

48

A
DESCRIPTIVE CATALOGUE
OF THE
INDIAN DEEP-SEA CRUSTACEA
DECAPODA MACRURA AND ANOMALA,
IN THE
INDIAN MUSEUM.

BEING A REVISED ACCOUNT OF THE DEEP-SEA SPECIES

COLLECTED BY THE

ROYAL INDIAN MARINE SURVEY SHIP
INVESTIGATOR.

BY
A. ALCOCK, M.B., LL.D., C.M.Z.S.

INDIAN MEDICAL SERVICE, SUPERINTENDENT OF THE INDIAN MUSEUM AND PROFESSOR OF ZOOLOGY IN THE MEDICAL
COLLEGE, CALCUTTA; SOMETIME SURGEON-NATURALIST TO THE MARINE SURVEY OF INDIA.



CALCUTTA:

PRINTED BY ORDER OF THE TRUSTEES OF THE INDIAN MUSEUM.

1901.

Price Ten Rupees.

See survey to India

BAPTIST MISSION PRESS, CALCUTTA.

PREFACE.

In *An Account of the Deep-Sea Brachyura collected by the Royal Indian Marine Survey Ship Investigator* published by the Trustees of the Indian Museum in 1899, and in the *Scientific Memoirs by Medical Officers of the Army of India* for the same year, I have explained something of how, and under what limitations, the "Investigator" collections have been made.

In the present memoir the Decapod Crustacea of the suborders *Macrura* and *Anomala* are included, to the number of 169 species. The species of the suborder *Brachyura*, treated elsewhere, number 58; so that the total number of species of Decapod Crustacea collected by the "Investigator" in the depths of the seas of India, up to the end of the year 1900, amounts to 227.

This memoir, like the Catalogue of Investigator Deep-Sea Fishes published in 1899, is very far from being a mere reprint of earlier-published reports. In addition to tables and descriptions of species, it contains tables and definitions of all the genera and subgenera, families, tribes, and suborders under which the several species are arranged, and it embodies a large amount of material that I have prepared for the basis of a more comprehensive work on Indian Crustacea.

As most of the Crustacean types discovered by the "Investigator" have already been figured in the *Illustrations* published under the authority of the Director of the Royal Indian Marine, the only figures that are appended to this memoir are those of a few species that have escaped notice in that serial.

A. ALCOCK, Major, I.M.S.,
Superintendent of the Indian Museum.

CORRIGENDA AND ADDENDA.

- Page 27 line 10 from bottom insert ' is ' after ' Smith '
- „ 39 „ 1 delete the second ' have '
- „ 45 „ 12 for ' it outer edge ' read ' its outer edge '
- „ 63 „ 2, 3rd column read ' Arthrobranchiæ ' for ' Pleurobranchiæ '
- 4th „ „ ' Pleurobranchiæ ' „ ' Arthrobranchiæ '
- „ 63 „ 8 from bottom for ' papilla or ' read ' papilla on '
- „ 68 „ 13 for ' while is ' read ' which is '
- „ 93 „ 14 from bottom for ' expodite ' read ' exopodite '
- „ 131 „ 16 „ „ for ' Vol. XLIII ' read ' Vol. LXIII '
- „ 149 „ 15 „ „ for ' Salicoques at Galatheides ' read ' Salicoques et
Galatheides '
- „ 166 „ 21 for ' carapace in concave ' read ' carapace is concave '
- „ 203 After line 6 insert " This species is most closely related to *Gebia spinifrons*
Haswell."
- „ 204 „ 12 from bottom for ' A. M. Edw. ' read ' S. I. Smith '

PART I. CRUSTACEA MACRURA.

INTRODUCTION.

The Macrurous Decapod Crustacea included in this Catalogue were all of them dredged by the Royal Indian Marine Survey Ship "Investigator," in deep water, between the meridians of 65° and 99° E. and the parallels of 5° and 24° N., during the years 1885-1900.

They number 117 species, namely:—

<i>Peneidea</i>	...	...	...	...	27 species.
<i>Caridea</i>	...	...	...	...	58 "
<i>Stenopidea</i>	...	...	...	...	3 "
<i>Astacidea</i>	...	...	...	...	20 "
<i>Thalassinidea</i>	...	...	...	...	9 "

Of these 117 species, 69 are believed, for the present, to be proper to the seas of India, although it is highly probable that many of them will be found to have a wider range; while 48 are already known to occur in other seas.

Of the 48 widely-ranging species, 25 are known to inhabit the North Atlantic, and 29 the Pacific,—6 species being common to the Atlantic and Pacific—as is shown in the tables following.

