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IN

SOUTH AFRICA.

SOUTH AFRICAN CRUSTACEA.

BY THE

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When about two years ago I received from Dr. Gilchrist the first of the Crustacea which he has been sending me from South African waters, the hope entered my mind that in course of time I might be able to produce a systematic review of the whole carcinological fauna of the region over which the Government of Cape Colony is extending its scientific investigations. It has now, however, become clear to me that such a plan would not only involve very serious delay before any results could be published, but would also have little chance of securing that completeness and finality for the sake of which the delay might be justified. On the very eve of publication an inconsiderate trawl might bring up from the vasty deep a miscellaneous assortment of the unknown and the unexpected, and the symmetry of the main treatise would have to be destroyed by an appendix of odds and ends more interesting and more important perhaps than anything contained in the methodical catalogue. Forsaking, therefore, more ambitious projects, I offer the present report as an instalment in which the student may possibly find some points worthy of his notice. Should other instalments follow, the inconvenience arising from a somewhat desultory mode of publication may in the end be remedied wholly or to a great extent by a satisfactory index. In the higher groups of the Malacostraca the recent systematic labours of Dr. Ortmann and Major Alcock may be said to hold the field. Accepting their decisions as to large sections, I here confine my own comments chiefly to genera and species.

BRACHYURA.

CYCLOMETOPA.

FAM. : XANTHIDAE.

GEN. : PILUMNUS, Leach, 1815.

Dr. Ortmann, in his "Decapoden und Schizopoden der Plankton-Expedition," p. 55, 1893, and in his Decapoden-Krebse des Strassburger Museums, pt. 7, Zool. Jahrb., v. 7, p. 433, 1894, has transferred this genus to a sub-family *Pilumninae* of a new family *Menippidae*, which he includes in the Xanthini, his third sub-group of the Cyclometopa. Major Alcock, in his "Materials for a Carcinological Fauna of India," No. 3, p. 69, 1898, divides the Cyclometopa into four families, *Canceridae*, *Xanthidae*, *Portunidae*, *Telphusidae*, and makes the *Pilumninae* the sixth sub-family of the *Xanthidae*. In No. 4 of the same work, in 1899, he adds the *Corystidae* as a fifth family of the Cyclometopa. Miss M. J. Rathbun, in 1900, substitutes '*Pilumnidae* Leach' for '*Xanthidae* Alcock' (American Naturalist, vol. 34, p. 132).

PILUMNUS VERRUCOSIPES, Stimpson.

1858. *Pilumnus verrucosipes*, Stimpson, Prodromus descr. anim. evert. Exp. ad Pacificum Septentrionalem, Proc. Ac. Nat. Sci. Philad., Dec. 1857, p. 34.
 1881. *Pilumnus verrucosipes*, Miers, Ann. Nat. Hist., Ser. 5, v. 8, p. 216, t. 13, f. 5.
 1886. *Pilumnus verrucosipes*, Miers, Challenger Brachyura, Reports, v. 17, p. 146.

This little species has the carapace, except the frontal margin, covered with a close felting of short hairs, from among which arise singly or in groups longer cylindrical or clavate setae. All the limbs are furnished with similar setae and also with warts, of which Stimpson notices that the chelipeds have nine on the fifth joint and five on the sixth. This is true of the specimen from Mossel Bay, and concerning four specimens from Goree Island, Senegambia, Miers remarks that they agree in all respects with Stimpson's diagnosis.

Stimpson's specimen was taken at the Cape in Simon's Bay, on a sandy bottom, in eleven fathoms. The present specimen was taken at Mossel Bay, 10 fathoms, on a large ascidian locally known as "red bait." Dr. Gilchrist remarks that the "muddy-looking carapace and limbs give a (protective?) resemblance to the large ascidian on which it was found."

FAM. : CORYSTIDAE.

GEN. : NAUULOCORYSTES, Milne-Edwards.

1829. *Corystes* (part) Latreille, Le Règne Animal, Cuvier, nouv. éd., v. 4, p. 53.
1833. *Dicera* (not Germar, 1817) de Haan, Siebold's Fauna Japonica, Crustacea, pp. 4, 14 (see also pp. 112, xvi, xxviii, and mouth-organs t. A).
1837. *Nautilocorystes*, Milne-Edwards, Histoire Naturelle des Crustacés, v. 2, p. 149.
1843. *Dicera*, Krauss, Die südafrikanischen Crustaceen, p. 27.
1853. *Dicera*, Dana, U.S. Exploring Expedition, v. 13, p. 298.
1893. *Nautilocorystes*, Stebbing, History of Crustacea, p. 74-75.
1899. *Nautilocorystes*, Alcock, Journ. Asiatic Society of Bengal, v. 68, pt. 2, p. 104.

Like *Corystes* in general form and in the arrangement of the second antennae for forming an antennal tube, but distinguished from it by two salient features, the third maxillipeds having the fourth joint decidedly shorter instead of longer than the third, with the fifth inserted not below but on the apex, and the last trunk-leg having the terminal joint flatly expanded with convex inner margin instead of being narrow with inner margin straight. The five-jointed pleon of the male is rather longer than in *Corystes*, the composite segment not deeply notched. The second and third trunk-legs have the terminal joint compressed as in the fifth pair, but less expanded, only the fourth pair being narrow, with triangular section; in all the apex is acute.

To the above characters de Haan adds that the buccal area is oblong, narrower in front; outer plates of first maxillipeds above the middle incurved, narrow, on the inner margin truncate, ciliated, at the apex acute, peduncles of the palps surpassing the length of the outer plates, the flagella short; peduncles of palps of the second maxillipeds shorter than the maxillae (but in *Corystes* longer).

The importance of the antennal tube in the Corystidae is clearly explained by Mr. Walter Garstang in the Journal of the Marine Biological Association, N.S., v. 4, No. 3, pp. 223-232. The animal deeply burrowing in the sand, with only the tips of its long antennae above it, is no longer in a position to breathe in the ordinary way by allowing the water to enter its branchial chamber beneath the branchiostegite, and after bathing the gills to pass out by the apertures at the side of the mouth. It, therefore, reverses the current, allowing the water to pass down the tube formed by the juxtaposed hairy antennae and after serving the two branchial chambers to make its exit by the usual doors of entrance.

NAUTILOCORYSTES OCTODENTATUS (de Haan).

1833. *Corystes (Dicera) 8-dentata*, de Haan, Fauna Japonica, Crust., Decas 1, p. 15.
 1837. *Nautilocorystes ocellatus*, Milne-Edwards, Hist. Nat. Crust., v. 2, p. 149.
 1843. *Dicera 8-dentata*, Krauss, Südafrik. Crust., p. 27.
 1857. *Nautilocorystes ocellatus*, Stimpson, Proc. Ac. Nat. Sci. Philad., Prodromus, p. 23.

The specific name chosen by de Haan evidently refers to the prominent teeth of the antero-lateral margins, the teeth of both sides being added together to form the number eight, a method which is followed also in naming the species *Oeidia 20-spinosa*. In the present instance there is a slight complication, because in the generic account de Haan speaks of the thorax as being "5-spinosus" on the sides. He is then evidently including the small tooth at the outer corner of the orbit, which in the specific name he leaves out of reckoning as an inconspicuous feature. The name given by Milne-Edwards no doubt refers to markings on the carapace, which in the specimen here described are very suggestive of the name *ocellatus*. In spirit they appear as thin reddish brown lines forming irregular ovals or circles, of which the four principal ones are disposed in a broad quadrilateral. The upper pair rather detract from the mask-like appearance of the carapace, being wider apart and rather too high up to suit for eyes or spectacles to the mask.

The carapace is 32 mm. long by 26 mm. in greatest breadth, the front with a rather deep notch in the centre, thence sloping with a faint emargination to the orbits, in which the upper margin has two little unequal notches, the smaller near the outer tooth, while below the pterygostomial region is produced into an escutcheon-like piece, not spinose as in *Corystes*, its apex reaching rather beyond the front of the carapace, giving the appearance of a prolonged orbit, though only the base belongs to the little narrowly-ending eyes, and the mouth is blocked by the hairy basal joints of the second antennae. Of the teeth on the antero-lateral margin the fifth is about as large as the second, both are smaller than the third and fourth, and all four are acute. The upper part of the branchiostegite, the proximal parts of the legs, and a line across the sternum between the second and third pairs of legs are densely hairy. The second antennae are 24 mm. long, or possibly rather longer. The chelipeds are 37 mm. long. The female being apparently as yet unknown, it cannot be said whether these limbs show any sexual distinction parallel to that in *Corystes*. The fourth

joint is shorter than the sixth, hirsute along two edges, the fifth has a prominent tooth, the sixth on the right limb has the thumb shorter than the trunk of the joint, on the left limb scarcely shorter, in both with an acute apex and an irregularly denticulate or tuberculate margin, the teeth or tubercles along the finger more or less fitting the interstices along the thumb. In the four following pairs of limbs the sixth joint is very short and apically narrow; all the joints have hairy fringes, but on the seventh the single fringe is continuous nearly to the apex along the convex margin only in the last pair, in the three preceding pairs being limited to a short proximal space.

OXYRRHYNCHA.

FAM. : MAIIDAE.

1895. *Maiidae*, Alcock, Materials for a Carcinological Fauna of India, No. 1, p. 160.

GEN. : DEHAANIUS, M'Leay.

1834. *Acanthonyx* (part), Milne-Edwards, Hist. Nat. Crust., vol. 1, p. 342.
 1838. *Dehaanius*, M'Leay, in Smith's Illustrations of the Zoology of South Africa, Annulosa by W. S. M'Leay, p. 57.
 1839. *Dehaanius*, de Haan, Siebold's Fauna Japonica, Crust., part 4, p. 83.
 1843. *Acanthonyx*, Krauss, Die Südafrik. Crust., p. 47.
 1852. *Dehaanius*, Dana, U. S. Expl. Exp., vol. 13, part 1, p. 79.
 1879. *Dehaanius*, Miers, J. Linn. Soc. London, vol. 14, p. 650.
 1886. *Dehaanius*, Miers, Challenger Brachyura, Reports, vol. 17, part 49, p. 39.

Carapace sub-quadrate between the antero-lateral lobes and the trilobed hind margin, rostrum bifid, praeocular tooth prominent, postocular small. Pleon, in the male, seven-jointed. Eyes small, mobile. Base of second antennae slightly dilated at the middle, distally narrowed. Third maxillipeds having the third joint narrow at the base, then wide, the tubercular inner margin leading to a rounded apical lobe, the shorter fourth joint similarly produced, but with the truncate apical part forming a squared lobe, partially folded beneath the rounded one, but not reaching its inner edge; to the inner edge of the squared lobe is attached the fifth joint, which is widest distally, while the two following joints are more conical. The exopod has the outer

margin bluntly angled, the inner near the apex produced inward into a tooth. Chelipeds not large in either sex, fingers acute, not leaving an interspace when closed. The four following pairs of trunk-legs not long, subchelate, the sixth joint having a prominence near the middle, and the finger which is strong and acute curving towards it.

This genus is near to *Acanthonyx* Latreille (1829) in which the pleon is six-jointed, and to *Pugettia* Dana (1851) in which the trunk-legs are not subchelate.

DEHAANIUS DENTATUS (Milne-Edwards).

1834. *Acanthonyx dentatus*, Milne-Edwards, Hist. Nat. Crust., vol. 1, p. 343.
 1838. *Dehaanius acanthopus*, M'Leay, Zool. South Africa, Annulosa, p. 58, pl. 3, f. a, b, c.
 1843. *Acanthonyx dentatus*, Krauss, Die Südafrik. Crust., p. 48.
 1879. *Dehaanius acanthopus*, Miers, J., Linn. Soc. London, vol. 14, p. 650.
 1886. *Dehaanius dentatus*, Miers, Challenger Brachyura, Reports, vol. 17, part 49, p. 39.

The sides of the carapace are produced outward each into two triangular teeth; the anterior is the larger and extends forward; between them there is sometimes a small blunt process. The surface of the carapace is rather flat, but with various small prominences. The horns of the rostrum are subacute, rather wide apart; on their bases there are several hooked spines, serrate on the inner margin, but these instruments for retaining extraneous objects are inconspicuous compared with the club-like tubules which occupy every prominence. In the pleon of the female there are faint indications in the broad composite segment of the fourth, fifth, and sixth segments, its constituents.

The eyes, which are darkly pigmented, have a minute projection of the eye-stalk above the oval cornea.

The longitudinally folded first antennae have numerous plumose setae on the first joint, which is distally narrowed; the third joint is distally widened, one flagellum 10-jointed, very thick at the base, the other slender, 4-jointed. The second antennae have two joints of the peduncle free, cylindrical, the flagellum slender, pellucid, 7-jointed.

The chelipeds have on the fourth joint a line of tubercles and nearly parallel to this a blunt ridge, on the fifth joint two divergent ridges, one of them tuberculate; the thumb and finger are rather shorter than the trunk of the hand and have each from seven to nine teeth on the opposing edges. The

following trunk legs are more or less dorsally carinate, the ridge seeming to be sharpest on the fifth joint. The fingers are spinulose on the concave margin as far as the nail, which is horny-looking and smooth.

Krauss describes and figures *Acanthonyx macleayi* as without a tooth at the outer angle of the ophthalmic orbit and as having the two lateral teeth of the carapace widely distant, and *Acanthonyx quadridentatus* with four teeth on each side of the carapace. Miers retains these in the genus *Acanthonyx*, although they both have a seven-jointed pleon, which appears to be the chief, if not the only, distinction of *Dehaanius* from *Acanthonyx*. A question remains open whether these two species may not be mere variations of *Dehaanius dentatus*. Krauss reports them all from the rocky coasts of Natal, describing *Macleayi* as dull reddish-brown, 7 lines long; *dentatus* as red-brown, 3.2 lines; *quadridentatus* yellowish-brown, 5.7 lines. The specimens from Algoa Bay, dredged between Bird Island and the mainland, at a depth of 10-16 fathoms, on a bottom of sand and shells and stones, were of various sizes, the largest nearly 11 lines long from tips of rostrum to hind margin of carapace. They also vary much in colour markings, one of the largest being all over of a lively red, except for a dot of white near the middle of the carapace, and another near the end of the pleon, and the tips and teeth of the fingers, which are yellowish. Another large specimen has two white blotches above and several below. Some of the specimens are marbled with red and white, one or the other being more predominant, in one specimen the red almost disappearing, so as to leave a yellowish-brown effect.

All the specimens were more or less coated with algae, hydroid zoophytes, and other foreign substances, among which in one instance a small amphipod was found nestling. The extraneous organisms were principally attached near the rostrum, but in many cases the whole external surface of the body, including the third maxillipeds and the pleon, is coated with outgrowths such as those described by Dr. Graeffe for *Pisa armata* (Bolletino Soc. adriatica sci. nat. in Trieste, vol. 7, 1882), and by Sars for "*Scyramathia Carpenteri*" (1885). Besides the tubules of different lengths with thickened ends, on the projecting point in the sixth joint of the walking-legs there are groups which differ from the others in having acute apices. Almost everywhere are found outgrowths which are short, broad, and flattened. To these the midrib, which is common to all, gives a leaf-like appearance, but their normal condition appears to be not flattened but inflated, and they are perhaps essentially the same in structure as the tubules,

or even stages in the growth of the tubules. It may be worth noticing that these outgrowths are coloured in agreement with the part from which they spring. The two largest specimens, which were of a more uniform red than most of the others, also had the carapace and the limbs dorsally almost free from outgrowths, though in parts there were indications of their coming to development. From this it may be surmised that the tubules and leaf-like appendages are lost at the exuviation and have to be grown afresh. Dr. Graeffe considers that they may be auxiliary to respiration as well as facilitating the adhesion of algae and other substances.

OXYSTOMATA.

FAM. : CALAPPIDAE.

1896. *Calappidae*, Alcock, Materials for a Carcinological Fauna of India, No. 2, p. 136.

