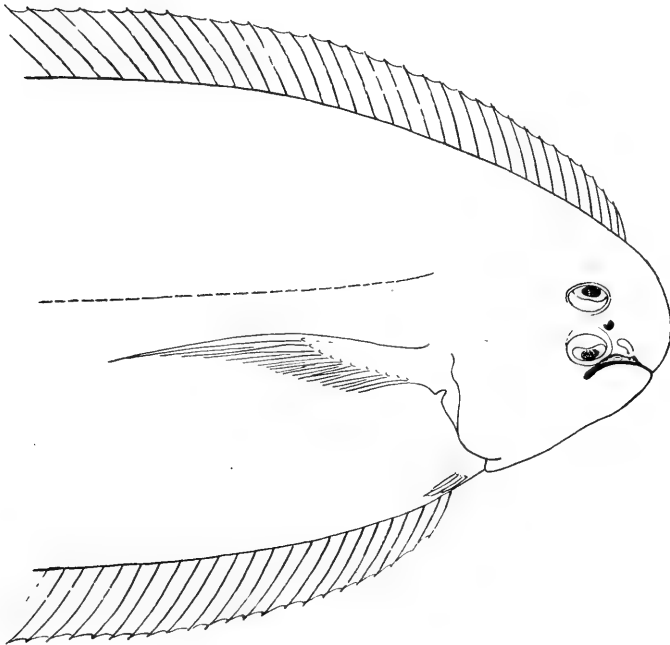
South Africa; one species from Natal.

Synaptura microlepsis, Bleek. from the Cape also belongs to this genus.

AUSTROGLOSSUS PECTORALIS.

Synaptura pectoralis, Kaup, Arch. f. Nat. 1858, p. 96; Boulenger, Mar. Inv. S. Afr. I, 1902, p. 3.

TEXT-FIG. 4.



AUSTROGLOSSUS PECTORALIS.

Depth of body $3\frac{1}{4}$ to $3\frac{1}{2}$ in length, length of head $5\frac{2}{3}$ to 7. Eyes small, separated by a scaly interspace; angle of mouth below middle of lower eye. Dorsal 95-110. Anal 80-95. Right pectoral much longer than head, about 3 times as long as left. 150 to 175 scales in a longitudinal series. Brownish, with or without small darker spots; right pectoral blackish.

S. Africa.

Several examples up to 470 mm. including two from Durban.

4. ZEBRIAS.

Zebrias, Jord. and Snyder, Proc. U.S. Nat. Mus. XXXI, 1907, p. 232.

Form oval. Scales small, ctenoid. Dorsal and anal fins continuous with the caudal. Pectoral small, especially the left; opercular membrane joined to upper edge of pectoral fin. Mouth moderately curved; lips not fringed. Anterior nostril of eyed side a short tube; posterior in front of lower eye; nostrils of blind side inconspicuous.

India to Japan; one species from Natal.

ZEBRIAS REGANI.

Synaptura regani, Gilchr. Mar. Inv. S. Afr. IV, 1908, p. 160, pl. xlv.

Depth of body $2\frac{1}{2}$ to $2\frac{2}{3}$ in the length, length of head $5\frac{1}{2}$. Eyes contiguous; angle of mouth below anterior part of lower eye. Dorsal 68-70. Anal 56-59. Right pectoral about as long as eye. 82 to 88 scales in a longitudinal series. Grayish, with 13 pairs of dark brown cross bands extending to edge of fins; caudal blackish posteriorly, with oblong white spots.

Natal, off mouth of Umhlanga River, 22-26 fathoms.

A specimen of 125 mm. examined.

5. ÆSOPIA.

Æsopia (Kaup), Günth. Cat. Fish. IV, p. 487 (1862).

Similar to *Zebrias*, but scales cycloid and first dorsal ray free, swollen, papillose, produced.

A single species.

ÆSOPIA CORNUTA.

Æsopia cornuta, Kaup, Arch. f. Nat, 1858, p. 95.

Synaptura cornuta, Day, Fish. India, p. 430, pl. xciv, fig. 4.

Very similar to *Z. regani* in form and coloration. Dorsal 69-79. Anal 61-66. 90 to 100 scales in a longitudinal series.

S. Africa to Japan.

Total length 150 mm.

Family 2. CYNOGLOSSIDÆ.

Eyes on the left side. Vertical fins confluent; no pectoral fins; pelvic fin of blind side present, 4-rayed, median.

The two genera represented on the coast of Natal may be distinguished as follows:

- Lips fringed.....1. PARAPLAGUSIA.
Lips not fringed.....2. CYNOGLOSSUS.

1. PARAPLAGUSIA.

Paraplagusia, Bleek. Atl. Ichth. VI, p. 26 (1866).

Form elongate, ovate. Snout hooked; lips fringed. Scales small; 2 or 3 lateral lines on left side.

1. PARAPLAGUSIA MARMORATA.

Plagusia marmorata (Bleek.), Günth. Cat. Fish. IV, p. 491 (1862); Day, Fish. India, p. 431, pl. xcv, fig. 1 (1878).

Paraplagusia marmorata, Bleek. Atl. Ichth. VI, p. 28, Pleuron. pl. xv, fig. 5 (1866).

Plagusia marmorata, var. *africana*, Gilchr. Mar. Inv. S. Afr. IV, 1908, p. 163, pl. xlvii.

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head 4 to $4\frac{1}{2}$. Snout rounded, as long as head behind lower eye; rostral hook rather long, its posterior edge about equal to length of snout; interorbital width equal to or less than diameter of eye; eyes small, upper in advance of lower; angle of mouth below posterior part of lower eye. Dorsal 99-106. Anal 75-86. Scales ctenoid, about 100 to 110 in a longitudinal series; two lateral lines on left side, separated by 16 to 19 series of scales; no distinct lateral line on right side. Brownish, spotted and marbled with darker.

Indian Ocean and Archipelago.

Total length 250 mm.

2. PARAPLAGUSIA ROBINSONI.

Plagusia robinsoni, Regan, Ann. Durban Mus. vol. ii, 1919, p. 203, fig. 6.

Closely related to *P. marmorata*, but snout pointed, as long as head behind upper eye, and rostral hook shorter, its inner edge much less than length of snout. Dorsal 109-110. Anal 82-83.

Durban.

Total length 240 mm. A second specimen of 155 mm. is essentially similar to the type.

2. CYNOGLOSSUS.

Cynoglossus (Ham. Buch.), Günth. Cat. Fish. IV, p. 492 (1862).

Form elongate, ovate. Snout hooked; lips not fringed. Scales small; 2 or 3 lateral lines on left side.

West Africa; Indo-Pacific.

Synopsis of the Species.

- I. Two lateral lines on both sides; scales ctenoid on left side, cycloid on right. Angle of mouth nearer to gill-opening than to end of snout; eyes separated by an interspace. D. 118. A. 92. Scales 84-88, 12 between lateral lines.....1. *attenuatus*.

- II. Two lateral lines on left side only; scales ctenoid on both sides.
 - A. Angle of mouth nearer to gill-opening than to end of snout; eyes separated by an interspace. D. 102-110. A. 82-86. Scales 85-90, 13 or 14 between lateral lines.
 2. *lida*.

 - B. Angle of mouth nearer to end of snout than to gill-opening; eyes contiguous.
 - Depth 4 to 4½ in length. D. 105-107. A. 82-84. 14 scales between lateral lines.....3. *gilchristi*,
 - Depth 3 in length. D. 102. A. 85. 10 scales between lateral lines.....4. *ecaudatus*.

1. CYNOGLOSSUS ATTENUATUS.

Cynoglossus attenuatus, Gilchr. Mar. Inv. S. Afr. III, 1905, p. 11.
pl. xxix.

Depth of body 4 in length, length of head 5. Snout $\frac{2}{5}$ length of head; interocular width less than diameter of eye, which is 10 in length of head; angle of mouth below posterior edge of lower eye, nearer to gill-opening than to end of snout. Posterior nostril between eyes. Dorsal 118 (103). Anal 92 (90). Scales ctenoid on left side, cycloid on right, 84 to 88 in a longitudinal series. Two lateral lines on both sides, 12 series of scales between them.

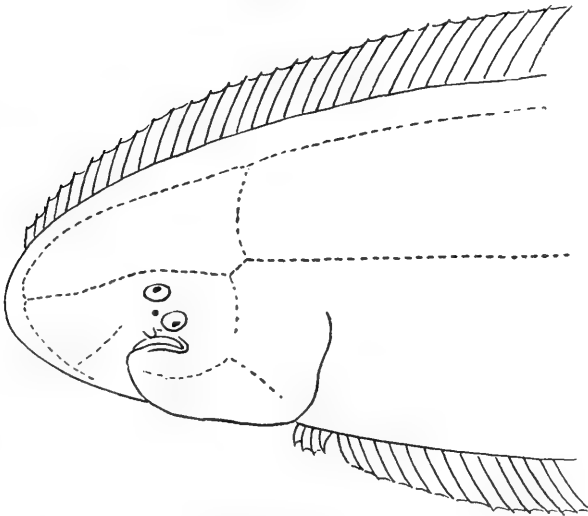
Natal.

Here described from a specimen 225 mm. in total length from off the mouth of the Tugela; depth 24 fathoms.

2. CYNOGLOSSUS LIDA.

Cynoglossus lida (Bleek.), Günth. Cat. Fish. IV, p. 498 (1862);
Bleek. Atl. Ichth. VI, p. 36, Pleuron. pl. xii, fig. 2 (1866);
Day, Fish. Ind. p. 436, pl. xcvi, fig. 3 (1878).

TEXT-FIG. 5.



CYNOGLOSSUS LIDA.

Depth of body 4 to $4\frac{1}{2}$ in length, length of head $4\frac{1}{3}$ to 5. Snout $\frac{2}{5}$ length of head or more; interocular width less than diameter of eye, which is about 10 in length of head; angle of mouth below posterior edge of lower eye, nearer gill-opening than end of snout. Posterior nostril between eyes. Dorsal 102-110. Anal 82-86. Scales ctenoid on both sides; 85 to 90 in a longitudinal series. Two lateral lines on left side; 13 or 14 series of scales between them; no distinct lateral line on right side. Grayish or brownish. Total length 180 mm.

Coasts of India and Malay Archipelago; two specimens from Durban are the first recorded from Natal.

3. CYNOGLOSSUS GILCHRISTI, nom. nov.

Cynoglossus brachycephalus (non Bleek.), Gilchr. Mar. Inv. S. Afr. III, 1905, p. 12, pl. xxx.

Depth of body 4 to $4\frac{1}{2}$ in length, length of head $5\frac{1}{2}$. Snout less than $\frac{1}{3}$ length of head; eyes contiguous, diameter 6 to $6\frac{1}{2}$ in length of head; angle of mouth below middle of lower eye, nearer end of snout than gill-opening. Dorsal 105-107. Anal 82-84. Scales ctenoid on both sides, 76 in a longitudinal series. Two lateral lines on left side; 14 series of scales between them; no lateral line on right side. Pale brown, spotted and marbled with darker; fins with a series of large black spots.

Natal; off mouth of Umhlanga R., 22-26 fathoms.

Here described from a specimen of 145 mm.

4. CYNOGLOSSUS ECAUDATUS.

Cynoglossus acaudatus, Gilchr. Mar. Inv. S. Afr. IV, 1908, p. 162, pl. xlvi.

Resembles *C. gilchristi* in the short snout and contiguous eyes, but is less elongate. Depth 3 in length. Dorsal 102. Anal 85. 63 to 65 scales in a longitudinal series, 10 between lateral lines. Upper lateral line not developed on posterior third of body.

Natal.

In the types (three specimens) a rayless membrane connected the last rays of dorsal and anal.

XX.—The White Rhinoceros,
with special reference to its habits in Zululand,
by
F. Vaughan-Kirby, F.Z.S., Game Conservator for Zululand.

WITH PLATE XXVII.

ALTHOUGH this article deals mainly with the white rhinoceros of Zululand, here and there reference to the species generally and to its habits, etc., in other parts of the Continent are unavoidable, and indeed are necessary if it is to be at all complete.

Where my conclusions differ from those put forward by others, they must not necessarily be taken as contradictory, seeing that all wild creatures are likely to modify or even entirely change certain of their habits in accordance with their immediate surroundings.

My remarks at least claim the virtue of accuracy, and the conclusions arrived at in respect of the animal specially dealt with, i.e., the white rhinoceros of Zululand, are based upon most careful personal observation.

I regret extremely that owing to an unfortunate accident which occurred during a recent expedition for securing specimens for the Durban and Maritzburg Museums, my preparations for illustrating this article with photographs were non-productive of results. I had an excellent equipment, including a complete tele-photographic outfit, but in a weak moment early in the trip it was left in the bush one evening near a dead rhinoceros, in order that assistance might be given to the natives who had to carry the hide. During the night everything was dragged out of the bush by hyænas, and although there were three or four tons of meat wherewith these wretched creatures could have satisfied their appetites, they evinced a preference for ash-wood, hickory, brass plates and screws, with the result that the whole outfit was chewed into fragments, and completely destroyed.

I shall have occasion frequently to refer to a valuable article by Mr. Edmund Heller entitled "The White Rhinoceros," published in the Smithsonian Miscellaneous Collections, Vol. 61, 1913, which I have had an opportunity of consulting.

Geographical Distribution.

At the present time Zululand is the only portion of the Sub-continent in which the white rhinoceros, is known to exist, as I understand it is now entirely extinct in Rhodesia, its one time favourite haunt.

Prior to 1900 it was not known with certainty to occur anywhere north of the Zambezi River, but in that year Major A. H. Gibbons found a skull in the Lado Enclave, on the west bank of the Nile, where he consequently procured a complete specimen. Other sportsmen have shot it there since, although there is insufficient evidence that its range in that portion of the Continent is other than very restricted. It appears to be confined to a comparatively narrow tract along the left bank of the Upper Nile, in the Bahr-el-Ghazal province. In this area and in Zululand are to be found the only living specimens in the world of this gigantic quadruped.

It may be pointed out that, on account of a slight difference in the dorsal outline of the skull and somewhat smaller teeth, the Nile representatives have been separated as a sub-species from the typical southern form, under the name *Rhinoceros simus cottoni*, Lydekker.

At one time the species ranged over a vast tract of country in South Africa, from the Vaal River to the Zambesi, and there is not wanting evidence that it once ranged far south of even the Vaal River, while to the west it extended into Damaraland. On the east coast it occurred from Zululand up to the Zambesi, above where the Shire River enters the latter from the north, and in 1904 the writer found two incomplete skulls near that spot, in the Mwanza Bush.

In the north the species appears to be very local in distribution, and there is little doubt that this was also the case in South Africa, even in the days when it was plentiful.

More remarkable, however, is the discontinuity in its distribution, as shown by the fact that no trace of the animal has ever been found between the Zambesi River and its present range in the Nile region, a distance of well over one thousand miles. Heller has pointed out that the separation between the two forms has doubtless taken place "fairly recently," because sufficient time has not elapsed "for the development of specific differences in the individuals inhabiting such widely separated localities." But how or when such separation happened, and the vast tract of country lying between the Zambesi and the Blue Nile lost its white rhinoceroses, there is no evidence to show. It seems probable that one may be misled by the absence of specific differences into supposing that the separation took place

much more recently than has actually been the case, because there is no doubt that long periods of time are necessary to bring about important changes in old and fixed types, such as rhinoceroses are.

In Zululand, at the present day, the white rhinoceros is to be found only in the Mfolozi Game Reserve, which is situated between the two Mfolozi Rivers, the White on the south, and the Black on the north, and in a narrow strip of country along the south bank of the former river. The area included within the Reserve is about 75,000 acres, and that to the south of the White Mfolozi about another 15,000 acres.

From time to time evidence has been adduced which indicates that there may be a few of these animals, probably not exceeding five or six in number, in the dense bush at the north end of False Bay, but I have never yet been able to confirm this. Owing to the indiscriminate manner in which the natives apply the term "mkombo" (actually the White Rhinoceros) alike to the white species and to *any large full-grown bull* of the black, a great deal of misunderstanding at one time existed as to the actual localities in which the former was to be found. When I first came to Zululand I was informed not only by the Provincial Administration officials but by the Magistrate of the Division concerned, and by the native Game-guards, that the "mkombo" was plentiful in the Hluhlwe Game Reserve, situated to the north of the Mfolozi Reserve. Personal observation during an extended patrol in the former convincingly proved that the white rhinoceros did not exist there at all, and the error was explained when, upon one occasion a large black rhinoceros bull was encountered at very close quarters, and my Game-guards at once said "there you are, there's an 'mkombo." The fact is that none of those particular men who were with me at the time had ever seen a white rhinoceros, but had fallen into the habit of applying the word, which really signifies the white species, to large bulls of the black. When subsequently they were shown, first the different nature of the dung, and afterwards the animals themselves, they realised the extent to which their previous reports had been misleading.

Mr. Edmund Heller when describing the geographical range of this species falls into an error. He writes: "In the south there are a few (some ten individuals) strictly preserved on an estate in Zuzuland (sic) where they live under fairly normal conditions." He may rest assured that he has not *over-estimated* the number of white rhinoceroses on this little "estate," and that the animals are living under conditions which are practically as normal as those which obtain on the Nile.

Preservation.

It has already been shown that at one time the white rhinoceros ranged over an enormous tract of country in South and South Central Africa, wherever extensive grass-lands were to be found to supply its natural food in sufficient abundance. But writing as far back as 1894, before its existence was ascertained in the Nile region, Mr. R. T. Coryndon, when recording that the subject of the extinction of this species had a "melancholy interest" for him, gave it as his opinion that "long before the close of this (the 19th century) the white rhinoceros will have vanished from the face of the earth."* There can be no question that but for the discovery of its existence in the north, and the wise forethought of successive Natal Governments in prohibiting its slaughter in the south, these fears would have been confirmed. No praise therefore can be too great to accord to former Natal Governments, and since Union, the Provincial Administrations, for their action in saving this interesting creature from destruction; and all true lovers of Nature owe them a vast debt of gratitude for the fact that so far as this little corner of South Africa is concerned, Mr. Coryndon's melancholy prophecy failed of fulfilment.

General Description and External Characteristics.

Rhinoceros simus, the species under consideration, has had no less than five different names applied to it, viz.: Burchell's, the Square-lipped, the Square-mouthed, the Square-nosed, and the White Rhinoceros. The first of these is for many reasons unsatisfactory, and though either one of the next three is the most accurately descriptive, yet the terms are clumsy to a degree, and the writer has therefore adopted the inaccurate, but far better known appellation of White Rhinoceros.

It is the largest of the group, and is well differentiated from the other African species—the Black Rhinoceros, *Rhinoceros bicornis*—in the structure of the mouth, the upper lip of the former being square and bluntly truncated, whereas in *bicornis* the upper lip is more or less pointed, elongated, and highly prehensile.

The head of the white rhinoceros is immense; its great length being due to the remarkable occipital projection of the skull.

The eye is placed behind the posterior horn, while in the black species it is immediately below it.

* Proceedings of the Zoological Society, London, 1894, p. 329.

Again the shape of the ear-conches is markedly different in the two species, being much rounded in the black, and having their outer edges very hairy, whereas in the white the very large ear-conches are much elongated and pointed, with a few bristly, stiff, and somewhat curly hairs at the extreme tips. In the latter species also the lower edges of the conches meet to form a sort of tube.

Other external characters which at once attract the attention of the observer, in addition to the length of the head and the shape of the muzzle, are the huge muscular hump on the nape of the neck, and the comparative paucity of hide folds on the body, which are far less conspicuous than in the black species. There is a fold behind the elbow, less conspicuous in some positions of the body than in others, and one at the back of the thigh, below the buttock. A heavy fold passes transversely over the elbow joint, and completely encircles the outside of the fore-limb; it is well-marked in any position assumed by the animal, and as much so in calves as in adults. A short but heavy transverse fold passes over the nape of the neck, and a longer, but less heavy one encircles the throat. The conspicuousness or otherwise of these two folds depends upon the position in which the animal carries its head. When this is raised in alert watchfulness the neck fold is well-marked, while that under the throat is less so, but when the head is lowered in the manner so characteristic of the animal, the former becomes much flattened out, and the latter correspondingly increased in size.

Yet another character which the white rhinoceros shares in common with all other living species is the flattened, compressed ridge of hide which stands out along the front edge of the thigh, and is of considerable thickness.

The circumference of the spoor of three white rhinoceros bulls taken in damp hard sand were 31, 33 and 35 inches respectively, that of the black species under similar conditions is about 26 or 27 inches. In both species the spoor of the hind-foot, is smaller and more oval in shape than that of the fore-foot, but there is considerably less difference between the relative sizes of fore- and hind-foot spoor in the case of the white than in that of the black.

Upon the question of size, both actual and relative, it may be said that great differences of opinion exist, but at the same time it is quite clear that this ought to be a matter of *fact* and not opinion. If careful measurements were always taken, in a uniform manner, and absolute accuracy aimed at, there would be no room left for mere expressions of opinion, but, unfortunately, there has always been a remarkable lack of uniformity in the methods employed for measuring

animals, and it is to be feared that the necessity for absolute accuracy has not always been borne in mind. Although I have met with innumerable instances of this, I would perhaps have hesitated to call into question the accuracy of measurements recorded by other fine sportsmen, but for the fact that since this article was roughly drafted I have had an opportunity of perusing Mr. Edmund Heller's work upon the white rhinoceros of the Nile region. And I find that the conclusions arrived at by that obviously careful naturalist so exactly correspond with my own upon the subject of the size of the white rhinoceros, that I have no longer any hesitation in putting forward ascertained facts, in order that some of the present misunderstanding may be swept aside.

Much stress has been laid upon the alleged statement that the white rhinoceros is, after the elephant, the largest of living terrestrial mammals, having been said to attain a height at the shoulder of 6 ft. 9 in., i. e., only 2 ft. 9 in., less than a fair average-sized elephant. Now the writer is fully prepared to admit that with its huge bulk, its greatly elongated head, and enormous muscular development of the fore-arm, it appears when seen in the veld, incomparably larger than the black rhinoceros. But it will surprise many to learn that after all the average height of a white rhinoceros bull exceeds an average specimen of the black species by less than a foot.

Mr. Heller writes of the former, "In size this species (*R. simus*) exceeds but slightly, if at all, the great Indian single-horned species (*R. unicornis*) and but little the black African species." And again "The superiority in size of the white rhinoceros over the other living species, however, is not at all well established."

Now to proceed to data. We find that in the Proceedings of the Zoological Society of London, 1881, page 726, the late Mr. F. C. Selous gives the standing height of the white rhinoceros as 6 ft. 6 in.; Cornwallis Harris gives from 6 ft. 6 in. to 6 ft. 8 in., and R. T. Coryndon states that the two bulls which he shot in Mashonaland, one for the British Museum and the other for the Tring Museum, measured 6 ft. 6 in. and 6 ft. 9 in. respectively.

It will be admitted that a mounted specimen will show at least a height equal to that of the animal in the flesh, and usually something over, and yet the last two specimens above-mentioned measured by Mr. Heller when they were mounted, give heights of 5 ft. 10 in. and 6 ft. 2 in., a difference of 8 in. less in the one case, and 7 in. less in the other between the flesh measurements as given and those of the mounted specimens. In addition to these two, Mr. Heller measured

seven other mounted specimens, the largest of which gave a standing height of 5 ft. 8 in., while the largest *skeleton* measured by him gave a height of 5 ft. 9 in.

The two animals secured by me recently for the Natal Museum, Pietermaritzburg, and the Durban Museum measured, in the case of the bull, 5 ft. 10 $\frac{5}{8}$ in., and of the cow, 5 ft. 9 $\frac{3}{4}$ in., the girth of the former being 115 $\frac{3}{4}$ inches, and of the latter 112 $\frac{3}{4}$ inches. The bull, mounted, gives a standing height of 6 ft. and the cow, 5 ft. 10 inches. Now these were picked specimens, and as far as I was able to judge, were two or three inches over the average, this certainly was so in respect of the cow, while as to the bull, eleven large ones were examined at quite close quarters, before one was met with which was considered larger than those previously seen. I am therefore in complete accord with Mr. Heller, who sums up his conclusions in the following words:—"It is extremely doubtful if the square-nosed rhinoceroses ever exceed a standing height at the withers of 6 feet."

Referring to the comparison which has been made between *R. simus* and *R. unicornis*, the Indian species, there can be little doubt as to the superiority in size of the latter.

Rowland Ward, in his third edition of *Records of Big Game*, 1899, gives the measurements (presumably averages) of the Indian species as 5 ft. 8 in. to at least 6 ft. at the shoulder and girth 105 inches.

But he also gives measurements of three mounted specimens shot by H. H. the Maharajah of Kuch Behar, which are as follows:—

Shoulder height.....	6ft. 4 $\frac{1}{4}$ in.....	6ft. 1in.....	6ft. 0 $\frac{1}{2}$ in.
Girth.....	119in.....	112in.....	—

The colour of a normal individual of the "white" species is really very little lighter than that of the so-called "black rhinoceros," and it is fairly well-known at this time that neither is black and neither white. The shade designated "light mouse grey" in Ridgway's "Colour standards and Nomenclature" appears to me to best describe the normal colour of the white rhinoceros, darker individuals amongst them corresponding in shade with the "mouse grey" of the same authority. But, on the other hand, individuals may be met with in Zululand which by the same colour standards might be described as ranging from "drab" to "cinnamon drab."

When standing on a ridge exposed to the slanting rays of the morning sun they look absolutely white, and as these animals would have been first encountered by the early Dutch hunters on the open grass downs of the Vaal and Orange Rivers, and would thus be frequently seen under such conditions, it is possible that its present familiar, though inappropriate, name thus arose.

Character and Habits.

All species of rhinoceroses have certain characteristics which they share in common, these being sluggishness, a low order of intelligence and, generally, timidly of disposition, though the black African species often becomes extremely savage when attacked.

The white species is a very stolid, phlegmatic creature, nervous to a degree, without the truculent aggressiveness of the black, and but a fraction of the latter's curiosity.

I consider the white rhinoceros a far less intelligent creature than the black species: curiosity surely denotes a certain amount of intelligence, but it has always appeared to me that the former never displays the slightest curiosity, he takes things as they come, and does not seem to worry about anything, being too lazy to permit himself to be worried.

The question whether certain animals will attack, and under what circumstances they will do so, is one which has aroused considerable interest and not a little difference of opinion. It will probably be conceded that only the testimony of those who have had a wide experience of the animals they write of is of any real value in deciding the question. For instance, a man who has shot perhaps two or three lions in his time, neither of which showed fight, is apt to look upon *Felis leo* as being a pusillanimous creature, while he who has only bagged one, and was charged by it, would probably give it a very different character. Moreover, it is difficult to judge by the behaviour of an animal under one set of circumstances what another of the species might do under similar or other circumstances.

Although I have had wide experience in various parts of Africa with elephant, lion, buffalo, and black rhinoceros, I do not consider that the fact of having shot half-a-dozen white rhinoceroses qualifies me to speak with any authority upon the proneness or otherwise of the latter to attack.

I have stated that I do not consider my experience of the white rhinoceros *when wounded* to have been sufficient to warrant an expression of opinion as to their aggressiveness or otherwise under such conditions, but I have seen a great deal of them in their wild state, when not attacked, and at close quarters, and I assert without fear of contradiction, that with but very few exceptions, they are amongst the most inoffensive of beasts. Of the six which I have shot, only one ever made the slightest attempt to charge, and that was the

bull secured in the Reserve last winter for the Natal Museum. He was certainly a most savage dispositioned creature, for he made a very vicious attack when unwounded.

In a more or less sweeping manner, the statement has been made, and thoroughly believed, that the black rhinoceros is an exceedingly savage beast, a perfect "devil incarnate" in fact, that charges upon little or no provocation, while the white species is harmless and inoffensive. I do not at all agree with this sweeping denunciation of the black rhinoceros, and, while admitting that it frequently acts in an uncontrollably savage manner when wounded, and even when unwounded will charge most viciously if surprised at close quarters, I am certain that a large percentage of cases recorded of the animal charging, when itself unwounded, and not interfered with, are either much exaggerated or have been misunderstood. The exaggeration is not intentional perhaps, but is indulged in by those who believe they have related the circumstances accurately, and have only erred from want of wider experience of the creature's habits. Nervousness, lack of intelligence, and extreme curiosity (in both sexes) have a great deal more to do with the apparent truculence of the animal than natural aggressiveness.

It is well-known that a black rhinoceros will invariably advance towards a person or object that he is not able to make out properly, sometimes coming to very close quarters. This, in the writer's experience, the white rhinoceros never does.

The white rhinoceros is apparently of a far more sociable disposition than the black species, as it is frequently to be met with in parties of five or six in number, but if these are disturbed, it will be noticed that they usually separate and go off in different directions, two or three together, indicating that their being together was a more or less fortuitous circumstance, perhaps due to the discovery of some mutually satisfactory bit of grazing. It is, however, more usual to meet with a pair, or a family party of three or four. The latter would include an adult bull and a cow, a large calf, probably three parts grown, and a young animal six or eight months old. The writer has never met with two adult animals of one sex together, as he has frequently seen in the case of the black species, but a cow and calf without the bull are often seen together, and there are two or three bulls, solitary creatures, in the Reserve.

White rhinoceroses in Zululand (the following remarks will be understood to refer to this animal *in Zululand*, unless otherwise indicated) prefer a mud bath to bathing in clear water, though whether that is

due to the "brak" nature of all the water in the Reserve is not clear. But no mud-hole in the vicinity of their haunts will ever be found in which signs of recent wallowing by these huge creatures will not be obvious. On the other hand, their drinking places at clear streams very seldom bear any trace of their having bathed there. They may, however, be frequently seen without any mud at all on any part of their bodies, so it is quite certain that the wallowing in mud is not a regular part of their toilet. When mud covered they are weird-looking objects, as the colour of the mud differs in various localities, and as it only adheres in places, broad dark cracks are visible over the surface, and large irregular-shaped patches from which the mud has fallen off when dry, or been scraped off by the bushes.

On my recent collecting trip a young animal of perhaps six years old was found wallowing in a particularly glutinous and odoriferous mud-hole. Our attention was drawn to the spot by occasional low grunting sounds proceeding therefrom, sounds best described by saying that they exactly resembled the low grunts emitted by an old male baboon, and at first we believed they were so made. Stalking in cautiously up wind we came upon this young "mkombo" in the act of rising from the mud, his hind quarters at the moment being submerged, while he rested upon his fore-quarters, and a more ludicrous object it would be difficult to imagine. As we were able to approach to a distance of not more than 10 yards the chance of getting a photograph was unique, but unfortunately the writer's photographic outfit was out of action. Upon emerging from his wallow, the animal ascended a low bank where it stood for some three or four minutes, occasionally turning its head to one side or the other, then it disappeared behind a thick screen of bush. It had been absolutely unconscious of my presence and that of my five native attendants, notwithstanding that I was several times on the point of exploding with laughter at the comical figure, and it seemed that the efforts to suppress it must have been audible to the animal, and doubtless would have been but for the mud in its ears. We afterwards crept round the lower side of the mud-hole and through the bush screen and found that the animal had not gone more than 20 yards, and was standing under a large fig-tree. Once or twice it looked directly at us, but evidently without making us out, and after about quarter-of-an-hour it lay down and we left it in peace.