Most of the species were dredged in less—usually considerably less—than 1000 fathoms: the only species taken from great depths are the following:—

<i>Aristæus (Hemipeneus) carpenteri</i>	...	...	1644	fathoms.
<i>Aristæus (Aristæopsis) armatus</i>	...	...	1748	"
<i>Sergestes rubroguttatus</i>	...	...	1748-1997	"
<i>Hoplophorus gracilirostris</i>	...	...	1439	"
<i>Acanthephyra sanguinea</i>	...	...	1748	"
<i>Acanthephyra microphthalmus</i>	...	...	1748	"
<i>Dorodotes reflexus</i>	...	...	1300-1644	"
<i>Pontophilus abyssi</i>	...	...	1748-1997	"
<i>Glyphocrangon cæcescens</i>	...	...	1748	"
<i>Pentacheles carpenteri</i>	...	...	1370-1540	"
<i>Willemoesia indica</i>	...	...	1310-1803	"

Of these, however, there can be no doubt whatever that *Aristæus carpenteri*, *Sergestes rubroguttatus*, *Hoplophorus gracilirostris*, and *Acanthephyra sanguinea* were caught in the ascent of the trawl, for the very good reason that they are usually found in much shallower water, and that in the case of *Hoplophorus gracilirostris*, that species is often brought on board alive.

III. *Species common to the ATLANTIC, the INDIAN OCEAN, and the PACIFIC.*

- | | |
|--|--|
| 1. <i>Gennadas parvus</i> , Sp. Bate. | 4. <i>Acanthephyra microphthalmus</i> , S. I. Smith. |
| 2. <i>Aristæus (Aristæopsis) armatus</i> , Sp. Bate. | 5. ,, <i>armata</i> , A. M. Edw. |
| 3. <i>Heterocarpus ensifer</i> , A. M. Edw. | 6. <i>Calocaris macandrewæ</i> , Bell. |

Most of the new species discovered by the "Investigator" have been figured in the *Illustrations of the Zoology of the Investigator* for the years 1892-1901, and have been described in the following papers:—

J. WOOD-MASON, *Ann. Mag. Nat. Hist.*, Feb., 1891, pp. 187-199; October 1891, pp. 269-286, Nov. 1891, pp. 353-362, April 1892, pp. 265-275, May 1892, pp. 358-370, Feb. 1893, pp. 161-172.

A. ALCOCK, *Ann. Mag. Nat. Hist.*, March 1894, pp. 225-242.

A. ALCOCK and A. R. S. ANDERSON, *Journ. Asiatic Soc. Bengal*, Vol. lxxiii. pt. 2, 1894, pp. 144-166, and *Ann. Mag. Nat. Hist.*, April 1899, pp. 278-292.

A. R. S. ANDERSON, *Journ. Asiatic Soc. Bengal*, Vol. lxxv. pt. 2, 1896, pp. 90-98.

A. F. MCARDLE, *Ann. Mag. Nat. Hist.*, Nov. 1900, pp. 476-478.

A complete list of the species follows, with, in the case of the "new" species, the necessary references to the *Illustrations of the Zoology of the Investigator* in which they have been figured.

LIST OF THE INDIAN DEEP-SEA MACRUROUS CRUSTACEA IN THE INDIAN MUSEUM.

[The references for the plates and figures are to the *Illustrations of the Zoology of the Investigator* for 1892-1901].

The species marked with an asterisk are those that are known to occur outside Indian limits.

	Page.	Plate.	Fig.
I. MACRURA CARIDIDES :—			
i. PENEIDEA :—			
Family Peneidæ :—			
1. <i>Peneus coniger</i> , Wood-Mason ...	16	L	2
" " var. <i>andamanensis</i> , W.-M. ...	17		
* 2. " <i>rectacutus</i> , Spence Bate ...	17	XLIX	5
3. " <i>investigatoris</i> , Anderson ...	18	XLI	1
4. <i>Solenocera Heatii</i> , Wood-Mason ...	20	XXVI	5
5. " <i>annectens</i> , W.-M. ...	21	XLIX	6
* 6. <i>Haliporus aequalis</i> , S. Bate ...	23		
* 7. " <i>neptunus</i> , S. Bate ...	24		
* 8. " <i>microps</i> , S. I. Smith ...	25		
9. " <i>taprobanensis</i> , Anderson ...	25	XLI	3
10. " <i>villosus</i> , Alcock ...	26	XXVI	1
* 11. <i>Aristæus virilis</i> , S. Bate ...	30		
* 12. " <i>semidentatus</i> , S. Bate ...	31	XLIX	3
13. (<i>Hemipeneus</i>) <i>Carpenteri</i> , Wood-Mason ...	32	XLIX	4
14. " <i>crassipes</i> , Wood-Mason ...	33	XLIX	1, 2
* 15. (<i>Plesiopeneus</i>) <i>Edwardsonianus</i> , (Johnson) ...	36	I	1, 2
16. " <i>coruscans</i> , (Wood-Mason) ...	37	II	3
* 17. (<i>Aristæomorpha</i>) <i>rostridentata</i> (S. Bate) ...	39	II	1
* 18. (<i>Aristæopsis</i>) <i>armata</i> (S. Bate) ...	41		
* 19. (<i>Hepomadus</i>) <i>tener</i> , S. I. Smith ...	42		
20. <i>Benthesicymus investigatoris</i> , Anders. ...	44	XLI	2
* 21. " <i>Bartletti</i> , S. I. Smith ...	45		
* 22. <i>Gennadas carinatus</i> , (S. I. Smith) ...	46		
* 23. " <i>parvus</i> , S. Bate ...	46		
Family Sergestidæ :—			
24. <i>Sergestes bisulcatus</i> , Wood-Mason ...	49	L	1
* 25. " ? <i>inous</i> , Faxon ...	50		
26. " <i>rubroguttatus</i> , Wood-Mason ...	51	XLI	5
27. " <i>hamifer</i> , Alc. and Anders. ...	53	IX	3
ii. CARIDEA :—			
Family Pasiphæidæ :—			
* 28. <i>Pasiphæa sivado</i> , (Risso) ...	59	III	6
29. " <i>unispinosa</i> , Wood-Mason ...	60	III	7
30. (<i>Phye</i>) <i>alcocki</i> , Wood-Mason ...	61	{ III LII	{ 5 6
31. <i>Sympasiphæa annectens</i> , n. sp. ...	63	LII	7
32. <i>Parapasiphæa latirostris</i> , Wood-Mason ...	65	LII	1
33. " <i>Gilesii</i> , Wood-Mason ...	66	III	8