GEN. : MURSIA, Desmarest.

1825. *Mursia*, Desmarest, Considérations générales sur la classe des Crustacés, p. 108, footnote.
 1829. *Mursia*, Latreille, Le Règne Animal, Cuvier, nouv. éd., v. 4, p. 39.
 1837. *Mursia*, de Haan, Siebold's Fauna Japonica, Crustacea, p. 70, and p. xviii. (1849).
 1837. *Mursia*, Milne-Edwards, Histoire Naturelle des Crustacés, v. 2, 109.
 1839. *Thealia*, Lucas, Ann. Soc. Entom. France, ser. 1, v. 8, p. 577.
 1852. *Mursia*, Dana, U.S. Exploring Expedition, v. 13, p. 391.
 1886. *Mursia*, Miers, Challenger Brachyura, Reports, v. 17, p. 290.
 1896. *Mursia*, Alcock, Journ. Asiatic Society of Bengal, v. 65, pt. 2, p. 148.

Desmarest, who compares the genus with *Hepatus* and gives a distinguishing feature, says that the generic name had been adopted in the museum collection by Latreille from Leach. But, according to Miers, Leach's manuscript name was *Murcia*, and referred to a neighbouring genus afterwards defined as *Cycloës* by de Haan, and as *Cryptosoma* by Brullé and by Milne-Edwards, both names being published in 1837. Latreille in 1829, though accepting *Mursia* in Desmarest's sense, thinks that it ought to be changed as too near to another sub-genus of crustaceans, *Nursia*.

MURSIDIA CRISTIMANUS, de Haan.

1825. *Mursie Mains-en-crête*, Desmarest, Consid. gén. Crust., p. 431, t. 9, f. 3.
1837. "*Mursia cristimanus*, Desmarest," de Haan, Fauna Japonica, Crust., p. 70.
1837. *Mursia cristiata*, Milne-Edwards, Hist. Nat. Crust., v. 2, p. 109.
1839. "*Mursia cristimana*, Latreille," de Haan, Fauna Japonica, Crust., p. 73, t. 13 (mouth-organs).
1840. *Mursia custata*, Milne-Edwards, Hist. Nat. Crust., v. 3, p. 627 (index).
1843. "*Mursia cristimana*, Latreille," Krauss, Südafrik. Crust., p. 52.
1848. *Cryptosoma orientis*, Adams and White, Samarang Crustacea, p. 62, t. 13, f. 4, var. (?) Miers.
1882. *Mursia cristata*, Studer, Abhandl. k. Akad. Wiss. Berlin, Crustaceen der Gazelle von Westafrika, p. 15.
1886. *Mursia cristimana*, Miers, Challenger Brachyura, Reports, v. 17, p. 291.

Latreille in 1829 does not mention the specific name of this species, which Desmarest had left vague by giving it only in French. It may no longer be possible to decide the question of priority between de Haan and Milne-Edwards, their respective works having both been published in 1837, but, that being the case, it would be absurd to give such a form as *cristiata* preference over *cristimanus*. The opportunity for correcting *cristiata* into *cristata* in 1840 was evidently thrown away by the printers, who turned it into *custata*. The original *cristimanus* should not be disfigured into *cristimana*.

Studer, who had under observation a specimen taken from a depth of 50 fathoms at the entrance to Table Bay, says that the animal when alive was bright reddish brown with purple-red tubercles. The colour of the tubercles is moderately persistent, to judge by the specimens sent me, one from False Bay, found in trawl, the other from "South of Saldanha Bay, 33° 14' 36" S., 18° 2' 12" E."

ANOMALA.

1893. *Brachyura anomala*, Stebbing, History of Crustacea, Internat. sci. ser., v. 74, p. 133.

Of the two legions, Drominea and Ranininea, into which this group is divided, the former corresponds with "The *Brachyura Primigenia* or *Dromiacea*" of Alcock (Journ. Asiatic Society of Bengal, vol. 68, pt. 2, No. 3, p. 123, 1899).

In Major Alcock's paper, which was read Nov. 1st, 1899, and did not reach me until after my own manuscript had been sent to South Africa, will be found references to all the important papers on this section, by de Haan, Boas, Bouvier and others, together with full definitions and discussion of the various divisions and sub-divisions. The Dromiacea are divided by Alcock into two tribes, the Dromiidea and Homolidea, the former comprising three families, the Homolodromidae, Dynomenidae, and Dromiidae.

FAM.: DROMIIDAE.

1899. *Dromiidae*, Alcock, Journ. Asiat. Soc. Bengal, vol. 68, pt. 2, No. 3, p. 135.

Alcock supplies a valuable key to the genera which he accepts, but he reduces *Dromidia*, *Cryptodromia*, and *Petalomera* to the rank of sub-genera of *Dromia*, on the ground that "they are all linked together by intermediate forms." On this principle, as it seems to me, we only need a complete knowledge of zoology to reduce the whole animal kingdom to a single species—or a very few.

From Major Alcock's paper I may add two more references to the synonymy of the genus *Pseudodromia*, namely:—"Ortmann in Bronn's Thier Reich V. ii., Arthropoda, p. 1155," and "*Homalodromia*, Miers (*nec* Homolodromia A. M. Edw.), Zool. H.M.S. *Alert*, p. 553."

GEN.: PSEUDODROMIA, Stimpson.

1858. *Pseudodromia*, Stimpson, Pr. Acad. Nat. Sci. Philad., Dec., Prodrusus, pt. 7, p. 64.

1888. *Pseudodromia*, Henderson, Challenger Anomura, Reports, v. 27, p. 15.

Carapace longer than broad, convex, pubescent. Facial region more than half the width of the carapace. Epistome not joined to the front; palate with an elevation on each side. Sternal sulci in the female not reaching the segment which bears the chelipeds, convergent but not apically coalesced. Chelipeds with calcareous apices. The second to the fifth pairs of trunk-legs simple, fourth the shortest, fifth the longest.

It should be noticed that this genus makes an exception to the character assigned by Dr. Henderson and other writers to the Dromiidea and the family Dromiidae, according to which the fifth trunk-legs are small and short. In this genus, as Dr. Henderson himself observes in his generic description, they are longer even than those of the second pair. The

same writer points out as a misconception on Stimpson's part, the statement that "the abdomen is but slightly indurated posteriorly." Stimpson's remark appears to apply to the carapace, not the abdomen, but in neither part is it appropriate to the adult animal. In an Indian species Dr. Henderson found the sternal sulci of the female approximate, ending in a double tubercle, but in the female of the type species these sulci are apically separated by a narrow elevation of the sternal surface, which might be called a tubercle, but which certainly lies between the sulci.

PSEUDODROMIA LATENS, Stimpson.

1858. *Pseudodromia, latens*, Stimpson, Pr. Acad. Nat. Sci. Philad., Dec., Prodromus, pt. 7, pp. 64, 78.
 1888. *Pseudodromia, latens*, Henderson, Challenger Anomura, Reports, v. 27, p. 16, t. 1, f. 8.

The tridentate rostrum would be a conspicuous feature of this species, were it not that the hairy covering is apt to obscure the down-bent central tooth and the upper forward-pointing lateral teeth. The carapace has a smooth surface, more or less coated with a fine down; there is a depression on each side at the cervical groove, which, as Dr. Henderson points out, receives the fifth joint of the fifth pair of trunk-legs. These, when lying on the back, form a strong geniculation between the fourth and fifth joints, and yet with their apices reach the front of the carapace.

The lobes of the lower lip are oval, with a flattening of the inner margin. The mandibles are elongate, the cutting edge broad, convex, not dentate, the outer surface of the plate convex, the inner thickened at a distance from the front margin, with a strong process rising over the base of the much bent palp. The first maxillae have the inner plate very broad at about the middle, the well fringed margins then converging rather sinuously to a blunt apex carrying about half a dozen horny spines; the next plate widens to a distal border carrying fourteen horny spines besides others of slighter build; the outer section has a flask-shaped first joint, surmounted by a bent ligulate second. The second maxillae have the innermost plate broadly oval, with two fringes of long feathered setae, the next plate shorter and much narrower, the third widening distally cleft from near the middle, the outer lobe being the longer and wider; the outer section is produced into a narrow tongue tipped by one seta; the flabellum, which has all the free margin closely fringed, is narrowly rounded above, broadly and obliquely truncate below. In the first maxillipeds the expanded

second joint is oblong oval, considerably longer than the first; the following joint is long and narrow, with a strong twist, its slightly notched apex reaching a little beyond the first joint of the geniculate exopod; the epipod is large, triangular, broad at the base and for two-thirds of the length. In the second maxillipeds the first three joints are short, the fourth is much longer, narrowing distally, shorter than the first joint of the geniculate exopod, but subequal to the combined fifth, sixth and seventh joints, which fold closely against it, the rounded seventh carrying among others several strong horny spines; the narrow epipod is accompanied by a branchia. The third maxillipeds have the third joint broad, rather longer than the fourth, carinate on the inner surface, the inner margin thickly fringed with a mass of hairs or setae; the fourth joint wide at the base, but narrow at the apex, at which the fifth joint is attached, this and the two following narrow setose joints folding closely against the fourth and upper part of the third; the first joint of the geniculate exopod reaches nearly to the middle of the carinate outer margin of the fourth joint of the main stem; there is a slender branchia. The chelipeds have the fifth and sixth joints densely pubescent on the outer surface, but the thumb and finger clean; the thumb has the margins shallowly dentate, and the apex bifid, the blunt tooth of the finger closing into the cleft. Dr. Henderson mentions that the fingers of the second and third trunk-legs have "two yellow spines on the under surface of their proximal half," and that the sixth joint of the fifth pair "gives rise to two minute curved spines which oppose the dactylus." These I have not been able to observe, but only a yellow spine or two on the distal half of the fingers.

The pleon is seven-jointed in both sexes, narrow in the male, with several of the segments indented and in parts strongly pubescent, broad in the female, trilobed, pubescent in parts of the surface, strongly fringed on the borders; the telson is triangular, with convex sides. In the female, the first pleopods are small, uniramous, cylindrical, apparently seven or eight-jointed, but the articulation very indistinct. The next four pairs are biramous, the outer branch long, laminar, the first joint curved, narrowest at the two ends, inner surface concave, longer than the remaining joints together, these being flat, eight to ten in number, successively narrowing, the whole branch fringed with long plumose setae, more densely on the outer than the inner margin; the inner branch cylindrical, narrow, of twelve or fourteen joints, of variable length, carrying long setae, chiefly

on the distal half of each joint. When the pleon of the female is distended with a multitude of eggs, the outer rami of these pleopods, especially those of the second and third pair stand out from the segments clasping round the brood. A little process close to each basal angle of the telson appears to represent the uropods.

Of the specimens sent me from the Cape one is a male, obtained from a depth of 30 fathoms in False Bay. When it arrived it was still tightly embedded in a mass of what I suppose to be the compound ascidian, *Goodsiria placenta*, Herdman. This covering perhaps assisted to preserve the colouring, which is a pinkish red, produced by a plentiful sprinkling of dots of various sizes so coloured upon a lighter ground; the fingers of the chelipeds are red with lightish tips; the eyes are brown on red stalks. The female specimen, of which the mouth-organs and pleon have just been described, had lost all colour.

The carapace of the male measured 29 mm. in length by 22.5 mm. in breadth. It is, therefore, much larger than the males described by Stimpson and Henderson. The carapace of the female was 23 mm. long by 17.5 mm. broad.

MACRURA.

FAM.: PARAPAGURIDAE.

1882. *Parapaguridae*, S. I. Smith, Bull. Mus. Comp. Zool. Harvard, v. 10, No. 1, p. 20.
 1888. *Parapaguridae*, Henderson, Challenger Anomura, Reports, v. 27, p. 85.
 1892. *Parapaguridae*, Ortmann, Zoologische Jahrbücher, v. 6, p. 269.

By S. I. Smith this family is distinguished from the Paguridae only by the circumstance that the gills are trichobranchiate instead of phyllobranchiate. Henderson, who adds as a characteristic the fact that the species appear to occur only in deep water, explains that "the gills are modified trichobranchiae, each consisting of a central stem which gives rise to two collateral rows of rounded filaments, gradually decreasing in size towards the apex, whereas in the Paguridae the stem gives rise to two rows of flattened leaflets."

In *Parapagurus dimorphus* the mid-rib of the gill gives rise to two rows of flattened leaflets, which at about the middle divide into two unequal rounded filaments, thus producing what Milne-Edwards and Bouvier speak of as quadriseriate.

trichobranchiae. The gills are in fact phyllobranchiate at the base and trichobranchiate above. As the filaments become shorter and less crowded towards the apex of the gill, they are also less flattened.

Ortmann in 1892 proposes to refer *Parapagurus*, the typical genus, to the Paguridae, allotting *Pylocheles* and *Chiroplatea* to the Parapaguridae. But in such a classification it is obvious that the name Parapaguridae would need to be changed.

GEN.: PARAPAGURUS, S. I. Smith.

1879. *Parapagurus*, Smith, Trans. Connecticut Academy, v. 5, pt. 1, p. 50.
 1882. *Parapagurus*, Smith, Bull. Mus. Comp. Zool., Harvard, v. 10, No. 1, p. 20.
 1888. *Parapagurus*, Henderson, Challenger Anomura, Reports, v. 27, p. 85.
 1893. *Parapagurus*, A. Milne-Edwards and Bouvier, Mem. Mus. Comp. Zool., Harvard, v. 14, No. 3, Paguriens, p. 26.
 1893. *Parapagurus*, Stebbing, History of Crustacea, p. 166.

Rostrum inconspicuous, pleon spiral. Ocular peduncles not very long, the scales wide apart. First antennae, third joint of peduncle elongate, reaching much beyond the eyes. Third maxillipeds wide apart at the base. Right cheliped the larger. Second and third legs little distant at their bases, elongate, with long curved fingers. Female with the sexual orifice only on the left limb of the third pair. Fourth legs imperfectly chelate, fifth minutely chelate or sub-chelate. First and second pleopods, in the male, pairs, uniramous, sexual; in the female, first wanting, second biramous, on the right side wanting. Third, fourth, and fifth pleopods, on the right side wanting, on the left biramous, but one ramus rudimentary in all in the male, in the fifth pair in the female.

The branchiae are stated by Professor Smith to be eleven pairs, two each to the third maxillipeds and first three pairs of legs, the remaining three belonging to the fourth pair of legs. Professors Milne-Edwards and Bouvier found a rudiment of a flagellum on the palp of the first maxillae, but no vestige of one on the palp of the first maxillipeds. In *P. dimorphus* I can find no rudiment of such a flagellum in either of these appendages. They say in their description of the genus that the peduncle of the second antennae is longer than the carapace, but this is quite at variance with the measurements of *P. dimorphus* as well as with those given by S. I. Smith for *P. pilosimanus*, with which the French authors are also dealing.

PARAPAGURUS DIMORPHUS (Studer).

1883. *Eupagurus dimorphus*, Studer, Abhandl. k. Akad. Wiss., Berlin, for 1882, Crust. Gazelle, p. 24, t. 2, f. 11-12.
1888. *Parapagurus dimorphus*, Henderson, Challenger Anomura, p. 86, t. 10, f. 1.
1893. *Parapagurus dimorphus*, Milne-Edwards and Bouvier, Mem. Mus. Comp. Zool., Harvard, v. 14, Paguriens, p. 32.