The white rhinoceros usually drinks between midnight and 6 a.m., though I have seen them drinking at various times between 8 and 10 a.m., and it never appeared that the weather conditions had anything

to do with it. In the late afternoon they feed their way down to their drinking places, which, except in very dry seasons, when only one or two water-holes are available, are very seldom visited by the same animal on two successive occasions. If the water-holes are in narrow stream-beds the animals will wonder up and down such places in the damp sand for an hour or more, for no object that the writer could ever fathom, but if they drink at one of the large rivers, such as the Black or White Mfolozi, they go straight to the water's edge, drink, and move direct back again to the bush. The reason for this is obvious, the smaller streams such as the Ugcoye, Nobiya, Mpafa, and others run between narrow, steep banks, and the animals can wander there at will, completely hidden by the high banks from the sight of possible enemies. But in the case of the larger rivers the bush seldom comes down to the water's edge, there being a broad strip of open sandy ground between it and the river, upon which, if the animal were to loiter, it would be in full view from either side of the river if there were any light whatever.

On one occasion I watched at one of the Ugcoye water-holes upon a night when there was a young moon, but the latter had set before a rhinoceros came down to drink, and it was then quite dark, and although an examination of the spoor in the morning proved that the animal had been but twelve yards from me, it was impossible to make out any shape whatever, it merely loomed as a dark formless object. Seen in good moonlight, it may be mentioned, the white rhinoceros appears really white, more so than in strong sunlight. The above-mentioned animal drank quietly but very deliberately for, it was judged, eight or ten minutes; and before leaving, the water was heard to be violently agitated, though whether by the act of pawing or a movement of the head could not be determined.

After drinking they make off in the direction of their feeding grounds which are usually at a great distance, they sometimes indulge in a few mouthfuls of food if there is any by the drinking-holes, but they then travel straight away, seldom grazing on the way till they have covered at least three or four miles.

White rhinoceroses feed up against the wind, moving slowly, and swinging their great heads from side to side as they mow down the grass, and where the latter is short the marks where the chin has rubbed along are plainly discernible, and occasionally those of the horn.

As the hours pass on towards daylight, they draw nearer to the spot where they intend to lie up for the day, but if the weather is warm they seldom feed much after about 9 a.m., when they move to a

shady tree or patch of bush, and there they will stand for an hour or two, with their heads lowered and scarcely any sign of movement, save the constant flicking of the long ears, round which the biting flies, which worry them incessantly, congregate. They may then move off again for a short distance, seldom more than a few yards, or lie down on the spot where they have been standing. Sometimes they lie down on their sides, at others they sit up with their legs doubled under them. They will also rest and sleep when standing, and in either position are absurdly easy animals to approach, though particularly so when lying down; in fact, with the exception of the elephant no other species of wild game can be so easily approached.

As to choice of place and surroundings, they appear to have none, and I have seen them lying during the scorching midday heat on open shadeless flats, in low scrubby bush scarcely 2ft. high, with the blazing sun pouring down upon them: and I have found them far in the darkest recesses of the thorn jungles, into which it is difficult to make one's way. They are never found at rest on rocky kopjes however, nor can an instance be recalled of finding them sleeping on high open ridges; the former can be understood, as they are not partial to rough ground as are their back congeners, but the high ridges, open to the wind and dotted with fine shade trees would seem to be ideal spots in which to seek refuge from the ever annoying flies.

A single animal almost invariably lies down with its head to the wind, and if two or three are together, one of them assumes such position: during last winter we found four of them one day lying in the sun, in long grass, on the sheltered side of a long valley, and right on the edge of a thorn jungle. The positions adopted by them were most singular, as they lay in the form of a cross, all with tails in and heads outwards, and when we put them up they literally tumbled over one another in their efforts to get away from danger, the direction of which was not at all clear to them.

In rolling country, such as forms the greater portion of the Game Reserve, they seem to always choose the side sheltered from the wind, and in the majority of cases in which such a spot is selected for their noonday rest, there will be found an extent of dense bush close at hand.

It has always appeared to me that the white rhinoceros of Zululand is a more decidedly bush loving animal than it is elsewhere; some of the streams are fringed with stretches of very dense bush, inside of which the ground is always moist and the air cool, and while it seems quite the correct thing to find buffalo congregating there, and any number of bushbuck, it appears altogether incongruous to meet with

white rhinoceroses in such places. Nevertheless these animals pass a very great deal of their time in these localities, and very often lie up for the day in them.

There are large tracts in the Mfolozi Game Reserve covered with a particularly wicked form of vegetation known to the natives as "ihlehle" thorn: it is a species of cactus, armed with cruel spikes, and as the growth is of a very brittle nature, large pieces are constantly knocked off by passing game, and by those which actually feed upon it, such as kudu, bushbuck, baboons, etc. Thus the narrow game-paths through these jungles become strewn with the spikes, and bare-footed natives suffer severely in consequence. Wherever these jungle tracts are found, it is certain that the majority of the white rhinoceroses in the vicinity will be met with during the day sleeping far inside them, in the darkest and most inaccessible parts, to which silent approach is almost an impossibility even when the creatures' guardian angels, the "Rhinoceros birds" (*Buphagus erythrorhynchus*: Red-billed Oxpecker) are not in evidence.

It is well-known that there is considerable difference between the dung of the black and that of the white rhinoceros, and also in the manner in which it is deposited. That of the former species is always placed in large heaps, and after depositing it the animals scrape and scatter it about either with their horns or hind-feet. As they feed upon twigs, bark, and the green shoots of thorn-trees the dung is reddish-brown in colour, and is thus easily distinguishable from that of the larger species, consisting as this does entirely of grass, and being of a greenish colour when fresh, similar to that of zebras. Although the white rhinoceros does not systematically deposit its dung in heaps, and never afterwards disturbs or scatters it, I have remarked that as often as not this animal *does* visit one spot over and over again for the purpose, and though in some cases I have obtained proof that these heaps have been made by one animal, I am not prepared to state that one such place is not visited by a number of different animals.

An unusual fact, or one that does not appear to have been recorded from elsewhere, has been noticed in connection with such deposits in the Game Reserve. At one spot, not 50 yards from one of my camps, in the middle of an opening in the bush, there was a very large "dumping ground" consisting of a hollow scooped out in the sandy soil, roughly oval in shape, and about 11 feet in length by 7 feet in width. Whether the hole had been made by the animal itself or by some other creature it was impossible to determine, but at all events the hole was there, and was about 2 feet deep, and in it had been deposited

the droppings of one or more animals during a period of probably two or three months, in fact a white rhinoceros had visited the spot the morning of the day upon which we pitched camp there. In another place on a hog-backed ridge running off from the Imbulungu Hills, four similar, though shallower, basins had been scooped out, roughly about 8 yards equidistant from each other, but in distinctly harder soil, and these had been visited many times by white rhinoceroses. During the week we spent at a camp near by, only one of these holes was used, and on each occasion by but one animal, the only one in the immediate vicinity, a solitary bull.

On the other hand, their droppings may be found in all manner of different places, on ridges, in valleys, in dense bush, where no hole has been made or previously made hole used, and where the places have not been re-visited. On a high open ridge running south from the Amantiyane Hills an area of ground some 20 or 30 yards square was covered at quite close intervals with heaps of white rhinoceros dung.

Although never able to detect anything but grass in their droppings, I have wondered whether perhaps these animals sometimes eat the "ihlehle" cactus leaves, because they undoubtedly do assimilate a certain quantity of leaves of low-growing ground plants which they take in their mouths along with the grass.

The black species eats the ihlehle greedily, as also do buffalo, kudu, bushbuck, and bushpigs.

White rhinoceroses, like all other game animals are very partial to the young grass which springs up after the old grass has been burnt off.

Although their spoor was frequently met with on freshly burnt ground, yet I never saw any indication of their having rolled in the ash, as the black species delights to do.

Their powers of sight are extremely limited, so much so that at 100 yards it is very questionable whether a slowly moving object can be seen by them, and this feebleness of sight is quite apart from a certain amount of obstruction of vision due to the position of the anterior horn. At 50 yards even they are unable definitely to make out a slow moving object, such as, for instance, a person stalking towards them, stooping when in the open and occasionally hidden behind bushes.

Stationary objects must be between 25 and 30 yards distant before the animal can plainly distinguish them, but with ordinary care, and provided that the animal has not recently been disturbed, it is really a very simple matter to approach them to even less than 20 yards.

To compensate them for this defective power of sight they possess a wonderfully acute sense of smell, and under favourable conditions can wind a person at a distance of fully half-a-mile. And it is entirely to this acute sense that the animal trusts to warn it of enemies, and when annoyed and irritated by the suspected presence of danger from below wind, as for instance when its feeble vision detects objects close at hand, but its sense of smell fails, owing to the direction of the wind, to confirm its suspicions, the animal becomes utterly bemused and nervous. Presumably it fears to bolt off, lest there may be danger elsewhere than at the spot at which its weak eyesight has led it to suspect it, yet one would imagine that it would rely entirely under such circumstances upon its sense of smell, and move off at once up wind.

A black rhinoceros thus situated would at once advance towards the object of its suspicion, but not so the white, which shuffles its feet about, alternately raises and lowers its head, twists and untwists its tail, gazes from one side to the other, while all the time its ears are energetically worked about, and generally displays the upmost nervousness. At last these nervous actions cease, the head is raised, and for a few seconds the animal stares hard in the direction of the suspected danger, then wheeling round it trots off at a sharp pace.

The sense of hearing, while considerably less acute than that of scent, is greater than their powers of vision. On my recent collecting trip I was approaching a single rhinoceros, and was accompanied by four natives. My object was to secure a photograph, but as I only had a Vest-Pocket Camera, with an excellent, but short focus and very wide-angle lens, it was necessary to approach the animal to at least a distance of 20 yards. When still fully 60 yards from the animal, I withdrew the camera from its case, handing the latter together with my rifle to one of the natives, who in receiving them, stupidly dropped the leather case, which fell with a hollow sound on to an emerged tree-root. Glancing at the rhinoceros, I saw it raise its head instantly, turn half round, and face the party, the sound having been clearly heard by it, in fact its suspicions had been so aroused, that before we had covered another ten yards, the animal made off, followed by three others which had previously been hidden by a thick grove of trees. At a distance of about 25 yards a white rhinoceros bull most obviously detected the sound of the opening and closing of a camera shutter, because the animal, which had previously been standing broadside on, at once, at the click of the shutter, swung round and stared hard in my direction.

When one is following them through thick bush there is no doubt that they distinctly hear the sounds of breaking sticks, and the scraping of bushes on one's clothes, and yet with only ordinary caution they can be closely approached under these conditions. This is probably because such movements and sounds are of common occurrence in these places, where other creatures than themselves are on the move.

It has always appeared to me that they, in common with other wild game, are able to differentiate between natural, or usual, sounds and those which are unusual. For instance, if one is following them up as above described and sticks are unavoidably broken under-foot, or bushes noisily displaced, the animal when met with will be more or less alert, its ears cocking at different angles and seldom still for five seconds together, but if no unusual sound reaches him he will not decamp. You may tread on sticks or scrape past bushes in quite noisy fashion without causing the animal to become other than mildly alert, but if you are so careless as to carry a knife slung at belt and to let it come in contact with your rifle, or to allow a twig to jerk back and rattle against your camera-case well, *R. simus* will await no further developments, but move off, and you can then sit down and smoke, the while you reflect upon the paradoxical intelligence of the unintelligent rhinoceros.

Supposing such unusual sounds are above indicated occur when you have already approached so closely in the thick bush that the animal has become dimly aware of your presence, he will not bolt at once, but, if facing away from you, he swings round actively enough, staring hard in your direction, in which position, unless you are armed with some very differently constructed camera to that which I use, with its complexity of movements, there is very little hope of making an exposure.

It is supposed that you are perhaps 20 feet distant from the animal (at any further distance he would not be visible in the surrounding bush) that is, close enough for your every movement to be clearly discernible, thus precluding all possibility of manipulating the camera, in addition to which the chances are that although the great beast is almost at arm's length from you, all you will see will be two or three patches of grey, a flicking ear and a dark mass which looks like a tree stem, but which you know is the anterior horn, the whole harmonising so completely with the surrounding grey shade, that even these are most difficult to make out.

The white rhinoceros shares with the elephant a perfectly marvellous adaptibility for getting away, even in the densest cover, with almost uncanny silence. The writer recollects upon one occasion getting up to about 20 yards from the nearest of a little troop of a dozen or 15 elephants in thick cover. They stood with uplifted trunks "feeling for the wind," three or four of them offering quite easy shots if only it had been possible to see their tusks. Having already secured three from the main herd to which this little troop had belonged it was desired to kill only the best animal of these, but all the creeping and dodging about failed to discover the one which was wanted. Chancing to take my eyes off them for an instant, upon looking up again they had vanished, gone like morning mists, and as silently, all those huge creatures had passed out of sight without the slightest sound. And the white rhinoceros is equally adept at performing this vanishing trick.

When approached from below wind in more open country, it will probably be found standing with lowered head, its nose almost resting on the ground, but occasionally it will be raised, and turned uncertainly from side to side, not with the nervous jerky action peculiar to the black species, but in a ponderously deliberate manner. When satisfied that danger threatens, the animal wheels round and makes off at a swinging trot, its tail screwed tightly above its back. It usually goes a couple of hundred yards or so up wind, twisting and turning in and out amongst the bushes very smartly, and then generally pulls up, standing with its head in the direction previously taken, and, if followed up, will repeat the performance, till finally when his dull senses assure him that he is being persistently followed, he will break away at a sharp gallop for a hundred yards, then slowing down to its normal trot, will not halt again until it has put many a mile between itself and the object of its alarm.

The white rhinoceros is very much less active than the black, and more deliberate and heavy in every movement, the only action which it appears to perform smartly is that of getting on its feet from a lying down position, and it is really wonderful how quickly that is done.

The writer has never met with these animals high up on rocky hills, such as the black loves to clamber about upon, nevertheless, when put to it, they can negotiate uncommonly steep and rocky places with agility. They travel about amongst the foot-hills, however, here and there ploughing up long furrows with their horn as they walk along.

The habitats of the two species do not overlap, or at least not to any extent. In one spot only have I met with the dung of the black species within the range of the white's habitat, and upon another

occasion when passing through the latter about midnight, I and the party of natives accompanying me were held up by an aggressive black rhinoceros.

The two species, however, seemed to have mingled together in former days in their old haunts in Rhodesia, but it is noted that Heller remarks that in the Nile regions neither encroaches upon the habitat of the other.

They are frequently accompanied by the "Tick-birds" (*Buphagus erythrorhynchus*) and sometimes by the Buff-backed and the Little Egrets (*Bubulcus ibis* and *Herodias garzetta*). The former scramble about all over the huge animals, exactly as they do upon cattle, and as they are particularly wide-awake birds it is very difficult to approach their host when they are present, as they invariably set up a loud screeching, and in that way and by running rapidly about over its head, sound a warning of which even this dull-witted pachyderm never fails to avail itself. The egrets sedately follow up the rhinoceroses as they move, and may frequently be seen taking ticks from under the animal's belly. In reward for these services they get many a joy-ride on his back.

Burning stretches of grass within the range of their habitat in the Game Reserve appears to cause them some annoyance, and they usually repair to some other locality for a couple of days, after which they return and wander about over the burnt ground without any sign of alarm. Usually they are not alarmed at grass-fires, but it is possible that in Zululand, the knowledge that their range is comparatively restricted, may account for the fact that these fires cause them considerable temporary annoyance.

The late Mr. Selous states in one or other of his most interesting works that he has never met with a case of an adult rhinoceros perspiring, although the young calves do so most freely. I have, however, met with cases of the adults perspiring quite as freely, the black more so than the white, and mainly about the neck and flanks.

After the statement made by the above authority I would hesitate to record otherwise, but for the fact that I am so certain about this. The black rhinoceros cow, for instance, which was shot in the Hluhluwe Game Reserve last winter for the purpose of securing the calf, was covered with perspiration about the neck and flanks, and this was noted by the writer and his friends who accompanied him.

The only sounds which I have ever actually seen a white rhinoceros in the act of making are a loud snort or sniff, made when the animal comes upon some object the nature of which is foreign to him, and

loud grunting squeals made by a dying animal. The former has been heard upon several occasions when white rhinoceroses have come close to my camps, from below wind, in the night, and the latter I have heard made by wounded animals.

Reference has already been made to grunting sounds proceeding from a spot where an immature rhinoceros was wallowing, and that although upon our approaching closely and watching it, it was not seen to make any sound, yet both I and the natives who were with me believed that those we had heard so distinctly proceeded from that particular animal. At the same time, it must be admitted that there are large numbers of baboons in that part of the country, and it is just possible that a solitary male of that species might have been down at the mud-hole, and uttered the grunts as it moved off, and it will be noted that at the time, and before sighting the rhinoceros, we believed it *was* a baboon.

The white rhinoceros is an easily killed beast, as indeed is the black, and succumbs quickly to a shot through the upper portion of the heart or through both lungs. In the latter case it is essential that the bullet shall penetrate the two lungs, otherwise if only one is touched the wounded animal will travel for ever, and it is very little use trying to follow one so hit.

We have very little reliable information concerning the breeding habits of the white rhinoceros, and such as we do possess has caused considerable divergence of conclusions.

The generally expressed opinion is that it breeds very slowly, but Heller, basing his conclusions upon the evidence gathered on the Smithsonian Nile Expedition, opines that the reverse is the case, and it would seem that he had strong reasons for so thinking. In Zululand there is no doubt that this animal breeds very slowly, and this opinion was held by the late Mr. Selous in respect of the animals in Rhodesia.

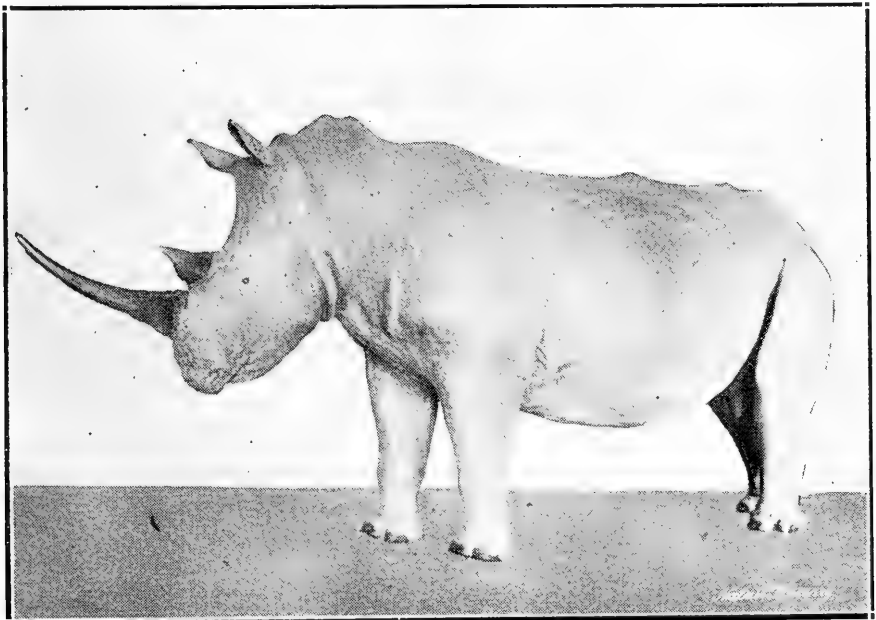
Heller points out that in the Nile region "the adult female is seldom found without a calf." This condition also obtains in Zululand. But as in the latter case these calves are invariably animals of fully four years old, and there is no younger animal running with the parent, it may be assumed that a period of at least four years elapses between the birth of one calf and that of the next. And this appears to be borne out by the conditions under which I have occasionally seen two calves with the mother, the elder of the two being an animal, as I should judge, of between four and six years old, and the younger less than a year.

I am disposed to think that the native report to the effect that the female rhinoceros of this species hides its young in dense cover for some time after birth may be true. Certainly I have never seen a very young calf, that is to say less than two to three months old.

Careful observations lead to the conclusion that the young may be born at any time of the year, and that there is no particular calving season.

It has always appeared to me that the female white rhinoceros evinces very little concern for its young after the latter is three months old or so, the concern seems mainly to be exercised by the young animal itself, and when danger has been located and the adult animals make a bolt for it, the ungainly youngster very promptly places itself in front of its mother, a position it retains, guided by the latter's horn against its flank, no matter how intricate the twists and turns through the bush or how variously the pace may be accelerated or reduced.

A brief reference to the native nomenclature of this rhinoceros may not be out of place. I have elsewhere shown that the word in general use in S.E. Africa for this creature is "Umkombo" (or as pronounced, "'mkombo") but that large adult males of the black species are frequently referred to by the same name. I have, however, been recently informed by Mr. Oswald Fynney, Resident Magistrate for the Ndwandwe Division of Zululand, a very clever native linguist, that when natives who *know* the white rhinoceros wish to refer to it in a manner which shall leave no doubt in the listener's mind as to which species is indicated, they use the word "Umkava," usually abbreviated to "'mkava." Personally, I have never heard this word used, even by the game-guards who have been in charge of the Mfolozi Reserve for years, but it is interesting to know that, if my memory serves me, the Matabili people call the animal "'mkofo," which bears distinct resemblance to "'mkava," if it be taken into consideration that the relative pronunciations of the "f" and "v" in the Bantu language are often difficult to determine.



Block lent by "Natal Mercury."

White Rhinoceros (female) from Zululand,
presented to the Durban Museum by William A. Campbell, Esq.
The horn measures $28\frac{3}{4}$ inches along the curve.

XXI.—On the Genus ICTIDOPSIS,

by

S. H. Haughton, B.A., F.G.S.,

Assistant Director, South African Museum, Capetown.

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TWO skulls belonging to this genus in the collection of the Durban Museum enable me to give a fuller account of the form than has hitherto appeared. The skulls are almost exactly similar. The larger one has been almost fully developed and shows most of the features.

Two species of the genus *Ictidopsis* have been described, both very briefly :—*Ictidopsis elegans* from Harrismith, described by Broom (Proc. Zool. Soc. 1912, p. 872) and *I. formosa*, also from Harrismith, described by van Hoepen (Ann. Transvaal Mus. V, 3, Suppl. 2, 1916). The latter is said to be “larger than the type species, and its interorbital space is relatively broader. The hinder end of the nasal is only slightly broader than the front end.” Comparative measurements are as follows :—

	<i>I. elegans</i>	<i>I. formosa</i>	Durban Mus. specimen
Greatest length ...	63mm.	81mm.	72mm.
Greatest width ...	42mm.	55mm.	44mm.
Interorbital width ...	12·5mm.	18mm.	15·5mm.
Six molars occupy a space of	13mm.	17mm.	16mm.

This form comes, therefore, nearer to *I. formosa* than to *I. elegans*; but it is possible that the differences between the two species may be due to individual variation. All the known specimens come from the Middle Beaufort Beds of Harrismith. The two skulls belonging to the Durban Museum, although obviously of the same species, show slight differences in size and relations due to crushing.

The premaxilla carries four pointed incisors, which are bent backwards. The fourth and smallest has a rounded anterior edge but is flattened posteriorly. The others are apparently nearly round in cross-section.

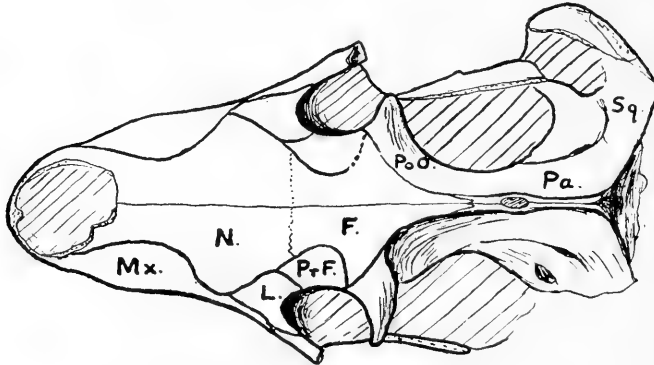
The maxilla extends forward outside the premaxilla to the fourth incisor and forms the lower border of the foramen lying exterior to the nostril. It is highest above the canine and extends back below the orbit as a splint underlying the jugal. In addition to the canine it carries six molars. All the molars are cusped with a large pointed median cusp and a small anterior and posterior cusp, as in *Nyctosaurus*. The first molar is small and the subsidiary cusps rudimentary. The 2nd, 3rd, and 4th are large teeth. The 5th and 6th somewhat smaller; but all have the cusps well marked.

The septomaxilla forms only a small part of the face. It lies between the nostril and the external foramen. Behind this it lies within the maxilla, its upper edge only appearing on the face. Anteriorly it lies on the floor of the nostril just overlapping on to the premaxilla.

The nasals are very broad between the points where they meet the lachrymals and maxillæ. Anterior to this they narrow rapidly and then broaden to the nostril; while they also narrow between the prefrontals.

The jugal sends forward a process to lie between the maxilla and lachrymal. The latter is larger than the prefrontal. The frontal is small and excluded from the orbital margin and articulates with the parietal along the intertemporal bar some distance in advance of the pineal foramen.

TEXT-FIG. 1.



ICTIDOPSIS FORMOSA, v. Hoep.

Skull and lower jaw, from above. (*Slightly larger than natural size*).

The posterior part of the palate and the side wall of the brain-case have been cleared, and are here described for the first time.

The occipital condyle is double. The ventral surface of the basioccipital is short and broad, forming the inner border at least of the foramen jugulare, which is large and looks wholly downwards. The ventral surface of the basioccipital is pitted with two or three small pits.

The posterior portion of the basisphenoid forms an equilateral triangular area whose base is the articulation with the basioccipital and whose sides are slightly ridged only near the apex. As in *Diademodon* and other forms the bony fenestra ovalis is bounded by the basisphenoid, basioccipital, and prootic. Anterior to the apex of the

triangular area the basisphenoid is continued as a narrow vertical plate whose lower surface passes forwards and upwards. Near the bottom, either side of this plate has a groove, which is separated from its neighbour by a free-ending short tongue of the basisphenoid. Each groove leads forward into the interpterygoid vacuity whose hinder margin is formed by the basisphenoid. In cross-section the basisphenoid is seen to lie above the interpterygoid vacuity and anterior to the vacuity the bone is again seen as a tongue lying between the pterygoids at the top of the arch whose side-walls are pterygoidal.

The side-walls of the interpterygoid vacuity are formed by the pterygoids which pass back to lie outside the basisphenoid. The latter has a very short basiptyergoid process which meets the pterygoid and is separated by a thin splint of that bone from the large epiptyergoid.

In front of the anterior tongue of basisphenoid the pterygoids are in contact with one another. Here for a short distance there is a median groove, but at the level of the transverse processes of the pterygoids the palate becomes suddenly vaulted; and no development has been done anterior to this point.

The side-wall of the brain-case is similar to that of *Cynosuchus* and *Diademodon*. The sinus canal separates the epiptyergoid and prootic from the parietal and passes back to the post-temporal opening. The foramen for the exit of branches 2 and 3 of the Vth nerve lies in the suture between the prootic and epiptyergoid, the former forming only its posterior border. The epiptyergoid has a suture with, and lies external to, the pterygoid anteriorly; but the pterygoid dies out posteriorly whilst the epiptyergoid passes back to meet the quadrate.

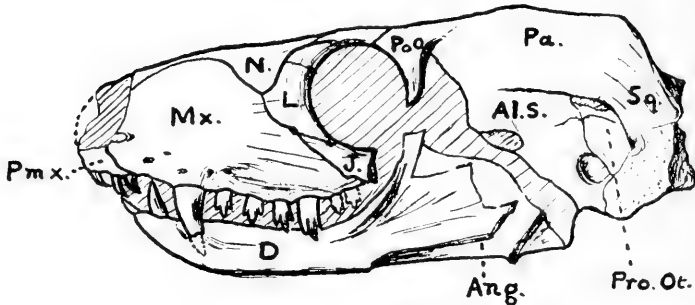
The quadrate is small and fixes on to the squamosal by means of two processes which fit loosely into two deep grooves on the under surface of the squamosal as in *Diademodon*. The external auditory meatus lies just mesial to the inner of these two grooves. It is deep, but does not pass on to the top of the skull.

The lower jaw is typically Cynodont in structure, with a long shallow dentary provided with a large coronoid process, and a small postdentary portion. The notch in the lower border of the angular is almost covered by the dentary; and the outer face of the bone is provided with a channel facing backwards and downwards and passing upwards and backwards from the notch, its outer wall formed by a reflected lamina of the angular. The splenial meets its neighbour at the symphysis, lying along the inside of the dentary.

In general features this skull is a Cynodont; but in the possession of an interpterygoid vacuity it differs from all the hitherto-described

Cynodonts, from the Gorgonopsia, and from *Cynosuchus*. An interpterygoid vacuity is a feature of the Therocephalia which differs from *Ictidopsis*, however, in many respects—as do the Bauridae. I have shown elsewhere that in the development of *Whaitsia* the loss of the interpterygoid vacuity probably took place at a late stage, as a little skull possibly ancestral to *Whaitsia* and from a slightly lower horizon differs from the latter type chiefly in the possession of a single molar and an interpterygoid vacuity. *Ictidopsis* is from the Middle Beaufort Beds found associated with the zone fossil *Lystrosaurus*. *Nyctosaurus* possibly also first appears near the top of the Middle Beaufort Beds but extends through to the Upper Beaufort Beds of Aliwal North. By the gradual closing together of the pterygoid plates and the consequent elimination of the interpterygoid vacuity *Ictidopsis*

TEXT-FIG. 2.



ICTIDOPSIS FORMOSA, v. Hoep.

Skull and lower jaw, side view. (*Slightly larger than natural size*).

could conceivably become a typical Nyctosaurid; but if this be the line of evolution, then we must look for the ancestors of at least some of the Cynodonts among forms with an interpterygoid vacuity which is divided above by an anterior prolongation of the basisphenoid. Such features are seen in the Scaloposauridae of the *Cistecephalus* zone and some of the Therocephalia of the *Endothiodon* and *Tapinocephalus* zones. In these, however, a suborbital vacuity is persistent; but the ancestors of *Ictidopsis* and of *Nyctosaurus* may have arisen from a Therocephalian in whose descendants the suborbital vacuity gradually became obliterated and a secondary palate formed. It has been suggested that the Gorgonopsia are further from the line of descent of Cynodonts such as *Diademodon* than has usually been suspected; and the features of *Ictidopsis* seem to bear out this contention.

XXII.—On South African Bees, chiefly collected in Natal,

by

T. D. A. Cockerell, University of Colorado.

CERATINA, Latrielle.

CERATINA VIRIDIS, Guérin.

♀. Doonside, 20th December, 1916 (L. Bevis). Umbilo, 18th February, 1917 (L. Bevis). *C. viridis* was described from Senegal, and I have specimens from Benguela. I am quite unable to separate those from Natal, though the wide range is surprising. The abdomen in Natal specimens varies from blue to green.

CERATINA BRAUNSIANA, Friese.

♀. Krantz Kloof, 2nd October, 1916 (Marley). Agrees with specimens from Algoa Bay, received from Dr. Brauns.

CERATINA MIMULA, sp. nov.

♀. Length 7·5 mm.; black, with fuliginous wings; clypeus normal, with a broad pale yellowish band; anterior femora with a short yellow line in front, and their tibiae with a similar line at base; hind tibiae with abundant long hair on inner side; abdomen densely punctured, the segments at sides fringed with widely spaced yellowish spine-like bristles; third ventral segment with a very conspicuous transverse patch of white tomentum.

Krantz Kloof, 30th October, 1916 (Marley). Very close to *C. geigeriae*, Ckll., but differing by the entirely black tubercles and darker, more violaceous wings. *C. geigeriae* is from Benguela. The clypeus has a feeble median sulcus, not distinct and conspicuous as in *C. sulcata*, Friese.

CERATINA SPECULIFRONS, sp. nov.

♀. Length 10–10·5 mm.; black, with fuliginous wings; no pale markings on head, thorax or abdomen; no abdominal hair-bands; anterior tibiae with an ivory-white stripe on outer side, extending from base to a little beyond middle; hind tibiae angulate externally beyond

middle, and just before the angle coarsely serrate with four teeth; clypeus abbreviated, snout-like, with a large semi-circular concave smooth polished space, surrounded above and at sides by a salient rim; on the upper surface, above the rim, is a broad wedge-shaped depression. Labrum very large, shallowly sulcate in middle; cheeks broad and rounded, very densely punctured; front and vertex densely and coarsely punctured; mesothorax polished, with sparse strong punctures; scutellum densely punctured; abdomen punctured all over; ventral segments with short silvery-white hair.

Variety A. Length 8.5-9 mm.; the depression on upper-side of clypeus with a longitudinal yellow mark. The depressed shining basin of clypeus is quite small in the smallest specimen.

Type from Eshowe, 8th January, 1916 (Marley). Co-type the same, but 7th January, 1916. Variety a, Umbilo, 7th February, 1917 (L. Bevis) and Umbilo, 1916 (L. Bevis). Nearest to *C. nigriceps*, Friese, but larger, with pale marks on anterior legs.

CERATINA FIMBRIATULA, sp. nov.

♀ (Type). Length about 7 mm.; black, with dusky wings; no pale marks on thorax or abdomen; abdomen with narrow hair-fringes, only at sides on first two segments; hind tibiae with a single large sharp tooth on middle of outer side; anterior tibiae with a variable pale line; clypeus with a depressed polished triangular basin, rounded above and produced at sides, the part above broadly yellow, the yellow extending on each side of the basin as a curved stripe, the whole yellow mark like a very broad reversed V with a very large base; sides of face with very coarse punctures; upper part of labrum with a triangular dull area; cheeks coarsely punctured all over; mesothorax very coarsely punctured, but a large space in middle with only a few punctures; scutellum densely and very coarsely punctured.

♂. Length about 6 mm.; clypeus ordinary, bright chrome-yellow, with a slender median sulcus; labrum yellow; anterior tibiae and basitarsi with a slender yellow line along their whole length; apex of abdomen broad, with a small dentiform apical angle; hind tibiae with a broad pencil of very long hairs on inner side.

Type ♀ from Malvern, Natal, March, 1916 (Barker). Co-type ♀, Durban, 11th March, 1917 (E. C. Chubb). Male, Umbilo, 25th February, 1917 (L. Bevis). Related to *C. lunata*, Friese, but smaller, with the yellow face-mark of female differently shaped (crescent-like in *lunata*), and the male with black tubercles.

CÆLIOXYS, Latr.

CÆLIOXYS LORICULA, Smith.

Durban, 2 ♀, 12th October, 1918, and 18th October, 1918 (C. N. Barker).

CÆLIOXYS PENETATRIX, Smith.

Bluff, Durban, 1 ♀, 25th November, 1916 (C. N. Barker).

CÆLIOXYS (LIOTHYRAPIS) PACHYURA, sp. nov.

♀. Length 14.5 mm.; with an abundance of white hair; tibiae and tarsi red. I had taken this for *C. verticalis*, Sm., until I saw the true *verticalis* from Natal. It differs from *verticalis* by the much clearer wings (fuliginous in *verticalis*), hair of face pure white (mixed with brown in *verticalis*), and last ventral segment of abdomen conspicuously broader.

Willowmore, S. Africa, 1st December, 1904 (Dr. H. Brauns). Sent as *C. decipiens*, Spinola. It is undoubtedly the *C. decipiens*, var. *rufipes*, Friese, but the name cannot be used, as there is an earlier *C. rufipes* from Cuba. According to Vachal's description, it is very close to *C. lanuginea*, Vachal, from the Gabun (French Congo), but differs by the red tibiae and tarsi and the distinctly punctured under surface of abdomen. Possibly *lanuginea* and *pachyura* are races of a single species.

CÆLIOXYS (LIOTHYRAPIS) VERTICALIS, Smith.

The male, not before described, resembles the female in appearance, but the hair on the face is yellowish. The fifth abdominal segment has no lateral spines; the sixth has six spines, the upper terminal ones directed outward. In Friese's table of males it runs to *C. seaspinosa*, Friese, a form with clear wings resembling *C. afra*.

♀. Durban, 1915 (H. W. Bell Marley). ♂, Malvern, 22nd December, 1915 (C. N. Barker).

CÆLIOXYS CHUBBI, sp. nov.

♀. Length about 15 mm.; black, with the patches of hair pure white; eyes dark brown, with short hair; clypeus dull, granular, with sparse punctures, not keeled, the surface not hidden by the very

fine pruinose pubescence, the apical margin rather broadly covered with pale ochreous tomentum; mandibles black; cheeks anteriorly (next to orbits) covered with dense white hair, but posteriorly with thinner hair; posterior ocelli unusually close together, the distance between them about equal to the diameter of one; mesothorax bare, shining, very strongly and densely punctured, the punctures mostly in longitudinal grooves; scutellum rugose, slightly emarginate apically, base with two short transverse stripes of white pubescence; axillar teeth long and pointed, strongly punctured; tegulae black; wings fuliginous, with strong violaceous tints, hyaline basally; legs (with spurs) black; abdomen shining, not densely punctured, segments with narrow pure white hair-bands, enlarged at sides; last dorsal segment delicately keeled throughout its length, the apex pointed; last ventral extending some distance beyond last dorsal lanceolate, not notched at sides; penultimate ventral segment dull and finely granular except at base.

Type; Bluff, Durban, 6th April, 1917 (C. N. Barker). Co-type, with abdominal bands spoiled. Durban, 22nd April, 1916 (E. C. Chubb). The apex of the abdomen is formed much as in *C. brevis*, Eversm., but the last ventral is broader, and not nearly so long. Superficially, *C. chubbi* resembles *C. durbanensis*, Ckll., but the end of the abdomen is entirely different.

CÆLIOXYS BARKERI, sp. nov.

♀ (Type). Length 10–10.5 mm.; black, with white pubescence, very scanty and slightly ochreous-tinted on thorax above; mandibles and legs dark red; tegulae piceous; wings smoky-hyaline, darkest apically. Eyes dark grey, with very short hair; face densely covered with snow-white hair; cheeks densely white-hairy; distance between posterior ocelli much greater than the width of one; mesothorax and scutellum with very coarse large punctures; anterior border of mesothorax with scale-like white hairs, not covering the surface; scutellum very short, posteriorly truncate; axillar spines rather short; spurs cream-colour; abdomen shining, strongly but not densely punctured, with linear pure white hair-bands, greatly enlarged at sides; last dorsal segment broad but pointed, keeled throughout; last ventral shaped much as last dorsal, but broader, and extending very little beyond the dorsal; venter with broad bands of white hair; penultimate ventral segment without distinct punctures.

♂. Length 7–9 mm.; similar to the female. Anterior coxæ with stout red divergent spines; fifth abdominal segment with small lateral

teeth; sixth with six teeth; lateral ones sharp and slender; median sulcus broad and deep; apex of sixth segment reddish, the lower apical teeth very sharp, longer than the upper; seen from above the apical teeth bound a rather high semi-circle.

Type ♀. Umgeni, Durban, 4th December, 1918 (C. N. Barker); co-type ♀, Bluff, Durban, 20th March, 1917 (C. N. Barker). Males: Bluff, Durban, 20th March, 1917 (two) and 28th January, 1917 (C. N. Barker). In the male, this closely resembles *C. dolichacantha*, and especially *C. loracula* and *penetratrix*. These males may be separated by the following key:

- Axillar spines long and sharp, so that of total length of axilla more than half is spine; legs black.....*dolichacantha*, Ckll.
 Axillar spines relatively short and obtuse.....1.
 1. Legs bright ferruginous; eyes green.....*penetratrix*, Smith.
 Legs black or dark red, in the latter case eyes not green.....2.
 2. Face broader, with white hair; cheeks broader...*barkeri*, Ckll.
 Face narrower, with yellow hair; cheeks narrower...*loracula*,
 Smith.

CAELIOXYS NATALENSIS, sp. nov.

♀ (Type). Length 11–13 mm.; black, with white pubescence; legs and antennæ black, mandibles reddish apically; eyes dark grey, the hair short; face covered with white hair, dense and snow-white at sides, clypeus with an apical fringe of long pale creamy hair; ocelli rather large; mesothorax and scutellum closely and strongly punctured; scutellum broadly and gently rounded behind; axillar spines rather long, gently curved; tegulae piceous with a dark rufous spot; wings dilute fuliginous except at base; spurs cream-colour; abdomen shining, distinctly but not very densely punctured, and with linear pure white hair-bands, enlarging at sides; last dorsal segment rather weakly keeled, its end broad lanceolate; last ventral similar, going a little beyond last dorsal; penultimate ventral segment very distinctly punctured.

♂. Length about 9 mm.; face densely covered with pure white hair; anterior coxæ with rudimentary spines; wings with only the broad apical margin fuliginous; fifth abdominal segment without spines; sixth with six spines, median sulcus narrow but deep, lateral spines slender, apical spines short, the upper broad, the lower stout.

Type: Bluff, Durban, 28th January, 1917 (C. N. Barker). Co-type ♀. Stella, Durban, 16th November, 1918 (C. N. Barker). Male, Bluff, Durban, 23rd February, 1917 (C. N. Barker).

CÆLIOXYS BEVISI, sp. nov.

♂. Length 9-10 mm.; black, wings dark fuliginous except basally, legs dark but very distinct red; face with dense pale yellow hair; eyes dark brownish-grey, with short hair; mandibles red; mesothorax and scutellum dullish, with large punctures; scutellum short, feebly arched behind; axillar spines rather short and stout; tegulæ black; anterior coxæ with stout obtuse well-developed spines; spurs pale reddish; abdomen polished, sparsely punctured, the white hair-bands failing in middle; fifth segment without lateral spines, sixth with six spines, laterals and lower apicals slender.

Type: Umbilo, 25th February, 1917 (L. Bevis). Co-type with the same data.

The above Natal species may be separated by the following key:

- | | |
|--|-----------------------------|
| Females..... | 1. |
| Males..... | 6. |
| 1. Eyes bare; axillar teeth short and obtuse..... | <i>verticalis</i> , Smith. |
| Eyes hairy; axillar teeth longer | 2. |
| 2. Last ventral segment with lateral notches..... | 3. |
| Last ventral without lateral notches..... | 4. |
| 3. Lateral notches weak; tegulæ reddish..... | <i>penetratrix</i> , Smith. |
| Lateral notches strong; tegulæ black or reddish..... | <i>loricula</i> , Smith. |
| 4. Last ventral conspicuously longer than last dorsal; wings
(except basally) dark fuliginous with strong violaceous tints
..... | <i>chubbi</i> , Ckll. |
| Last ventral little longer than last dorsal; wings not so
dark..... | 5. |
| 5. Penultimate ventral segment without distinct punctures; legs
dark red..... | <i>barkeri</i> , Ckll. |
| Penultimate ventral segment with distinct punctures; legs
black..... | <i>natalensis</i> , Ckll. |
| 6. Eyes bare; axillar teeth short..... | <i>verticalis</i> , Smith. |
| Eyes hairy | 7. |
| 7. Apical sulcus of abdomen narrow; inferior apical teeth stout
..... | <i>natalensis</i> , Ckll. |
| Apical sulcus of abdomen broad; inferior apical teeth slender
..... | 8. |
| 8. Apical emargination (between lower apical teeth) broad, nearly
with the form of a semi-circle..... | <i>barkeri</i> , Ckll. |
| Apical emargination narrower, with the form of the end of a
finger..... | <i>bevisi</i> , Ckll. |

CTENOPECTRA NITIDULA, sp. nov.

♀. Length about 6.5 mm.; robust; shining black; hind margins of abdominal segments narrowly hyaline; small joints of tarsi ferruginous; head very broad, much broader than long; mandibles dark, with a few long golden hairs beneath; labrum large, shining, with a strong keel down the middle; clypeus strongly punctured, depressed apically; front very strongly and coarsely punctured, the punctures extremely dense in middle; sides of face with conspicuous white hair; ocelli placed in a curved line, far apart; scape black, with base and apex bright ferruginous; flagellum very short, chestnut red, blackened above; thorax very broad, circular seen from above; mesothorax gibbous in front, polished, with sparse shallow punctures, a strong median groove on anterior half; scutellum dullish, with minute punctures; metathorax with much pure white hair, thin on disc posteriorly, the basal area white-tomentose, contrasting with the shining bare post-scutellum; tegulae dark reddish; wings hyaline, nervures and stigma dark brown; stigma small but well-formed, its lower side convex; marginal cell pointed apically, the tip away from costa and briefly appendiculate; two sub-marginal cells, of about equal size, the second contracted one-half to marginal; basal nervure falling some distance short of transversomedial; first recurrent nervure joining second sub-marginal cell far from base, the second joining near to apex; hind tibiae greatly broadened at end, their basitarsi very broad, sub-quadrate, both carrying on outer side a very coarse abundant pale scopa; the inner face of the tibiae is finely tomentose, but the narrow anterior face is bare and shining, and the apex appears as if prolonged into a large thorn-like spur; abdomen polished and impunctate, without hair-bands; apical half of venter with coarse reddish hair, forming stiff brush-like apical fringes on apices of second and following segments. The mouth parts cannot be seen; Mr. Barker notes that the tongue is short. The compound microscope shows that the large thorn-like structure at the end of the hind tibia is actually the inner spur; its margin throughout (posteriorly) is beset with fine very closely set spines, forming a comb. This comb is dark brown. The other spur is simple. Antennal joints 4 to 6 are extremely short, ring-like; the apical joint is about twice as long as the one before. The hairs of the ventral abdominal fringe are partly consolidated, forming curved processes recalling those on the abdomen of *Cambarus*. The end of the abdomen presents a couple of black hairy finger-like sting-palpi.

Durban, September, 1916 (C. N. Barker).

Apparently related to *C. polita* (Strand, as *Scrapter*), from Spanish Guinea, but smaller.

Scrapter, Lepeletier, 1825, included four species. One of these, *S. lagopus* (Latr.), was the European insect now known as *Macropis labiata* (Fabr.). The other three are from Caffraria, and apparently have not been collected since, but they are presumed to belong to *Ctenoplectra*, Smith. Formerly it was customary to regard *Scrapter* as a synonym of *Macropis*, but more recently Friese and others have used it in place of *Ctenoplectra*. Ashmead (1899) treated it as a distinct Panurgine genus, designating *S. brullei*, Lepeletier, 1841, from the Canary Islands, as the type. This is impossible, since *brullei* is not one of the original species. I will herewith designate *S. lagopus* as the type of *Scrapter*, making it accordingly a synonym of *Macropis*.

Robertson defined a family Macropodidæ, type genus *Macropis*; but there is already a family Macropodidæ, Waterhouse (1841), for *Macropus*, Shaw, the kangaroo. The family of bees may be called Ctenoplectridæ, with *Ctenoplectra* as the type genus.

HALICTUS ATELOPTERUS, sp. nov.

♀. Length about 6.6 mm.; black, head and thorax with rather long white hair, abundant and coarse on face and pleura, but not hiding surface; head broader than long, orbits converging below; mandibles bright pale ferruginous in middle; antennæ black; clypeus dullish; vertex shining; region in front of ocelli rather swollen; cheeks small, with dense white hair; mesothorax and scutellum shining, appearing impunctate under a lens; area of metathorax semi-circular, well-defined behind, irregularly wrinkled all over; legs black with white hair, small joints of tarsi ferruginous; tegulæ piceous; wings milky-hyaline; stigma and nervures dark sepia, except the second and third transversocubitals and second recurrent, which are hyaline and hardly noticeable; first recurrent nervure meeting second transversocubital; first submarginal cell larger than second and third combined; abdomen broad, shining, fourth segment reddened basally; no hair-bands; venter with loose white hair, which collects pollen; hind spur pectinate with numerous teeth. The stigma is reddish in middle, with broad dark borders.

Umbilo, 10th February, 1917 (L. Bevis).

Nearest, perhaps, to the smaller *H. lampronotus*, Cameron, but recognisable at once by the peculiar wings, which seem at first sight to have only one submarginal cell.

ANTHOPHORA ODONTURA, sp. nov.

♂. Length about 14 mm., covered with red hair, and looking exactly like *A. vestita* or *A. capensis*. It differs from both by the tridentate apex of abdomen, the middle tooth shorter and more obtuse than the others. From male *vestita* it is at once known by the total lack of the black brush near the apex of middle tarsi, and by the clypeus having two large quadrate black patches above, which the supraclypeal mark is angulate above. From *capensis* it differs by having the vertical yellow band on clypeus almost or quite parallel-sided, and the hair on inner side of hind basitarsi black instead of chocolate. The eyes seem paler and yellower, and probably differ distinctly in life. I was, however, very doubtful whether to separate the insect from *capensis* until I noticed the tridentate apex of abdomen.

Type from Umbilo, 18th February, 1917 (L. Bevis). Two others, also collected by Mr. Bevis at Umbilo in 1917, on February 10th and 14th. One has the pale bands at apices of abdominal segments unusually distinct.

ANTHOPHORA CAPENSIS, Friese.

The male, not before described, differs from the female by the very broad vertical and apical yellow bands on clypeus; space between eyes and clypeus, except at top, yellow; and scape with a yellow stripe. The legs are without teeth or special ornaments. The eyes are reddish.

Males from Eshowe, December, 1916 (H. W. Bell Marley), Malvern, January, 1916 (C. N. Barker) and Umbilo (L. Bevis). Females from Eshowe, December, 1916 (H. W. Bell Marley) and Karkloof, January, 1919 (E. E. Platt).

ANTHOPHORA MEDIORUFA, sp. nov.

♂. Length about 13 mm., anterior wing 10 mm.; black, robust, the face, labrum and mandibles white, with the usual black stripe at each side of clypeus; scape white in front; legs simple, hind basitarsi broad. Flagellum obscurely reddened beneath; third antennal joint about as long as fourth and fifth together; head and thorax with mixed black and dull white hair, presenting a grey, slightly yellowish, appearance; cheeks beneath and under side of thorax with pure white

hair; sides of thorax posteriorly with long fulvous hair; tegulae ferruginous; wings dusky, nervures black; legs with the hair mainly white, a tuft of fulvous on inner side of middle tarsi, middle tarsi with black hair, except a white line on basitarsi, hind tarsi with hair all black; abdomen with pale fulvous hair at extreme base, but black hair on first segment above, and a band of white hair on its hind margin; segments 2 to 5 with similar rather narrow white bands; segments 4 and 5 with scattered white hairs, and longer black ones, on the disc; apex and venter with black hair. On inner side of hind tibiae the hair is black.

Durban, Natal, 25th January, 1919 (C. N. Barker). Type. Also one from Winklespruit, 27th December, 1918 (C. N. Barker). In Friese's table this runs nearest to *A. circulata*, from which it is quite distinct. It closely resembles *A. rapida*, Smith, described from Natal, and may prove to be its male. Only the female of *rapida* was known to Smith, and the species was unknown to Friese when he wrote his work on African bees. Meade-Waldo states that the apical band on the first abdominal segment is pale fulvous in *rapida*.

The following table separates the species of *Anthophora* sent in the last consignment.

- Labrum black; clypeus with only an apical yellow band. ♀.
(Krantz Kloof, 2nd April, 1917, Marley)...*A. vestita*, Smith.
- Labrum pale.....1.
1. Clypeus white, except marginal stripes.....*mediorufa*, Ckll.
Clypeus at least largely black.....2.
2. Scape black.....3.
Scape with a yellow stripe, males.....4.
3. Larger; hair-bands of abdomen red.....*A. capensis*, Friese, ♀.
Smaller; hair-bands of abdomen white.....*A. circulata*,
Fabricius, ♀. (Pinetown, 12th November, 1916 (H. W. Bell
Marley).
4. Abdomen black, with conspicuous whitish hair-bands.....
A. fallax, Smith (Umbilo, 1916 (L. Bevis).
Abdomen with red hair.....5.
5. Vertical band on clypeus almost or quite parallel-sided;
abdomen tridentate at apex.....*A. odontura*, Ckll.
Vertical band on clypeus narrowing above; abdomen bidentate
at apex.....*A. capensis*, Friese.

OSMIA, Panzer.

OSMIA NATALENSIS, sp. nov.

♀. Length 10.5–11 mm.; robust, pure black, closely and conspicuously punctured; head broad; face covered with long greyish-white hair, vertex with dark fuscous; mandibles broad, black and sharply quadridentate; clypeus truncate, with simple margin, its surface finely rugose, and covered with hair; vertex shining and well punctured; antennæ black, the flagellum very short; mesothorax and scutellum very densely punctured, and with thin inconspicuous fuscous hair; behind scutellum is a fringe of long white hairs; tubercles and pleura with long abundant white hair, slightly creamy on tubercles; tegulæ black, punctured; wings strongly dusky, grey, the stigma and nervures black; legs with pale hair; hind basitarsi long; spurs ferruginous; abdomen with little hair, shining between the close punctures, which are smaller on first two segments than beyond; hind margins of segments with extremely narrow white hair-bands, sixth segment pale grey from a covering of appressed hairs; ventral scopa pale red, in the type carrying bright orange pollen (not of the Compositæ).

Type from Winklespruit, Natal, 2nd January, 1919 (C. N. Barker). Also from Stella Bush, 18th October, 1916 (H. W. Bell Marley). Related apparently to *O. elizabethæ*, Brauns, but that has the mesonotum with yellowish-red hair.

OSMIA INFRAPICTA (Cockerell).

Megachile infrapicta, Cockerell, Annals Durban Museum, I (1916), p. 203.

This has well-developed pulvilli, and is an *Osmia*; it was a strange oversight to fail to see this when describing. The species is valid, and related to *O. natalensis*, but easily separated by the more hairy, more glistening, and less densely punctured abdomen, colour of tegulæ, etc.

While on this group I take the opportunity to note that the related Algerian parasitic genus *Perezia*, Ferton (Ann. Soc. Ent., France, 1914), is a homonym of *Perezia*, Léger & Duboscq, 1909. Ferton's genus may take the name *Fertonella*, n.n., type *Fertonella mauria* (Ferton).

The following insect is to be removed from *Osmia* :

MEGACHILE FERVIDA (Smith), Meade-Waldo.

This is *Osmia fervida*, Smith, and *Megachile intricata*, Smith, as Meade-Waldo has determined by a comparison of types. Meade-Waldo states that the type of *Megachile perplexa*, Smith, from Port Natal, cannot be found. Smith's description of *perplexa* is not very good, but I feel confident that it is another synonym of *fervida*. Females from Stella Bush, Durban, 31st December, 1916 (C. N. Barker), and Durban, 13th February, 1917, nest in wardrobe (E. C. Chubb), agree exactly with a female *intricata* from F. Smith's collection. Males from Malvern, December, 1915 (C. N. Barker), evidently belong with the female *intricata*, but agree essentially with the description of *perplexa*. Unfortunately the description under *Osmia* not only has page-priority over *M. perplexa*, but also over *Megachile fervida*, Smith, from Hong Kong. The latter may become *Megachile perfervida*, n.n.

GRONOCERAS, Cockerell.

Mr. E. C. Chubb collected females of the fine species *G. bombiformis* (Gerst.) at Bulawayo, Rhodesia, and sends the note: "nests in projecting banks, makes a long tunnel, almost straight." According to Smith, *G. combusta* (Smith), common at Durban, makes a nest like that of *Chalicodoma*, but Taschenberg found it nesting in old wasp (*Synagris*) nests. Further studies should be made of the habits of this insect. I have a specimen of *Gronoceras* determined by Strand as *bombiformis*, from "N. Nyassa-See, Langenburg, 26th November, 1899, Fülleborn." It is, however, a female, *G. tithonus* (Smith), and I find that *nigrocincta*, Rits., as I have identified it, is also *tithonus*. Friese puts *nigrocincta* in another group, but I think my identification is correct, as Ritsema considered it related to the species of *Gronoceras*.

MEGACHILE, Latreille.

MEGACHILE CYANURA, sp. nov.

♀ (Type). Length 17-18 mm.; of parallel-sided type, black, including the antennæ, mandibles and legs; head with black hair, even on the cheeks below; mesothorax and scutellum with rather long black hair, and shorter greyish hair, so that the thorax does not look perfectly black, though it is very dark; sides of post-scutellum

and metathorax with dark red hair ; pleura with black hair ; hair of legs black ; first abdominal segment with rather bright red hair, but appressed white hair at sides and along posterior margin ; remaining segments appearing bluish-grey with narrow pale bands, the bluish effect due to a mixture of black and white ; ventral scopa black, the basal middle creamy-white ; facial quadrangle about square ; mandibles massive, broad, with a deep notch separating the apical teeth ; clypeus much more than twice as broad as high, coarsely and very conspicuously punctured, but not keeled, the lower edge straight except for a slight crenulation ; mesothorax dull, very densely rugosopunctate ; tegulae piceous, with a broad fulvous border, finely punctured ; wings hyaline faintly dusky, apical margin not darkened ; nervures black ; hind basitarsus not very broad.

♂. Length about 16 mm. ; like the female in general appearance, but narrower ; mandibles dark red, very broad, and elbowed in middle ; cheeks with dense pure white hair beneath ; face and front with pale yellow silky hair ; vertex with dark fuscous hair ; flagellum slender, not enlarged at end ; first abdominal segment with less red hair ; anterior coxae with very long curved black spines ; a large tuft of pure white hair in front of base of each anterior femur ; legs slightly rufescent, the anterior tibiae strongly so on inner side ; anterior femora with a line of pure white tomentum beneath ; anterior tarsi broadened, cream-colour except the unmodified apical joint, with a fringe of long white hair, lined with blackish within ; the second joint with a dark spot beneath, and the basitarsus with a dark anterior callosity, covered with short stiff black hair ; the second and third joints with short grey hair, more or less tipped with fulvous, on anterior side ; claws bifid at end ; sixth abdominal segment broadly truncate but the margin strongly denticulate ; at each extreme side of the segment is a short but stout thorn-like tooth ; seventh segment with a short triangular median tooth.

Type from Durban (E. C. Chubb). Also another female with the same data, and males from Durban, 9th March, 1918 (C. N. Barker), and Umbilo, 7th February, 1917 (L. Bevis). I have also received both sexes from the Cape Town Museum, collected at Mfongosi, Zululand (W. E. Jones). I was surprised to find no description of this large and handsome insect. It looks like *M. fimbriata caerulea* (Friese), but the abdomen of the female is not at all metallic, and there are many other differences. In Friese's key it seems to run to the *laminata* group, and in the form of the clypeus (though not of the mandibles) there is a certain approximation to the *Eumegachile* group. The structure of the male abdomen indicates affinity with *caerulea*.

MEGACHILE VITTATULA, sp. nov.

♀ (Type). Length 12·5–13·5 mm.; black, including the legs, form robust; vertex, mesothorax and scutellum with short dark fuscous hair, the mesothorax and margins of scutellum also with shorter greyish hair, producing a speckled effect; other parts of head and thorax with pale hair, white on cheeks, on front greyish and slightly mixed with fuscous, on face slightly ochreous, on upper part of mesopleura strongly stained with greyish-fuscous; mandibles very broad, quadridentate, dark reddish with the broad cutting edge black, beyond the first tooth circumscribed by an impressed line; clypeus ordinary, truncate, finely rugose, with the elevated (but not keeled) middle line smooth and shining; antennæ dark, scape red at extreme base, and fourth joint conspicuously red beneath; vertex very finely punctured; mesothorax and scutellum dull, extremely densely and finely punctured; tegulæ dark red-brown with a pallid margin; wings greyish-hyaline, the broad apical margin perceptibly darker; legs with pale hair, red on inner side of basitarsi; middle basitarsi broad, densely hairy, and the small joints beyond extremely short; hind basitarsi very broad; spurs ferruginous; abdomen with fox-red hair on first segment, but there is an apical white fringe; segments 2 to 5 also with white or greyish-white fringes, greyer and less distinct on 5; sixth segment with black hair, and greyish-white tomentum, not always very evident; ventral scopa clear yellowish-ferruginous, white at base, black on last segment.

♂. Length 10·5–11·5 mm.; differing in the usual manner, the special male characters as follows: anterior coxæ with short spines, easily overlooked; anterior legs mainly dark red on inner side; anterior basitarsi slightly broadened, obtusely swollen anteriorly, with a thickened edge which presents beneath a shining trough; middle tarsi not especially short, but densely hairy; keel of sixth abdominal segment broadly rounded, variably but inconspicuously denticulate (especially at sides), and narrowly emarginate in middle; no median spine beneath. The flagellum is dark, and the face is densely covered with pale hair, which is more or less yellow, especially on clypeus and sides of face. In one specimen the flagellum on one side only is clear ferruginous beneath, apparently owing to an error in mitosis, whereby a factor was lost from certain cells.

Stella Bush, 1916 (H. W. Bell Marley), type. Males from Bluff, Durban, 25th March, 1917 (C. N. Barker); Winklespruit, Natal, 4th January, 1919 (C. N. Barker); Umbilo, 25th February, 1917 (L. Bevis).

The female has much the appearance of *M. damaraënsis*, Friese, but the latter is less robust, with the tegument at the base of the abdomen red, the dark edge of mandibles narrower, the middle tarsi less abbreviated, and the anterior margin of hind basitarsi very convex.

MEGACHILE OPACULA, sp. nov.

♀ (Type). Length about 12.5 mm.; rather robust, black, including the antennæ; hair of head and thorax long and white, faintly creamy at sides of face, black on vertex, thin and mixed with black on mesothorax and scutellum; cheeks with a broad dense band of pure white hair; long golden hairs from beneath mandibles; mandibles broad, quadridentate, very obscurely reddish sub-apically; clypeus densely punctured all over, without a smooth line, the lower margin arched, concave; sides of vertex shining; mesothorax and scutellum dull, very densely rugosopunctate; tegulæ bright ferruginous, with a dark basal spot; wings greyish-hyaline; stigma dark reddish, nervures piceous; legs reddish-black, with pale hair, red on inner side of tarsi; hind basitarsi broad, but not excessively so; abdomen finely punctured; first segment with tufts of creamy-white hair at sides; segments with extremely narrow white hair-bands, broadening at sides, on fifth only at sides; sixth segment with short black hair; ventral scopa white, fulvous or yellow at sides posteriorly, black on last segments.