Front with central convexity flanked by an obtuse tooth on either side, hind border of carapace acutely emarginate; there are tufts of fine hairs on the surface behind the cervical groove. Eye-stalks somewhat constricted in the middle, according to Studer carrying on the upper surface a narrow longitudinal row of little hairs, a feature which probably becomes more conspicuous with age, as in average specimens it is only with difficulty detected; the corneae are dilated, distinguishing this species from others as yet known. Ophthalmic scales short, with an apical tooth. First antennae with a tooth at apex of otolithic lobe, the actual apices of the first joint rounded, third joint almost clear of the eyes, distally widened, lower flagellum eight-jointed, about half as long as the upper. The peduncle of the second antennae scarcely reaches beyond the eyes; the acicle is bordered with a dozen teeth and some slender hairs. The elongate mandibles have the third joint of the palp much longer than the first or second. The third maxillipeds; the sternum separating them has two median forward pointing teeth; the third joint is oblong, bordered with (22) very unequal teeth, of which three are considerably larger than the rest; the fourth joint is narrow at the base.

The left cheliped is small, rather hairy, the thumb in line with the trunk of the hand or nearly so, and the finger lying close to the thumb. The right cheliped in the male is greatly elongate, fourth joint on inner side with tuberculate ridge apically rounded, fifth and sixth covered with tubercles, larger ones forming a ridge on inner side of fifth and on both sides of sixth; a fine down coats parts of these joints, chiefly the outer surface; the thumb is shorter than the trunk of the sixth joint, from which it bends slightly away; the carinate, tuberculate finger more or less adapts the irregular tubercles of its inner margin to the intervals between those of the thumb, but there is sometimes a gap left, as shown by Studer, probably, as explained by Dr. Henderson, a character of advanced age. In the female the right cheliped is less elongate, much less strongly tuberculate, and without a thumb, the sixth joint not being sufficiently

produced to lose the effect of a rhomboidal termination; the sharply carinate finger fits closely and exactly to the oblique finely tuberculate distal margin of the sixth joint. The third legs are slightly longer than the second, the finger about as long as the fifth and sixth joints combined, longitudinally grooved on both sides, fringed with short fine hairs. The fourth legs are surrounded with long plumose hairs, the fourth joint little longer than the fifth or sixth, which are both broad, the inner margin of the sixth joint coated with subcircular scales, the apex projecting but little in opposition to the rather long slender curved finger, which has a close-set row of teeth following its curve and setae on both margins. The fifth legs likewise have long fringes of serrate setae, the sixth joint squamose distally behind the finger hinge, the very small thick finger covered with long setae, closing down upon the short almost transverse palmar margin. Of *P. pilosimanus*, Smith, the French authors say that the fourth legs are provided with an almost perfect chela (pincer), and that in the fifth legs the chela is narrower but longer, the palmar portion being much more elongate than the digital portion, but this latter statement may only mean that the sixth joint is much longer than the seventh.

The sixth segment of the pleon is almost completely calcified dorsally. The uropods on the left are the larger. The infolded telson is obliquely oval, with numerous little spine teeth at and near the apical margin.

Specimens in formalin retain for some time red markings, almost all longitudinal, on body and limbs and on the eye-stalks, the eggs a deep-red when first the mother is withdrawn from a shell. The "Gazelle" specimens were in shells of *Buccinum porcatum*, Gm., completely covered with colonies of *Epizoanthus cancrisocius* v. Martens. Henderson reports the species from the neighbourhood of Nightingale Island, Marion Island, the coast of Patagonia, as well as from the Agulhas Bank. The specimens here described were taken 34° 43' 15" S., 18° 31' E.

The greatest depth recorded for this species is 245 fathoms, off Port Churruca, Patagonia (Challenger).

FAM.: PALINURIDAE.

GEN.: PALINURUS, Fabricius.

1798. *Palinurus*, Fabricius, Supplementum Entomologiae Systematicae, p. 400.
 1884. *Palinurus* (sensu restricto), T. J. Parker. Trans. New Zealand Institute for 1883, v. 16, p. 304.
 1888. *Palinurus* (sensu restrictiore), Bate, Challenger Macrura, Reports, v. 24, p. 84.
 1891. *Palinurus*, Ortmann, Zool. Jahrb., v. 6, p. 14.

In establishing this genus in 1798 Fabricius divided it into two sections, the first having the ocular spines simple, the second having those spines dentate beneath. In the second section he placed only the species *Palinurus quadricornis*, a new name for what he and Herbst had previously called *Astacus elephas*. This has since been adopted as the type of the genus under the name *Palinurus vulgaris*, Latreille, which ought perhaps rather to be called *Palinurus elephas*. Pennant in 1777 called this species *Astacus homarus*, confounding it with the Asiatic *Cancer Homarus* of Linnæus.

In 1884* T. J. Parker also divided the genus into two sections, containing numerous species, distributed over three sub-genera. The first of these sections, the "Silentes," contained the sub-genus *Fasus*, and was defined as having, "stridulating organ absent; rostrum well developed, clasped by paired pedate processes of the epimeral plates; procephalic processes present; coxocerites imperfectly fused; antennular flagella short." The species included *lalandii*, Milne-Edwards; *edwardsii*, Hutton; *hügelii*, Heller. Of these Ortmann considers that *edwardsii* is a synonym of *lalandii*. *Fasus lalandii*, though its specific name was given by Lamarck, appears to have been first described by Milne-Edwards. Dr. Gilchrist informs me that this species is common at the Cape, grows to a large size, and is commercially valuable.

The second of Parker's sections was designated "Stridentes," and distinguished as having "stridulating organ present; rostrum variable, but rarely (? never) well developed as in A [Section of the Silentes]; pedate clasping processes absent; procephalic processes absent." This section was divided into two sub-sections, the first containing the sub-genus *Palinurus*, and having "Antennulary sternum narrow below and bases of antennae consequently approximated; bases of antennules hidden, in a view from above, partly by the antennulary sternum, partly by the antennae; coxocerites imperfectly fused; antennulary flagella short." The sub-genus contained "*Palinurus vulgaris*," in which the rostrum is reduced to a small spiniform tubercle, with the ophthalmic segment uncovered, and *Palinurus trigonus*, de Haan, in which the rostrum is well developed, covering the ophthalmic segment. This latter species had, however, already been made the type of *Linuparis*, White, 1847. Parker's second sub-section was opposed to the first by having "Antennulary sternum broad below, causing a wide separation of bases of antennae; bases of antennules visible

* See also Nature, v. 29, p. 190, 1883.

in a view from above; rostrum absent; ophthalmic segment uncovered; coxocerites perfectly fused; antennular flagella long." This suffices to define the sub-genus *Panulirus*, White, 1847, which contains several more or less well-known species, such as *penicillatus*, Olivier, and *argus*, Latreille.

The sub-genera above-mentioned are now accepted as genera. Of two species *P. longimanus*, Milne-Edwards, and *P. frontalis*, Milne-Edwards, Parker could not say whether they should come under *Fasus* or the restricted *Palinurus*. Ortmann decides that the Chilian *frontalis* is a synonym of *lalandii*, and that the West Indian *longimanus* with its variety from Mauritius properly belongs to *Palinurus*. Parker makes the following observation on the distribution:—"Leaving these two species aside, it is worthy of remark that all the species of *Fasus* are confined to the Southern Hemisphere (Ethiopian and Australian Regions), and those of *Palinurus*, as restricted above, to the Northern Hemisphere (Palearctic Region), while those of *Panulirus* occur in both hemispheres, and, as far as I can make out, in all the zoogeographical regions." This generalization, however, will not hold in regard to *Palinurus*, being opposed both by the var. *Mauritianus* of *P. longimanus*, described by Miers in 1882, and by the new species from the Cape here described.

PALINURUS GILCHRISTI, n. sp.

PLATE I.

With the so-called *Palinurus vulgaris* from the northern hemisphere, this southern species shows a close relationship. The rostral spine is, in accordance with the generic character, very small. The large ocular spines are smooth on the upper (or hinder) margin, but have from four to five teeth on the lower (or front) margin; they are followed by three successively much smaller spines, these rows extending to the cervical groove. The large spines on the outer sides of the eyes are followed each by a couple of spines, these rows being much less considerable than in *Palinurus vulgaris*. The rest of the ornamentation differs by its greater compactness in the new species, two median rows, each consisting of three prominent spines very close together, running nearly parallel to one another to the cervical groove, whereas in the species compared such spines are wide apart in convex lines. Behind the cervical groove there are numerous tubercular spines, two median rows of which are very close together to start with and converge to the hind rim of the carapace. The sternum is strongly tuberculated, but with the pear-shaped bulb at its apex quite smooth. In the pleon the second to the

fifth segments have the transverse furrow interrupted in the centre by a very low, discontinuous carina. On the sixth segment two median tubercles precede the furrow. The second to the sixth segments have their sides produced to a tooth, though it is far smaller than in *Palinurus vulgaris*, as are also the denticles to the rear of it. The postero-lateral angle of the first pleon segment rests on a slight smooth depression of the antero-lateral margin of the second segment, the corresponding part in *P. vulgaris* being not smooth but dentate.

The eyes are dark, the stalk grooved below the faceted portion, but without the widening towards the base, which is conspicuous in *P. vulgaris*. Both pairs of antennae appear to agree closely with those of that species.

The first pair of trunk-limbs are slightly shorter and only moderately stouter than the others; the third joint has two tubercles on its inner margin, the fourth joint or arm has on the inner margin 5 teeth, of which the subapical one is rather large; its outer and lateral keels are smooth, not acute, but each ends in a sharp tooth; the fifth joint has a smooth outer margin, produced to a rounded apex; the sixth joint has a sharp subapical tooth on the inner margin; the finger, which is not much shorter than the sixth joint, is longitudinally grooved, and carries several tufts of short setae. The following pairs of limbs are slender and subequal, but contrary to what is the case in *P. vulgaris*, in the fifth pair the two joints preceding the finger are together slightly longer than in the preceding limbs.

The colour of this pretty species is orange, banded with yellowish white on the antennae and limbs, nearly uniform on the carapace, but transversely striped with yellowish white on the pleon, the light colour predominating at the sides, and also dividing the transverse furrow on the pleon segments along the raised ridge. The length of the larger of two male specimens sent me is about 170 mm. or $6\frac{3}{4}$ inches, from rostrum to end of the telson.

Palinurus longimanus is distinguished both from the present species and from *P. vulgaris* by having teeth on both margins of the ocular spines, and the first trunk-legs much longer than the second.

Of the new species, for which I do myself the pleasure of using Dr. Gilchrist's name, the larger specimen was taken in False Bay, the smaller was trawled 25 miles s.w. $\frac{1}{4}$ w. from Cape St. Blaize.

FAM. : NEPHROPSIDAE.

GEN. : ASTACUS, Leach.

1814. *Astacus*, Leach, Edinb. Encycl., vol. 7, p. 398.
1815. *Astacus*, Leach, Trans. Linn. Soc. London, vol. 11, p. 343.
1816. *Astacus*, Leach, Encycl. Brit., Art. Annulosa, p. 420.
1819. *Astacus*, Leach in Samouelle's Entomologist's Useful Compendium, p. 95.
1825. *Astacus*, Desmarest, Consid. gén. Crust., p. 209.
1829. *Astacus*, Latreille, Le Règne Animal, vol. 4, p. 88.
1837. *Homarus*, Milne-Edwards, Hist. Nat. Crust., vol. 2, p. 333.
1847. *Homarus*, White, List of Crustacea in Brit. Mus., p. 72.
1850. *Astacus*, White, List of British Animals in Brit. Mus., Crust., p. 35.
1852. *Homarus*, Dana, U.S. Expl. Exp., vol. 13, part 1, p. 523, part 2, p. 1558.
1853. *Homarus*, Th. Bell, British Stalk-eyed Crustacea, p. 241 (part published not later than 1850, since it is quoted by White in that year).
1857. *Astacus*, White, Popular History of British Crustacea, p. 101.
1875. *Astacus*, Sowerby, Continuation of Leach's Malac. Podophth. Brit., text to t. 35.
1881. *Homarus*, Huxley, The Crayfish, Intern. sci. ser., vol. 28, p. 13, etc.
1888. *Homarus*, Bate, Challenger Macrura, Reports, vol. 24, p. 192.
1893. *Astacus*, Stebbing, History of Crustacea, Intern. sci. ser., vol. 74, p. 201.
1895. *Homarus*, Herrick, The American Lobster, Bulletin U.S. Fish Commission, p. 8.
1896. *Astacus*, Ortmann, Zoologische Jahrbücher, vol. 9, p. 429.
- 1896-7. *Homarus*, F. J. Bell, Annals and Magazine Nat. Hist., ser. 6, vol. 18, p. 476, vol. 19, Feb.
1897. *Astacus*, Stebbing, Annals and Magazine Nat. Hist., ser. 6, vol. 19, pp. 120, 353, 470.
1898. *Astacus*, Stebbing, Natural Science, vol. 12, p. 239.

Leach in his early restriction of the genus *Astacus* retained in it three species, the Common Lobster, the Common River Crayfish and the Norway Lobster. He presently separated from it the genus *Nephrops* for the last of the three, assigning the other two to separate sections of *Astacus*. But eventually he left the lobster alone in *Astacus*, forming a new genus *Potamobius* for the fresh water crayfish.

According to Huxley the most important distinction is presented by the podobranchiae, in which the stem (in *Astacus* and *Nephrops*) is, as it were, completely split into two parts longitudinally, one half corresponding with the lamina of the crayfish (*Potamobius*) gill, and the other with its plume. Ortmann expresses the same thing by saying that in the Nephropsidae the podobranchiae are not coalesced with the mastigobranchiae, and that in the *Potamobiidae* they are coalesced. Moreover, in the former family the last thoracic segment is firmly adherent to the rest, while in the latter family it is movable. In *Potamobius* the telson has a transverse division which is wanting in *Astacus* and *Nephrops*. Between the two latter, on the other hand, there are well marked distinctions. The branchial plume of the podobranchia of the second maxilliped is well developed in *Astacus*, but very small or absent in *Nephrops* (Huxley, The Crayfish, p. 281). The second antennae have a very small exopod in *Astacus*, but a large one in *Nephrops*, and the slender prismatic form of the front chelae which is characteristic of *Nephrops* is not shared by those of *Astacus*.

The species of *Astacus* sensu restricto at present known may be distinguished as follows:—

- | | | | |
|----|---|--|--|
| 1. | } | Rostrum with teeth on the under surface, | 1. <i>A. americanus</i> (Milne-Edwards). |
| | | Rostrum without teeth on the under surface, | 2. |
| 2. | } | Front chelae not pubescent on outer surface, | 2. <i>A. gammarus</i> (Linn.). |
| | | Front chelae pubescent on outer surface, | 3. <i>A. capensis</i> , Herbst. |
| | | | |

ASTACUS CAPENSIS, Herbst.

1792. *Cancer (Astacus) capensis*, Herbst, Versuch einer Naturgeschichte der Krabben und Krebse, Bd. 2, Heft. 2, p. 49, t. 26, f. 1.
1803. *Astacus capensis*, Latreille, Hist. Nat. Crust., v. 6, p. 240.
1837. *Homarus capensis*, Milne-Edwards, Hist. Nat. Crust., v. 2, p. 335.
1841. *Homarus capensis*, de Haan, Fauna Japonica, Crust., p. 161.
1843. *Homarus capensis*, Krauss, Die Südafrikanischen Crustaceen, p. 54.
1878. *Homarus capensis* (?), Huxley, Proc. Zool. Soc. London, for 1878, p. 754.
1895. *Homarus capensis* (?), Herrick, The American Lobster, p. 8.

According to Herbst this beautiful Macruran is found at the Cape in mountain streams. It is, he says, very like the common European river Crayfish, but of more slender form, with an almost uniform breadth, the colour coral-red, with a fine polish like carnelian. What the colour might be in living specimens he had no means of deciding. He describes the arm or fourth joint of the front chelipeds as relatively small, the fifth as almost larger than the fourth and strongly tuberculate, the hands as large, with a margin very delicately raised and curved, and as everywhere coated with long, yellow, transparent hairs. He declares that all the four following pairs of feet have chelate apices, in contrast with the common river Crayfish, in which only the first two pairs are so constructed. This account agrees very well with the figure given on Herbst's plate. It agrees almost too well, suggesting a suspicion that the author wrote his description from the figure rather than from the specimen, for there is reason to suppose that the hands of the chelipeds have the long hairy coating only on the outer and not on the inner surface, and that the fourth and fifth pairs of trunk-legs are simple, not chelate.