♂. Length about 11 mm., with the same red tegulæ; face densely covered with pale golden hair; anterior tibiæ red in front, their tarsi simple, anterior coxæ without spines; hair of thorax above long and pale ochreous, mixed with black; hair-bands of abdomen ochreous-tinted, and more distinct; fifth abdominal segment with coarse black hair, and a narrow red margin; sixth with dense white tomentum above, the keel broadly rounded, minutely crenulate, and very feebly emarginate in middle; no median spine beneath; venter with broad pure white hair-bands.

Type from Pinetown, 29th October, 1916 (H. W. Bell Marley). Males from Krantz Kloof, Natal, 7th February, 1915 (H. W. Bell Marley); another from same place, April, 1916 (H. W. Bell Marley); Stella Bush, December, 1916 (H. W. Bell Marley).

The male is not unlike *M. frontalis*, Smith, but that is much smaller, with rufo-testaceous nervures, and has the keel of sixth segment distinctly denticulate. Superficially, the female is like *M. familiaris*, Ckll.

MEGACHILE FLAVIBASIS, sp. nov.

♀ (Type). Length about 11·5 mm.; black, including antennæ and greater part of legs, but the broad mandibles are dark red, anterior trochanters and femora broadly red above, middle femora with a red stripe above; vertex and dorsum of thorax with much long black hair, but on the thorax mixed with pale, and metathorax with very long light yellowish-fulvous hair; cheeks and under side of thorax with dull white hair; first abdominal segment with long yellowish hair like that of metathorax; segments 2 to 5 with linear dull white hair-bands; coarse black hair before these bands, and on sixth segment; ventral scopa pale orange-ferruginous in middle, broadly white at sides, black on last segment. Very near to *M. venustella*, Ckll., with the same dull mesothorax; tegulæ piceous, with the margin anteriorly pallid; middle of clypeus strongly punctured, with no smooth line; lower margin of clypeus with a transverse bow-shaped shining callosity, which gives it a subemarginate appearance; hind basitarsus about as in *venustella*.

♂. Length 8·5–9 mm.; hair of head and thorax variably yellowish, but usually strongly so, especially on posterior part of thorax; long black hair on vertex, and plentifully intermixed on mesothorax, but not scutellum; face covered with pale golden hair; first two abdominal segments with long reddish-yellow hair, sometimes very brightly coloured; abdominal hair-bands fulvous to pale ochreous; sixth segment above densely covered with pale ochreous tomentum, the transverse keel strongly emarginate in middle, and on each side feebly crenulate or sub-denticulate, or almost entire; third and fourth ventral segments emarginate, the fourth with broadly pallid margins. Anterior tarsi simple, but reddened; anterior coxæ with small spines, hidden in the pale yellowish hair; middle tarsi with very long pale ochreous hairs behind; hind tarsi with long hairs on each side; the hind basitarsi not longer than the next three joints together, the last joint long. I suppose this to be the male of *flavibasis* because (a) it comes from the same place, (b) it has the same strongly yellowish hair on thorax behind and base of abdomen, (c) the tegulæ are dark though varying to red anteriorly, (d) the mesothorax has the same dull surface, and the vertex exactly the same sculpture, (e) the dusky wings are the same. There is no other female in the collection which could be associated with the males. The female is evidently related to *M. wilmsiana*, Strand, from the Transvaal, but is distinct.

Type from Umbilo, 7th February, 1917 (L. Bevis). Males from Umbilo, 25th February, 1917 (L. Bevis), three specimens; and Durban, 24th December, 1916 (C. N. Barker).

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PART 6.

ANNALS
OF THE
DURBAN MUSEUM

EDITED BY THE CURATOR,

E. C. CHUBB.

Issued 25th August, 1920.

PRICE 5/- NETT.

PRINTED BY
JOHN SINGLETON & SONS, DURBAN,
FOR THE DURBAN MUSEUM.

OCT 13 1920

The Annals of the Durban Museum is devoted principally to South African Zoology and is issued from time to time as circumstances permit.

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XXIII.—The Malacostraca of Durban Bay,

by the

Rev. T. R. R. Stebbing, M.A., F.R.S., F.L.S., F.Z.S.

WITH PLATES XXVIII—XXXII.

THOUGH only two of the eleven species here considered lay claim to names hitherto unrecorded, some of the others seemed to call for more illustration than they have previously received, and the rest are noted for various reasons which their occurrence suggested. Some of the specimens were not taken actually in the Durban area, but in South African waters within easy range of it, for species enjoying a wide distribution.

BRACHYURA.

TRIBE OXYRRHYNCHA.

FAMILY INACHIDÆ.

GENUS PSEUDOCOLLODES, Rathbun.

1911. *Pseudocollodes*, M. J. Rathbun, Tr. Linn. Soc. London, ser. 2, vol. xiv, pt. 2, pp. 193, 247.

Carapace subtriangular. Rostrum short, bifid. Eyes retractile against a strong postocular tooth. Basal antennal joint very narrow, spinous, less advanced than rostrum. Fourth joint of third maxillipeds elongate-oval, narrower than the third joint, the latter strongly advanced at its inner angle. In both sexes the last two segments of the pleon are fused.

Miss Rathbun supplies other characters. Of those relating to the ambulatory limbs I cannot speak, because all those limbs were missing from the only available specimen. "An interantennular spine, visible from above," would seem to be unnecessary as a generic character, since in the present specimen the spine in question was not sufficiently advanced to be seen from above.

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PSEUDOCOLLODES COMPLECTENS, Rathbun. Plate XXVIII (A).

1911. *Pseudocollodes complectens*, Rathbun, Tr. Linn. Soc., vol. xiv, p. 247, pl. 20, fig. 4.

Apart from the above-mentioned obscurity of the interantennular spine the specimen, a female with numerous eggs, here figured shows the closest agreement with Miss Rathbun's description. It also agrees in its proportions nearly with one of that sex measured by Miss Rathbun, the African being about 13 mm. long and 12 mm. broad. The second maxillæ show much agreement with those of *Achæopsis*, as also do the three maxillipeds. In the third of these a row of tubercles is observable on the outer surface parallel to the outer margins of the third and fourth joints; the fourth joint has a conspicuous spine on the inner margin which meets a similar spine on the fifth joint; the sixth joint is notably shorter than the fifth or seventh.

Locality: Cape St. Blaize, N. by E. 73 miles; depth 125 fathoms. Cruise of the "Pieter Faure."

GENUS PUGETTIA, Dana.

1851. *Pugettia*, Dana, Amer. J. Sci., ser. 2, vol. xi, pp. 268, 433.
 1852. *P.*, Dana, U.S. Expl. Exp., vol. xiii, pp. 84, 116.
 1886. *P.*, Miers, Rep. Voy. "Challenger," vol. xvii, no. 49, p. 40.

PUGETTIA QUADRIDENS, de Haan. Plate XXVIII (B).

1839. *Pisa (Menæthius) quadridens*, de Haan, Crust. Japon., decas quarta, p. 97, pl. 24, fig. 2, a, a, b, b. *Pisa (Halimus) q.*, pl. G. (*Menæthius) q.*
 1848. *Menæthius quadridens*, Adams & White, "Samarang," Crustacea, p. 20.
 1886. *Pugettia quadridens*, Miers, Rep. Voy. "Challenger," vol. xvii, no. 49, p. 40.
 1907. *P. q.*, Stimpson, Smithson. Misc. Coll., vol. xlix, p. 24 (to which the editor, Miss Rathbun, refers also "*Pugettia incisa* (de Haan) Stimpson.")

The specimen here referred to de Haan's species was incomplete, having its limbs represented by a single cheliped. But as the species

appears to be rather rare, some additional details of the structure may be acceptable. Owing to the shading, de Haan's figure of the carapace is rather obscure. With the help of his description, however, I think it will be found to agree fairly with the drawing which I had made before recognising the identification now proposed. All the salient points of the carapace are furnished with short curved setæ, to which in many instances extraneous objects are attached. The narrow pleon of the male folds obstinately on the very wide sternum; it is broadest at the third segment, the sides converging to the rounded apex of the telson, except at the sixth segment which is a little broader distally than at the base.

The mandibles, with the exception of the infolding palp, are opaque. The second maxillæ are very pellucid; the terminal joint has an acutely tipped process rising from a very wide base. In both the first and second maxillipeds the exopod is elongate, distally narrowed, and having the first joint of the flagellum bent closely backwards; the epipod in both is elongate, but much more extensive in the first than in the second. The much more solid third maxillipeds have the fourth joint subquadrate, the inner front angle excavate for the small palp, of which the terminal joint is abruptly narrower than the penultimate.

The carapace measured 11 mm. in length from the divergence of the horns to the hind margin, the inner measurement of the horns being 3.5 mm. and the breadth of the carapace between the tips of the hinder teeth a little less than the length.

Locality: Tugela River, N.W. by W. 3 miles; depth 14 fathoms. Cruise of the "Pieter Faure."

FAMILY ACANTHONYCHIDÆ.

See Ann. S. Afr. Mus., vol. vi, p. 226; 1910. McLeay in 1838 institutes a family *Epialtidæ* (Annulosa S. Afr., p. 56,) but *Acanthonyx* is an earlier genus within it and therefore offers a better foundation for the name of the family.

GENUS EPIALTUS, Milne Edwards.

1834. *Epialtus*, Milne Edwards, Hist. Nat. Crust., vol. i, pp. 297, 314.
 1852. *E.*, Dana, U.S. Expl. Exp., vol. xiii, pp. 85, 132.
 1873. *E.*, A. Milne-Edwards, Miss. Sci. Méxique, pt. 5, p. 138.

1877. *E.*, Tozzetti, 'Magenta,' Brachiuri, p. 17.
 1894. *E.*, Rathbun, Pr. U.S. Nat. Mus., vol. xvii, p. 67.
 1901. *E.*, ,, Bull. U.S. Fish. Comm. for 1900, vol. ii, p. 59.

EPIALTUS VETCHI, sp. nov. Plate XXIX.

This small female specimen, taken from under rocks at Vetch's pier, to which prolific locality its specific name alludes, was in life pal-green, with legs yellow, as observed by its captor, Mr. H. W. Bell Marley. It cannot be reconciled with any of the numerous varieties of the seemingly very variable *E. bituberculatus*, Milne Edwards. It has no tubercles on the carapace. The rostrum is broadly obtuse. The eyes just peep from its sides the small cornea projecting from a much wider bulbous stalk. At some distance from the eye the anterolateral margin shows a feeble tooth, thence sloping to one that is better marked, followed by the well-rounded postero-lateral margin. The female pleon is broader than long.

The dissection of the head was difficult or at any rate rather unsatisfactory owing to the smallness of the structures and the resistance they offered to separation. In the first antennæ the third joint of tolerably stout longitudinally folded peduncle is distally somewhat dilated. In the second antennæ the peduncle is very slender, the flagellum obscurely 3-4-jointed and tipped with a long seta and a setule.

The mandibles are strong, a quadridentate cutting edge being continued by a long straight margin sloping obliquely backward. The feeble palp has a very small third joint set on the second joint so as to form an insignificant chela, tipped with a setule. The principal lobe of the first maxilla widens strongly from its base.

The chelate first peræopods have the movable finger subequal in length to the palm. The slightly spinuliferous inner surfaces of the obtuse-ended fingers close almost completely together. The fourth joint has, in common with all the other peræopods, a distal tooth on the outer side, but the short fifth joint or wrist does not share with them a similar though less pronounced prominence. The curved, acute-ending fingers of all the ambulatory limbs have their inner margins densely fringed with setules, longest distally.

The unfurnished simplicity of the pleopods is no doubt a phase of development. Length of carapace 6 mm., breadth something over 5 mm.

TRIBE CYCLOMETOPA.

FAMILY XANTHIDÆ.

GENUS ATERGATIS, de Haan.

ATERGATIS ROSEUS (Rüppell), 1830.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 297; 1910, and these Annals, vol. i, pt. 5, p. 437; 1917. Add references to Nobili, Ann. Sci. Nat., ser. 9, Zool. vol. iv, p. 229; 1906-7, and R. D. Laurie, J. Linn. Soc., vol. xxxi, p. 443; 1915.

A specimen, of which the carapace is 18 mm. broad by 11 mm. long, was taken by Mr. H. W. Bell Marley at Vetch's pier. It prettily answers, after being in spirit for a considerable time, the description given by Rüppell for the colour variety which he named *Carpilius marginatus*, the dorsal surface being a fine red surrounded by a milk-white border. The antero-lateral margin is entire.

GENUS ATERGATOPSIS, A. Milne-Edwards.

1865. *Atergatopsis*, A. M.-Edw., Arch. Mus. Hist. Nat., vol. i, p. 252 (Miers).
 1886. A., Miers, "Challenger," Brachyura, vol. xvii, pt. 49, pp. xii, 123.

Miers, after giving the definition of the genus, remarks that it is distinguished "from *Atergatis* by the non-carinated and non-cristated antero-lateral margins of the carapace, and joints of the ambulatory legs."

ATERGATOPSIS SIGNATUS, Adams & White.

1848. *Carpilius signatus*, Adams & White, "Samarang" Crustacea, p. 37, pl. 10, figs. 1, 1a, 1b.
 1911. *Atergatopsis signatus*, A. M.-Edw., Arch. Mus. Hist. Paris, vol. i, p. 253.
 1911. A. *signata*, Rathbun, Tr. Linn. Soc., vol. xiv, pt. 2, pp. 191, 214, pl. 17, fig. 7.

The male specimen taken by Mr. H. W. Bell Marley on "rocks near Vetch's pier near water edge" measures 60 mm. in length by

88 mm. in breadth. The colour "deep rose with white dots in patches over carapace" was retained after a prolonged voyage to England. The pleon in shape agrees with that figured by Adams & White, the third to the fifth segments being completely fused, though bands of white dots are suggestive of non-existent sutures. The left cheliped is rather the larger and much the darker. In each the margin of the thumb forms four obtuse tubercles with an innermost small fifth. The tips of the otherwise black fingers are white. The terminal joints of the ambulatory limbs have a dark felt and black nails. "Front slightly projecting, deeply notched in the middle line."

A small specimen from the same locality has a carapace 12 mm. long, 18 mm. broad.

TRIBE CATOMETOPA.

FAMILY GONEPLACIDÆ.

GENUS EUCRATE, de Haan.

1835. *Cancer (Eucrate)*, de Haan, Crust. Japon., decas secunda, pp. 36, 51.
1858. *Pilumnoplax* (part), Stimpson, Pr. Ac. Philad., vol. x, p. 93 (39).
1882. *Eucraie*, Haswell, Catal. Austr. Crust., p. 86 (Pr. Linn. Soc. N.S.W., vol. vi).
1884. *Pseudorhombila*, Miers (not Milne Edw.), "Alert" Crust., pp. 240, 242.
1888. *Eucrate*, de Man, J. Linn. Soc. London, vol. xxii, 88.

Haswell says, "Abdomen of the male five-jointed." But de Man states that in Haswell's *Eucrate affinis* "the male abdomen is seven-jointed," and this agrees with Stimpson's "articulis totis distinctis" for the male abdomen in *Pilumnoplax*. Possibly the distinction of the median segments is variable either in fact or appearance.

EUCRATE SULCATIFRONS (Stimpson).

1858. *Pilumnoplax sulcatifrons*, Stimpson, Pr. Ac. Philad., vol. x, p. 93 (39).
1884. *Pseudorhombila sulcatifrons*, var. *australiensis*, Miers, "Alert" Crust., p. 242, pl. 24, figs. C, c.

The specimen, a male, is a relatively large one, having a carapace 15 mm. broad by 13 mm. long. It answers well to the figures given by Miers for a much smaller specimen, of which the carapace measured 8 mm. by 6 mm. The emargination and sulcus of the front are well marked. The colour is "light red, yellow edging round carapace," as given by Mr. H. W. Bell Marley. As preserved the carapace retains the red colouring, the chelipeds and other limbs showing white and red.

Place of capture : Bluff, Natal.

FAMILY HYMENOSOMATIDÆ.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 331 ; 1910.

GENUS ELAMENA, Milne Edwards.

1837. *Elamena*, Milne Edwards, Hist. Nat. Crust., vol. ii, p. 33.
 1839. *Elamene*, de Haan, Crust. Japon., decas quarta, p. 75.
 1843. *Elamena* (subgen. of *Inachus*), Krauss, Südafrik. Crust., p. 51.
 1853. *Trigonoplax*, Milne Edw., Ann. Sci. Nat., ser. 3, vol. xx, p. 224.
 1907. *T.*, de Man, Tr. Linn. Soc. London, ser. 2, vol. ix, p. 396.
 1911. *Elamena*, Rathbun, Tr. Linn. Soc. London, ser. 2, vol. xiv, p. 242.
 1915. *Trigonoplax*, Parisi, Soc. Ital. Sci. Nat., vol. liv, p. 281.
 1915. *Elamena* (*Trigonoplax*), Kemp, Mem. Ind. Mus., vol. v, p. 216.
 1916. *E.*, Borradaile, "Terra Nova" Exp., Zool., vol. iii, p. 101.

The genus has been noted by numerous authors : Adams & White, Dana, Heller, Paulson, Miers, Kirk, Filhol, Henderson, Alcock, Fulton & Grant, W. H. Baker, and McCulloch. For its characters see the following discussion of the single species for which it was originally founded. That it is apparently a link between the *Oxyrrhyncha* and the *Catometopa* has been pointed out by de Haan. Whether the typical species is as variable superficially in the latter tribe as *Huenia proteus* is in the former may be regarded as at present an open question.

ELAMENA MATHÆI (Desmarest). Plate XXX.

1825. *Hymenosoma mathæi*, Desmarest, Cosid. Gén. Crust., p. 163.
 1837. *Elamena mathæi* (part), Milne Edwards, Hist. Nat. Crust., vol. ii, p. 35.
 1900. *E. m.*, Stebbing, P.Z.S., London, p. 520.

The account given of this species by Desmarest is in translation as follows: "Length six lines [12.5 mm.]; carapace extremely depressed, smooth, semi-transparent, in form of an equilateral triangle; anterior angle or rostrum a little rounded and raised, concealing the eyes and the base of the antennæ; chelipeds and ambulatory legs very elongate, slender and smooth; hands very long, having their fingers of equal force, a little inflated towards the end; a little spine on the extremity of the hind face of the last four pæreopods; colour corneous."

Before identifying the South African specimen with Desmarest's description above rendered, on the possibility of its proving to be a new species, the name *aequilateralis* had occurred to me as appropriate. It is in shape very nearly allied to the form which de Haan in his text calls *Ocypode (Elamene) unguiformis*, but on his plate 29, fig. 1, *Inachus (Elamene) unguiformis*, which Milne Edwards in 1853 placed in a new genus *Trigonoplax*, clearly, as Alcock suggests, a synonym of *Elamena*. Paulson's *Elamena mathæi* seems to be an independent member of the genus, and Heller's *Elamene mathæi* is rather doubtful, but Rüppell's *Hymenosoma mathæi*, if his figure may be trusted, cannot, as I now think, possibly be referred to the present species.

The chief, perhaps the only, reason for distinguishing de Haan's species from Desmarest's is that in de Haan's figures the fingers of the chelæ are represented very much shorter than the palm. But Alcock, describing specimens from the Andamans, says that these fingers are "as long as the slender subcylindrical palm." In our specimen the relation of the movable finger to the palm is about 24-29 in length. When Desmarest speaks of "a little spine on the extremity of the hind face of the last four legs," I suppose him to mean the apical prolongation of the fourth joint which might pass for an extremity when the three following joints are folded towards the preceding joint.

The flat, semi-transparent carapace measured 10 mm. from the acute apex to the truncate hind margin, with a breadth of 11 mm. at the rounded off hind corners. The female pleon is broader than long, of six segments, slightly lobed along the centre, which is distally convex. The four pairs of biramous pleopods are long and slender. The ova were not numerous and had not been deposited on the pleon.

The eyestalks are short and stout, just allowing the cornea to appear beyond the edge of the carapace. The second antennæ are very slight in structure. The palp of the mandibles has a long curved second joint, while the first and third joints are exceedingly small, the third scarcely reaching beyond the slightly advanced apex of the second. In all three maxillipeds the exopod has a narrow terminal joint tipped

with a brush of setæ; the long penultimate joint reaching much beyond the fourth joint of the endopod in the second maxilliped, but not reaching its extremity in the third. In the latter the third joint of the endopod is both longer and broader than the fourth, although its outer margin is rather shorter than that of the fourth joint. In the first peræopods the movable finger is slightly shorter than the fixed one, closing upon it somewhat in the fashion of the macruran *Stylodactylidæ*; both fingers are apically dilated with edges a little denticulate. The fingers of the following peræopods have two denticles adjoining the pointed apex.

Locality: Umlongakulu River, N.W. by N. 7 miles; depth 50 fathoms. Cruise of the "Pieter Faure."

TRIBE OXYSTOMATA.

FAMILY LEUCOSIIDÆ.

GENUS LEUCISCA, McLeay.

See Ann. S. Afr. Mus., vol. vi, pt. 4, p. 338.

LEUCISCA PHENONMA, sp. nov. Plate XXXI.

The specific name, from *φαίνειν*, to show, and *ὄμμα*, eye, refers to the fact that in both the male and female the small eyes project beyond the carapace. For his *Leucisca squalinus*, McLeay as part of the generic character gives "Orbits small, subcircular, and hidden under the clypeus; while the eyes are deeply set, very minute and globose." In the closely allied and perhaps identical genus *Carcinapsis*, Stimpson (Smithson. Misc. Coll., vol. xlix, p. 161; 1907) we also have "Eyes concealed beneath the carapax," so far agreeing with McLeay's much damaged specimen. McLeay speaks of it as a female, but the figure which he gives of the pleon is so much more like that of the male in our species that, unless McLeay was deceived about the sex, his specimen must have been immature.

Of the specimens sent me from Umtentweni by Mr. H. W. Bell Marley, the male measured a little over 5 mm. in length and breadth, the female 6.5 mm. in length by 7.3 mm. in breadth. The latter carried a small sessile barnacle firmly attached on the middle of the carapace dorsally. In both sexes, but especially in the female, it is

difficult to determine any effective lines of division between the last five segments of the pleon. In the male, however, the sides of the sixth segment begin by diverging and end by converging, with tuberculiform elevations in between. Centrally to the rear it carries a pointed upraised process. The seventh segment is triangular, with blunt apex. The pleon of the female is remarkably broad.

The mandible has a very broad, angled but not denticulate cutting edge, against which lies the palp with setose terminal joint. The maxillæ I could not satisfactorily determine. The very delicate first and second maxillipeds are figured, I think, for the first time for this genus. In the second it will be noticed that the penultimate joint of the endopod is broader than either the fifth or seventh. For the third maxillipeds neither as to *Leucisca* nor *Carcinaspis* do the authors make any mention of the three terminal joints. These are, I believe, rudimentary, affixed low down on the inner margin of the sharply-pointed fourth joint.

The chelipeds are nearly alike, that of the male on the right rather the larger. In the female they are similar to those of the male, but not quite so large. The under surfaces are white and smooth, while the upper are ridged and have colour markings on various parts. The movable finger is curved, with inner margin minutely denticulate. The ambulatory limbs are much smaller than the chelipeds, and the last pair are the shortest. The narrow, nearly straight, fingers have dark curved tips.

GENUS ACTÆOMORPHA, Miers.

1877. *Actæomorpha*, Miers, J. Linn. Soc. London, Zool., vol. xiii, no. 67, p. 184.

1896. A., Alcock, J. Asiat. Soc. Bengal, vol. lxxv, pt. 2, pp. 166, 170, 172.

This genus is near to *Oreophorus*, Rüppell, but the carapace, though granular and pitted, is not honeycomb and only partially covers the ambulatory limbs in flexion. The front is broad, the buccal cavity arched, the pleon narrowly oval and seven-segmented in both sexes. The eyes are small, the first antennæ obliquely folded, the second almost obsolete. Mandibles normal. First maxillæ with inner plate narrow, outer distally broad, palp two-jointed. Second maxillæ with lower lamina almost linear, upper very unequally bilobed, apical part of endopod narrowly produced from a wide base. First maxilliped

with very large epipod, the endopod produced beyond the small flagellum of the exopod. Second maxilliped with much smaller epipod, the exopod with crenulate and setulose outer margin along two-thirds of the principal joint, thence abruptly narrowed to its junction with the small flagellum. Third maxilliped as usual of much more solid structure, the fourth joint triangular, almost concealing the insignificant palp which is attached some way from the acute apex of the fourth joint. The solid exopod reaches a little beyond the oblong third joint of the endopod and carries a very small flagellum. The chelipeds in both sexes much exceed in size the ambulatory limbs.

To *A. erosus*, Miers, Alcock in 1896 added *A. morum* and *A. lapillulus*.

ACTEOMORPHA EROSUS, Miers. Plate XXXII.

1877. *Acteomorpha erosa*, Miers, J. Linn. Soc., vol. xiii, no. 67, p. 184, pl. 14.

The South African specimen of this as yet very rare species is in essential agreement with the description and figures supplied by Miers, although I can find no trace of the dividing line which his figure shows on the under-side of the rostrum, and I should be far from describing the orbital cavity as "large." That the pleon should be narrowly ovate in the female, just as Miers describes it for the male, agrees with Kemp's observation in regard to the two sexes of the genus *Dotilla* (Mem. Ind. Mus., vol. v, p. 227; 1915). Alcock speaks of the exopod of the the third maxillipeds as "narrow, with the outer edge almost straight." In the present species it is half as broad as the endopod, with a decided curve to the outer margin.

The chelipeds are comparatively massive, the exposed surfaces of the last four joints granular and pitted, the fifth joint having a projecting tooth on the inner surface; the fingers are considerably shorter than the palm, with denticles on their confronting edges fitting closely together. The sexual openings of the female are in the sternum opposite the insertion of the third pereopods. The pleopods of the female have two long rami, one furnished with outstanding plumose setæ, the other with setæ apparently simple and not spreading. The carapace has a length of 7 mm. and a breadth of 9 mm., the pleon extended being 6 mm. long.

Locality: Port Shepstone, W.N.W. $2\frac{1}{2}$ miles; depth 24 fathoms. Cruise of the "Pieter Faure."

MACRURA ANOMALA.

TRIBE HIPPIDEA.

FAMILY HIPPIDÆ.

See these Annals, vol. ii, pt. 1, p. 25.

GENUS HIPPA, Fabricius.

1787. *Hippa*, Fabricius, Mantissa, p. 329 (Sherborn).

HIPPA ADACTYLUS, Fabricius.

1787. *Hippa adactyla*, Fabricius, Mantissa, p. 329.

1793. *H. a.*, Fabricius, Ent. Syst., vol. ii, p. 474.

1798. *H. a.*, Fabricius, Suppl. Ent. Syst., p. 370.

183-. *Remipes testudinaris*, Milne Edwards, Règne Anim. Illust., pl. 42, figs. 1, 1a-h.

1837. *R. t.*, Milne Edw., Hist. Nat. Crust., vol. ii, p. 206, pl. 21, figs. 14-20.

1878. *R. t.*, Miers, J. Linn. Soc., vol. xiv, no. 76, p. 316, p. 5, fig. 1.

The specimen which Mr. H. W. Bell Marley has sent me from Umgeni Lagoon has just such a front as Miers has figured, with no central tooth in the rostral lobe. The carapace measures 30 mm. in length by 26 mm. in breadth. There are numerous very small eggs. Miers gives an extensive synonymy, and considers several points as variable. The very short eyestalks in this species are in notable contrast to the very long stalks in *Emerita asiaticus*, but in both they are very slender with diminutive cornea.

MACRURA GENUINA.

TRIBE CARIDEA.

FAMILY GNATHOPHYLLIDÆ.

1890. *Gnathophyllide*, Ortmann, Zool. Jahrb., vol. v, pp. 462, 537.

1901. *G.*, M. J. Rathbun, U.S. Fish Comm. Bull. for 1900, p. 126.

1907. *G.*, Borradaile, Ann. Nat. Hist., ser. 7, vol. xix, p. 473.

GENUS GNATHOPHYLLUM, Latrielle.

1819. *Gnathophyllum*, Latrielle, *Nouv. Dict. Hist. Nat.*, ed. 2, vol. xxx, p. 72 (Rathbun).
 1901. *G.*, Rathbun, U.S. Fish Comm. Bull. for 1900, p. 126.

Desmarest in his *Consid. gén. Crust.*, p. 228, 1825, includes in the definition of the genus the curious misstatement that the nippers of the second pair are more slender as well as much longer than those of the first pair. Miss Rathbun notes the misspelling *Gnatophyllum* in Latrielle's original account. The misprint is ignored by Desmarest and by Latrielle in Cuvier's *Règne Anim.*, ed. 2, vol. iv, p. 96, 1829. But Milne Edwards in *Hist. Nat. Crust.*, vol. ii, p. 369, 1837, wrongfully quotes Latrielle's last named work as responsible for *Gnatophyllum elegans*.

GNATHOPHYLLUM AMERICANUS, Guérin.

1857. *Gnathophyllum americanum*, Guérin, in Sagra's *Hist. Cuba*, vol. 2, p. xx; *Atlas*, viii, pl. ii, fig. 14 (Rathbun).

Miss Rathbun (*loc. cit.*) includes in the synonymy *G. fasciolatum*, Stimpson, 1860; *G. zebra*, Richters, 1880, and with, I think, needless hesitation *G. pallidum*, Ortmann, 1890. Mr. H. W. Bell Marley's specimen, taken from under rocks, at Bluff, Natal, is described by him as running on the ground with claws extended, making no attempt to swim; "colour white mixed with brown, chelipeds white with a broad band of brown bordered with lemon-yellow, tail white with two yellow bands." It measures about 13 mm. in length, and as far as could be determined, without dissection, has six teeth to the rostrum. The eyes have the "conical obtuse protuberance, pigmented with black, arising from upper part of cornea," as described by Miss Rathbun. *G. panamense*, Faxon, 1895, has this protuberance similarly described, but the colouring of that species differs remarkably from ours. *G. tridens*, Nobili, 1906, has only three teeth on the rostrum, but the dentation of the rostrum is variable, and therefore not a very trustworthy character.

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EXPLANATION OF PLATES XXVIII-XXXII,

Illustrating paper by the Rev. T. R. R. Stebbing on
"The Malacostraca of Durban Bay."

PLATE XXVIII (A).

Pseudocollodes complectans, Rathbun.

- n.s. Lines indicating actual size of carapace figured with part of pleon in dorsal aspect.
- a.i., mx. 2, mxp. 3. Second antenna more highly magnified; and to the same scale part of the second maxilla and the third maxilliped.
- prp. 1. The first peræopod.

PLATE XXVIII (B).

Pugettia quadridens (de Haan).

- a.s. Lines indicating actual size of carapace figured in dorsal aspect, together with partial view of the ventral aspect.
- Pl. Dorsal view of pleon as seen undetached.
- m., mx. 2, mxps. 1, 2, 3. Mandible with palp infolded; second maxilla; first, second and third maxillipeds, all to a uniform scale.
- prp. 1. First peræopod, uniform in scale with figures of carapace and pleon.

PLATE XXIX.

Epiallus vetchi, sp. nov.

- ns. Lines indicating natural size of carapace figured below in dorsal aspect, with all the peræopods on the right, first and fourth on the left.
- Pl., prps. 1, 4, plp. Pleon flattened out, first and fourth peræopods and a pleopod, uniformly more highly magnified.
- oc., a.s., a.i. Eye, first and second antennæ, to a uniform scale.
- m., mx. 1, mx. 2. Mandible, part of first maxilla and second maxilla incomplete, to a uniform scale, but with parts m. and mx. 1 more magnified.

PLATE XXX.

Elamena mathai (Desmarest).

- n.s. Figure showing natural size of specimen with its first peræopod. The enlargement shows protruding bases of peræopods 2-5, prp. 2 on the left and prp. 3 on the right carrying minute restorations of lost limbs.
- Pl. Pleon of female.
- oc., a.s., a.i. Eye, first and second antennæ with ends further enlarged.
- m., m. Upper-side of left mandible and, below, under-side of the right mandible.
- mx. 1, mxps. 1, 2, 3. First maxilla (incomplete), first, second and third maxillipeds.
- prp. 1; prp. 2. Parts of first and second peræopods; ends of chela more enlarged.

PLATE XXXI.

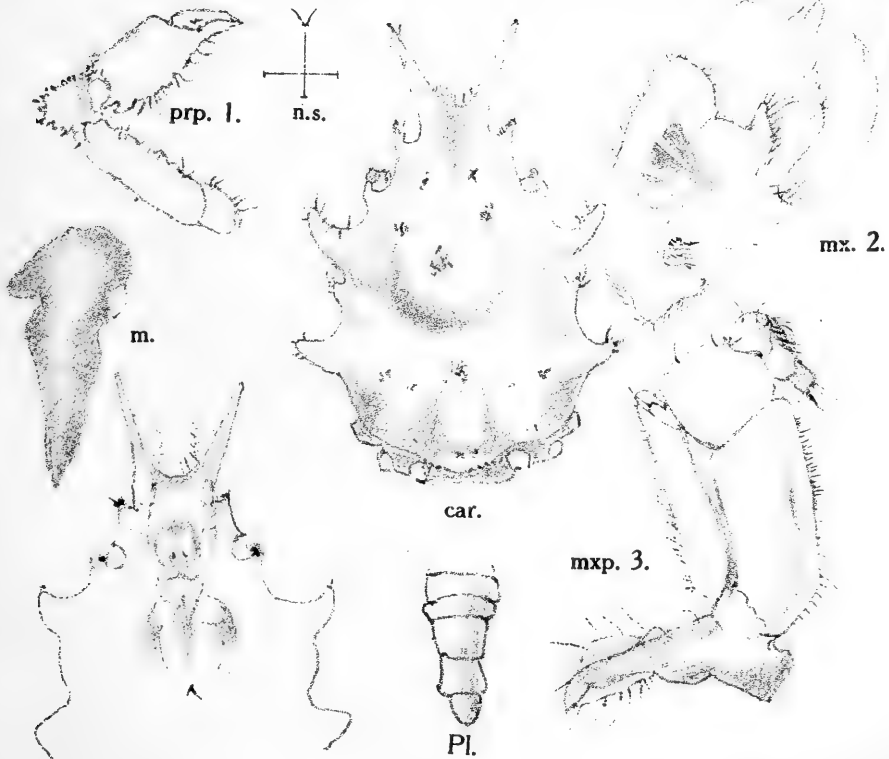
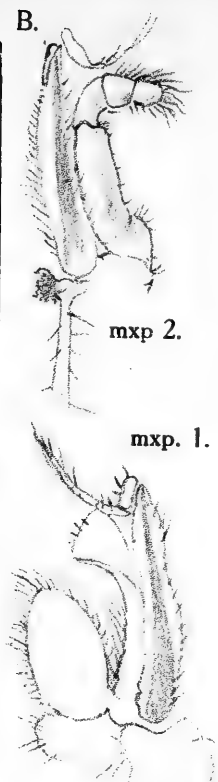
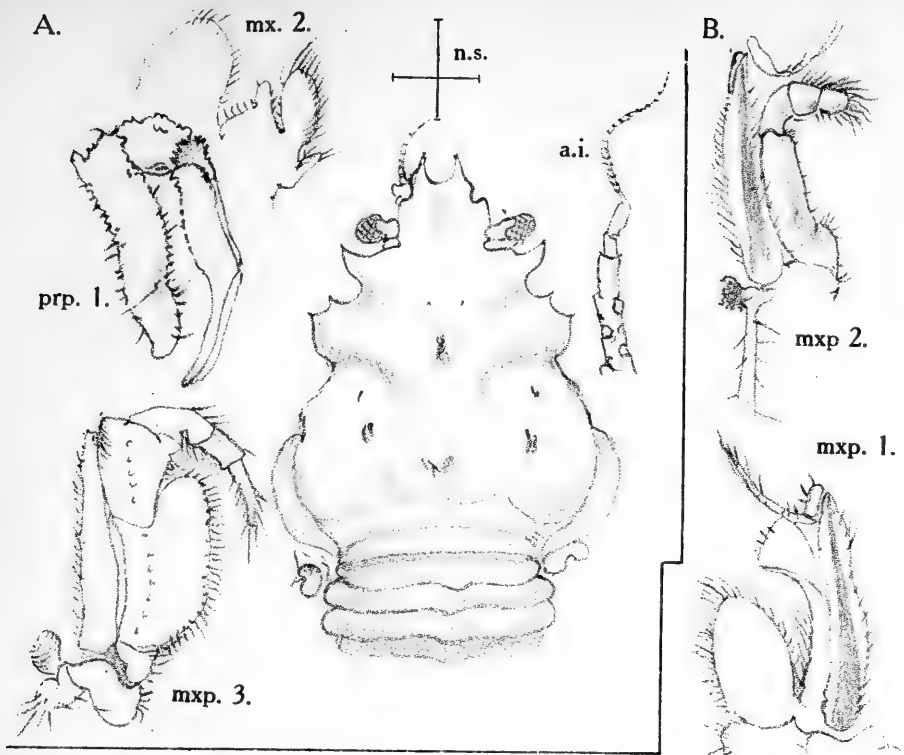
Leucisca phœnomma, sp. nov.

- n.s. ♂, n.s. ♀. Lines indicating natural size of male and female specimens.
- V. Ventral aspect of male carapace; dorsal view above with limbs on the right.
- m., mxps. 1, 2, 3. Mandible, first, second and third maxillipeds, with parts of mandible and second maxilliped more magnified.
- prp. 1 1, prp. 1 r, prp. 2, prp. 5. Left and right chelipeds of male, and second and fifth peræopods (first and fourth ambulatory limbs).
- plp. 2. Second pleopod (probably imperfect).

PLATE XXXII.

Actcomorpha erosus, Miers.

- n.s. Lines indicating actual size of carapace figured below.
- car. D, V, car. V. Carapace dorsally, and ventrally with and without limbs.
- T, T. Dorsal and lateral views of the pleon.
- m, mxs. 1, 2, mxps. 1, 2, 3. Mandible, both maxillæ, and the three maxillipeds.
- prps. 1, 2, 5, plp. Cheliped, second and fifth peræopods, and a pleopod.

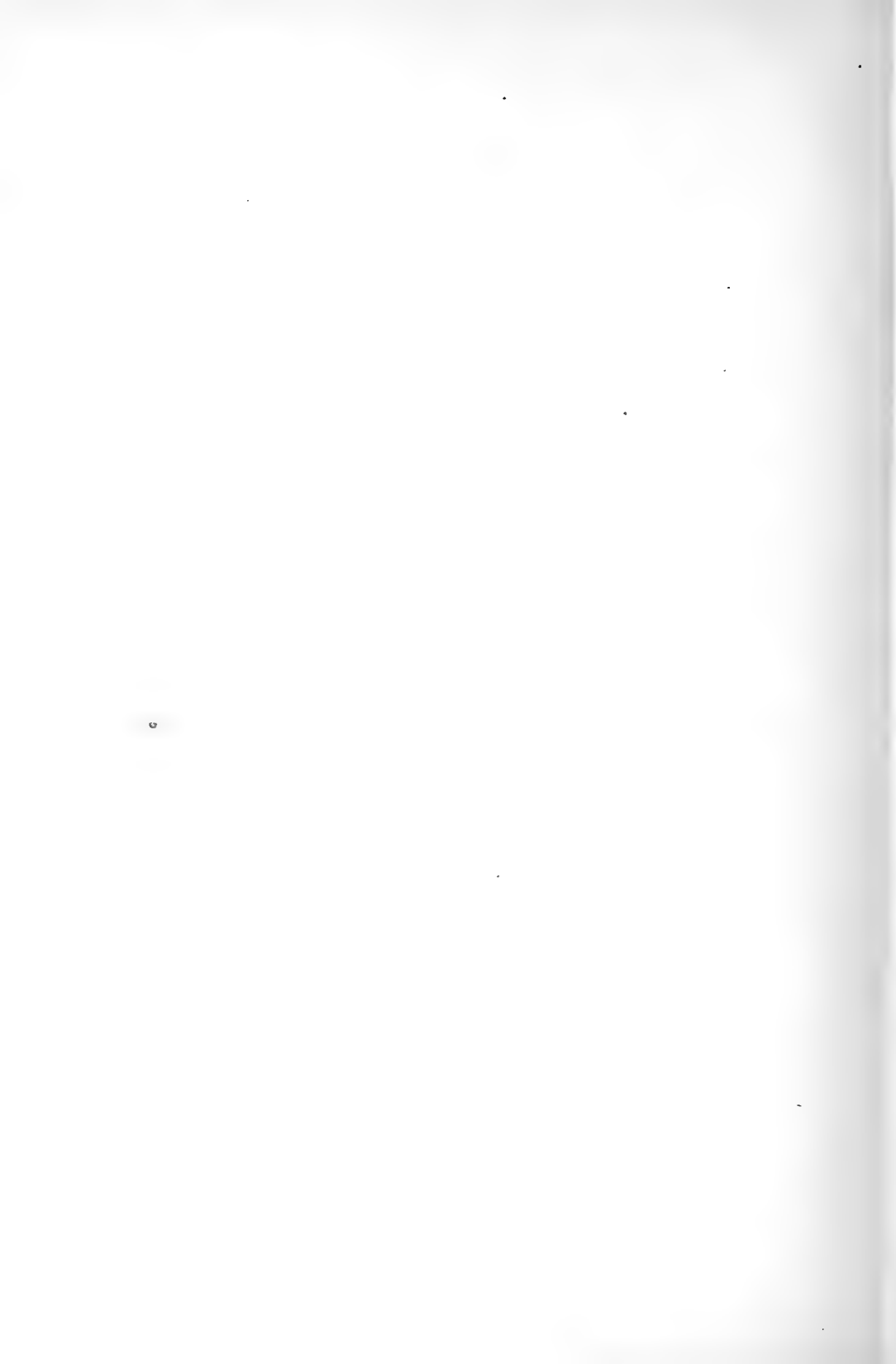


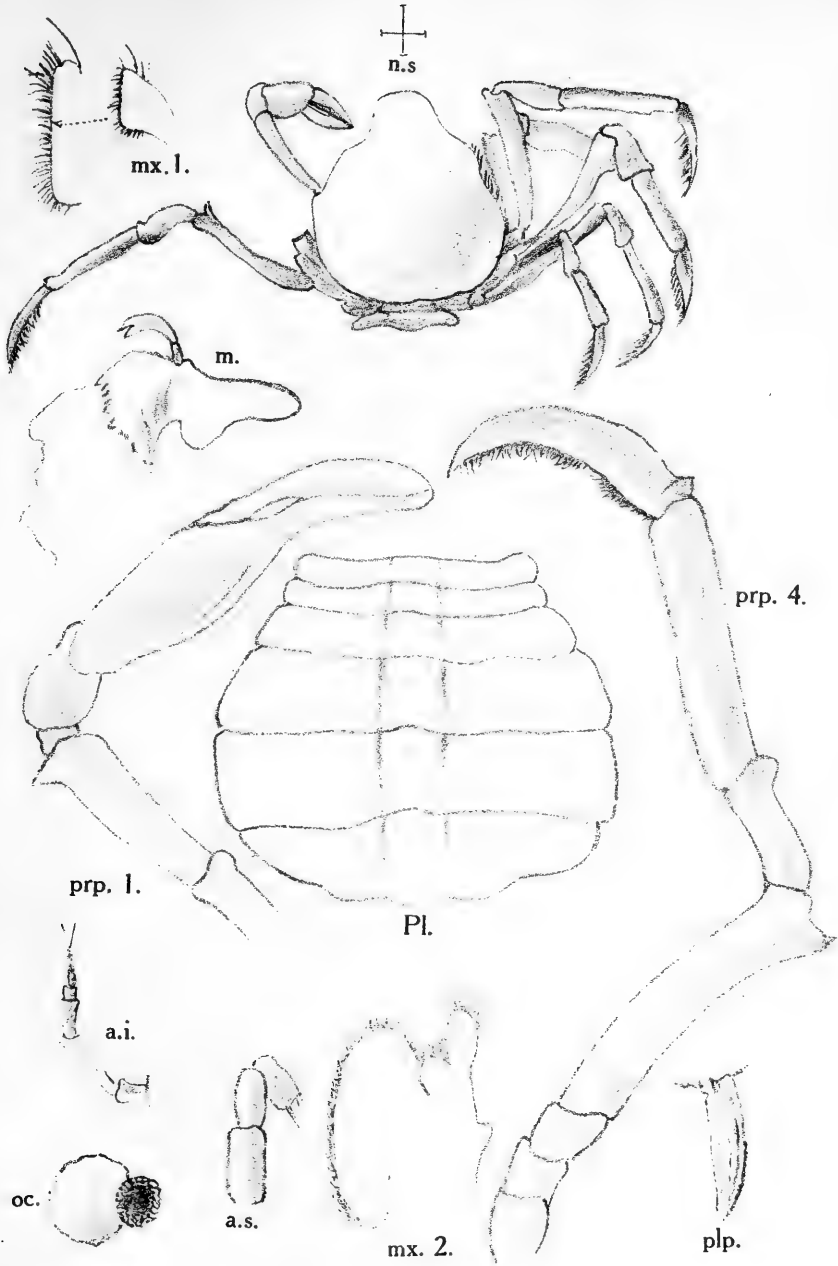
T. R. R. Stebbing del.

John Singleton & Sons lith.

A.—PSEUDOCOLLODES COMPLECTENS, Rathbun.

B.—PUGETTIA QUADRIDENS (de Haan).

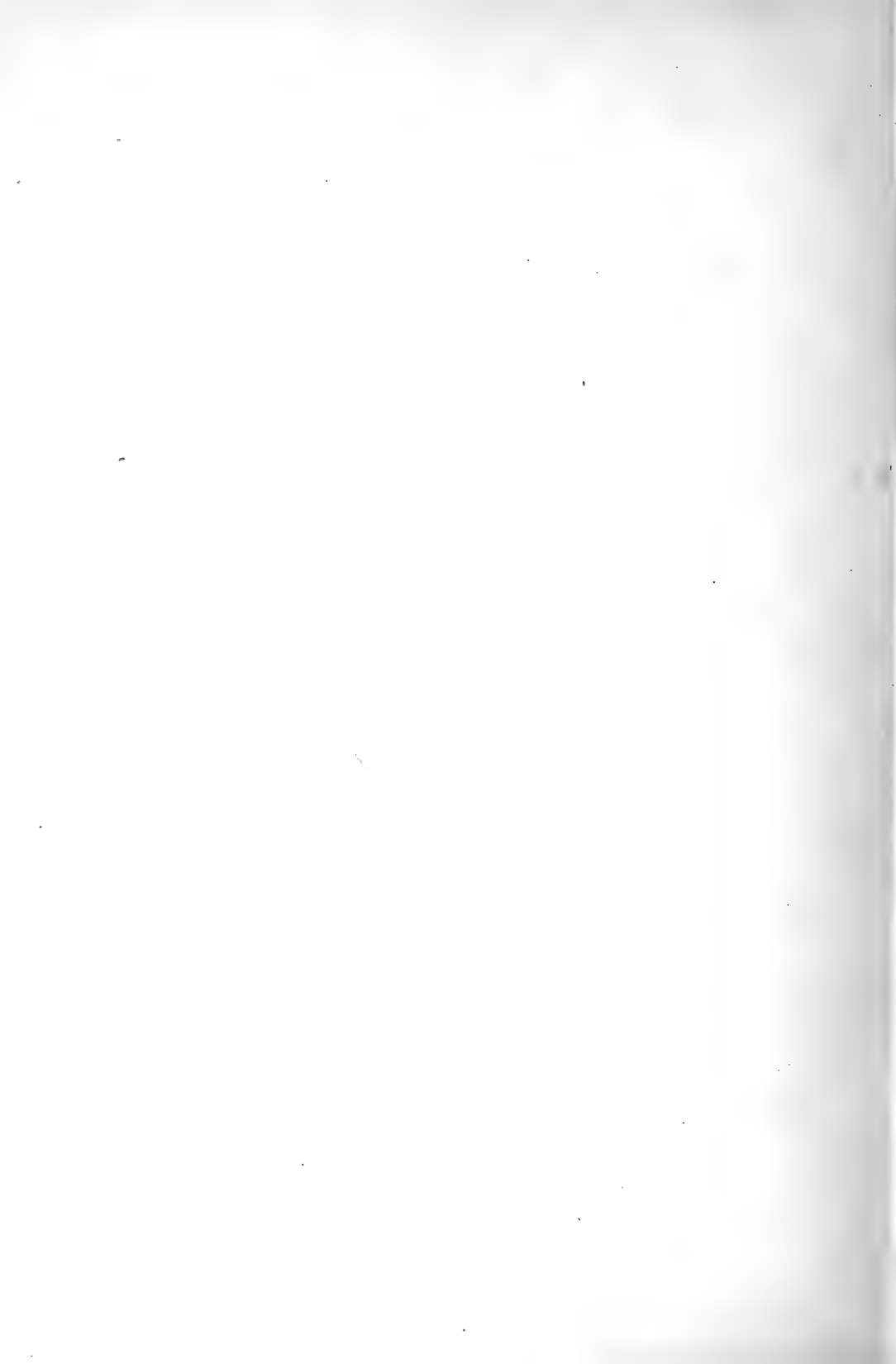


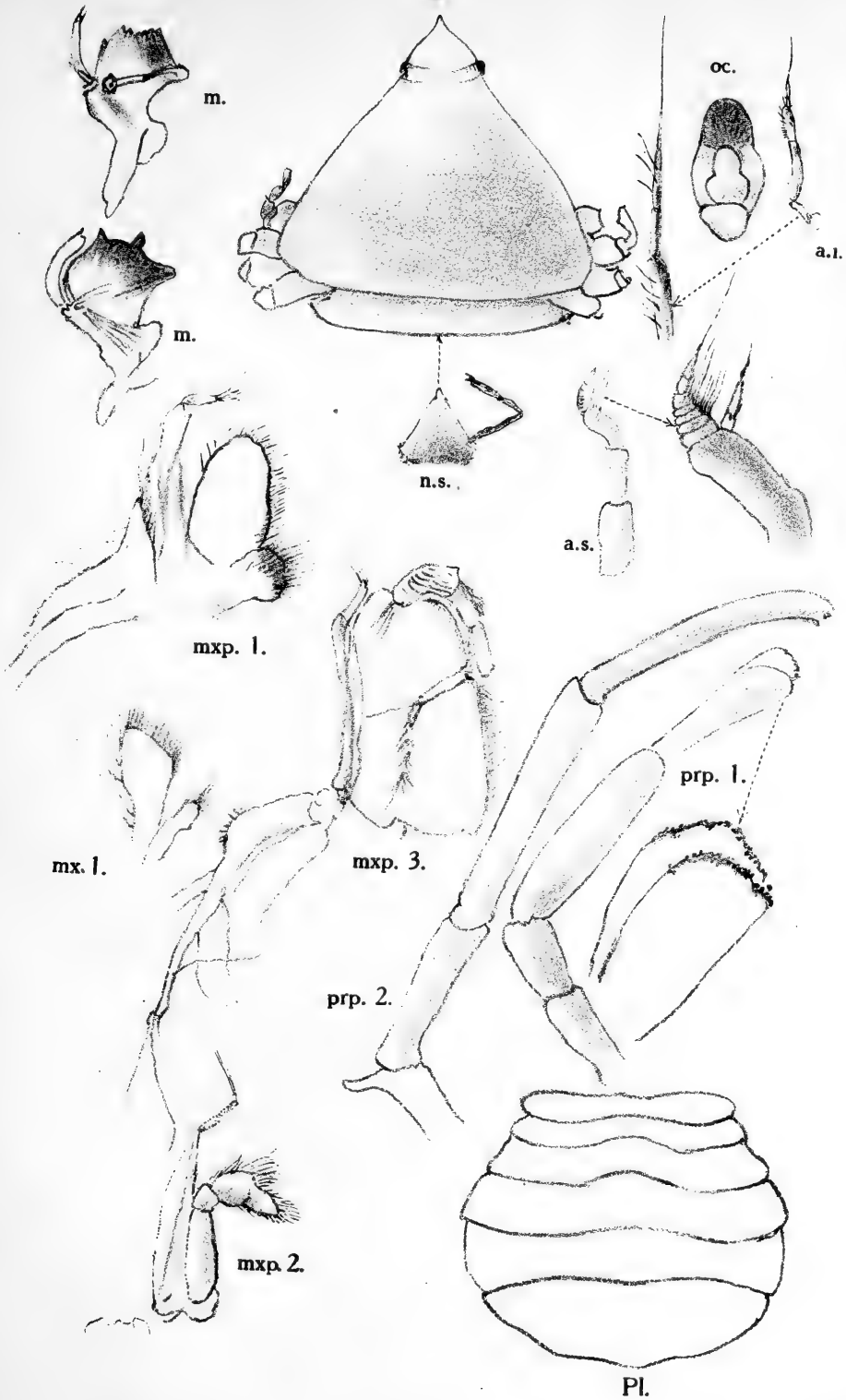


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EPIALTUS VETCHI, sp. nov.

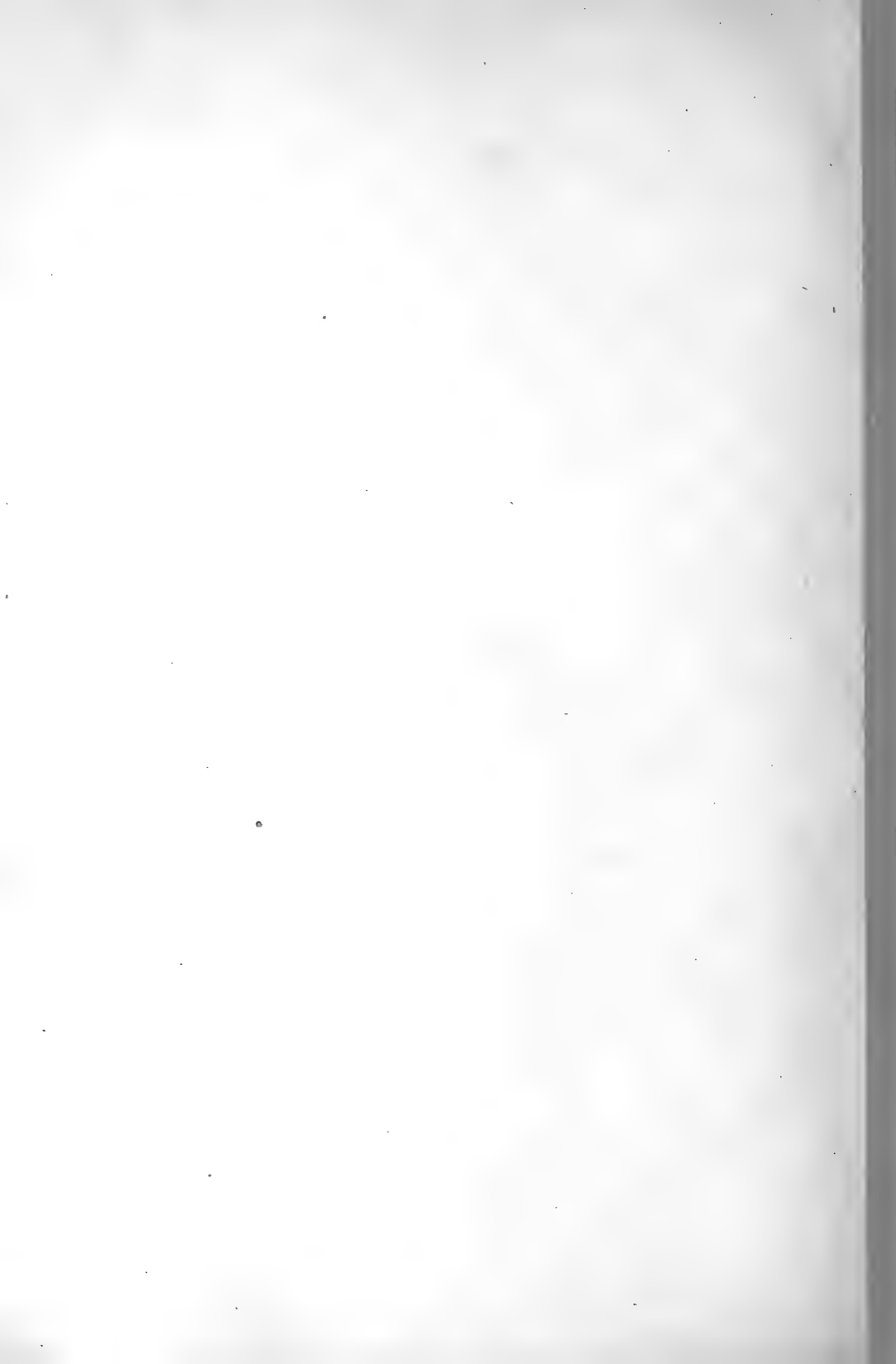


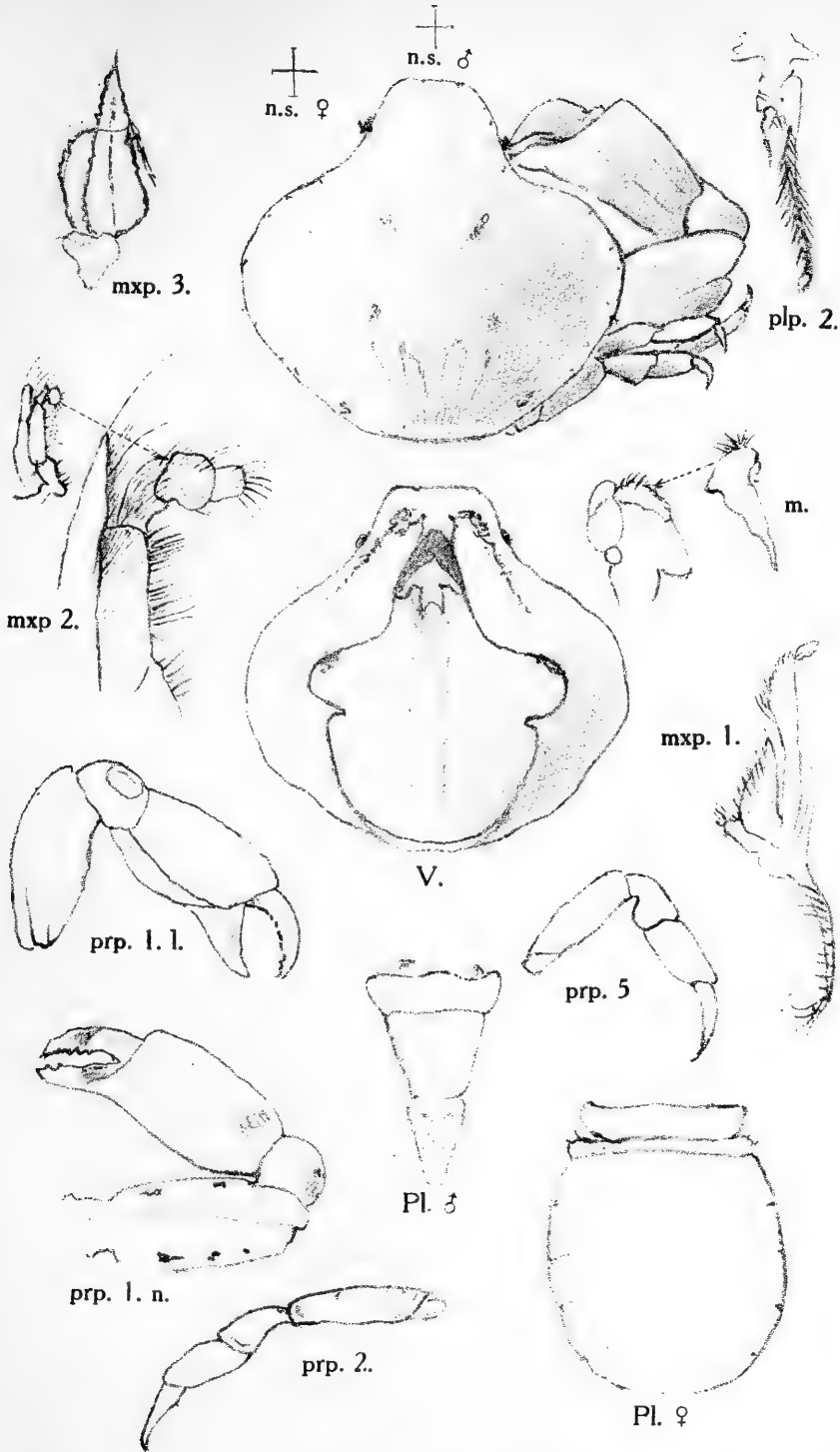


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ELAMENA MATHLEI (Desmarest).