Milne-Edwards in changing the name to *Homarus capensis* shows that he did not believe in the chelate character of the last two pairs of trunk-legs. He gives the description as follows:—Body slender. Rostrum flattened, much shorter than the peduncle of the outer antennae, and finely denticulate on the edges. Wrist granular, hands elongate, very compressed, furnished on the upper edge with a finely denticulate crest, and covered with hairs above. Length about 5 inches. The letters C. M. appended to this description testify that Milne-Edwards had a specimen at his command. He goes on to say that the *Astacus scaber* of Fabricius, Supplem. p. 407, 1798, appears to be identical, Fabricius having, he thinks, been deceived as to the number of chelae both in this species and in the species subsequently known as *Nephrops norvegicus*. But this identification cannot be accepted. For *Astacus scaber* is described as having the rostrum short, subulate, acute, the back of the carapace in front spinose with two spines on each side larger and stronger than the rest, and the wrist of the front chelipeds short. To these distinctions must be added the fact that the habitat of the species is not South African but the Indian Ocean, and a little weight may be given to the circumstance that the author of the species assigns to it only a single pair of filiform chelipeds in addition to the large front ones. The account given by Fabricius is more easy to reconcile with Herbst's *Cancer modestus*, 1796, called *Eutrichocheles modestus* by Wood-Mason in 1895.

The only information supplied by de Haan is that, whereas the flagella of the palps of the third maxillipeds are ovate-oblong in *Homarus vulgaris*, they are elongate in "*Homarus capensis*, *Nephrops*, *Astacus*, *Axia*."

Krauss adds nothing to our knowledge of *Astacus capensis* except the negative evidence that he had never seen it in Natal.

Huxley, in "The Crayfish," p. 332, 3rd Ed., 1881, incidentally remarks that the genera *Homarus* and *Nephrops* "are exclusively confined to the northern hemisphere," a statement inconsistent with the existence of the little Cape Lobster, to which he here makes no allusion. In the proceedings of the Zoological Society, however, Huxley says:—"I must confess myself to be in a state of hopeless perplexity respecting the Crayfish or Lobster, which is said to occur at the Cape of Good Hope, *Cancer* (*Astacus*) *capensis* of Herbst," and as to Herbst's statement that all the legs are chelate he observes that "it is impossible to suppose that Herbst should have made a mistake on such a point as this." But mistakes are never impossible, and in regard to the presence or absence of minute chelae they are rather exceptionally easy to make, especially when only a dried specimen is examined.

Herbst quotes no authority for the declaration that his species lives in mountain streams, at which he would not have felt surprise, since on the one hand he probably regarded it rather as a crayfish than a lobster, and on the other hand he elsewhere speaks of lobsters living in the rivers in Chili. But the existence of fresh water lobsters still awaits corroboration. Of the two specimens, a male and a female, which I consider to be *Astacus capensis*, the male was labelled as coming from Table Bay, and more particularly described as having been "got in rock-pool at Sea Point, a village a few miles from Cape Town." Dr. Gilchrist subsequently took pains "to verify that it was found in a salt water rock-pool." The female was also from the Cape, but without more special indication of locality. The male specimen when first received in England retained plentiful traces of a rich red colouring. This unfortunately disappears in spirit. It is, however, a character which combines with the general proportions and the structure of the front chelipeds to produce conviction that this specimen and its companion belong to the species described by Herbst. That they belong to the species described by Milne-Edwards there can be no doubt, since they agree with his description at all points. Dr. Gilchrist in answer to my enquiries writes, "It

is certainly a mistake to say that it occurs in the rivers of the Colony, where so far as I can make out no such Crustacean occurs. I have learned that it is also found in Algoa Bay."

The small apical tooth of the rostrum reaches beyond the base of the third joint of the peduncle of the first antennae, the sides of the rostrum are serrate with five, six or seven points, all small and diminishing successively backward; it is without teeth on the lower surface; on either side there is a small tooth a little way behind the margin of the orbit. The carapace, rostrum included, in the male is shorter than the pleon; its sides and the back of the telson are hirsute and there are scattered hairs at various parts of the whole back; the female specimen is much less hairy than the male. The lower margins of the pleon segments are closely fringed with hairs, and they are shaped nearly as in *Astacus gammarus*, the common lobster. The telson is longer than broad, the slightly sinuous sides converging very little to the pair of denticles which flank the broad apical convexity. The short stout eyes, black in spirit, reach about half-way along the rostrum. The first antennae are about two-thirds the total length of the carapace, their two flagella nearly equal in length. The second antennae are as in *Astacus gammarus*, and when bent back reach the extremity of the body. The elongate hairy third maxillipeds differ a little from those of the species just mentioned in the marginal denticulation. In the chelipeds the fourth joint has a hairy fringe; the fifth besides being hirsute has three or four lines of tubercles, not all very regular or distinct; the sixth which is very much longer than broad, and is rather broader in the right limb than the left, besides the hairy covering on the outer surface which extends over the base of the thumb, has the outer margin delicately serrate, and the inner conspicuously; the thumb and finger of the larger chela are much shorter than the trunk of the joint, the bent apices crossing, the marginal teeth few and not bulky, hairs at the base of the thumb partly filling the cavity between it and the finger; in the narrower chela the thumb and finger are not much shorter than the trunk of the joint, nearly approximate, with many minute but unequal teeth and a long brush of hairs. The fourth and fifth legs have the finger subequal in length to that which assists in forming the chela of the second and third pairs, but it is less hairy. In the fifth pair there is a tuft of hairs at the apex of the sixth joint which in a dried specimen might go some way towards producing the false impression of a chela. This limb has a branchia as in the common lobster. In Huxley's "Crayfish," p. 265, there is a perplexing statement that "in the lobster, the solitary

arthrobranchia of the eighth somite disappears, and the branchiae are reduced to twenty on each side. In *Astacus* (*i.e.*, *Potamobius*, the crayfish) this branchia remains." From the adjacent formulae it is evident that not an arthrobranchia but a pleurobranchia is intended, and other writers have pointed out that the supposed disappearance is due to an oversight.

The pleopods in both sexes appear to agree closely with those of the common lobster. On the second, third, and fourth segments of the pleon there is a very small medio-ventral tooth in the male, but none in the female.

The colour (so far as known), the small size, the pubescence of the body and claws, and the flattened hands of the front chelipeds, will sufficiently distinguish this neat little South African species, less than four inches long and less than three-quarters of an inch broad, from the clumsier lobsters of the North.

FAM. : CALLIANASSIDAE.

1888. *Callianassidae*, Bate, Challenger Macrura, Reports, v. 24, p. 27.
1893. *Callianassidae*, Stebbing, Hist. Crust., p. 183.

This family is included in the Thalassinidae by Dr. Heller in 1863. Kinahan in 1859, Haswell in 1882, and Dr. de Man in 1888 separate from it a family Gebidae or Gebiidae, which Ortmann in 1893 suppresses.

GEN. : CALLIANASSA, Leach.

- 1813-14. *Callianassa*, Leach, Edinburgh Encyclopaedia, Art. Crustaceology, v. 7, p. 400.
1837. *Callianassa*, Milne-Edwards, Hist. Nat. Crust., v. 2, p. 307.
1863. *Callianassa*, Heller, Crust. des südlichen Europa, p. 201.
1870. *Callianassa*, Alphonse Milne-Edwards, Nouvelles Archives du Muséum, v. 6, p. 75.
1888. *Callianassa*, Bate, Challenger Macrura, Reports, v. 24, p. 28.

Since the revision of the genus by Professor Alphonse Milne-Edwards, referred to below, several new species have been described, as *C. Stimpsoni*, S. I. Smith, 1874; *C. Krukenbergi*, R. Neumann, 1878; the phosphorescent *C. Filholi*, A. Milne-Edwards, 1879; *C. madagassa*, Lenz and Richters, 1881; *C. mauritiana*, Miers, 1882; *C. Martensi*,

Miers, 1884; the doubtful *C. occidentalis*, Bate, 1888; *C. truncata*, Giard and Bonnier, 1890; the very large *C. diademata*, Ortmann, 1892; and in the same year Ortmann's var. *japonica* of *C. subterranea* (Montagu); the blind *C. caecigena*, Alcock and Anderson, 1894; *C. novae-britanniae*, Borradaile, 1899, from New Britain; and *C. lignicola*, Alcock, 1899, "obtained from burrows in the interior of water-logged mangrove-twigs."

CALLIANASSA KRAUSSI, n. sp.

PLATES, 2, 3.

The rostral point is short, the lateral teeth represented only by a faintly indicated angle on either side at some distance from the centre. The first and second segments of the pleon are membranous, rather indistinctly separated, the third, fourth and fifth are subequal, each shorter than the sixth, and each having on either side a tuft of hairs, and the middle of the hind margin obtusely produced, the sixth is distally narrowed, with a dorsal suture near the attachment of the uropods. The eye-lobes are contiguous, obtusely triangular, the eyes small. The first antennae are more than half as long as the second, the first joint rather longer than the eyelobes, the second longer than the first, the third than both combined, the fringing setae of both second and third very long, the lower flagellum 13-jointed, with long setae, the upper 17-jointed, a very little shorter, thickest near the end, with short setae. Second antennae much more slender, with shorter peduncle, and flagellum of more than forty joints.

The subquadrate distal end of the mandible is fringed with about 19 small unequal teeth; the third joint of the palp is longer than the second or the pentagonal first, and has a dense row of short hooked spines on and near the truncate apex. In the second maxillae the slender piece between the four setose plates and the respiratory fan has a twist at the apex which gives the appearance of an articulation. The third maxillipeds have the first and second joints very small, but the third abruptly broad at the rounded proximal end, thence widening to the obliquely truncate distal margin which nearly equals the length of the joint, and carries the still wider but considerably shorter fourth joint; at the outer extremity of the distal margin of this is attached the oval fifth joint, as long as the fourth but less than half as wide; the sixth joint is rather shorter than the fifth, but wider, its

inner margin greatly bulging both beyond the fifth joint and the narrowly oval finger; all these joints are fringed with long setae.

Of the chelipeds or first peraeopods in the largest specimen the larger is on the right side, but on the left in the two smaller specimens. In the larger limb the third joint is narrow, having a serrate inner margin, the fourth is slightly shorter, proximally considerably broader, with its sinuous inner margin strongly serrate, devoid of the tooth present in many species; the fifth is broad but longer than broad, equal to the sixth in breadth, but shorter than its total length, though longer than the trunk of it without the thumb; the trunk of the sixth joint is nearly square, longer than the thumb but equal in length to the finger; thumb and finger are a little separated at the base, setose on the outer and inner margins, the inner being in each tuberculate, in two series with a cavity between on the thumb, in one series along a sharp projecting lobe on the finger. The smaller limb has the third and fourth joints devoid of conspicuous serration, the fourth not bulging, the fifth about twice as long as broad, as long as the sixth, in which the thumb is longer than the trunk and together with the still longer finger is densely setose and on the inner margin tuberculate. The second peraeopods have extremely long setae on one margin of the fourth and fifth joints, the fifth widening distally, considerably longer than the setose sixth, of which the thumb is longer than the short trunk and a little shorter than the finger, finger and thumb acute, densely setose, forming a small but regular chela, the apices not curved for overlapping. In the third peraeopods the fourth joint has few setae, the fifth is distally widened and has some apical groups, while the sixth and seventh joints are covered with these ornaments; what may be called the trunk of the sixth joint is a little wider than the fifth but not half as long, but it is produced backward in a great rounded lobe fringed with long curving setae, so that its entire length exceeds that of the fifth joint; to its truncate extremity is attached the broadly triangular, densely setose, finger, which is little longer than broad. In the fourth peraeopods the fifth joint has a distal group of setae, but the sixth and seventh joints are so buried in them that the outlines of the joints are difficult to follow; especially the sixth joint has on the breast at the distal half a closely set triangular group of serrate spine-like setae which appear to mark a short blunt prolongation of the joint; this would give a kind of chelate antagonism to the oval finger, which is scarcely half as broad and not half as long as the sixth joint. The fifth peraeopods are rather sub-chelate than chelate, a very small curved finger

closing down on a short, convex, transverse palmar margin of the sixth joint; this, which is about twice as long as broad, is except near the base immersed in very long setae, one group near the convex hind margin being exceptionally dense.

The branchiae are composed of leaflets so narrow that they may be regarded as something intermediate between phyllobranchiae and trichobranchiae.

The first pleopods have an S-shaped appearance, with many outstanding setae, the ramus about twice the length of the peduncle, a narrow membranous strip, with a widening at the bend (as seen without dissection). The second pleopods are biramous, both rami short, narrow, membranous, the outer seemingly the shorter. The three following pairs have broad rami, the outer the broader, with the outer and apical margin bordered with long feathered setae that look as if composed of numerous joints like an antennary flagellum; the inner ramus is narrower at the apex with similar but fewer setae.

The uropods extend beyond the telson, the outer ramus the larger, with the inner and upper margins straight and smooth, the outer and apical convex, densely fringed with long plumose setae, of which an additional curved series extends from the upper outer corner on the surface to near the centre of the ramus; the inner ramus is approximately oval, with long setae at the apex and on the lower part of the inner margin.

The telson is broader than long, with a small group of setae near each corner of the nearly straight apical margin, the lateral margins sinuous, making the telson narrowest at the base and broadest at the middle.

In spirit the colour is a sort of ivory white.

The length of the largest specimen from rostrum to end of telson was 47 mm.

Habitat, Cape of Good Hope, Gordon's Bay, a little below high water mark.

Alphonse Milne-Edwards in his revision of the genus in 1870, divides the 17 species then known into two groups, the second distinguished by a short telson and comprising 7 species. Of these, 4 have a tridentate front, and of the remaining three which are devoid of latero-frontal teeth, one has the rostrum itself tridentate. There thus remain only two for comparison with the present species, namely, *C. Bocourti*, A. Milne-Edwards, which is distinguished by the strong rostral point, and *C. mucronata*, Strahl, in which the third joint of the first antennae is not elongate. Of species established since the above-mentioned revision, *C. mauritiana*, Miers, has the trunk of the sixth joint in the larger cheliped much larger than the fifth joint, as is also the

case in *C. Martensi*, Miers; *C. Krukenbergi*, Neumann; *C. madagassa*, Lenz and Richters; and *C. novae-britanniae*, Borradaile. In *C. occidentalis*, Bate, the trunk of the sixth joint is much broader than the fifth joint. In *C. Stimpsoni*, Smith, the fourth joint has a very prominent tooth near the base. *C. truncata*, Giard and Bonnier, founded on specimens attacked by parasites, is said to be approximate to *C. laticanda*, Otto. The large cheliped has a strong tooth on the fourth joint.

GEN. : UPOGEBIA, Leach.

- 1813-14. *Upogebia*, Leach, Edinburgh Encyclopaedia, Art. Crustaceology, v. 7, p. 400.
 1815. *Gebia*, Leach, Trans. Linn. Soc. London, v. 11, pp. 335, 342.
 1816. *Thalassina*, Risso, Hist. Nat. Crust., de Nice, p. 76.
 1825. *Gebia*, Desmarest, Consid. gén. Crust., p. 203.
 1826. *Gebios*, Risso, Hist. Nat. de l' Europe Mérid., v. 5, p. 51.
 1837. *Gebia*, Milne-Edwards, Hist. Nat. Crust., v. 2, p. 312.
 1841. *Gebia*, de Haan, Fauna Japonica, Crust., p. 162.
 1852. *Gebia*, Dana, U.S. Expl. Exp., Crust., v. 13, p. 509.
 1853. *Gebia*, Bell, Brit. Stalk-eyed Crust., p. 222.
 1863. *Gebia*, Heller, Crust. süd. Europa, p. 204.
 1880. *Gebia*, Boas, Studier over Decapodernes Slaegtskabsforhold, p. 82.
 1882. *Gebia*, Haswell, Catal. Australian Crustacea, p. 164.
 1884. *Gebia*, Sars, Archiv. Naturv., v. 9, pt. 2, p. 198.
 1893. *Upogebia*, Stebbing, History of Crustacea, p. 185.
 1893. *Gebia*, Ortmann, Decap. u. Schizop. Plankton-Exp., p. 49.
 1900. *Upogebia*, M. J. Rathbun, Pr. U.S. Nat. Mus., v. 22, p. 308.

The definition of this genus is not at present very clear. According to a character usually given the anterior limbs of the trunk do not form a proper chela, there being great disparity of size between the movable finger and the tooth which does duty for a thumb. In 1868 Professor A. Milne-Edwards (Nouv. Archiv. Mus. Hist. Nat., v. 4, p. 64), founded the genus *Gebiopsis* to receive a species in which the anterior limbs are perfectly chelate, but both Miers in 1884 (Crustacea of "Alert," p. 282) and Ortmann in 1893 are disposed to give *Gebiopsis* only the rank of a sub-genus. Ortmann remarks that the comparative length of the fingers in the different species of *Upogebia* shows all possible gradations from fingers of equal length to a very abbreviated condition of the

immovable one. He is willing, however, to accept *Gebiopsis* as a sub-genus for those species which are without the small tooth on the antero-lateral margin of the cephalothorax (on a level with the eyes and just over the second antennae). This minute negative characteristic is shared, he says, by the species *nitida*, *darwinii*, *intermedia*, and *isodactyla*, all of which appear to have the fingers of about equal length. But if the absence of one spine justifies the sub-genus *Gebiopsis* for these species, then the presence of three spines would seem to demand another sub-genus for the *Gebia spinifrons* of Haswell, in the description of which we find the "anterior border, below the lateral frontal process, and behind the base of the antennae, with three prominent acute spines." In describing *Gebiopsis intermedia* Dr. de Man speaks of "the equally long fingers" of the chelipeds, but in the figures the immovable finger is much the shorter (J. Linn. Soc. London, v. 22, p. 259, t. 16, f. 6, 7, 1888). Bell in his generic definition of *Gebia* says, "the hand elongate, imperfectly cheliform; the moveable finger large, turning down to the immovable one, which is not half its length," and in his description of "*Gebia stellata*" states that it has "the moveable finger long and slender, extending far beyond the immovable one," but immediately afterwards in his comparative description of "*Gebia deltura*" (which he regards as doubtfully distinct from *G. stellata*) he declares that it has "the fingers more nearly of equal length," and gives a figure in which the right cheliped might fairly well pass for perfectly cheliform. The *Upogebia littoralis* of Risso, which when adult has the tooth on the antero-lateral margin and the chelipeds imperfectly cheliform, is figured by Sars in the first postlarval form without the tooth and with the hands forming "a perfectly normal chela, in that both the fingers are of about the same length." The animal at this stage is, however, only 5 mm. long. But already its mouth-organs show a near approximation to those of the adult *Upogebia*, at least as seen in *Upogebia capensis* (Krauss). These also very closely agree with the figures given in Savigny's Crustacea of Egypt, t. 9, f. 3, for the species which Audouin doubtfully identified with "*Gebia stellata*," but which H. Milne-Edwards thought likely to require a new genus for its reception on the ground that it differed from species of *Gebia* proper by having the fingers of the chelipeds of equal length. As there is no indication in the figure of an antero-lateral tooth, this species will naturally fall to the *Gebiopsis* of Prof. Alphonse Milne-Edwards, if that is upheld either as genus or sub-genus. But there is no reason to expect that the mouth organs will help to strengthen its distinction from the parent genus.

In his account of the first post-larval stage of *Upogebia littoralis*, Sars states that in the second antennae a five-jointed peduncle and a thinner multiarticulate flagellum can be distinguished. At the end of the third joint of the peduncle, he says, there is observable an inconsiderable conical process set off from the joint, which seems to be the last remnant of the antennary scale. In discussing the second antennae of the *Macrura*, Spence Bate, in his Challenger report says, "One thing, however, is invariably constant, that however few the joints of the peduncle may appear, that which supports the scaphocerite is always the second." Judging from Sars' figure (Arch. Naturv., v. 9, t. 5, f. 6), I believe that the rule is not really violated in the young *Upogebia*, and that the process is not on the third joint, but on the second, just as it is shown in Heller's figure of the adult *Upogebia littoralis*, and as it appears in *Upogebia capensis*. Heller says that the peduncle of the second antennae in this genus is composed of five joints, and gives a figure indicating their arrangement. But there is this to notice, that on the outer side the third joint is either not visible or is completely coalesced with the fourth, although on the inner side it forms a triangular lamina in alto-relief and densely fringed with setae, which serve as a sort of brow to the adjacent eye.

In regard to the branchiae, various statements have been made which are not all easy to reconcile with one another and with the facts of the case. H. Milne-Edwards says the branchiae are "en brosse," in two rows, and that there is one above the second maxilliped (pate being no doubt a misprint for pate-mâchoire), and two above the third maxillipeds and four anterior trunk legs, thus reckoning eleven pairs in all. But de Haan and Huxley both state that the pairs of branchiae are ten in number. Moreover Huxley, after explaining that the branchies en brosse of Milne-Edwards may be called trichobranchiae, expressly declares that in *Gebia* and *Callianassa* the gills are phyllobranchiae (Proc. Zool. Soc. London for 1878, pp. 776, 782). Yet the narrow filaments of these gills, in four rows, two rows on each side of the midrib, would better justify the epithet trichobranchiate than those which are found in the Parapaguridae, a family distinguished solely by its trichobranchiate gills. As to the pair of branchiae on the second maxillipeds, I am disposed to think that Milne-Edwards was right, though I cannot speak positively on the point, but I can say for certain that, at least in *Upogebia capensis*, there is a single pair of branchiae pertaining to the fifth pair of trunk-legs, and as they stand apart from and rather further from the centre than the other branchiae, they are easily distinguished.

A singular character of this genus, mentioned by de Haan and by Boas, but by most authors neglected, is that in the male the first pleon segment is without pleopods, whereas it has them in the female, but of a form totally unlike the four following pairs, which are biramous, with the rami very unequal, but both broad and blade-like. The first pair, on the contrary, are uniramous, with a peduncle scarcely free from the segment carrying it, and a cylindrical or almost linear two-jointed ramus, such an appendage as might be expected rather on the male than the female.

A revision of the genus, based on adequate material, may eventually show that seeming discrepancies between various descriptions are due to real differences in the species examined.

UPOGEBIA CAPENSIS (Krauss).

1843. *Gebia major*, var. *capensis*, Krauss, Südafrik Crust., p. 54.
 1892. *Gebia capensis*, Ortmann, Zoologische Jahrbücher, v. 6, p. 54.
 1893. *Gebia capensis*, Ortmann, Decap. u. Schizop. Plankton-Exp., p. 49.

When Krauss wrote, de Haan's remarks on the genus *Gebia* and his figures of *Gebia major* from Japan had been published, but the description of the species did not appear till 1849, at p. 165 of the Fauna Japonica, Crustacea, decas sexta. Krauss was therefore unable to determine whether the form found at the Cape was specifically identical with the Japanese form or distinct from it. By way of compromise he named it as a variety. He was struck by the considerable difference of size suggested by the name of de Haan's species, a difference to which some importance may be allowed when it does not stand alone. *Upogebia major* attains a length of more than three inches and a half, while *Upogebia capensis* does not attain to two and a half. Dr. Ortmann decides that the two species are distinct, but without giving the marks of differentiation. To judge by de Haan's figure the chelipeds in his species have the fifth joint (or wrist) much more strongly dentate on the upper margin than it is in the Cape species, which has a single apical tooth emerging from this hair-clothed border. In the second pair of legs de Haan's species has a strongly denticulate border to the fourth joint, which in the Cape species appears to be free from denticles, though carrying the usual immensely long setae. In the fifth pair of legs the fourth, fifth and sixth joints are in both species approximately equal. The telson

is somewhat differently shaped in the two forms, having in de Haan's figure straight sides, whereas in *Upogebia capensis* the telson is broader in the upper half than in the lower, the diminution in width taking place rather abruptly near the middle. Krauss states that the colour of the Cape species when alive is bluish green, after drying turning reddish-yellow. He found it common in Table Bay, and Dr. Gilchrist informs me that it is very abundant in some of the "Vleis" or salt water lakes of the colony, the specimens sent being from Zwartkops River, Algoa Bay. Stimpson's *Gebia subspinas* from Simon's Bay has the legs of the first three pairs armed near the base with a sharp spine, which is wanting in the species described by Krauss.

FAM. : CRANGONIDAE.

1837. *Crangoniens* (tribe), Milne-Edwards, Hist. Nat. Crust., vol. 2, p. 339.
 1852. *Crangoninae* (sub-fam.), Dana, Proc. Ac. Nat. Sci. Philad., Jan., 1852, p. 15.
 1852. *Crangoninae*, Dana, U.S. Expl. Exp., vol. 13, Crust., pt. 1., p. 532.
 1853. *Crangonidae*, Bell, Brit. Stalk-eyed Crust., p. 255.
 1862. *Crangonidae*, Kinahan, Proc. Royal Irish Acad., vol. 8, part 1, p. 3 (extract).
 1871. *Crangonidae*, Kinahan, Trans. Roy. Irish Acad., vol. 24, p. 57.
 1885. *Crangonidae*, Sars, Norske Nordhavs Exp., Crust., vol. 1, p. 14.
 1888. *Crangonidae*, Bate, Challenger Macrura, Reports, vol. 24, p. 481.
 1890. *Crangonidae*, Ortmann, Zool. Jahrb., vol. 5, part 1, p. 530.
 1890. *Crangonidae*, Sars, Decapodernes Forvandlinger, Arch. Naturv., p. 132.
 1893. *Crangonidae*, Stebbing, Hist. Crust., Intern. Sci. Ser., vol. 74, p. 224.
 1896. *Crangonidae*, Ortmann, Zool. Jahrb., vol. 9, p. 425.

Mandibles simple, without palp; second maxillae and first maxillipeds with the inner plates reduced. First trunk-legs strong, subchelate; second thin, chelate or simple, fifth joint (wrist) undivided, this pair often short and in one genus wholly wanting; third pair slender, simple; fourth and fifth pairs more robust, simple. Pleopods two-branched; tail-fan well developed.

Dr. Ortmann adds to the above characters that there are no epipods and exopods on the trunk-legs, and that the rostrum is generally short and flat. There is, however, a small exopod on the first trunk-legs in *Ægeon cataphractus* and some other species. In my History of Crustacea I have followed Spence Bate in saying that "the second maxillipeds end in a rudimentary sixth joint, and the third pair have neither the sixth nor the seventh joint." Spence Bate's own expressions are, "First pair of gnathopoda without a dactylos, and the propodos reduced to a rudimentary condition. Second pair having neither dactylos nor propodos." I am now far from thinking this a correct interpretation of the phenomena. In the second maxillipeds (first gnathopoda) the short strongly spined terminal joint no doubt represents the true seventh. It may be difficult to determine the boundaries of the basal joints, but the three terminal are marked off by the customary flexure. In like manner in the third maxillipeds it is clear that the geniculation occurs between the fourth and fifth joints, and in all probability the sixth joint which is much longer than the fifth represents a coalescence of the sixth and seventh joints. It must, however, be remarked that in *Sclerocrangon* Sars has discovered a minute terminal joint, as Krøyer had earlier done in his *Crangon nanus*, and it is therefore possible that in other genera this dwindled representative of the seventh joint may have vanished altogether, leaving the maxillipeds to end with the sixth. The geniculation referred to is, at any rate sometimes, very pronounced in *Ægeon*, and, independently of it, Bate's description of the third maxillipeds in his own genus *Pontocaris* agrees with the view here set forth and is inconsistent with his definition of the family.

It happens that Dr. Ortmann makes no mention of *Pontocaris*, and that Bate takes no notice of *Ægeon*. But specimens from the Cape so minutely agree with Heller's tolerably full description of *Ægeon cataphractus* (Olivi), and at the same time differ so little from Bate's two species of *Pontocaris*, that I feel no hesitation in making that genus a synonym of *Ægeon*.

The genus *Rhynchocinetes*, Milne-Edwards, included among the Crangonidae in my History of Crustacea, should be removed, since it has an articulated rostrum and a palp to the mandibles. Dr. Ortmann has established a family Rhynchocinetidae. The genus *Nika*, Risso, included in the Crangonidae by Sars, should be called *Processa*, Leach, and referred to the family Processidae, Ortmann, 1896.

Cheraphilus, Kinahan, 1862, at its institution not only included the type species of *Pontophilus*, Leach, 1817, but was

expressly stated to be in substitution for that name, which Kinahan supposed to have lapsed. Since *Pontophilus* is now upheld it is evident that *Cheraphilus* itself must lapse, and the species which have been referred to it, *Crangon nanus*, Kröyer; *C. echinulatus*, M. Sars; and *C. neglectus*, G. O. Sars, may be placed under the new generic name *Philocheras*, which has the accent on the ante-penultimate syllable.

The name *Egeon*, Risso, 1816, was preoccupied, and perhaps for that reason it occurs in the altered form *Ægeon* in the writings of Guérin-Méneville, 1835; Kinahan, 1862; Ortmann, 1890. The two latter authors draw a very fine distinction between this genus and *Pontophilus*, namely, that the latter has the rostrum pointed or somewhat rounded, while in *Ægeon* it is broadly truncate or emarginate. This distinction is untenable if I am right in considering that *Pontocaris* is a synonym of *Ægeon*, for in Bate's genus the rostrum is emarginate in one species and pointed in the other. According to Bate the branchial formula of *Pontocaris* differs from that of *Pontophilus* by not including a rudimentary mastigobranchia on the third maxillipeds. He also points out the interesting distinction that in *Pontocaris* "the inferior extremity of each branchial plume is thrown forwards," which I have verified in the case of *Ægeon cataphractus*, whereas in *Crangon* and *Pontophilus* the extremity is directed backwards. Whether Bate's definition of *Pontophilus* is based on any examination of the type species is left uncertain in his "Challenger" report. He makes a reference, but a wrong one, to the work in which the genus was instituted. In his revision of "The Crustacea in Couch's Cornish Fauna," 1878, he speaks of having frequently taken the type species in question, and there calls it *Crangon spinosus*. Sars, in his Essay on the Metamorphoses of the Crangonidae, notes that *Pontophilus* has six pairs of well developed branchiæ, and a rudimentary pair, as distinguished from *Crangon* and *Cheraphilus*, in which there are only five pairs of branchiæ. He further shows that between the larval forms there are some very striking differences, the telson for instance in *Crangon* and *Cheraphilus* being broadly truncate, but in *Pontophilus* variously bifid.

Sars also shows that in the larval forms of the Crangonidae the mandibles have both molar and dentate cutting edge. According to Spence Bate and Ortmann it is the cutting edge that disappears in the adult and the molar that remains. But it seems more natural to suppose that the dentate apex of the adult mandible represents the cutting edge, and that the molar has disappeared, as in many other crustaceans it undoubtedly does.