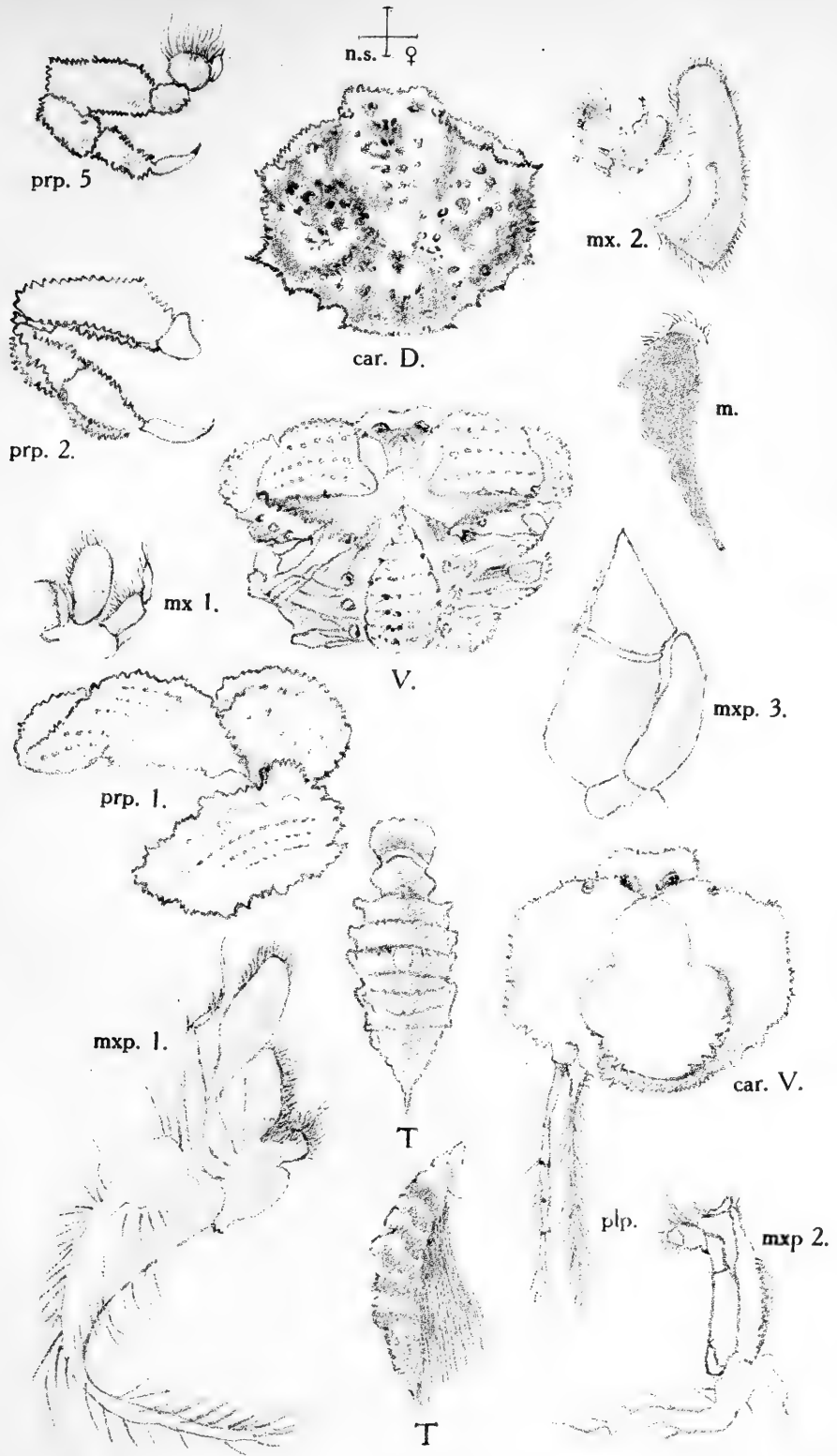


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LEUCISCA PHENOMMA, sp. nov.





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ACTEOMORPHA EROSUS, Miers.

XXIV.—Further Data and some Corrections on the

BREVICOLLIS Group of CICINDELÆ,

by

C. N. Barker, F.E.S.

I HAVE lately received (end of January, 1920), from Dr. Horn of Berlin, para-types (female labelled Senegal and male presumably from same country but unlabelled) of *Cicindela neglecta*, Dej. On comparing these insects with those that I tentatively assigned to *neglecta*, I find they are quite distinct forms. Seemingly this well defined race, which throughout its very considerable range remains remarkably stable in all its characteristics, has been overlooked or possibly, as in my case, wrongly determined from description alone. In my remarks, pages 172–173, Vol. II, Annals of the Durban Museum, I alluded to the discrepancies between Dejean's description of *neglecta* and the form I attributed to it, which left me much in doubt as to the correctness of my determination. This has proved to be well founded, and the insect thus wrongly assigned remains yet to be dealt with. I can find no written description that applies to it, therefore I propose to name it *reliqua*, a name appropriate to the circumstances. The following is a fuller description of it than that given in my original paper under the designation *C. brevicollis*, race *neglecta*, Dej.

CICINDELA RELIQUA, sp. nov.

Length $9\frac{1}{4}$ –12 mm. Width 4–5 mm.

Head and prothorax coppery bronze, with more or less of blue green and glowing red reflections about head and furrows of prothorax. Elytra bronze black (appearing quite black except in strong light), with pale testaceous markings; pectus and abdomen dark metallic blue to blue green; lateral margins of prothorax beneath, coxæ, femoræ and tibiæ more or less glowing to metallic purple; tarsi purplish. The sides of the sternæ and abdomen densely clothed with decumbent white hairs; legs with the usual sparse white hairs and setæ.

Labrum convex, triangular produced in both sexes, central tooth in female prominent.

Antennæ, length medium to long, articles beyond 4th pubescent and slightly compressed, last joint squarely truncate.

Supra-ocular striation strongly developed and the whole of the head more or less plicated.

Prothorax transverse, gently rounded, sub-equal at base and apex, lateral margins densely fringed with short white decumbent hairs, disc bare, except for a few sparse hairs extending from neck along the median line.

Elytra short, broad, sides nearly straight, a little more explanate beyond middle in female than in male, serrated and gradually rounded to apical angle, which is sharply and briefly spinous; epipleuræ and a narrow inner margin purplish, sutural margins dark metallic or glowing bronze. The basal lunulate and sutural bands of pattern widely interrupted, forming three narrow elongate spots on either side, the lowest reaching to about middle; submarginal bands narrow to very narrow, continuous from base to apex, humeral and median rami given off from the submarginal bands in a downward diagonal direction, the latter bluntly elbowed about middle, thickened at apex and nearly reaching the suture above apical declivity; sub-apical teeth or rami short and pointing a little upwards.

The principal characteristics differentiating this race, from other members of the group, are the coarse striation and plication of the head, the transverse slightly rounded prothorax with its narrow fringe of white hairs, the short elytra with its exceptionally dark bronze ground and the downward curved, less elbowed median rami. The supra-orbital striation, dark ground colour, and in a lesser degree the diagonal trend of the median rami, are reproduced in its nearest South African ally *vivida*, Boh., from which, however, it is easily discriminated by its less robustly convex form, much narrower pattern and uninterrupted sub-marginal bands.

Thanks to Dr. Horn's courtesy, I now have before me not only para-types of *neglecta*, Dej., but also a female from Gaboon and a male from Abyssinia of *discoidea*, Dej.; also the sexes of the following interesting members of this pattern group:—*C. abbreviata*, Klug. from Madagascar, *C. cancellata*, Dej. from Bengal Prov., India, its sub-sp. *subtilisculpta*, Horn from Formosa and *C. catena*, F. from Ceylon.

A careful comparison of the para-types of *neglecta* and *discoidea*, leaves little to justify their separation from one another, as other than geographical races. Dejean, in his description of *neglecta*, says "it greatly resembles *discoidea* but is slightly bigger and proportionally

wider. In the two examples before me, the *neglecta* are a little longer and the female is proportionally narrower, but with the same elongate oval outline. Further Dejean avers that the eyes of *neglecta* protrude a little more, but this difference is not apparent in my examples.

The pattern is identical in the two races, a little more broadly developed in the male *neglecta* than in the same sex of *discoidea*. The inter orbital striation and sculpture is a trifle coarser in the former than in the latter. The labra are identical in both races and are shaped exactly as in those of *intermedia*, Klug.; the same equally applies to the prothoracic and elytral contours of these three races in both sexes. There is a slightly greater inclination in the male *neglecta* to the rounding of the apical angles of the prothorax, but the female, presumably, from the same country has it as elongate and straight as in any examples of *discoidea* and *intermedia* that I have met with. The antennæ are unfortunately wanting in all but the female *discoidea*, which, however, shows the same slender tapering characteristics that pertain to *intermedia*, relatively perhaps a trifle shorter. With the very limited material at my disposal, it would be rash for me to say more, than that there are good grounds for believing these three races may form a distinct section, *discoidea* being the connecting link between *neglecta* and *intermedia*.

Dr. Peringuey has generously entrusted to me for examination and comparison his types of *C. herero* and *C. damara*.

The race which I tentatively assigned to the former proves to have been rightly determined by me, in my previous paper on the group.

C. damara is a more difficult subject to tackle and the type, a female, is unfortunately minus the antennæ. The figure of it in the author's Descriptive Catalogue, 1896, Plate I, is misleading, for it portrays a short broad insect with the robust facies of *C. candida*, Boh. and this is enhanced by the pattern which is very similar to that of the variety *mixta*, Chd. Dr. Peringuey's description (vide S.A. Trans. Phil. Soc., Vol. VII, p. 35) correctly defines it, "elytra elongated nearly plane on the upper part," but omits to add that the sides are sub-parallel for about $\frac{2}{3}$ their length, an unusual occurrence in the females of the group and very different to the ampliate slightly convex figure of *C. candida*, female. The labrum is as the author describes it "convex in the centre, triangular in front, tridentate at apex," and, in this respect again, it differs materially from that of *candida*, as it does also in its less produced mandibles. The prothorax of *candida* is transverse, that of *damara* is longer than broad. The lateral margins have a narrow fringe of white hairs, the disc being almost

denuded as in *reliqua mihi*; in *candida* the hairs are longer and sparsely distributed over the whole surface. The sculpture of the head is coarser and has well defined supra-orbital striation; the eyes are also more protruberant. The sum total of these differences quite precludes its acceptance as a variety or even near ally of *C. candida*.

Dr. Horn places *damara*, Per. as a variety of *neglecta*, Dej., and also records having received typical *neglecta* from the same locality, i.e., Sandwich Harbour (S.W. Africa). Comparing *damara* with my single female example of *neglecta*, some important divergences are shown. (1) The eyes are slightly more protruberant and approximate more than those of *neglecta* and its near relatives *discoidea* and *intermedia*. (The space between the eyes in these three races is usually a little wider than is met with in other members of the group). (2) The prothorax and elytra are proportionally shorter, and the latter is parallel sided, thus lacking the distinctive elongate oval contour characteristic of the females of *neglecta*, *discoidea* and *intermedia*.

On such points, as supra-orbital striation and shape of the labrum (the antennæ being missing must remain in doubt), *damara* female agrees with *neglecta*, and may have been correctly placed by Dr. Horn, who has had more material on which to found an opinion. Per contra it must be conceded that the shape and garniture of the prothorax and the eyes of *damara* are identical with those of my *reliqua*. This may either indicate that the south western forms of *neglecta* approximate to *reliqua* or (what I think is more probable) that the nearest affinities of *damara* lie with *reliqua*.

In conclusion, I am venturing a few remarks upon the classification and the difficulty of determining the relative specific or sub-specific values of this interesting pattern group. The primitiveness of the insects included in the group is amply demonstrated by the vast range of their distribution, and as a sequence their low susceptibility to variation is shown also, by the very limited modifications of pattern, form and sculpture that occur.

These slight and often inconspicuous differences of details are, nevertheless, extraordinary stable, and are of greater importance on account of the large areas over which they are maintained.

As at present catalogued (vide Systematischer Index der Cincididen 1905, by Dr. W. Horn), the following are listed as sub-species of *C. brevicollis*, Wied. :—*intermedia*, Klug., *discoidea*, Dej. *neglecta*,

Dej., *bertolonii*, Horn and *clathrata*, Dej. For some reason unknown to me *vivida*, Boh. is placed as a variety of sub-species *neglecta*, to which it is not even the most nearly related. The claims of *C. bertolonii* to specific rank I have already dealt with in my previous paper, and they can therefore be omitted from further review. Adding *reliqua mihi* to the list (which under the old arrangement would probably be included as another sub-species of *brevicollis*), we have the following anomalies. *Intermedia* occurs frequently in association with either *clathrata* or *fasciculicornis*, as I have previously shown. From Bothaville, O.F.S., I have received *clathrata* and *reliqua*, and in November, 1919, at the Upper Tongaat, Natal, I personally came across and captured *reliqua*, *intermedia* and *fasciculicornis* within a few hundred yards of one another. Each of these forms has a very extended range and well defined characteristics, and, as at present classified, they are all sub-species of *C. brevicollis*, which obviously they cannot be. They are equally impossible as mere varieties. Their authors originally described them as species, and as such some of them at least must still be recognised.

Intermedia, *neglecta* and *discoidea* appear to be very intimately related, and so far as my present knowledge goes, they can only be accepted as geographical forms or races of one another. *Discoidea*, Dej. has priority of description, and must therefore rank as species, with the other two as sub-species of it. *C. vivida*, Boh. and *C. reliqua mihi* are sufficiently distinct from one another and from *C. brevicollis* (which is also isolated geographically) to be retained as species, in the same section with *discoidea*.

C. brevicollis, Wied, is a very local race and only owes its importance, as head of the group, to being the earliest described. *Clathrata* has a much wider range than *brevicollis*, whose place in nature appears to be that of a strictly localized race or sub-species of the former. However; this change of arrangement is not desirable, and I think it would be better to treat each as species. The larger size, lighter ground with deeper yellow pattern, and the non-liability to vary that pattern on the lines affected by *brevicollis*, are sufficient reasons for keeping them apart.

The following classification appeals to me as the best that can be arranged for the Ethiopian members of the group, upon our present knowledge. *C. tetradia*, Fairm. and *C. quadraticollis*, Chd. with its sub-species, all from Madagascar, are unknown to me and are therefore omitted :—

SECTION A.

1. *Cicindela candida* Boh.
caffra, Klg. Dej. i.l.
var. *mixta*, Chd.
2. „ *hevero*, Pér.
race *braunsi*, *mihi*.
3. „ *differeus*, Horn.

SECTION B.

4. „ *abbreviata*, Klug.
baliensis Brancs. *circumdata*, Brancs.
5. „ *brevicollis*, Wied.
hottentota, Klg-Gemm. et Har. i.l. *catena*.
var. *prima*, Thnb.
6. „ *clathrata*, Dej.

SECTION C.

7. „ *discoidea*, Dej.
heteromalla, Dej. i.l.
race or sub-sp. *neglecta*, Dej.
trifasciata, Oliv., Har.
„ „ *intermedia*, Klug.
8. „ *reliqua*, *mihi*.
neglecta, m. olim (nec Dej.)
form *damara*, Pér. ?
9. „ *vivida*, Boh.

SECTION D.

10. „ *bertolonii* (Chd. i.l.), Horn.
race or sub-sp. *fasciculicornis*, *mihi*.

AFTERWORD.

Since writing the above I have received from Dr. Horn a letter, dated Berlin, March 7th, 1920, in reply to one from me of February 2nd, in which I pointed out that the form I had attributed to *neglecta* was not that form, but a distinct species for which I proposed the name *reliqua*. Unfortunately Dr. Horn had in the interim come to the same conclusion, and had forwarded the description for publication of a geographical race of this form or species from Kassai, Congo State, Central Africa, to which he has given the name *obliquo-graciliænea*, and which he thinks represents the parent form. This claim, however, can only be substantiated by proof that its distribution is greater than that of *reliqua*, which as I have shown previously is very large, embracing known localities so far apart as those of Natal, Transvaal, Orange Free State and Southern Rhodesia. Accompanying his letter, Dr. Horn kindly forwarded me a type of his *obliquo-graciliænea* male. It is undoubtedly the same species or sub-species as my *reliqua*, only differing from it in its light bronze instead of dark bronze ground colour, and in the more important details of the antennæ, which are shorter with the terminal joints, beyond the 4th, considerably broader and more compressed. Dr. Horn's insect has priority of publication, so my synonymic table, Section C, No. 8, should read :

C. obliquo-graciliænea, Horn, race or sub-sp. *reliqua*, *mihi*,
form or variety *damara*, Per. ?

ERRATA ET CORRIGENDA.

The following errors in my previous paper (Annals of the Durban Museum, Vol. II., Part 4), require correction :—

Page 175, line 6, to read Bushmanland for Bechuanaland.

Page 188, Plate XXV., No. 16, Bushmanland for Bechuanaland.

Page 179, lines 4-5, to read Umvuma for Umvuma River.

Page 185, Distribution Table for race *neglecta*, to read Umvuma for Umvuma River.

XXV.—On South African Bees, chiefly collected in Natal,

by

T. D. A. Cockerell, University of Colorado.

MEGACHILE RHODESICA, sp. nov.

♀. Length about 10 mm.; black, with the general appearance of *M. venusta*; hair of head and thorax above pale ochreous, darkest on vertex, but nowhere fuscous or black; face, cheeks, pleura and metathorax with long white hair, first abdominal segment with long creamy-white hair, the sides of first segment, and extreme lateral margins of second and third, with the tegument red; abdominal segments with linear dull white hair-bands, the second with wholly pale hair before the band, the others with scanty short black hair, the sixth segment with pale tomentum and short black hair; ventral scopa white on first two segments, then clear orange-ferruginous, black or dark fuscous on last segment. Eyes pale pea green; mandibles quadridentate, obscure reddish subapically, the base with white tomentum; clypeus and supraclypeal area rather elevated in middle, roof-like, but not keeled, broadly polished and impunctate in middle, the whole covered by long hairs which converge toward the middle from each side; flagellum rather long, very obscurely reddish beneath; mesothorax and scutellum dull and finely roughened; tegulae testaceous; wings hyaline, faintly brownish, stigma ferruginous, nervures dark; legs dark castaneous or partly piceous; hair of legs white; hind basitarsi not much broadened, not so broad as tibia.

Bulawayo, Rhodesia, 23rd September, 1918 (E. C. Chubb). Three specimens.

MEGACHILE NATALICA, sp. nov.

♀. Length 10–10.5 mm.; black, similar to *M. rhodesica*, but a little more robust; eyes dark brown or black; vertex with fuscous or reddish fuscous hair; legs black; red hair of scopa very bright, and black on last segment intense; abdominal bands clear white. Very close to the last; possibly a sub-species, but no intermediates are known.

Type from Winklespruit, Natal, 4th January, 1919 (C. N. Barker). Also from Bluff, Durban, 23rd February, 1907 (C. N. Barker).

MEGACHILE FUNEBRIS, Radoszkowski.

Karkloof, January, 1918 (E. E. Platt); Pinetown, 19th October, 1916 (H. W. Bell Marley).

MEGACHILE FLAVESCENS, Friese.

Doonside 6th January, 1917 (L. Bevis); Umbilo, 25th February, 1917 (L. Bevis); Durban, March, 1916 (E. C. Chubb).

MEGACHILE UMBILOENSIS, sp. nov.

♀. Length about 9 mm.; black, with white hair, but vertex and scutellum with much long dark fuscous hair, and mesothorax with a few dark hairs; ventral scopa white on basal half, bright ferruginous beyond, but black at end; mandibles quadridentate, the teeth low; clypeus minutely rugoso-punctate, with a median smooth band; eyes dark brown; antennæ entirely dark; mesothorax and scutellum finely and extremely densely punctured, but glistening between the punctures; tegulæ black; wings hyaline, very faintly greyish; nervures and stigma black, the stigma obscurely reddish in middle; legs with white hair, pale yellowish on inner side of tarsi; hind basitarsi; moderately broadened; abdomen with distinct white hair-bands, but that on first segment linear and subobsolete; sixth segment with black hair, and no pale tomentum.

Umbilo, 18th February, 1917 (L. Bevis). Resembles *M. venustella* Ckll., but smaller, with dark tegulæ, and very much more finely sculptured clypeus.

MEGACHILE STELLARUM, sp. nov.

♀. Length 11.5 mm.; black, with white hair, but that on upper part of front, and upper part of sides of thorax, stained with yellow, while the vertex, mesothorax and scutellum have dark reddish-fuscous hair, long on vertex, short and scanty on mesothorax (which has pale hair in front), and not very long on scutellum; ventral scopa coloured as in *M. umbiloensis*, except that it is white in middle of fourth segment, and black at sides of fifth; mandibles quadridentate; sides of face with long dense white hair, but clypeus with short thin reddish hair, its surface densely and coarsely punctured, without a smooth line, but upper and lower margins narrowly smooth; supra-clypeal area with a smooth and polished space just above clypeus; antennæ black; vertex coarsely punctured; mesothorax and scutellum finely and extremely densely punctured, but glistening

between the punctures; tegulæ rufofuscous with a broad pallid margin; wings dusky, greyish; legs with white hair, ferruginous on inner side of tarsi; middle basitarsi on outer side densely covered with silky white hair, and with a white fringe behind; hind basitarsi not as broad as titræ; spurs ferruginous; abdomen with conspicuous creamy-white hair-bands, sixth segment with black hair.

Stella Bush, Durban, 21st January, 1917 (C. N. Barker). The entire abdominal bands distinguish it from *M. venustoides*, Strand, which also has the hair of the face brassy-yellow.

MEGACHILE TARSISIGNATA, sp. nov.

♂. Length 10·5–11·5 mm.; black, including antennæ, but last tarsal joint (and the one before more or less) red; face and front densely covered with white hair, the lower half creamy; clypeus glistening, but extremely finely and closely punctured, without a smooth line; flagellum long and slender; vertex with ochreous hair; thorax above with pale ochreous hair, beneath with white; tegulæ ferruginous; wings dusky hyaline, brownish; stigma ferruginous nervures fuscous; legs with white hair, long and abundant on under side of anterior and middle trochanters and femora; anterior coxal spines broad, dentiform, only moderately long; anterior tarsi; broadened, with a large thick white fringe behind; first three joints white posteriorly, but anteriorly black, the basitarsus with a very large dark lobe concave within, and covered on outer side with long hair; middle tarsi with dense white hair, forming a conspicuous fringe behind; hind tarsi broad, the hair on inner side ferruginous; abdomen densely covered with orange-fulvous tomentum, except that segments 2 to 4 have a transverse bare band; keel of sixth segment crenate, and with a small median notch; venter with broad white hair-bands.

Two from Umbilo, 7th February, 1917 (L. Bevis). The cotype is conspicuously broader and more robust than the type, but they are certainly one species. Closely resembles *M. flavescens*, Friese, but known at once by the anterior tarsi.

MEGACHILE BEVISI, sp. nov.

♂. Length about 11·5 mm.; rather long and narrow; black, with the first abdominal segment (except a broad apical band not reaching sides), spot or mark on each side of segments 2 to 4 (and extreme base more or less), anterior femora and tibiæ in front, anterior tarsi and middle femora more or less, ferruginous; face and front densely

covered with creamy-white hair, cheeks below with pure white; apical tooth of mandibles long and sharp; flagellum very obscurely reddish beneath; hair of vertex very slightly fuscous; thorax with very pale yellowish-tinted hair above, white below, on scutellum and disc of mesothorax the hair is faintly tinged with fuscous; tegulae bright ferruginous; wings hyaline, the outer border pale brownish; stigma dark reddish, nervures piceous; anterior tarsi almost simple, but with a rather long white fringe behind; anterior coxae with short slender spines; middle tarsi covered with long shining silky white hair; spurs red; abdomen with pale ochreous hair on first segment; segments with apical slightly creamy hair-bands, and narrower whiter bands along the subbasal grooves; disc of second segment with ochreous hair, of third to fifth with black hair; sixth segment, except the keel, densely covered with appressed pure white hair; keel of sixth segment rounded, minutely subcrenulate, with a broad but not deep median notch; beneath are four short red spines.

Doonside, 6th January, 1917 (A. L. Bevis). The general appearance is very like that of *M. damaraënsis* Friese, but that has only the fifth abdominal segment with black hair on disc.

MEGACHILE BARKERI, sp. nov.

♂. Length about 8 mm.; black, of the short and broad type; antennae long, entirely black; mandibles with a red subapical spot; anterior femora and tibiae red in front; hair of head and thorax mainly fulvous, pale golden on face, long and white on under side of head and thorax, long and black on vertex, strongly mixed with black on mesothorax, but not scutellum; vertex glistening, but mesothorax and scutellum entirely dull; tegulae piceous; wings dusky, stigma and nervures black; anterior coxae with short spines, hidden by hair; anterior tarsi long and simple, but hairy; with the first two joints pallid apically; hair of legs very pale yellowish; spurs cream-color; first abdominal segment with long fulvous hair, second to fifth with black hair, but with narrow even cream-coloured apical hair-bands; sixth segment densely covered with cream-coloured tomentum, the keel very broadly but shallowly excavated in middle, with a couple of little teeth on each side of the excavation.

Durban, 3rd March, 1918 (C. N. Barker).

MEGACHILE HETEROTRICHA, sp. nov. (*barkeri* var?)

♂. Length about 8.3 mm.; very like *M. barkeri*, but with hair of mesothorax all fulvous; apical emargination of abdomen (keel of

sixth segment) much narrower, with nearly the form of a half-circle; very likely not more than a variety of *M. barkeri*.

Doonside, 5th January, 1917 (A. L. Bevis). A close examination shows a few hairs in middle of mesothorax darker than the rest, indicating a slight approach toward the *barkeri* character. If the two are one species, *heterotricha* is probably a mendelian recessive.

The following key separates the species of *Megachile* (including *Gronoceras*) in the last sending:

- Length 20 mm. or more; thorax with black hair, abdomen covered with red hair.....*Gronoceras bombiformis* (Gerst.) ♀.
 Much smaller; or if large, abdomen not red.....1.
1. Abdomen with conspicuous lateral patches of white tomentum, but not banded; large species, about 16 mm. long; ventral scopia red.....*Megachile funebris* Rad.
 Not so.....2.
2. Thorax above and at sides with black hair, abdomen with red.....3.
 Abdomen not red haired; or if so, thorax not thus black haired.....4.
3. Females; ventral scopa red, clypeus keeled...*fervida* (Smith).
 Males; face with ochreous hair.....*fervida* (Smith).
4. Large species, 16 mm. long or over; abdomen grey with paler bands, the base sometimes red-haired.....5.
 Smaller species, 14 mm. long or less.....6.
5. Male with long spine at end of abdomen, and no red hair at base (Durban, Mārch, 1916, E. C. Chubb).....
*Gronoceras felina* (Gerst).
 Male without long spines at end of abdomen; hair at extreme base of abdomen red...*Megachile cyanura*, sp. nov.
 Female with red hair at base of abdomen; head with black hair; ventral scopa soot-colour.....*cyanura*, sp. nov.
6. Females; hair of face white or cream-colour.....7.
 Males.....14.
7. Abdomen red-haired above, and the tegument also largely red (Winklespruit, Natal, 23rd and 29th December, 1918, and 15th January, 1919, C. N. Barker; Durban, 12th April, 1918, C. N. Barker).....*melliferina*, Ckll.

- Abdomen with red hair at base only, and tegument not red.....*vittatula*, sp. nov.
- About 13 mm. long, with shining finely punctured mesothorax; tegulae dark reddish; hair of abdomen evidently reddish, but nearly all worn away. (Malvern, Natal, April, 1916, C. N. Barker; St. Lucia Bay, Zululand, November, 1918, H. W. Bell Marley).....sp. (condition too bad to identify, but species unknown to me).
- Abdomen without red hair or tegument above8.
8. Length about 13 mm.; tegulae bright ferruginous; mesothorax dull.....*opacula*, sp. nov.
- Smaller; or tegulae dark.....9.
9. Length about 9 mm.; tegulae black; vertex and scutellum with much black hair.....*umbiloensis*, sp. nov.
- Larger; or if nearly as small, tegulae testaceous.....10.
10. Hair of metathorax and base of abdomen yellow.....*flavibasis*, sp. nov.
- Hair of metathorax white.....11.
11. Ventral scopa white at sides and red in middle, except on last segment, where it is black; scutellum with many long black hairs (Krantz Kloof, 8th October, 1916, H. W. Bell Marley; Pinetown, 26th November, 1916, H. W. Bell Marley).....*venustella*, Ckll.
- Ventral scopa at least partly red at sides, but white basally.....12.
12. Sixth abdominal segment without white tomentum, but black hair; ventral scopa black on last; scutellum with rather short dark fuscous hair.....*stellarum*, sp. nov.
- Sixth abdominal segment with white tomentum.....13.
13. Eyes green.....*rhodesica*, sp. nov.
- Eyes dark brown or black.....*natalica*, sp. nov.
14. (Males). Anterior tarsi modified (merely thickened, red and fringed in *bevisi*).....15.
- Anterior tarsi simple.....17.

15. Anterior tarsi dark, the basitarsus only somewhat expanded; abdomen with reddish hair at base, and grey bands beyond... *villatula*, sp. nov.
Anterior tarsi at least partly pallid, and with much white hair.....16.
16. Anterior basitarsi white, with a very dark large lobe.....
.....*tarsisignata*, sp. nov.
Anterior tarsi pallid, the basitarsi with a large dark spot at base posteriorly; tegument of abdomen varying from black to largely red... *flavescens* Friese.
Anterior tarsi entirely ferruginous, thickened but little modified, with a long white fringe behind—*bevisi*, sp. nov.
17. Fifth abdominal segment covered with fulvous tomentum; anterior femora partly red.....*flavibasis*, sp. nov.
Fifth abdominal segment at least mainly bare and black...18.
18. Larger; tegulae red.....*opacula*, sp. nov.
Smaller (hardly 9 mm.); tegulae dark.....19.
19. Vertex and mesothorax with much black hair.....
.....*barkeri*, sp. nov.
Vertex with black hair, mesothorax with fulvous.....
.....*heterotricha*, sp. nov. (?*barkeri* var.).

TRIGONA, Jurine.

TRIGONA CLYPEATA, Friese.

Bulawayo, Rhodesia, 18th September, 1910 (E. C. Chubb).

TRIGONA DENOITI, Vachal (*zebra*, Friese).

Bulawayo, Rhodesia, 18th September, 1910 (E. C. Chubb).

Meade-Waldo (1913) indicated the identity of *T. clypeata* with *T. denoiti*, but Vachal's species with the orange-fulvous, black banded, abdomen, the *T. clypeata* var. *zebra* Friese. In Proc. U.S. Nat. Museum, 55 (1919), p. 211, I treated *zebra* as a distinct species, but it is perhaps after all only a dimorphic (dischroic) form of *clypeata*, as would be suggested by the fact that Mr. Chubb took both at Bulawayo on the same day. In that case, since Vachal's name has priority, the form with entirely black abdomen will be *T. denoiti* var. *clypeata* (Friese).

NOMIA, Latreille.

NOMIA STRENUA, Cameron.

The male averages a little larger than 13 mm., Meade-Waldo's measurement; the abdomen varies from very dark reddish to reddish-black. The wings are strongly darkened apically. The female is very similar, except for the usual sexual differences. Its abdomen is strongly reddened apically, and the venter is clear ferruginous; the face is covered with appressed white hair, but on the labrum it is golden; mesothorax coarsely and closely punctured, scutellum less closely, with a polished area on each side of disc; scape very long; flagellum red at apex; extreme base of abdomen with stiff erect pale golden hair; tibial scopa pale reddish, dark fuscous basally above.

Both sexes from Stella Bush, 12th December, 1916, "nesting in ground, making a hole near paths, with a mound of earth above hole." (H. W. Bell Marley). Male also from Durban, December, 1916 (H. W. Bell Marley).

NOMIA TRIDENTATA NATALENSIS, Cockerell.

Male from Winklespruit, Natal, 20th December, 1918 (C. N. Barker). The female, not previously known, comes from Malvern, March, 1916 (Barker), and Bluff, Durban, 28th January, 1917 (Barker). The female is very like *umbiloensis* and *perornata*; the three may be separated thus:

Disc of first abdominal segment closely punctate..... *umbiloensis*.