In the present state of knowledge the following table may suffice to discriminate the genera of this family:—

- | | | | |
|----|---|---|---|
| 1. | } | Second pair of trunk-legs wanting. | 1. <i>Paracrangon</i> , Dana, 1852. |
| | | Second pair of trunk-legs present, 2. | |
| 2. | } | Second pair of trunk-legs simple. | 2. <i>Sabinea</i> , Owen, 1835. |
| | | Second pair of trunk-legs chelate, 3. | |
| 3. | } | Fourth and fifth pairs of trunk-legs, seventh joint laminar. | 3. <i>Argis</i> , Kröyer, 1843. |
| | | Fourth and fifth pairs of trunk-legs, seventh joint not laminar, 4. | |
| 4. | } | Second trunk-legs subequal in length to the rest, 5. | |
| | | Second trunk-legs much shorter than the rest, 6. | |
| 5. | } | Body dorsally little or not at all sculptured. | 4. <i>Crangon</i> , Fabricius, 1798. |
| | | Body dorsally strongly sculptured. | 5. <i>Sclerocrangon</i> , Sars, 1882. |
| 6. | } | With only five pairs of branchiae. | 6. <i>Philócheras</i> , n.n. |
| | | With more than five pairs of branchiae, 7. | |
| 7. | } | Apices of branchiae turned backward. | 7. <i>Pontóphilus</i> , Leach, 1817. |
| | | Apices of branchiae turned forward. | 8. <i>Ægeon</i> , Guérin-Méneville, 1835. |

GEN. : ÆGEON, Guérin-Méneville.

1816. *Egeon*, Risso, Hist. Nat. Crust. de Nice, p. 99.
 1825. *Egeon* (part), Desmarest, Consid. gén. Crust., p. 218.
 1826. *Egeon*, Risso, Hist. Nat. Europe mérid., vol. 5, p. 64.
 1835. *Ægeon*, Guérin-Méneville, Exp. Sci. Morée.
 1837. *Crangon* (part), Milne-Edwards, Hist. Nat. Crust.,
 vol. 2, p. 340.
 1862. *Ægeon*, Kinahan, Proc. Roy. Irish Acad., vol. 8,
 part 1, p. 9.
 1863. *Crangon* (part), Heller, Crust. Südl. Europa, p. 224.
 1881. *Crangon* (*Cheraphilus*), Miers, Ann. Nat. Hist., Ser. 5,
 vol. 8, p. 365.
 1885. *Ægeon*, Carus, Prodr. Faunae Mediterraneae, vol. 1,
 p. 483.
 1888. *Pontocaris*, Bate, Challenger Macrura, Reports, vol.
 24, p. 495.
 1890. *Ægeon*, Ortmann, Zool. Jahrb., vol. 5, part 1, p. 530.
 1893. *Egeon*, Stebbing, Hist. Crust., Intern. Sci. Ser.,
 vol. 74, p. 226.

How many species may properly be referred to this genus does not appear to have been yet determined by any full and accurate examination, nor have I the materials for deciding. In addition to the characters mentioned in the discussion of the family given above, Bate mentions that in his two species of *Pontocaris* the rostrum is short, not longer than the eye-stalks, that the exopod of the second antennæ is short and broad, that the first trunk-legs have a small one-jointed exopod, that the pleopods are broad and foliaceous, and that the outer branch of the uropods has no diæresis. All these characters belong also to *Ægeon cataphractus*. In the latter, and apparently also in the other two species, the longer inner flagellum of the first antennæ is except at the distal part greatly widened in the male, but not in the female.

ÆGEON CATAPHRACTUS (Oliv.)

1792. *Cancer cataphractus*, Oliv., Zoologia adriatica, p. 50, pl. 3, f. 1.
 1816. *Egeon loricatus*, Risso, Crust. de Nice, p. 100.
 1826. *Egeon loricatus*, Risso, Hist. Nat. Europe Mérid., vol. 5, pl. 1, f. 3.
 1837. *Crangon cataphractus*, Milne-Edwards, Hist. Nat. Crust., vol. 2, p. 343.
 1839. *Crangon cataphractus*, Milne-Edwards, Règne Animal, Ed. illustr., pl. 51, f. 3.
 1849. *Crangon cataphractus*, Lucas, Expl. Sci. Algérie, Crust., p. 39.
 1862. *Crangon cataphractus*, Heller, Crust. Südl. Europa, p. 230, pl. 7, f. 12-15.
 1869. *Crangon cataphractus*, Nardo, Mem. R. Ist. Veneto, vol. 14, p. 237.
 1881. *Crangon (Cheraphilus) cataphractus*, Miers, Ann. Nat. Hist., Ser. 5, vol. 8, p. 365.
 1885. *Crangon cataphractus*, Carus, Prodr. Faunae Mediterraneae, p. 482.
 1890. *Ægeon cataphractus*, Ortmann, Zool. Jahrb., vol. 5, part 1, p. 535.

This species is easily distinguished from the *Pontocaris propensalata* and *Pontocaris pennata* of Bate, because of the seven carinae on the carapace, the central one is formed of only four or five teeth, while in those species it is composed of nine teeth, of which the hinder ones are comparatively small. *Ægeon nennatus*, unlike the other two, has the fronto-lateral angles of the carapace strongly produced into oblique processes, and *Ægeon propensalatus* has an acute rostrum instead of the emarginate one found in *Ægeon cataphractus* and at least in one specimen of *Ægeon pennatus*.

Aegeon cataphractus is said to be common in the Mediterranean, at a distance from the shore, and in depths of 20-30 fathoms. Miers reports it "with scarcely any doubt," from Goree Island, Senegambia. Its range is now extended to the Cape. The specimens, two of which measured each an inch and three-tenths or about 33 mm, were taken "between Cove Rock and Hood Point near East London, 33° 5' 45" S., 27° 52' 45" E., by shrimp-trawl, at 40 fathoms depth, on bottom of sand, shells and mud."

ISPODA.

FAM. : IDOTEIDAE.

1829. *Idoteides* (part), Leach in Latreille, Règne Animal, Cuvier, v. 4, p. 138.
 1840. *Idoteides* (part), Milne-Edwards, Hist. Nat. Crust., v. 3, p. 121.
 1843. *Idoteidea*, Krauss, Südafrik. Crust., p. 61.
 1852. *Idoteidae*, Dana, Amer. Journ. Sci., Ser. 2, v. 14, p. 300.
 1853. *Idoteidae*, Dana, U. S. Expl. Exp., v. 13, Crust., pp. 697, 1436.
 1867. *Idoteidae*, Bate and Westwood, Brit. Sess. Crust., v. 2, p. 375.
 1876. *Idoteidae*, Miers, Catal. New Zealand Crust., p. 91.
 1880. *Idoteidae*, Harger, U.S. Fish and Fisheries Report for 1878, pt. 6, p. 335.
 1881. *Idoteidae*, Miers, J. Linn. Soc. London, v. 16, p. 4.
 1893. *Idoteidae*, Stebbing, History of Crustacea, p. 372.
 1894-5. *Idoteidae*, Dollfus, Feuille des Jeunes Naturalistes, Ser. 3, Année 25, No. 289, p. 1, No. 292, p. 1.
 1897. *Idotheidae*, Sars, Crustacea of Norway, v. 2, p. 78.
 1897. *Idotheidae*, Sars, Caspian Crustacea, Annuaire Mus. Zool. Ac. Impér. St. Pétersbourg, Extr. p. 21.
 1899. *Idoteidae*, Harriet Richardson, Pr. U.S. Mus., v. 21, p. 842.

The typical genus was called *Idotea* by J. C. Fabricius when he instituted it in 1798 in his Supplementum, p. 302. An index to the Supplementum, published in 1799, gives the name as *Idothea*. The older spelling is also the one that has been the more generally adopted.

Notwithstanding the strong resemblance outwardly among species of this family, authors have found it expedient to distribute them over several genera. As usually happens when superficial likeness is striking the separation of similar forms has not met with universal acceptance, and some of the genera have been discarded as needless. But renewed

investigation has brought several of them to life again, and in this process the pleon, which at first glance would not seem likely to offer differentiating characters of generic value, has been latterly made to play an important part.

Though the pleon throughout the family is dorsally very compact, and in some species has all its segments coalesced, there are many in which the segmentation is not entirely neglected. The dividing line may either be dorsally complete or limited to the sides, or dorsally expressed but laterally incomplete. In *Stenosoma*, Leach, and *Erichsonia*, Dana, there are no such dividing lines. In *Epelys*, Dana, and *Synidotea*, Harger, there are the lateral rudiments of one line. A new genus, *Paridotea*, has one line and lateral rudiments of two others. In *Idotea*, Fabricius, sensu strictiore, there are two lines and one pair of lateral rudiments. The same seems to be the case with *Cleantis*, Dana, according to his account of the type species, but in the figure three lines are shown in addition to the pair of rudiments. In *Edotia*, Guérin-Méneville, there are three lines. In *Zenobiana*, Stebbing (n.n., 1895, for *Zenobia*, Risso, 1826, pre-occupied), there are three lines and one pair of lateral rudiments. In *Chiridotea*, Harger, there are three lines, with (or without) one or two dorsal rudiments. In *Glyptonotus*, Eights, there are four lines.

It is at once obvious that the character in question is not sufficient by itself for the delimitation of the genera, and it is still uncertain whether it can conveniently be allowed anything more than specific value, when all members of the family are taken into consideration. In the genus *Cleantis*, for example, its use will be completely nullified, if we accept the extension given to that genus by Mr. E. J. Miers, who includes in his generic definition a pleon "with all the segments coalescent, or composed of two to five distinct segments." But so wide or loose a characteristic seems more proper to the definition of the family than of a single genus. Suitably used, the segmentation of the pleon may prove a very serviceable adjunct to other generic characters, among which may be mentioned the extent and number of the side-plates in the peraeon, the one-jointed or many-jointed flagellum of the second antennae, the number of distinct joints in the maxillipeds, and the presence or absence of the second branch of the opercular uropods.

PARIDOTEA, n.g.

Side-plates of second and third peraeon segments not reaching to the end of the respective segments. Pleon with one short basal segment and lateral divisions indicating

second and third. Second antennae with many-jointed flagellum. Maxillipeds six-jointed, ultimate joint oval, very much smaller than the penultimate. Uropods without a second ramus.

PARIDOTEA UNGULATA (Pallas).

1772. *Oniscus unguulatus*, Pallas, Spicil. Zool., Fasc. 9, p. 62, t. 4, f. 11.
 1818. *Idotea unguulata*, Lamarck, Hist. Anim. sans Vertèbres, v. 5, p. 160.
 1836? *Idotea Edwardsii*, Guérin-Méneville, Iconographie, Crust., p. 33 (without figure).
 1840. *Idotea Lalandii*, Milne-Edwards, Hist. Nat. Crust., v. 3, p. 132, t. 31, f. 7.
 1840. *Idotea affinis*, Milne-Edwards, Hist. Nat. Crust., v. 3, p. 133.
 1843. *Idotea Lalandii*, Krauss, Südafrik. Crust., p. 61.
 1843. *Idotea affinis*, Krauss, Südafrik. Crust., p. 61.
 1861. *Idotea nitida*, Heller, Verhandl. Zool.-bot. Vereins Wien, p. 497.
 1868. *Idotea nitida*, Heller, Reise der Novara, p. 131, t. 12, f. 1.
 1868. *Idotea affinis*, Heller, Reise der Novara, p. 130.
 1876. *Idotea affinis*, Miers, Catal. New Zealand Crust., p. 93.
 1879. *Idotea affinis*, Thomson, Trans. New Zealand Inst., v. 11, p. 232.
 1881. *Idotea unguulata*, Miers, J. Linn. Soc. London, v. 16, p. 52.

There is good reason to think that the above synonymy supplied by Miers in his careful discussion of this species is thoroughly trustworthy. Miers examined the types of *Idotea Lalandii* from the Cape in the Paris collection, so that Milne-Edwards evidently used a misleading expression in saying that the side-plates were of the same form as in *Idotea tricuspidata*, because in that species those of the second and third peraeon segments are as long as the segments. In describing the colour as blackish and figuring the animal as of a deep purplish black, Milne-Edwards may be supposed to have had in view an abnormally coloured specimen, since none of the other authors make mention of this funereal hue. Krauss gives the colour of *Idotea affinis* as yellowish green with blackish dots. Heller describes the same species as greyish green with the side-plates somewhat lighter, and for his *Idotea nitida* says that the colour of the body is grey, finely dotted with black, flecked with brownish red, the pleon somewhat darker; the legs, especially towards their end, with

a brownish red flush. The specimens in formalin sent me from the Cape correspond well with the colour description of *Idotea affinis* given by Krauss and Heller, the general effect being a dark appearance dorsally.

As the species has been carefully and accurately described by Mr. Miers, it is unnecessary to repeat what can be found in his important work on the Idoteidae. It may, however, be mentioned that the eyes are irregularly round and somewhat prominent, and that there is a rather conspicuous spine on the inner margin of the penultimate (sixth) joint of the peraeopods a little above the middle. In the large dredged specimens the fourth, fifth, and sixth joints of both gnathopods and first four peraeopods are thickly coated with hair on the inner margin, while in the longer fifth peraeopods the fifth and sixth joints are almost smooth, but in the smaller beach specimens sent me all the peraeopods have the joints in question comparatively smooth, and thus show the marginal spine of the sixth joint much more distinctly than is the case in the larger specimens.

No description appears to have been given of the mouth-organs of this species, but Milne-Edwards has supplied a figure of one of the mandibles and of the maxillipeds. The epistome, or that part of it distinguished by Dollfus as the mesepistome, has the usual conical prominence above or forward, and is produced below or backward so as to flank on either side the transversely oval labrum or upper lip. The two lobes of the lower lip are roughly rotundo-quadrate, converging below. The left mandible has a straight trunk, the cutting plate horny in appearance, divided into three or four broad teeth, the secondary plate having three strong teeth, the spine-row about five slender serrate spines; the molar is strong and prominent, with an accessory brush of setae; above the molar there is a process, near the point at which the palp might be expected, were it present. The right mandible has the trunk geniculate, the teeth of the cutting-plate more tooth-like, the secondary plate with about four slender teeth; there is also a marginal tuft of hairs to the rear of the molar, but these may be present though not observed, also on the other mandible. The first maxillae have six strongly plumose setae on the narrow inner plate and ten stout apical spines on the outer. The three plates of the second maxillae are approximately equal in breadth. In the maxillipeds the epipod is slightly narrowed distally, with a rounded apex turned in upon the first joint of the palp; the narrowly oblong plate which surmounts the long second joint of the stem has on and near the apex several spines and plumose spiniform setae, and also on the inner margin near

the base three spines standing out at right angles to the margin, the lowest one straight, the other two rather larger and apically knobbed or hooked; of the four-jointed palp the first joint is very short, the second not very long but distally very wide, overlapping the base of the next joint on the outer side with a narrow point, on the inner with a broad fringed lobe; the third joint is the longest, fringed on the inner margin, widening almost abruptly from the base, its distal margin truncate, much wider than the rounded oval, small, partially fringed, fourth joint.

Of the specimens sent me from the Cape two were dredged in Table Bay, and measured respectively 48 and 51 mm., two from Woodstock Beach, Table Bay, measured 39 and 40 mm. The range of the species includes the Indian Ocean, New Zealand, South Australia, Auckland, Chili, Rio Janeiro, as well as the Cape of Good Hope.

FAM. : CYMOTHOIDAE.

1867. *Cymothoidae*, Bate and Westwood, British Sessile-eyed Crustacea, v. 2, p. 274.
 1880. *Cymothoidae*, Harger, U.S. Fish and Fisheries Report, Pt. 6 for 1878, p. 390.
 1890. *Cymothoidae*, Hansen, "Cirolanidae," Vidensk. Selsk., Ser. 6, Naturv. Afd., v. 3, pp. 316, 406.
 1893. *Cymothoidae*, Stebbing, History of Crustacea, p. 340.
 1897. *Cymothoidae*, Sars, Crustacea of Norway, v. 2, p. 67.
 1899. *Cymothoidae*, H. Richardson, Pr. U.S. Mus., v. 21, p. 828.