Disc of first segment dull and impunctate..... 1.

1. Wings conspicuously darkened at apex; abdomen with three orange-fulvous bands..... *perornata*.

Wings little darkened at apex; abdomen with three dull whitish bands..... *natalensis*.

The hind tibiae of *perornata* are clear red, which is not at all the case in *natalensis*.

NOMIA ERYTHROPTERA, sp. nov.

♀. Length a little over 10 mm., anterior wing 9 mm.; head and thorax black; legs dark brown, the anterior ones more nearly black; abdomen shining, bright ferruginous, base of first segment black, no hair-bands, apex of abdomen with dark fuscous hair; wings dilute fuliginous, strongly reddened; tegulae piceous with a rufous spot.

Similar to *N. fausta* (Smith), but larger, with redder wings, and basal area of metathorax rugose, not shining. It also differs in the very broad second submarginal cell.

Malvern, Natal, 22nd December, 1915 (C. N. Barker).

NOMIA DURBANENSIS, sp. nov.

♀. Length about 7 mm.; black, with the hind tibiæ, and all the tarsi, dull ferruginous, but the red color largely concealed by white hair; head broad; hair of sides of face clear white (yellowish in *N. megalepis*); apical half of flagellum red beneath; clypeus and supraclypeal area closely and very distinctly punctured, but shining; mandibles dark red subapically; prothorax (with tubercles) densely covered with creamy-white or fulvescent hair: mesothorax dullish, with excessively minute well separated punctures, and widely scattered much larger ones; base of metathorax with a narrow transverse channel, dullish but hardly ridged; tegulæ very large, expanded behind, brown anteriorly, posteriorly whitish; abdomen with broad greyish hair-bands at basis of segments 2 to 4, and narrower ones in transverse sulci; first segment with an eye-shaped patch of white tomentum on each side; fifth segment fringed with pale brown hair. Very close to *N. megalepis*, Ckll., but more slender; with white hair on face, and darker, shorter stigma. Also related to *N. tegulata* Smith, described from Sierra Leone. Possibly the Durban (Meade-Waldo, 1916) record of *tegulata* refers to this or *megalepis*. True *tegulata* has pale fulvous hair on hind tibiæ; as in *megalepis*; in *durbanensis* it is white.

Durban, 26th August, 1916 (C. N. Barker). Two specimens.

It is possible that *N. megalepis* may prove identical with *N. tegulata*, but it is certainly distinct from the supposed *tegulata* described by Vachal.

NOMIA CLARIPES, sp. nov.

♂. Length 9.5-10 mm.; black, with broad abdomen, the pubescence pale fulvous, light golden on face; head broad, mandibles pale yellow basally, red subapically, black at tip; scape red, flagellum black above and clear red below; mesothorax very hairy, very densely punctured, glistening between the punctures; mesothorax hairy, the transverse basal sulcus crossed by strong ridges; tegulæ rather large, light ferruginous; wings dusky hyaline, yellowish, not distinctly darkened apically; stigma and nervures ferruginous; basal

nervure little bent; femora, tibiæ and tarsi clear light ferruginous, the anterior and middle femora blackened basally behind; hind legs quite unmodified; abdomen with erect pale fulvous hair, and broad pale ochreous hair-bands on hind margins of segments; first two segments dull, with the surface appearing coarsely granular, but basal sulcus of second shining; the other segments shining; apical plate red; venter largely red.

Type from Bluff, Durban, 25th March, 1917 (C. N. Barker). Also two from Durban, 2nd April, 1918 (C. N. Barker). The colour of antennæ and wings readily separate it from *N. rubripes* Friese, which it resembles in the red legs.

NOMIA NITIDIBASIS, sp. nov.

♀. Length about 12 mm., with very bright and dense ferruginous hair covering thorax above; wings hyaline, the apical margin faintly infuscated; stigma and nervures dull brown; tegulæ clear ferruginous; abdomen with four broad hair-bands, the first two fulvous, the third white at sides and pale fulvous in middle, the fourth pure white; heavy fringe on fifth segment and apex dark chocolate. Looks exactly like *N. vulpina umbiloensis*, but readily separated by the shining abdomen, the first segment especially polished and brilliant; it also differs by the stigma being heavily bordered by dark fuscous, the knees not red, and the hind tibiæ beneath with a loose curled beautifully plumose white scopa.

Two from Durban, 9th and 23rd March, 1918 (C. N. Barker).

NOMIA PLATYCEPHALA, Cockerell.

The female from Winklespruit, 23rd December, 1918 (C. N. Barker), is very like the male, but the head is not so broad. The hind tibiæ have long pale fulvous hair on inner side, but some fuscous hair on outer face, while the curled scopa beneath is creamy-white. The venter of the abdomen has pale reddish hair. The tongue is long and slender.

NOMIA MURINELLA, sp. nov.

♀. Length about 8 mm.; superficially just like *N. platycephala*, but differing thus: face narrower below; tongue much shorter; paraglossæ with long hairs; palpi shorter, last two joints of labial palpi short (long and slender in *platycephala*); scutellum and middle

of postcutellum with red hair; stigma not so dark; second submarginal cell smaller; abdomen dull, the first segment (except depressed margin) entirely dull and impunctate.

Durban, 11th March, 1917 (E. C. Chubb).

The following key separates the species of *Nomia* in the last sending:

- Abdomen mainly or wholly red1.
 Abdomen not red (very dark reddish in *strenua*).....4.
1. Abdomen very coarsely punctured, at least on first two segments.....2.
 Abdomen finely punctured.....3.
2. Anterior wing about 10 mm. long; hind basitarsi of ♂ red. (Winklespruit, Natal, 31st December, 1918, C. N. Barker).
*rubella*, Smith.
 Anterior wing about 7·5 mm. long; ♀. Durban, 10th February, 1918, C. N. Barker; Bluff, Durban, 20th March, 1917, C. N. Barker)...*serratula*, Smith (variety).
3. Larger; wings strongly reddened.....*erythroptera*, sp. nov.
 Smaller; wings grey (Winklespruit, 4th January, 1919, 31st December, 1918; Durban, 4th May, 1918; Bluff, Durban, 28th January, 1917; all C. N. Barker).....
*fausta*, (Smith)
4. Larger species; anterior wing 10–11 mm.....5.
 Smaller.....6.
5. Hind margins of abdominal segments with broad ivory-color or yellowish tegumentary bands; males. (Krantz Kloof, 14th February, 1917, H. W. Bell Marley; St. Lucia Bay, Zululand, November, 1918, H. W. Bell Marley).....*speciosa*, Friese
 Hind margins of abdominal segments dark; apical joint of male antennæ enlarged.....*strenua*, Cameron
6. Small slender species, expanse about 14 mm.; base of abdomen very strongly punctured.....7.
 Otherwise.....8.
7. Tegulæ small and black (Umbilo, 4th February, 1917, L. Bevis; Durban, 1st April, 1917, C. N. Barker).....
*serratula*, Smith.

- Tegulae very large (Malvern, April, 1916, C. N. Barker ; Umbilo, 7th February, 1917, L. Bevis.....*bevisiana*, Ckll.
8. Tegulae greatly enlarged ; small species.....9.
Tegulae not enlarged.....10.
9. More robust ; hair of face yellowish ; flagellum dark, dusky reddish beneath (Malvern, April, 1916, C. N. Barker).
.....*megalapis*, Ckll.
Less robust ; hair of face white ; apical half of flagellum red beneath.....*durbanensis*, sp. nov.
10. Legs clear red except at base, males.....*claripes*, sp. nov.
Legs at least mainly dark.....11.
11. Males12.
Females.....13.
12. Hind femora with three large teeth beneath (Winklespruit, 20th December, 1918, C. N. Barker.....*tridentata natalensis*, Ckll.
Hind femora high-conical ; hind tibiae with an enormous flattened lobe ; flagellum bright-ferruginous beneath (Durban, 10th February, 1917, C. N. Barker).....*vulpina umbiloensis*, Ckll.
Hind legs simple ; head broad ; antennae short as in a ♀. (Winklespruit, 3rd January, 1919, 24th December, 1918, C. N. Barker).....*platycephala*, Ckll.
13. End of abdomen with conspicuous orange-fulvous hair (Durban, 16th March, 1918, 8th December, 1918, C. N. Barker ; Bluff, Durban, 20th March, 1917, C. N. Barker ; Winklespruit, 10th January, 1919, C. N. Barker ; Eshowe, December, 1916, Marley).....*pyrura*, Ckll.
End of abdomen without such hair.....14.
14. Tegulae piceous ; smaller species.....15.
Tegulae ferruginous ; larger species16.
15. Second abdominal segment shining ; scutellum with hair partly fuscous, not red.....*platycephala*, Ckll.
Second abdominal segment dull ; scutellum with red hair.
.....*murinella*, sp. nov.
16. First abdominal segment shining.....*nitidibasis*, sp. nov.
First abdominal segment dull.....*tridentata natalensis*, Ckll.

ANTHIDIINAE.

The classification of the Anthidiine bees is a matter of some difficulty, owing to the uncertainty whether the presence of certain characters always indicates real affinity, or may be due to quite independent evolution. Friese, when describing the sub-genus *Pachyanthidium* (1905), included ten species, of diverse appearance. The first of them, *A bicolor* Lepeletier, may be designated as the type. It is a thick set bee, with black thorax and entirely red abdomen; the second recurrent nervure goes beyond the end of the second submarginal cell, and the feet are without pulvilli. The scutellum has a sharp projecting edge, without any emargination. *Hypanthidium*, Ckll (1904), was based on South American species with the appearance and venation of *Dianthidium*, but without pulvilli. It is widely distributed in the Neotropical region, and I have described one (*H. salemanse*) from India. Some of the South African species appear to fall in *Hypanthidium*, but may not be genetically connected with the Neotropical ones. They are perhaps more related to *Pachyanthidium*, though very unlike the type of that group. *Dianthidium* has a pulvillus on each foot, in the manner of the Osmiines, and constructs its nest with resin. It is an ancient type, well differentiated in the Miocene rocks of Colorado, and no doubt *Hypanthidium* and *Pachyanthidium* may be considered derivatives from it. All the Anthidiines discussed below have the second recurrent nervure going beyond the end of the second submarginal cell.

DIANTHIDIUM, Cockerell.

DIANTHIDIUM MELANOCEPHALUM, sp. nov.

♀. Length about 6.6 mm.; black, with no yellow markings except on the abdomen, where they consist of a spot on each extreme side of first and second segments, a pair of very small transversely elongated spots subdorsally on third, two large transverse subdorsal marks on fourth, a broad narrowly interrupted band on fifth, and whole disc of sixth except at sides. Head and thorax densely and coarsely punctured, with very short thin dull white hair; facial quadrangle much broader than long; mandibles and antennae black; tegulae large, black, well punctured; wings strongly dusky; scutellum projecting, sharp-edged, shallowly emarginate; ventral

scopa white, tinged with pale fulvous in middle; hind basitarsi short and broad: pulvilli present.

Three from Bluff, Durban, 13th and 28th January, 1917 (C. N. Barker).

DIANTHIDIUM SPILOTUM, sp. nov.

♂. (Type). Length about 7 mm.; black, robust, head and thorax with white hair, on vertex and dorsum of thorax thin and tinged with ochreous; mandibles cream-colour with the bidentate apex black; the cream-coloured face-markings including clypeus, except upper margin (the upper edge of the light area trilobed), a round spot beneath each antenna, and large cuneiform lateral marks; antennæ black; head and thorax very densely punctured; scutellum projecting, shallowly emarginate; tegulæ large, copper-red, closely punctured; wings dusky, thorax all black except two short obscure lines on hind margin of scutellum; femora black with red knees, the anterior and middle femora mainly red in front; anterior and middle tibiæ red in front on inner side, and at apex, hind tibiæ mainly black; basitarsi mainly yellowish, the small joints reddish, anterior and middle tarsi with a dense fringe of white hair behind; abdomen closely punctured, with a large cream-coloured spot on each side of first two segments, third on each side with a lateral dot and sub-lateral dash, fourth with lateral dots and a pair of very large transverse marks on disc, fifth with a broad band (emarginate in middle, and not reaching sides of segment), sixth nearly all pale, but seventh brown; sixth segment without lateral teeth; seventh broad, tridentate, the middle tooth small.

♀. Similar, but face all black except lateral marks, which are subquadrate below, with a linear extension along orbits more than half-way up front; mandibles black, with a small basal pale yellow spot; lines on edge of scutellum as in male; hind legs ornamented, the tibia on outer side with a very large oval black area, bounded at each end by cream-colour, the whole on a red ground; hind basitarsi with a large cream-coloured area with a dark edge; light abdominal marks smaller, third segment with only a pair of dots; ventral scopa pale fulvous, white at sides. Pulvilli present.

Both sexes from Karkloof, January, 1918 (E. E. Platt). The female is easily known from that sex of *D. zebra* (Friese) by the black clypeus, lack of yellow marks at sides of mesothorax and on axillæ, etc.

HYPANTHIDIUM, Cockerell.

Species without pulvilli on feet.

HYPANTHIDIUM CORDATUM (Smith).

Male from Winklespruit, 21st December, 1918 (C. N. Barker); female from same locality and collector, but 23rd December, 1918 I have compared the male with one from F. Smith's collection.

HYPANTHIDIUM COMPACTUM (Smith).

Eshowe, December, 1916 (H. W. Bell Marley). ♀.

HYPANTHIDIUM ANGUSTIFRONS, sp. nov.

♂. Length about 6 mm.; black, with bright chrome yellow markings, which include mandibles (except the tridentate apex) all of clypeus, broad lateral face-marks ending abruptly just below level of antennæ, band on occiput, large spot on tubercles, comma-shaped spot on tegulæ, entire axillæ, very broad posterior corners of the projecting scutellum (narrowing toward the middle where briefly interrupted), greater part of legs (including entire outer surface of tibiæ), and broad bands on abdomen (lacking middle third on first two segments, broadly interrupted on third, narrowly on fourth, with linear interruption on fifth, sixth all yellow except lateral bases, and seventh yellow); scape with nearly apical half yellowish-red on outer side; flagellum dark reddish beneath; tegulæ piceous except the yellow mark; wings dusky; scutellum projecting and sharp-edged, with rectangular corners; seventh abdominal segment truncate and simple, but two little dentiform projections from beneath its margin.

Malvern, Natal, March, 1916 (C. N. Barker). Resembles *H. truncatiforme* (*Dianthidium truncatiforme*, Ckll), which also lacks pulvilli.

The following key separates the above Anthidiine bees:

- | | | |
|--|-------------------------------------|----|
| Tegument of face entirely black, but abdomen with yellow markings..... | <i>D. melanocephalum</i> , sp. nov. | ♀. |
| Tegument of face partly light..... | | 1. |
| 1. Clypeus entirely black..... | <i>D. spilotum</i> , sp. nov. | ♀. |
| Clypeus largely or wholly pale..... | | 2. |

2. Tibiæ mainly black on outer side; where not black, dull ferruginous.....*D. spilotum*, sp. nov. ♂.
Tibiæ yellow on outer side.....3.
3. Clypeus broader than high.....*H. cordatum* (Sm.) ♂, ♀.
Clypeus higher than broad.....4.
4. Larger; scutellum entirely black...*H. compactum* (Sm.) ♀.
Smaller; scutellum with much yellow.....
.....*H. angustifrons*, sp. nov. ♂.

When treating of *Hypanthidium*, the following specimens were overlooked:

H. compactum (Sm.) Males from Durban, 22nd September, 1918 (C. N. Barker), and Umbilo, 25th March, 1917 (L. Bevis). The male runs to the same place in the table as the female.

H. angustifrons, Ckll. Male from Umbilo, 14th February, 1917 (L. Bevis). The thoracic and abdominal markings are reddened by cyanide. The front legs are extended, showing well the extremely long fringe of white hair on anterior tarsi posteriorly.

STRANDIELLA, Friese.

STRANDIELLA PALLIDIPENNIS, sp. nov.

♂. (Type). Length about 8 mm.; slender, black, mesothorax and abdomen polished and shining; head thick, a little broader than long; mandibles black, dark red at apex; face and cheeks with long white hair; antennæ rather short and thick, flagellum bright ferruginous beneath; front dull and densely punctured; thorax with white hair; mesothorax smooth, with sparse weak punctures; metathorax hairy, the basal area large and dull; tegulæ reddish testaceous; wings hyaline, with a diffused brown cloud beyond the third discoidal cell; stigma and nervures ferruginous; femora black with pale knees; anterior tibiæ in front yellow suffused with reddish; middle and posterior tibiæ with yellow basal mark and apex; all the tarsi yellow, the small joints suffused with reddish; abdomen slender, without evident punctures and without hair-bands, but hind margins of first two segments rather broadly ferruginous, of the others very narrowly more or less pallid.

♀. Length about 8.5 mm.; similar to the male but more robust; second joint of maxillary palpi fully as long as next two together, the last four joints reddened and subequal; anterior knees and tibiæ

in front rather dull reddish; tarsi reddish-brown; hind femora and tibiae with a large yellowish-white scopa; only first abdominal segment with a red margin.

Two females and a male from Bulwer (W. J. Haygarth).

The following key separates the described species of *Strandiella*, all of which are South African:

- Black, with at most a red margin to one or more of the abdominal segments.....1.
- Abdomen with at least some segments mainly red.....5.
1. Flagellum clear ferruginous beneath except at base; male antennæ short for that sex; length of insect less than 9 mm.2.
- Flagellum dark, sometimes brown beneath apically; insect often longer than 9 mm.....3.
2. Wings dark fuliginous (Willowmore, Cape Colony).....*ruficornis*, Ckll.
- Wings pale.....*pallidipennis*, sp. nov.
3. 10 mm. long, with brown wings; scopa of legs yellowish-brown, blackish-brown above.....*fuscipennis*, Friese.
- Wings hyaline or somewhat dusky.....4.
4. 9-10 mm. long.....*longula*, Friese (Type of genus).
- 8 mm. long, with more shining abdomen; antennæ of male relatively long, reaching scutellum.....*glaberrima*, Friese.
5. 9 mm. long: first two abdominal segments clear red.....*sphæcodoides*, Friese.
- 11.5 mm. long; first four abdominal segments red.....*rufiventris*, Friese. ♀.
- 11 mm. long; differs from *rufiventris* by the broader, blacker bands on abdominal segments 2 to 4.....*rufescens* Friese. ♂.

TETRALONIA, Spinola.

The species sent may be separated thus:

- Males.....1.
- Females.....3.
1. Clypeus yellow; antennæ long: hind femora with a tooth beneath.....*junodi*, Friese.
- Clypeus black; antennæ shorter.....2.

2. Thorax above with fulvous hair.....*nigropilosa*, Friese.
 Mesothorax with mainly dark brown hair.....
*nigropilosa*, var. *nigrosellata*, var. nov.
3. Hind tibiæ and tarsi with black hair.....*nigropilosa*, Friese.
 Hind tibiæ and tarsi with fulvous hair.....4.
4. Hair of scutellum mainly clear fulvous.....
*fulvomarginata*, sp. nov.
 Hair of scutellum mainly dilute chocolate, not at all
 fulvous.....*brunnescens*, sp. nov.

TETRALONIA JUNODI, Friese.

Males, Umgwavuma, Zululand, March, 1917 (E. W. Baxter).
 The labrum is not all yellow, but black with a large pale spot.

TETRALONIA NIGROPOLISA, Friese.

Males from Winklespruit, January, 1919 (C. N. Barker); female
 from same place and collector, 29th December, 1918.

TETRALONIA NIGROPILOSA, var. NIGROSELLATA, var. nov.

♂. Mesothorax and scutellum with very dark fuscous hair,
 giving the appearance of a black saddle; but anteriorly (widest in
 middle) the mesothorax is fulvous haired, as are the axillar region
 and the suture between mesothorax and scutellum. A very striking
 variety, but evidently not a distinct species.

Pinetown, 17th March, 1910 (C. N. Barker).

TETRALONIA FULVOMARGINATA, sp. nov.

♀. Length about 12 mm.; tegument of the densely punctured
 clypeus all black; tegulæ testaceous; wings brownish-hyaline; disc
 of mesothorax and scutellum with dark fuscous hair, broadly
 surrounded by fulvous; bases of abdominal segments with greyish-
 white tomentum; fringe of fifth segment bright orange-fulvous, paler
 at sides; scopa of hind legs entirely golden. Extremely close to
T. braunsiana Friese, but with shorter flagellum, not red at tip;
 and differently coloured hair on thorax, hind legs and end of
 abdomen. The basal nervure exactly meets the nervulus.

Krantz Kloof, 2nd April, 1917 (H. W. Bell Marley):

TETRALONIA BRUNNESCENS, sp. nov.

♀. Length hardly 11 mm., but very thick set. Similar to *T. fulvomarginata* but smaller, with the following differences: Disc of mesothorax and scutellum with rather light chocolate coloured hair, narrowly surrounded by dull white, the scutellum with little white along posterior margin; face, occiput, cheeks and sides of metathorax with white hair, but a tinge of brown on vertex behind the ocelli; hind margins of abdominal segments strongly rufescent; first segment more closely and finely punctured, and its smooth apical margin narrower; fifth segment with darker red hair.

Malvern, Natal, January, 1916 (C. N. Barker).

THRINCHOSTOMA, Saussure.

- Females.....1.
 Males.....3.
1. First two abdominal segments red, broadly marked with black; first recurrent nervure meeting second transverso-cubital.....2.
 First two abdominal segments black, with the hind margins pallid; first recurrent nervure joining third submarginal cell a short distance from its base.....*millari*, Ckll.
2. Hair on inner side of hind basitarsi pale chocolate; wings reddened, apical field not evidently dusky.....*torridum* (Smith).
 Hair on inner side of hind basitarsi clear fulvous; wings with apical field strongly dusky.....*nomiæformis*, Ckll.
3. Larger; no patch of black hairs in submarginal cells..
*nomiæformis*, Ckll.
 Smaller; a conspicuous patch of black hairs in submarginal cells.....*millari*, Ckll.

T. millari is very distinct, but it is doubtful whether *nomiæformis* can be separated as a species from *torridum*. I have a *torridum* from Smith's collection, and one from Durban (J. H. Bowker), is in the South African Museum collection recently submitted to me. These females differ from males of undoubted *nomiæformis* (Malvern, Natal, April, 1917, C. N. Barker; Eshowe, 1916, H. W. Bell Marley; Durban, 20th May, 1916, E. C. Chubb; and three from Mfongosi, Zululand, W. E. Jones), in the reddish wings without evident dark margin.

A female collected by W. E. Jones at Mfongosi, Zululand (South African Museum), agrees in the character of the wings with *nomiæformis*, and is placed as such in the table above. Yet it is by no means certain that the differences observed may not be ascribed to variation, and Mr. Barker notes on his Malvern male: "*T. nomiæformis*, query = male of *T. torridum*; both common insects in same resorts." It is possible that the male of *torridum*, if it is a valid species, would show structural characters separating it from *nomiæformis*.

NOTHYLÆUS, Bridwell.

This is a genus of African Prosopididæ recently (Proc. Hawaiian Ent. Soc. IV, 1919, p. 126), separated by Bridwell, to contain such species as *Prosopis heraldica*, Smith; *P. bevisi*, Ckll.; and *P. braunsi*, Alfken. The mandibles are simple and acute at apex (bidentate in true *Prosopis*), and there are various other characters. A subgenus *Anylæus*, Bridwell, includes a couple of species with the scutellum and postscutellum modified.

NOTHYLÆUS (ANYLÆUS), DENTIFERELLUS (Strand).

This was described from Delagoa Bay, some 300 miles up the coast, but a couple of males from Natal (Durban, 31st July, 1916, C. N. Barker; Umbilo, 18th February, 1917, L. Bevis), appear to belong here, though the wings are brownish and not pure hyaline, as Strand seems to infer. The scutellum has two yellow spots on elevated areas, and the postscutellum is bidentate. The face is cream-coloured and the supraclypeal mark is large.

PROSOPIS, Fabricius.

PROSOPIS MELANOSOMA, sp. nov.

♀. (Type). Length 5.5-6 mm.; entirely black, except that the flagellum is dusky reddish beneath. Head rather large and thick; face dull; clypeus high, its surface minutely rugose and sparsely punctured; two sharp keels between antennæ; front well punctured; mesothorax dullish, closely and finely punctured; scutellum flattened, somewhat shining, the punctures very distinct; area of metathorax large, well defined, coarsely sculptured, with a transverse median

ridge; pleura very finely punctured; wings dusky hyaline; stigma and nervures dark brown; recurrent nervures joining submarginal cells a short distance from their ends; abdomen dullish, impunctate, first segment with a small fringe of white hair on each side.

♂. Length about 5.5 mm.; slender, with very long antennæ, the flagellum dull ferruginous beneath; clypeus and lateral face-marks pale lemon-yellow, the clypeus narrowly edged with black above, below and at sides, except the lower lateral margins; lateral marks narrow, broadest opposite upper part of clypeus, tapering to a slender point at about level of antennal sockets; anterior tibiæ and basitarsi with a pale yellow line in front; middle and hind tibiæ brown, with the basal half of the basitarsi mainly creamy-white; extreme bases of abdominal segments inclined to be reddish or pallid. Mandibles bidentate.

The type female is from Durban, August, 1916 (C. N. Barker). Another female, received from the South African Museum, is from Knysna, Cape Colony, October, 1916 (L. Péringuey). The males are from Durban, August, 1916 (C. N. Barker). The sexes are associated because of the similar sculpture, and the fact that they were both collected at Durban in August. The black labrum and mandibles of the male and the venation separate the species from *P. longula*, Friese, from Rhodesia.

1 ALLODAPE, Lepeletier.

ALLODAPE MARLEYI, sp. nov.

♂. Length about 8 mm.; robust, head and thorax black with light yellow markings; legs black; abdomen chestnut red, first segment black except posterior margin (the edge of the black concave posteriorly), third segment infuscated, and segments beyond black with dark reddish margins; labrum and mandibles black; clypeus yellow; yellow lateral marks filling space between clypeus and eye nearly to top of clypeus, then suddenly narrowed and continued as a narrow band up orbits to about middle level of front; a narrow yellow stripe behind each eye; tubercles and margin of prothorax black; a small yellow mark on the translucent tegulæ; scutellum with a large crescent-shaped yellow mark, its anterior (concave) margin angulate in middle; antennæ and legs black; wings strongly reddish, with ferruginous stigma and nervures; hind trochanters dentate.

Krantz Kloof, Natal, 1st October, 1916 (H. W. Bell Marley). Close to *A. mediorufa*, Ckll, but the tegulæ are hyaline, the face-marks are different, and the narrow shining groove at each side of clypeus of *mediorufa* is not present. The stigma is redder than in *mediorufa*, and the second submarginal cell is shorter.

ALLODAPE VITTATICEPS, sp. nov.

♀. Length about 8 mm.; similar to *A. marleyi*, but apparently not its female, as the wings are greyer and the second submarginal cell is longer. The first recurrent nervure joins the second submarginal cell at a distance from its base more than equal to half length of first transversocubital, but at a much less distance in *marleyi*. The lateral face marks are entirely band-like, but broader below, and their upper ends (nearly as high as middle ocellus) curve away from the orbits; the clypeus is black with a broad parallel-sided yellow band, which at its extreme upper end emits a hook-like process at each side; scutellum mainly yellow, but the posterior margin broadly black; hind tibiæ on outer side with a patch of brilliant copper-red hair, only descending base of first abdominal segment red, and only fifth and sixth segments black; scape obscurely reddened at base and apex.

Umgwavuma, Zululand, March, 1917 (E. W. Baxter). This may be *A. rufogastra*, Lepeletier, described from "Cafrerie," although Lepeletier describes the abdomen as ferruginous, without mentioning any black. I have a male labelled "Cape," from F. Smith's collection, determined by him as *A. rufogastra*, and it has the abdomen black beyond the fourth segment, and the sides of the fourth black. The clypeus has a yellow band, broadening below; and there is a supraclypeal yellow dot. Unfortunately this does not agree with the male as described by Smith in 1854; it was then stated that the clypeus of the male was entirely yellow, as in *A. marleyi*. The matter is further complicated by the existence of another species of *Allodape* at Algoa Bay, of the same immediate alliance. This insect, collected and given a manuscript name by Dr. H. Brauns, is very close indeed to *vittaticeps*, yet separable. My conclusion is, that we cannot be quite sure of *rufogastra* until comparisons can be made with the type; but *A. marleyi*, *vittaticeps*, the F. Smith supposed *rufogastra* and the Algoa Bay species are distinct from one another, though very closely allied.

ALLODAPE BEVISI, sp. nov.

♀. Length about 4·5 mm.; black, with very scanty white pubescence; face narrow, the orbits converging below; no lateral face-marks; clypeus very broad, cream-colour or pale yellowish, with a black pit on each side, so that the light area recalls a cup (with a long base) standing in a saucer; labrum pale reddish; mandibles ferruginous with black base; antennæ black, scape pale yellow in front; tubercles yellow; scutellum entirely black, dullish; tegulæ hyaline; wings hyaline, very faintly dusky; stigma very large, reddish brown; lower section of basal nervure vertical; first recurrent nervure joining extreme base of second submarginal cell; femora black with the knees red; tibiæ and tarsi bright ferruginous; abdomen broad, hind margins of segments dull brownish-testaceous.

Type from Umbilo, 26th August, 1914 (L. Bevis). Also Umbilo, 1916 (L. Bevis). Close to *A. maurula*, but easily known by the red tibiæ and tarsi.

The following key separates the species of *Allodape* in the last sending. Two species (A and B), which seem to be new, are represented by specimens which lost the abdomen in transit. I place them under the heading of abdomen black, as this was probably the colour. I hope they will be rediscovered, and if confirmed as new, described, by the local collectors. It is much regretted that we do not know what flowers these species of *Allodape* visit. It is probable that they have different habits, and not unlikely that they are oligotropic, that is, confined to particular genera or closely related genera of plants.

- Abdomen mainly red; scutellum largely yellowish (it is all black in *A. pyriferæ*, Ckll); larger species.....1.
 Abdomen black (lost in A and B).....2.
 1. Male; clypeus yellow.....*marleyi*, sp. nov.
 Female; clypeus with a yellow band.....*vittaticeps*, sp. nov.
 2. Clypeus with a white anchor-shaped mark, the arms of the T or anchor with downwardly projecting points (Pinetown, 29th October, 1916, H. W. Bell-Marley).....sp. A.
 Clypeus not thus marked.....3.
 3. Broad robust forms, with linear lateral face marks; males...4.
 Small slender forms; no lateral face-marks.....5.
 4. Clypeus white, marked with an irregular black line down each side (Stella Bush, December, 1916, H. W. Bell Marley).....*stellarum*, Ckll., var.