The genus *Cymothoa*, established by Fabricius in 1793, covered a very miscellaneous group of forms. In 1818 Leach (Dict. Sci. Nat., v. 12, p. 339) instituted the family Cymothoadae (see also Desmarest, Consid. gén Crustacés, p. 292, 1825). From this in 1840 Milne-Edwards (Hist. Nat. Crust., v. 3, p. 226) removed the Sphaeromidae and *Limnoria*, and established the Famille des Cymothoadiens, including three tribes, of which the first contained only the genus *Serolis*, the other two, the errant and the parasitic, corresponding respectively to the Ægidæ and the Cymothoidæ of Bate and Westwood. Carus in 1885 (Prodromus Faunae Mediterraneae, v. 1, p. 436) retains the family Cymothoidæ of Milne-Edwards, as Krauss had done in 1843, Krauss, however, calling it Cymothoidea. Dana in 1853, under a sub-tribe Cymothoidea, includes three families, Cymothoidæ, Ægidæ, Spheromidae. In their Monograph of the Cymothoae, 1879-1884, Schiödte and Meinert recognize four

families, Ægididae, Anilocridae, Saophridae and Cymothoidae, excluding from the group the genera which were subsequently included by Hansen in the families Cirolanidae, Corallanidae, Alcionidae and Barybrotidae. Hansen in 1890 makes the Cymothoid group consist of six families, the four just mentioned and the Ægididae and Cymothoidae, but it must be observed that the Cymothoidae of Hansen includes the Anilocridae and Saophridae as well as the Cymothoidae of Schiödte and Meinert. Thus it will be seen that the family Cymothoidae, with some variations in the spelling of the name, has also had a diversified career, being sometimes restricted and sometimes extended, so that nothing like general agreement has yet been reached as to its limits. Hansen distinguishes it from the Ægididae by the mandibles being without accessory plate and with the first joint of the palp inflated, and by the maxillipeds being always four-jointed, with the last joint rather long and narrow and sub-acute, and adds that the adolescent or adult animals of this family may be further distinguished from the Ægididae by the following characters:—both pairs of antennae having the peduncle in general scarcely or not defined from the flagellum; all the pleopods with bare rami; terminal segment with bare margin; uropods with margin of the rami bare at least in the female; the animals hermaphrodite.

GEN : ANILOCRA, Leach.

1818. *Anilocra*, Leach, Dict. Sci. Nat., v. 12, p. 350.
 1818. *Canolira*, Leach, Dict. Sci. Nat., v. 12, p. 350.
 1825. *Anilocra*, Desmarest, Consid. gén. Crust., p. 306.
 1829. *Canolira*, Latreille, Règne Animal, Cuvier, v. 4,
 p. 134.
 1840. *Anilocra*, Milne-Edwards, Hist. Nat. Crust., v. 3,
 p. 255.
 1853. *Anilocra*, Dana, U.S. Expl. Exp., Crust., v. 13, p. 747.
 1870. *Epichthys*, Herklots, Arch. Néerland., v. 5, p. 122.
 1881. *Anilocra*, Schiödte and Meinert, Mon. Cymothoarum,
 Naturh. Tidsskr., ser. 3, v. 13, p. 100.
 1893. *Anilocra*, Stebbing, History of Crustacea, p. 352.

From the other genera assigned by Schiödte and Meinert to their family Anilocridae, this genus is distinguished by the rounded or sub-truncate cuneiform front of the head, while the Anilocridae in general are distinguished from the Saophridae and Cymothoidae of the same authors by having the peduncle of the uropods produced into a long inner spine.

ANILOCRA CAPENSIS, Leach.

1818. *Anilocra capensis*, Leach, Dict. Sci. Nat., v. 12, p. 350.
 1825. *Anilocra capensis*, Desmarest, Consid. gén. Crust.,
 p. 306, t. 48, f. 1.
 1829. *Canolira du Cap*, Latreille, Règne Animal, Cuvier,
 v. 4, p. 134.
 1836? *Canolira capensis*, Guérin-Méneville, Iconographie,
 Crust., t. 29, f. 5.
 1840. *Anilocra capensis*, Milne-Edwards, Hist. Nat. Crust.,
 v. 3, p. 258.
 1843. *Anilocra capensis*, Krauss, Südafrik. Crust., p. 66.
 1881. *Anilocra capensis*, Schiödte and Meinert, Mon.
 Cymoth., Naturh. Tidsskr., Ser 3, v. 13, pp. 103, 146,
 t. 10 (17), f. 4.

From the other species of the genus this is distinguished by the following combination of characters, that the first antennae are straight, not geniculate, the first free joint of the limbs is not carinate; the inner branch of the uropods is much shorter than the outer; and the front of the head is strongly produced and roundly truncate. Of these four characters the first three are common to *A. physodes*, *A. frontalis*, and *A. plebeia*, and of these *A. frontalis* has the same frontal character in the adult male but not in the ovigerous female, and *A. physodes* has the front in the ovigerous female rounded truncate but not strongly produced. The latter species and *A. capensis* attain a very much greater size than the other two, In *A. capensis* the eyes are sub-oval, while in *A. physodes* they are described as sub-pentagonal.

According to Leach's original description, the terminal segment abruptly narrows beyond its middle, and is feebly rounded and almost carinate. Schiödte and Meinert speak of the body as being slightly twisted to the right or the left. The specimen sent me is symmetrical, and has the terminal segment feebly carinate, apically well rounded, with no abrupt narrowing. The length is 53 m.m. Leach describes the colour as brown with an inclination to olive-green or grey, and testaceous or whitish hind margins to the segments.

Habitat. Simon's Bay, Cape of Good Hope. Specimens are recorded from Java and Teneriffe.

GEN.: MEINERTIA, Stebbing.

1883. *Ceratothoa* (not Dana, 1853), Schiödte and Meinert,
 Mon. Cymothoarum, Naturhistorisk Tidsskrift, Ser.
 3, v. 13, pp. 289, 322.
 1893. *Meinertia*, Stebbing, History of Crustacea, p. 354.

Schiödte and Meinert distinguished a new genus *Glossobius* in 1883 from another new genus *Emetha* and Dana's *Ceratothoa* by the character that in *Glossobius* the fingers are unequal, those of the third pair being the largest, whereas in the other genera the fingers are equal or sub-equal. But in this arrangement the only two species which Dana had assigned to his *Ceratothoa* were transferred to *Glossobius*, so that obviously *Glossobius* is a synonym of *Ceratothoa*, Dana, and the eleven species assigned by Schiödte and Meinert to their *Ceratothoa*, together with *Ceratothoa deplanata*, Bovallius, 1885, will be properly grouped under the generic name *Meinertia*. The *Ceratothoa lineata* of Miers, 1876, does not appear to be noticed in the Danish Monograph. It was founded on "a single specimen, probably young," which in the opinion of the author himself "ought perhaps to be referred to the genus *Cymothoa*" For the present, therefore, it may be left out of account.

MEINERTIA IMBRICATA (J. C. Fabricius).

1787. *Oniscus imbricatus*, Fabricius, Mantissa Insectorum, v. 1, p. 241.
 1793. *Cymothoa imbricata*, Fabricius, Entom. Syst., v. 2, p. 503.
 1798. *Cymothoa imbricata*, Fabricius, Supplementum, p. 304.
 1818. *Cymothoa Banksii*, Leach, Dict. Sci. Nat., v. 12, p. 353.
 1835. *Cymothoa trigonocephala*, Milne-Edwards, Ann. Sci. Nat., Ser. 2, v. 3, t. 14, f. 1, 2.
 1836? *Cymothoa trigonocephala*, Guérin-Ménéville, Iconographie, Crust., t. 29, f. 2.
 1839? *Cymothoa trigonocephala*, Milne-Edwards, Règne Animal, Ed. illust., Crust., t. 65, f. 2.
 1840. *Cymothoa Banksii*, Milne-Edwards, Hist. Nat. Crust., v. 3, p. 273.
 1876. *Ceratothoa Banksii*, Miers, Catal. Crust., New Zealand, p. 105.
 1883. *Ceratothoa Banksii*, Schiödte and Meinert, Mon. Cymoth., Naturh. Tidsskr., Ser. 3, v. 13, p. 340, t. 14 (21), f. 6-21.
 1884. *Ceratothoa imbricata*, Miers, Zool. Coll. H. M. S. "Alert," p. 300.
 1890. *Ceratothoa Banksii*, Hansen, Cirolanidae, p. 68 (304), t. 10, f. 4.
 1893. *Meinertia imbricatus*, Stebbing, History of Crustacea, p. 354.

Schiödte and Meinert divide the genus into three groups, respectively with the peraeon carinate, flattened or convex. The last group is sub-divided into those with the front angles of the first segment carinate, and those with the angles not

carinate. Of the latter some have the front of the head acute or sub-acute, but two, *Gaudichaudii* and *imbricata* have the front obtuse. *M. Gaudichaudii* in the ovigerous female has the sides of the head broadly rounded, the eyes sub-rotund, the inner ramus of the uropods falcate. *M. imbricata* of that sex and condition has the sides of the head emarginate, the eyes rhomboidal, the inner ramus often a little flexuous. From *M. trigonocephala* (of Schiödte and Meinert), in which the front of the head is sub-acute, *M. imbricata* is further distinguished by having the front margin of the first pereon segment nearly straight instead of conspicuously bisinuate. But Miers, who carefully investigated the synonymy, thinks it not improbable that the original *C. trigonocephala*, Leach, ought to be regarded as a synonym of *M. imbricata*, and definitely includes in the synonymy as well the species which Heller names *Ceratothoa Banksii* (Reise der Novara, Crust., p. 148) as that which on the same page Heller describes as *C. trigonocephala*.

The female attains a length of 57 mm.

The species is recorded from the Indian Ocean, Java, New Zealand, Australia and the Cape.

Specimens sent me from the Cape were "from mouth of fish, Kalk Bay," with the note that the species is "a crustacean common in the mouth and gill cavity of the fish here."

The discussion of the mouth-organs of this species in Hansen's "Cirrolanidae" will be found especially valuable.

COPEPODA PARASITICA.

GEN. : SPHYRION, Cuvier.

1830. "Les Sphyrions," Cuvier, Le Règne Animal, v. 3, p. 257.
- 1829-43. *Sphyrion*, Guérin-Méneville, Iconographie du Règne Animal, Zoophytes, p. 11.
1840. *Sphyrion*, Milne-Edwards, Hist. Nat. des Crustacés, v. 3, p. 525.
1845. *Lestes*, Krøyer, Danmarks Fiske, v. 2, p. 517.
1861. *Sphyrion*, Steenstrup and Lütken, Kong. Danske Vid. Selsk. Skrifter, Ser. 5, v. 5. Snyltekrebs og Lernaer, p. 347 (7), 432 (92).
1864. *Lesteira*, Krøyer, Naturhistorisk Tidsskrift, Ser. 3, v. 2, pt. 3, p. 402.
1868. *Lesteira*, Heller, Reise der Novara, Crust., p. 228.
1890. *Lesteira*, G. M. Thomson, Trans. New Zealand Institute, v. 22, p. 370.
1899. *Sphyrion*, Bassett-Smith, Pr. Zool. Soc. London, pp. 441, 488.

In adult female cephalothorax transversely expanded, connected by a very narrow, smooth, cylindrical "neck" with a large and smooth, somewhat bulb-like genital segment, which carries behind two large clusters of tubules and two long and narrow ovisacs; the mouth very small, and apart from its obscure constituents no appendages present on the head or trunk. Male unknown. Young with eight pairs of appendages.

The generic name is obviously derived from *σφύριον*, a little hammer. Cuvier, founding the genus upon the "*Chondracanthe lisse*" of Quoy and Gaimard, defines *Sphyrion* as having "la tête élargie des deux côtés, comme un marteau, de petits crochets à la bouche, un cou mince, suivi d'un corps déprimé et en forme de coeur, qui, outre les deux longs cordons, porte de chaque côté un gros faisceau de poils." There is little fault to be found with this definition, except that the word "poils" is inappropriate to the blunt-ended, often bifid and trifid, branchlets, which in two great bunches are appended to the genital segment, probably with a branchial function.

SPHYRION LAEVIGATUM, Guérin-Méneville.

PLATE 4.

1824. *Chondracanthe lisse*, Quoy et Gaimard, in Freycinet's Voyage autour du Monde, Zoologie, Atlas, pl. 86, fig. 10.
1830. *Sphyrion lisse*, Cuvier, Le Règne Animal, Zoophytes (Intestinaux cavitaires), vol. 3, p. 257.
- 1829-43. *Sphyrion laevigatus*, Guérin-Méneville, Iconographie du Règne Animal, Zoophytes, p. 11, pl. 9, fig. 4.
1840. *Sphyrion laevigatus*, Milne-Edwards, Hist. nat. des Crustacés, vol. 3, p. 526.
- 1836-49. "*Sphyrion levigatus*, Cuv." Le Règne Animal, Edit. illustrée, Zoophytes (Intestinaux, Cavitaires), p. 62, 63, pl. 32, fig. 4, 4a.
1869. *Sphyrion laevis*, Steenstrup, Oversigt Vidensk. selsk. Kjöbenhavn, p. 202, pl. 2, fig. 4a, 4b.
1890. *Lesteira kroyeri*, G. M. Thomson, Trans. New Zealand Institute, vol. 22, p. 370, pl. 28, f. 4, 4a.
1899. *Sphyrion laevigatum*, Bassett-Smith, Pr. Zool. Soc. London, p. 489.

The soft cephalothorax which is wholly embedded in the tissues of the host is in this species distinguished by its great width, being not as in *Sphyrion lumpi* (Kröyer) narrower, but much wider than the genital segment. It is also very nodulose and somewhat variably so, the extremities in Thomson's New Zealand specimen being simply rounded.

but in that of the Cape forming three nodules. On the front margin of the upper side are two very prominent bosses, one of which in the Cape specimen has a subsidiary nodulè at its base. On the hind margin of this same side are two much smaller bosses, much closer together. Between the front points there is a shallow quadrilobate process, and just below this projects the minute mouth, consisting presumably of upper and lower lips and rudimentary mandibles. Of anything like antennae I see no trace either in Thomson's figure or in the Cape specimen.

From the middle of the under side of the great cephalothoracic expansion starts the smooth narrow chitinous "neck," which has a smaller relative length than in *Sphyrion lumpi*, but which cannot perhaps be depended upon as affording a specific character by its dimensions, there being in my opinion reason to suppose that it varies with the age and size of the specimen, becoming relatively smaller as the specimen grows larger.

In Quoy and Gaimard's figure this section of the animal is very elongate, but very short in the figure given by Guérin-Méneville.

The genital segment, which also has a firm smooth integument, is broader than long, and longer than thick. The upper and lateral margins are curved, the hinder is almost straight, with a slight median projection, explained as the rudimentary tail part. On either side of the latter are bunches of vesicles, which in the Cape specimen together exceed the size of the genital segment itself. The ovisacs are long and narrow, containing several rows of minute eggs.

The Cape specimen is rather less than two inches long, 47 mm., the head 30 mm. wide. Thomson's New Zealand specimen "taken from the abdomen of a ling (*Genypterus blacodes*)" was about 70 mm. long, with the head 59 mm. wide. In both specimens the neck measured 12 mm. Krøyer's *Sphyrion lumpi* was found burrowing in the tail fin of a *Cyclopterus lumpus* from Iceland. It was two inches long. The difference in the proportional sizes of its parts, the much less nodulose head, the very "elongate neck," and the northern habitat, make it at least possible that it may be a distinct species.

In 1871 (Tr. Linn. Soc. London, v. 27, p. 501, t. 59, fig. 12), a third species was described by Dr. R. O. Cunningham, M.D., F.L.S., under the name *Sphyrion Kingi*. The specimens were taken from the gills of fish, on the East Coast of Patagonia. The head is very distinctly nodulose and the "neck" extremely short. But it is still an open question whether either this or Krøyer's species should be upheld as specifically distinct from *laevigatum*.

It may be noted that Quoy and Gaimard and Cuvier only give the specific name "*lisse*" in French, Guérin-Méneville being the first to give the the Latin *laevigatus*, so that to him the name of the species must be attributed. Milne-Edwards in 1840 refers to the part of the "Iconographie" here in question, thus showing that that work antedates his own.

CIRRIPEDIA.

FAM. : BALANIDAE.

GEN. : TUBICINELLA, Lamarck.

1802. *Tubicinella*, Lamarck, Annales du Museum, vol. 1.
 1824. *Coronula*, de Blainville, Dict. Sciences Nat., vol. 32.
 1854. *Tubicinella*, Darwin, Monograph of the Cirripedia (Ray Soc.), vol. 2, p. 430.

"Compartments six, of equal size; shell sub-cylindrical, wider at the top than at the basis, belted by several large transverse ridges" (Darwin).

TUBICINELLA TRACHEALIS (Shaw).

1802. *Tubicinella major et minor*, Lamarck, Ann. Mus., vol. 1, pl. 30, f. 1-2.
 1806? *Lepas trachealis*, Shaw, Nat. Miscell. (1789-1813), vol. 17, pl. 726.
 1815. *Lepas tracheaeformis*, Wood, General Conchology, pl. 4, f. 1-3.
 1818. *Tubicinella balaenarum*, Lamarck, Anim. sans Vertèbres.
 1824. *Tubicinella Lamarckii*, Leach, Encycl. Brit., Suppl., v. 3, pl. 57.
 1824. *Coronula tubicinella*, de Blainville, Dict. Sciences Nat., vol. 32, pl. 117, f. 5.
 1825. *Tubicinella trachealis*, Gray, Annals of Philosophy, vol. 10.
 1836? *Tubicinella balaenarum*, Guérin-Méneville, Iconographie du Règne Animal, Mollusques, p. 58, pl. 38, f. 14.
 1854. *Tubicinella trachealis*, Darwin, Mon. Cirripedia, vol. 2, p. 431, pl. 17, f. 3a-c.
 1873. *Tubicinella trachealis*, Steenstrup (in Lütken), Vidensk. Selsk. Skr., Ser. 5, Naturv. Afd., vol. 10, No. 3, p. 244 (16).

Darwin, from whose work I have taken most of the synonymy, rightly observes that Lamarck's alternative name for a single species cannot be retained, and that Shaw's *trachealis*, being next in priority, ought to be adopted.

The skin of the whale with a large group of these cirripedes burrowing into it to the depth of an inch and three-quarters presents an extraordinary spectacle. In some cases the

cavities seem to be enlarged at the top by the efforts of a crowd of *Cyamus pacificus* which are seen to be nestling round the cirripedes. According to Darwin's explanation the burrowing is rather apparent than real, the pressure of the group of cirripedes merely pressing inwards the skin of the whale, and the epidermis as it forms being pushed upwards between the nearly approximate shells. The young *Tubicinella*, though nearly cylindrical like the adult, has a very much smaller aperture, and, as the growth takes place at the base of the shell, the problem was how to account for the widening of the aperture at the top. The solution is that the upper margin suffers a gradual disintegration. For this the structure of the shell is adapted, and specimens which by reason of their broken edges might be thought to be damaged and imperfect, are really in a condition essential to the growth of the animal. Darwin says that probably "the rapid downward growth of the shell, besides indenting the whale's skin, at the same time slowly pushes the whole shell out of the skin; and thus continually exposes the summit to the wear and breakage which seems to be necessary for its existence." It seems strange that the same rapidity of downward growth should have the two opposite effects of pushing the shell in and pushing it out. One would think it sufficient that the growth of the cirripede shell should keep pace with the formation of the upward pushing epidermis of the whale. Darwin thinks that the slightly greater width of the *Tubicinella* shell above than below is, on his view, beautifully explained, namely, "for the sake of facilitating the protrusion of the shell; for the ordinary conical shape of sessile cirripedes, with the apex upwards, would have rendered the pushing out of an imbedded shell almost impossible; on the other hand, we can see that the likewise very peculiar, concentric, prominent belts may be necessary to prevent too easy protrusion." But it is difficult to see why a slightly conical shell would have found any special difficulty in pushing out of the thinly surrounding walls of the whale's epidermis. At worst the shape could only have served the retarding purpose which Darwin attributes to the concentric belts. When a *Tubicinella* is taken out of the whale's skin, these belts are found to have left a pretty sharp impression, as sometimes the surface markings of a fossil are imprinted on the matrix. The epidermis pushing between the nearly contiguous shells will naturally take the impress of their projections, but the shells pushing through the epidermis would obliterate the stamp.

The specimens sent me were from a Right Whale taken in False Bay.

EXPLANATION OF PLATES.

PLATE 1.

PALINURUS GILCHRISTI, n. sp.

Dorsal view of a specimen, natural size, with detached flagellum of second antenna at the side.

PLATE 2.

CALLIANASSA KRAUSSI, n. sp.

n.s. Dorsal view of a specimen, natural size. The parts are figured from a rather smaller specimen; all to the same degree of magnification, except the still more enlarged border of the mandible and setae of the pleopod.

a.s. First antenna. a.i. Second antenna, showing only the first few joints of the flagellum. With these are shown the eyes and frontal margin.

mdb. Mandible.

mx. 2. Second maxilla.

mxp. 3. Third or outer maxilliped, with a portion of a branchia attached.

plp. 4. Extremity of outer ramus of fourth pleopod.

urp. The uropod on one side of the caudal fan.

T. The telson.

PLATE 3.

prp. 1-5. The trunk-limbs, without the branchiæ, much less highly magnified than the figures on the preceding plate, except the separate terminal portions of prp. 3-5. The lower prp. 1. is the left cheliped, the upper is the large right cheliped. The apex of prp. 5 is more enlarged than the other figures.

PLATE 4.

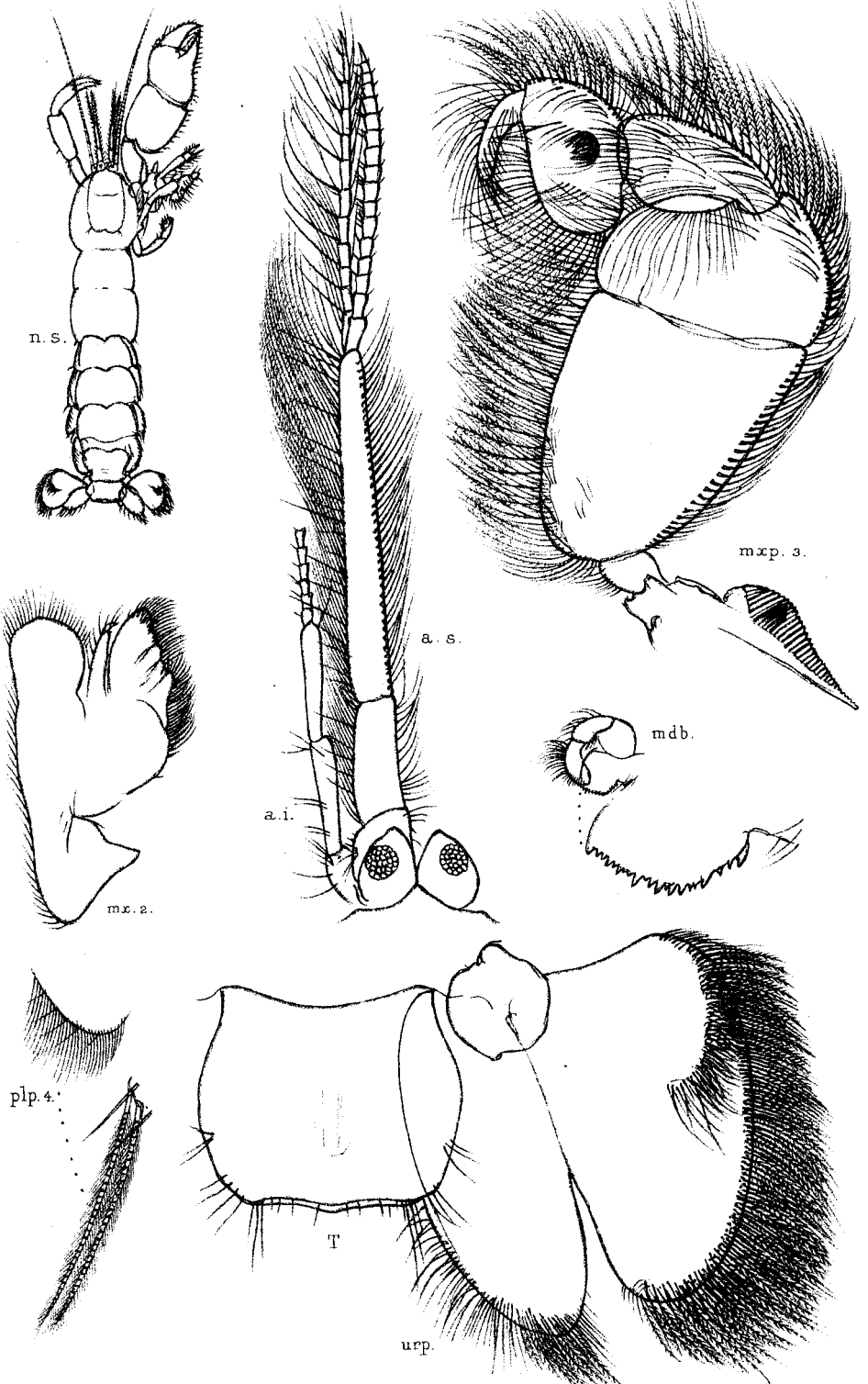
SPHYRION LAEVIGATUM, Guérin-Méneville.

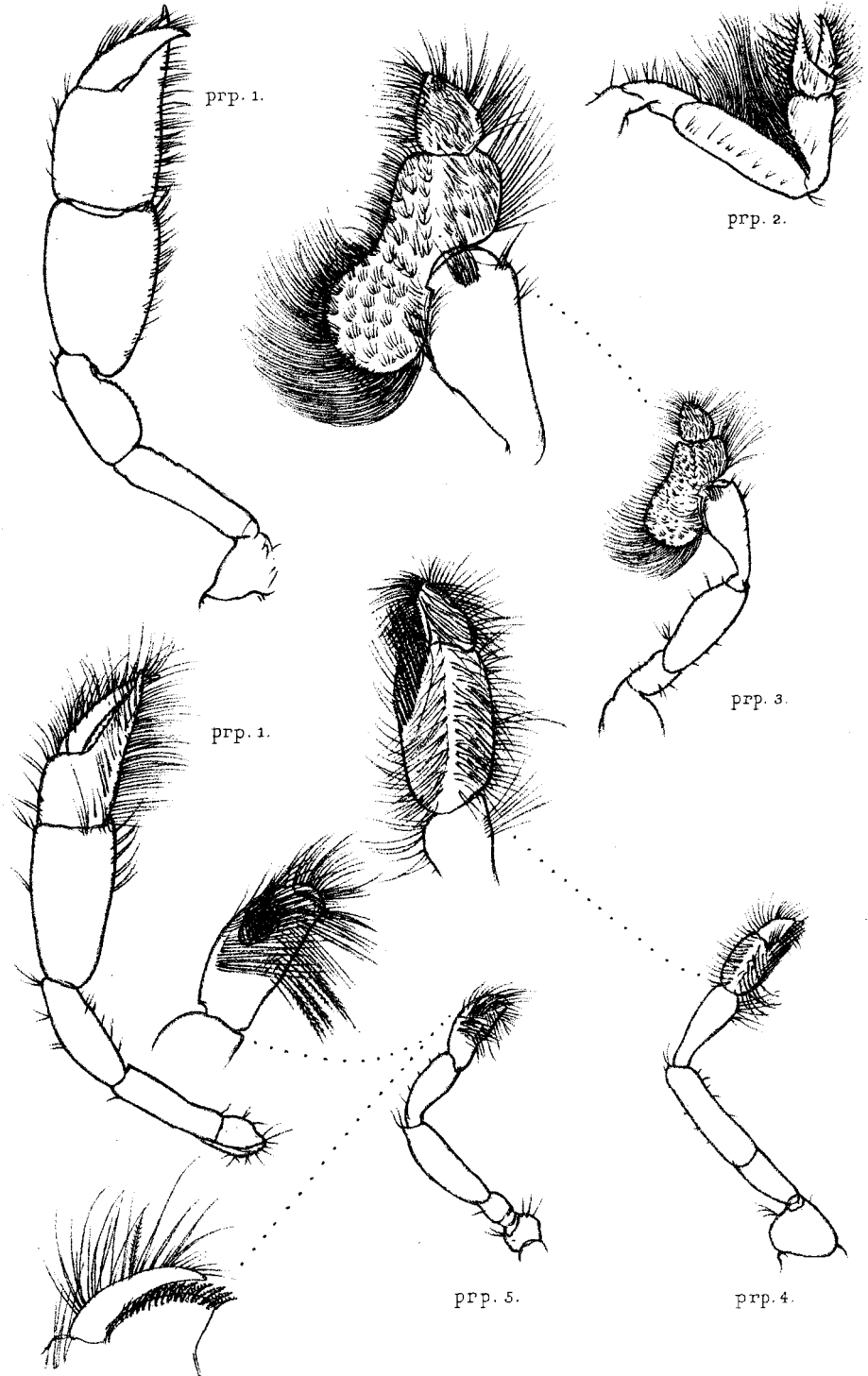
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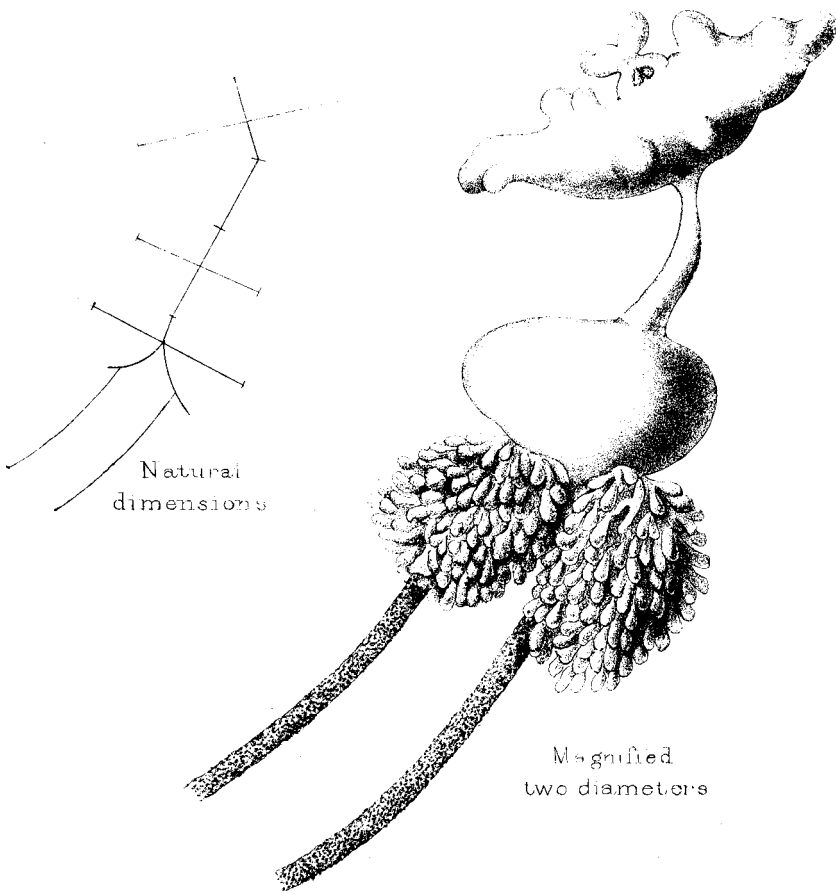




Del. T. R. N. Stebbing.

CALLIANASSA KRAUSSI, n. sp.

J. T. Rennie Reid, Lith. Kant.



THRS. del.

West, Newman sculp.

SPHYRION LAEVIGATUM, (Quoy & Gaimard.)