- Clypeus buffy (probably altered by cyanide), with two dark dots (Durban, 31st July, 1916, C. N. Barker).....
*stellarum*, Ckll., var.
5. Tibiæ red ; scape light in front.....*bevisi*, sp. nov.
 Tibiæ not red.....6.
6. Light face-mark broadest below, eyes strongly converging ;
 male (Isipingo 18th March, 1917, H. W. Bell Marley).....
*maurula*, Ckll.
 Light face-mark broadest above ; females.....7.
7. Enlarged upper part of light face-mark about half as long
 (vertically) as wide (Krantz Kloof, 23rd July, 1916,
 H. W. Bell Marley).....sp. B.
 Enlarged upper part of light face-mark subquadrate, over
 half as long as wide.....8.
8. Hind margins of abdominal segments narrowly brown
 (Doonside, 1st and 13th January, 1917, L. Bevis).....
*maurula*, Ckll., var.
 Abdomen black without evident bands (Umbilo, 18th
 February, 1917, L. Bevis ; Durban, August, 1916, C. N.
 Barker).....*maurula*, Ckll.

HERIADES, Spinola.

The species seen from Natal may be separated thus :

- Males.....1.
 Females.....3.
1. Eyes green ; wings strongly brown ; flagellum very long.
*chlorops*, Ckll.
 Eyes not green ; flagellum not very long.....2.
2. Larger, fully 6 mm. long ; wings clear hyaline.....
*pellucidus*, sp. nov.
 Smaller, wings dusky.....*bevisi*, Ckll.
3. A strong keel down middle of clypeus.. *tricarinatus*, sp. nov.
 No such keel on clypeus.....4.
4. Larger, about 7·3 mm. long ; first recurrent nervure joins
 second far from base.....*marleyi*, Ckll.
 Smaller, about 6·3 mm. long.....5.

5. A spine at each side of metathorax ; punctures of mesothorax fine.....*punctulata*, Ckll.
 No such spines on metathorax ; punctures of mesothorax coarse.....*chubbi*, Ckll.

A female from Smithfield, O.R.C. (Kannemeyer), received from Dr. L. Péringuey, and determined by Friese as *H. argentatus*, Gerst., runs in the above table to *chubbi* ; but is larger, with the wings not nearly so brown, and the eyes green (brown in *chubbi*).

HERIADES CHUBBI, Cockerell.

Females. Pinetown, 11th December, 1916 (H. W. Bell Marley).

HERIADES BEVISI, Cockerell.

Males. Durban, 31st July, 1916 (C. N. Barker).

HERIADES TRICARINATUS, sp. nov.

♀. Length 7.5–8 mm. ; black, with the usual whitish hair, forming very slender bands on abdomen ; ventral scopa silvery-white ; wings conspicuously dusky ; clypeus with a very prominent keel, which extends its whole length, and also up the supraclypeal area, which is tricarinate, having a keel on each side ; sides of face densely covered with pure white hair ; maxillary palpi three-jointed ; basal declivity of first abdominal segment bounded by a strong rim. Very close to *H. clypeatus*, Friese, from the Transvaal, but larger, with dusky wings. Also very close to *H. ekuvensis*, Ckll., from Benguela, but easily separated as follows :

Punctures of scutellum about one-fourth larger than on mesothorax, but similar ; surface of mesothorax granular between the punctures, not polished, the intervals not over one-third diameter of puncture.....*tricarinatus*.

Punctures of mesothorax, except anteriorly, smaller, the intervals over half diameter of a puncture ; scutellum cancellate with immense punctures.....*ekuvensis*.

H. tricarinatus is represented by three females from Durban, 24th December, 1916 (C. N. Barker).

HERIADES PELLUCIDUS, sp. nov.

♂. Length 6.5–7 mm.; black, of the usual form; with pure white hair, forming slender bands on abdominal segments; head thick and quadrate; eyes black; facial quadrangle much longer than broad; antennæ black; face and lower part of front with much long white hair; front with very dense large punctures; vertex with scattered punctures on a polished surface; mesothorax and scutellum shining, with very large not very dense punctures; tegulæ piceous, punctured; wings clear hyaline, stigma and nervures black; recurrent nervures joining second submarginal cell close to base and apex respectively; legs with abundant white hair; abdomen shining, strongly and evenly but not very densely punctured; basin of first segment bounded by a sharp rim; hind coxæ with a short apical tooth.

Three specimens were collected at Bellair, Natal, 31st December, 1918 (E. C. Chubb). They were obtained from a hole in a wooden post. One, which has unfortunately lost its head, is smaller than the other two. Compared with *H. bevisi*, the vertex is much more sparsely punctured, on a polished surface.

HALICTUS, SUBGENUS PATELLAPIS, Friese.

Friese, in 1909, proposed a subgenus *Patellapis* for a group of *Halictus*, resembling in a general way the European *calceatus*, *albipes*, etc., but noteworthy for the large rounded apical plate on abdomen of the male (seventh segment). This is not in itself a very peculiar character; it may be found in other *Halicti*, and is especially conspicuous in a group of Australian species (*H. cambagei*, Ckll., and allies). Friese described three species of *Patellapis*, all from Steinkopf in Namaqualand. In all, the clypeus of the male has the tegument entirely black, wherein they differ at once from the European *calceatus* and *albipes*. Strand, in 1911, added a species *H. cœruleodorsatus*, from Ruwenzori; it differs from the others especially in having the abdomen above, except the first segment, more or less distinctly bluish. The type of *Patellapis* is herewith designated as *P. schultzei*, Friese, the first species described. I possess a male from the original lot. In the collection from Natal I find three species which clearly fall in *Patellapis* according to the diagnosis; but they also differ from true *Halictus* in the long and very slender tongue, in the manner of the genus *Nesohalictus*, Crawford, from the Malay Archipelago. *Nesohalictus* also has the rounded apical plate, but the hind spur of the male is dentate, which is not true of the Natal males. *Patellapis*

schultzei seems not to have a specially lengthened tongue, and neither it nor *Nesohalictus* have sub-apical ventral spines on the abdomen, such as I find in the Natal males. By reason of the long slender tongue, these insects also approach *Thrinchostoma*, and there are other African *Halicti* (*H. patricius*, Strand; *H. flavofasciatus*, Friese) which more or less resemble that genus.

I should be inclined to regard the three Natal species as constituting a distinct genus, very close to *Nesohalictus*, or even as members of that genus; but *Patellapis* connects them with *Halictus*, and on the basis of its leading character, should include them. I therefore describe them under *Halictus*, leaving a more precise classification to the future, when more material shall have accumulated. They are *H. harveyi*, *H. trimeni* and *H. bowkeri*.

HALICTUS HARVEYI, sp. nov.

♂. Length about 7 mm.; black, robust for a male, with very scanty dull white hair, partly dark fuscous on mesothorax and scutellum; malar space linear; clypeus prominent, with shallow punctures running more or less in grooves; tongue long, apically linear; front dull, but vertex shining; antennæ rather long and thick, the flagellum moniliform, its apical part very obscurely brownish beneath; mesothorax and scutellum dull, with fine punctures; area of metathorax sharply defined, finely wrinkled; at each side of the basal area posteriorly is a shining space regularly crossed by plicæ; posterior truncation sharply defined at sides; tegulæ chestnut-red, black at base; wings dusky hyaline, nervures and stigma piceous; first recurrent nervure meeting second transversocubital; legs black, with the knees, the anterior tibiæ in front, all the tibiæ at apex, and all the tarsi, bright chestnut-red; hind spurs not dentate; abdomen broad, shining, with excessively minute but very numerous punctures; no distinct hair-bands; a broad rounded apical plate, and short lateral sub-apical ventral teeth.

Durban, 9th May, 1918 (C. N. Barker). Two specimens. A number of years ago I named a series of Australian *Halicti* after early explorers and noted scientific men of that country. I will follow a similar method in providing names for the S. African species.

HALICTUS TRIMENI, sp. nov.

♂ (Type). Length 8-8.3 mm.; black, robust, with rather short thick antennæ, the flagellum faintly brown beneath; tongue about or nearly as long as head, its apical half linear; mandibles dark

reddish apically; malar space short but distinct; clypeus strongly produced, snout-like, the upper part dull, with scattered punctures, the lower part more shining and irregularly malleate, with a strong median sulcus, the lower margin with a shining transverse groove; front dull, glistening at sides; ocelli in a curved line; head and thorax with dull white hair, not dense on face (abundant and dense in *H. schultzei*), no dark hair on thoracic dorsum; mesothorax dull, closely and finely punctured; scutellum dull, faintly bigibbous; area of metathorax well defined, shining and with very strong plicæ; posterior truncation sharply defined at sides; tegulæ piceous; wings brownish-hyaline, stigma and nervures brown; first recurrent nervure joining second transversocubital, or the apical corner of second submarginal cell; marginal cell obtuse, almost truncate, at apex, with a little appendicular projection; legs black, with pale hair, the small joints of the tarsi chestnut-red; abdomen broad, the hind margins of the segments broadly depressed; surface shining, with extremely minute punctures; no hair-bands, but a patch of pale hair at each side of base of second and third segments; apical plate large and rounded; sub-apical ventral spines, and a large median elevation on sixth ventral segment.

♀. Similar, but more robust; bases of abdominal segments 2 to 4 with bands of pale greyish tomentum, that on 2 broad at sides but interrupted in middle, on 3 very broad and of uniform width, on 4 often concealed; flagellum short and entirely black; discs of mesothorax and scutellum with a good deal of black hair; hind tibiæ with black hair on outer side; hind basitarsi with pale ferruginous hair on inner side; hind spur long, with nodular teeth, a large one sub-basally, and three very little ones beyond; caudal rima fringed with pure black hair.

Durban, 26th May, 1918, two of each sex (C. N. Barker). A small female (anterior wing 6 mm.) from Pinetown, 26th November, 1916 (H. W. Bell Marley), looks distinct, but has no distinctive characters except its size. It may stand as variety *a*.

HALICTUS BOWKERI, sp. nov.

♂ (Type). Length 8.5-9 mm.; black, robust, looking like a female, with short (not at all moniliform) antennæ, the flagellum obscurely reddish-brown beneath; head and thorax with long thin greyish-white hair, not at all dense on face; head very large, somewhat broader than long, face very broad; malar space linear;

mandibles very long, falciform, chestnut-red in middle; clypeus with a sericeous surface, and only minute indistinct punctures, the apical middle depressed; front somewhat glistening; mesothorax dullish, hairy, with scattered minute punctures: posterior part of mesothorax and scutellum more shining, but not polished; area of metathorax with strong but irregular and often broken plicæ; posterior truncation sharply defined at sides; tegulæ rufopiceous; wings hyaline, faintly dusky, stigma and nervures dilute brownish, the stigma quite pale; marginal cell ending as in *H. trimeni*; first recurrent nervure meeting second transversocubital; legs black, with small joints of tarsi chestnut-red; abdomen very broad, shining, with excessively minute punctures, hind margins of segments rufescent; no hair-bands, but thin pale hair at sides of segments; apical plate rounded, only moderately large; large sub-apical ventral spines.

♀. Similar, but head and mandibles ordinary, not enlarged; bases of abdominal segments with bands of greyish tomentum, as in *H. trimeni*. Readily known from *H. trimeni* by the entirely pale hair of mesothorax and scutellum; the surface of the scutellum is dull. The hind spur is of the same type as that of *trimeni*, but the enlarged basal tooth is narrow and distinctly spiniform. The stigma is amber colour.

Winklespruit, Natal, both sexes, 29th December, 1918, a female 2nd January, 1919 (C. N. Barker).

The following species belong to other groups of *Halictus*.

HALICTUS FARQUHARI, sp. nov.

♂ (Type). Length about 9 mm.; black, rather slender, with rather abundant erect greyish pubescence; legs dark reddish-brown, anterior knees and tibiæ in front redder; head oblong, longer than broad, facial quadrangle very much longer than broad; mandibles red sub-apically; clypeus entirely black, projecting, polished, with large punctures; head considerably produced above the eyes; flagellum long and slender, bright ferruginous beneath; front dull and granular; mesothorax and scutellum shining, with distinct fairly large punctures; metathorax very hairy except the basal area, which is covered with fine vermiform wrinkles; posterior truncation not sharply defined at sides; tegulæ rufous; wings hyaline, faintly dusky at apex; stigma and nervures dull ferruginous; first recurrent nervure joining apical corner of second submarginal cell; abdomen without distinct punctures, dullish, more shining toward apex; bases of first three

segments broadly clothed with grey hair, third with a hair-band in sub-apical depression, fourth and fifth with sub-apical bands; no sub-apical ventral spines.

♀. Similar, but more robust, with the mesothorax dullish, the head broader, mandibles dark, the short flagellum red only apically beneath. The tarsi are reddish, and the hind spur has five strong spines. The second and third abdominal segments have dense white basal bands. Superficially, this is very like *H. bowkeri*, but is easily separated by the disc of scutellum shining (dull in *bowkeri*). *H. diversus*, also from Natal, has the hind spur with three teeth. Male *diversus* has a yellow apical band on clypeus.

Type (male) from Durban, 8th October, 1916 (H. W. Bell Marley). Females; Umbilo, 14th February, 1917 (L. Bevis), Krantz Kloof, 23rd July, 1916 (H. W. Bell Marley). This is a true *Halictus*, but resembles the *Patellapis*-like series in having the male clypeus black without a yellow band.

HALICTUS LAYARDI, sp. nov.

♂ (Type). Length nearly 7 mm.; rather slender, black, with pale ochreous pubescence, long and white on cheeks, anterior trochanters, and lower part of mesopleura; all the tarsi, and anterior tibiæ in front, clear ferruginous; apical band on clypeus, labrum and stripe on mandibles pale yellow or whitish; tubercles black; head broad, eyes strongly converging below; black part of clypeus shining and finely punctured; antennæ very long, joints 3 to 10 red or partly red beneath; fourth joint at least twice as long as third, fifth equal to fourth; front entirely dull; mesothorax dull, appearing granular from very fine punctures, a couple of thin oblique patches of pubescence anteriorly (the same in female); scutellum bigibbous, the bosses more or less shining; area of metathorax polished and shining, with well-separated plicæ, at sides and posteriorly becoming oblique; sides of metathorax with oblique striæ; posterior truncation ill-defined; tegulæ rufous with black base; wings hyaline, slightly dusky, nervures and stigma rather dark rufous; first recurrent nervure meeting second transversocubital; third submarginal cell short, no longer than high; abdomen shining, without distinct punctures, bases of segments 2 and 3 with continuous bands of greyish tomentum; a fairly large rounded apical plate, but no sub-apical ventral spines.

♀. Size and appearance of the male, but with the usual short antennæ, the flagellum rufous beneath or (var. *a*) black, faintly rufous

apically. Mesothorax distinctly margined with pale ochreous hair, and post-scutellum densely covered with the same. Plicæ at base of metathorax short and feeble, and the smooth surface beyond not so polished as in male. Fourth abdominal segment with much pale hair. Hind spur with a few long spines.

Type (male) from Winklespruit, Natal, 4th January, 1919, three specimens (C. N. Barker). Females from Umbilo, 10th February, 1917 (L. Bevis), and Durban, 7th & 31st July, 1916, and 4th December, 1918 (C. N. Barker).

Although there is a marked difference in the base of metathorax, I think the sexes are correctly associated, as the venation exactly agrees (and differs from other possible candidates for association), and the hair on thorax and characters generally are alike. The var. *a* is from Durban. The female is distinguished from other Natal species by the small size, dark legs and dull mesothorax; the male by the red tarsi and ochreous hair of thorax, combined with a pale-banded clypeus.

HALICTUS BURNUPI, sp. nov.

♀. Length 5.5 mm.; not very robust; head, mesothorax and scutellum very dark olive green; metathorax dull black; legs black, with pale hair; abdomen shining dark brown, without hair-bands, the concealed bases of the segments pallid. Mandibles reddish subapically; clypeus somewhat shining but not polished, the punctures indistinct; front somewhat shining; antennæ black; thorax small, with thin white hair; area of metathorax appearing broadly semilunar, entirely dull and rough, but not plicate; tegulæ small, rufopiceous; wings dusky-hyaline, stigma and nervures brown; first recurrent nervure joining second submarginal cell some distance before its end; outer transversocubital and recurrent weak but distinct; hair of abdomen thin and sparse. Microscopical characters: punctures of clypeus very sparse, on a minutely wrinkled or tessellate surface; front densely minutely wrinkled, with minute shallow punctures; mesothorax and scutellum minutely tessellate, with sparse very minute punctures; area of metathorax with no sharp rim, its surface extremely minutely cancellate, and with weak irregular plicæ (not noticed under a lens); posterior truncation not sharply defined; tegulæ impunctate; hind spur with two very large obtuse spines.

Durban, 24th October, 1918 (C. N. Barker). Known among the Natal species by the small size, green mesothorax; venation and hind spur as described. It is referable to the subgenus *Chloralictus*.

HALICTUS MOFFATI, sp. nov.

♀. Length about 7 mm.; anterior wing 5.5 mm.; very robust, with broad abdomen, but head ordinary; black, including antennæ, legs and tegulæ; head and thorax with thin white hair, bases of abdominal segments with bands of white tomentum, conspicuous on second; facial quadrangle longer than broad; sides of face densely covered with greyish-white hair; mandibles with a conspicuous spot of chestnut-red in middle; clypeus shining, distinctly punctured, the upper part with a longitudinal ridge or keel, the lower with a broad flattened area; front dull, vertex shining; mesothorax dull, somewhat shining laterally, with sparse very distinct punctures; scutellum shining: truncation of metathorax large and sharply defined all round, sloping so as to greatly reduce the basal dorsal area, the basal area a mere transverse band crossed by plicæ; tegulæ with large punctures; wings dusky, nervures and stigma dark fuscous, the latter reddened in middle; marginal cell truncate at end; second submarginal narrow, much higher than long, receiving the first recurrent nervure at its apical corner; third submarginal about twice as broad as second; outer recurrent and transversocubital weakened but distinct; hind tibia with much silver-white hair; hind spur with a long obtuse spine, followed by three rounded teeth, the first large (a section of a circle), the second smaller, the third scarcely visible; abdomen moderately shining, very finely punctured; caudal rima fringed with pale, slightly yellowish hair.

Doonside, 17th January, 1917 (A. L. Bevis). A singular species, recognisable among the Natal forms by the black tegulæ, white band at base of second abdominal segment, distinctly punctured mesothorax and especially the peculiar metathorax. Two specimens were obtained.

HALICTUS PHILIPPI, sp. nov.

♀. Length about 7.2 mm., anterior wing 6.1 mm.; black, with the hind margins of abdominal segments suffusedly reddish-brown; head and thorax with much pale grey hair, short on mesothorax, on scutellum long and more or less fuscous; head broad; mandibles rufescent in middle; clypeus shining, with irregular sparse punctures; front dull, shining just below ocelli; antennæ black, the flagellum bright rufous beneath apically; mesothorax dullish, with minute punctures, median groove very deep and distinct; scutellum shining on disc; post-scutellum large, with dense moss-like tomentum; area of metathorax rather poorly defined, glistening, with many fine

irregular plicæ; posterior truncation not sharply defined; tegulæ piceous with a rufescent spot; wings hyaline, faintly dusky, stigma and nervures dusky reddish-brown, the outer recurrent and transverso-cubital pale and weak, but readily visible; second submarginal cell large, nearly square, receiving the first recurrent nervure at its apical corner; third submarginal short, not very much larger than second; legs dark reddish-brown, with the hind tibiæ on inner side, and tarsi in large part, ferruginous, the hind basitarsi red with a dusky cloud on apical half; tarsi on inner side with very brilliant orange-ferruginous hair, a line of copper-red hair on inner side of middle tibiæ, and one of paler hair on middle femora basally beneath; hind spur pectinate with about six dark teeth; abdomen shining, impunctate, microscopically transversely lineolate-reticulate; bases of segments with bands of greyish-white tomentum, dense and even on second segment, less distinct on the others.

Umbilo, 18th February, 1917 (L. Bevis). A rather ordinary species, known among the Natal forms by the partly red legs, dusky reddish-brown stigma, mainly dark flagellum, etc. It is not so large as *H. diversus*, Smith, and the hind spur is different.

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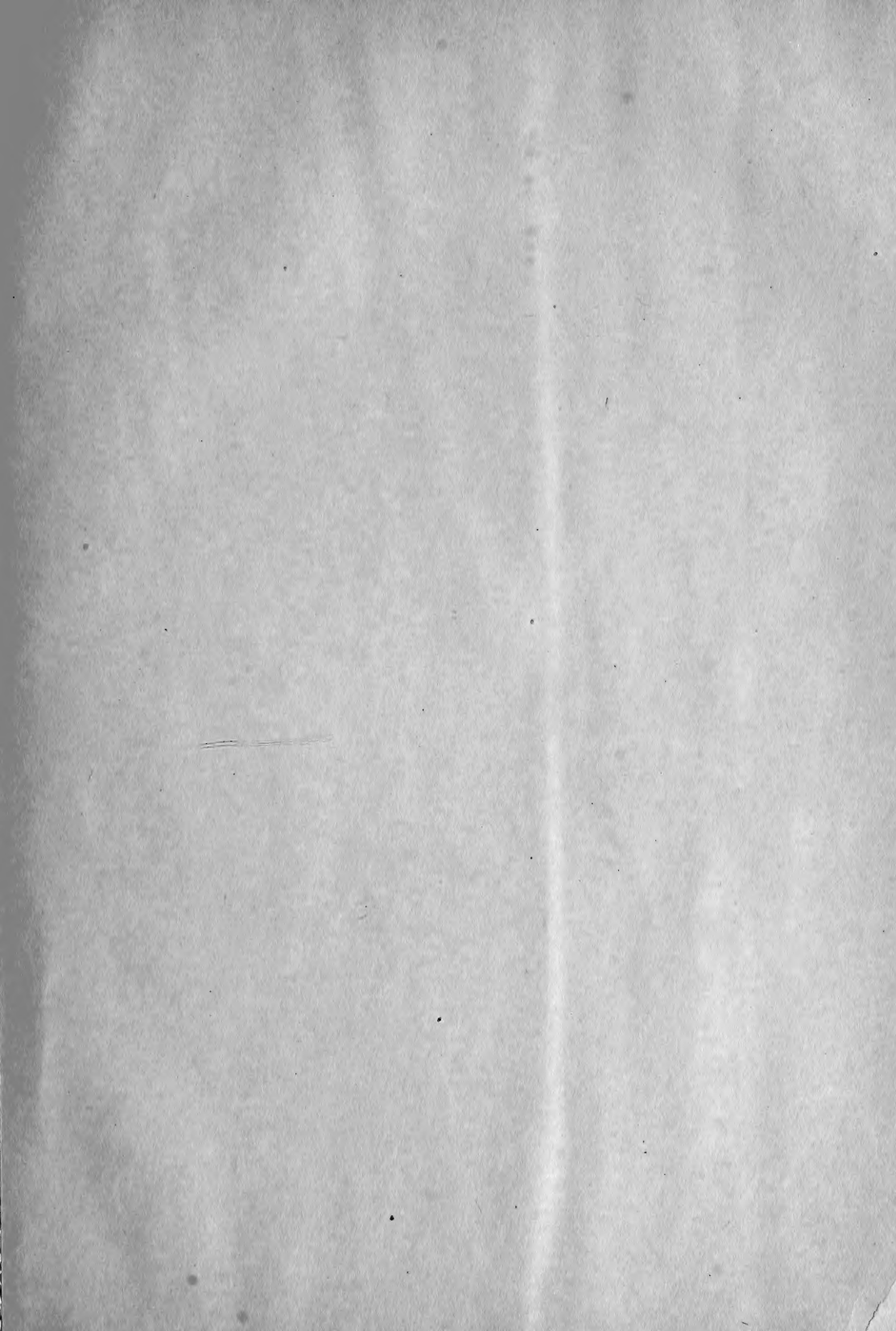
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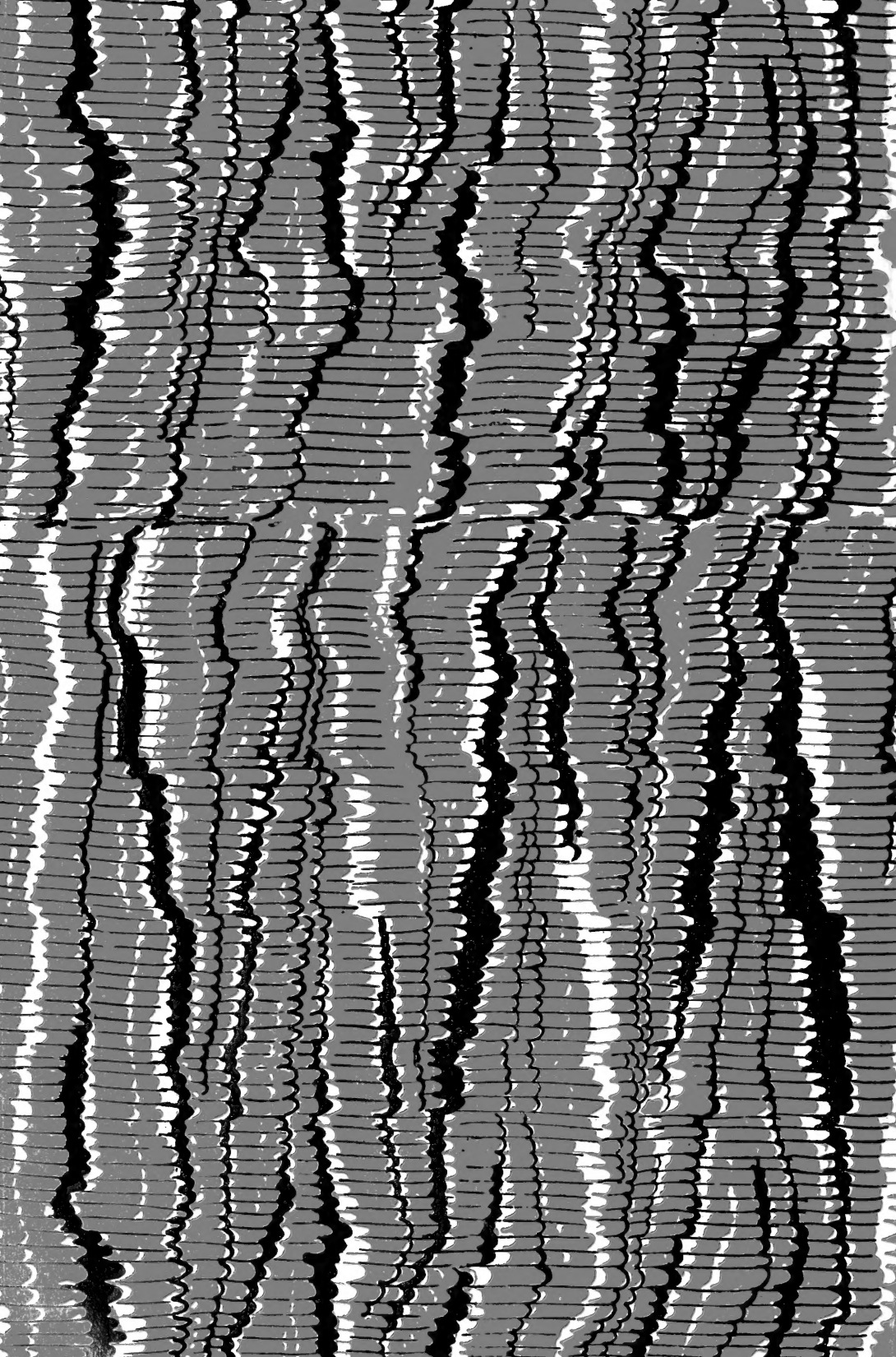
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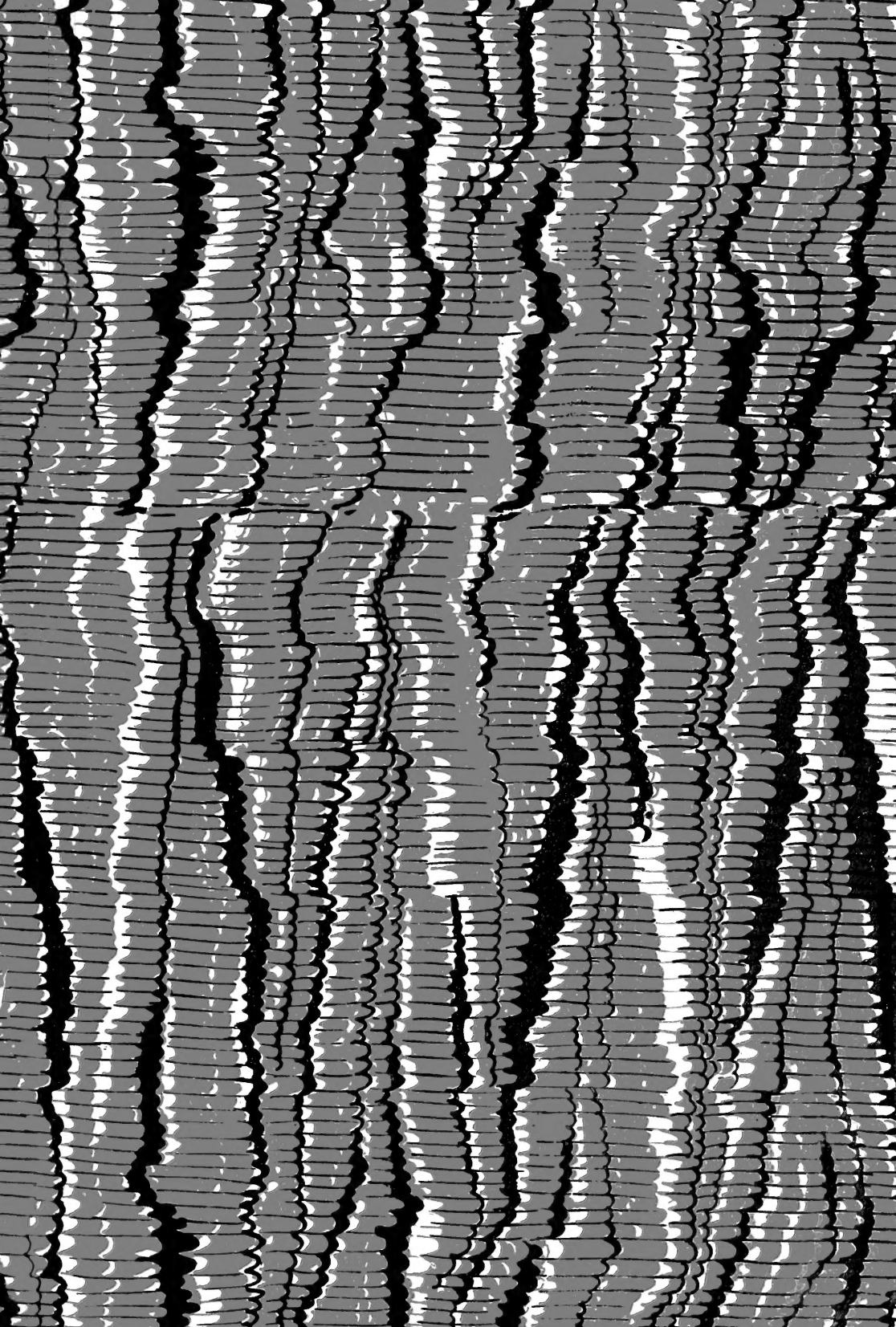
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