	Page.	Plate.	Fig.
69. <i>Aegeon affine</i> , n. sp. ...	118 ...	LI	... 3, 4
70. „ <i>medium</i> , (Alc. and Anders.) ...	120 ...	XLI	... 6
71. (<i>Parapontocaris</i>) <i>andamanensis</i> , (W.-M.)...	121 ...	IX	... 2
72. „ <i>bengalensis</i> (W.-M.) ...	122 ...	IX	... 1
73. <i>Prionocrangon ommatosteres</i> , W.-M. ...	123 ...	IX	... 4
Family Glyphocrangonidæ :—			
74. <i>Glyphocrangon investigatoris</i> , W.-M. ...	127 ...	VI	... 2, 3
75. „ <i>Smithii</i> , W.-M. ...	129 ...	VII	... 3
76. „ <i>priononota</i> , W.-M. ...	129 ...	VI	... 1
77. „ <i>unguiculata</i> , W.-M. ...	130 ...	VII	... 2
* 78. „ <i>hastacauda</i> , S. Bate ...	131		
79. „ <i>Gilesii</i> , W.-M. ...	132 ...	VII	... 4
80. (<i>Plastocrangon</i>) <i>caecescens</i> , (W.-M.) ...	133 ...	VII	... 5
81. „ <i>cæca</i> , W.-M. ...	135 ...	VII	... 1
82. „ <i>cerea</i> , Alc. and Anders. ...	136 ...	IX	... 6
Family Palæmonidæ :—			
83. <i>Palaemon (Brachycarpus) laccadivensis</i> , Alc. and Anders. } ...	138 ...	XXVI	... 4
Family Alpheidæ :—			
84. <i>Alpheus macrosceles</i> , Alc. and Anders. ...	140 ...	IX	... 5
85. „ <i>Shearmeri</i> , Alc. and Anders. ...	141 ...	XLI	... 4
iii. STENOPIDEA :—			
Family Stenopidæ :—			
86. <i>Engystenopus palmipes</i> , Alc. and Anders....	144 ...	{ XXVI L	... 3 ... 5 }
87. <i>Richardina spongicola</i> , Alc. and Anders....	146 ...	XLII	... 4
88. <i>Spongicola andamanica</i> , n. sp. ...	148		
II. MACRURA ASTACIDES :—			
i. ASTACIDEA :—			
Family Nephropsidæ :—			
* 89. <i>Nephrops Thomsoni</i> , S. Bate var. <i>anda-</i> <i>manica</i> Wood-Mason ...	153	{ IV VIII	... 1 ... 5 }
* 90. <i>Phoberus cæcus</i> var. <i>tenuimanus</i> , S. Bate ...	156		
91. <i>Nephropsis Stewarti</i> , Wood-Mason ...	159 ...	XXVII	... 1
92. „ <i>Carpenteri</i> , Wood-Mason ...	160 ...	XXVII	... 2
* 93. „ <i>atlantica</i> , Norman ...	161		
94. „ <i>ensirostris</i> , n. sp. ...	162		
* 95. „ <i>Suhmi</i> , S. Bate ...	163		
Family Eryonidæ :—			
96. <i>Polycheles phosphorus</i> , Alcock ...	168 ...	VIII	... 2
97. „ <i>andamanensis</i> , Alcock ...	169 ...	X	... 3
98. „ <i>ceratus</i> , Alcock ...	170 ...	VIII	... 1
* 99. „ <i>sculptus</i> , S. I. Smith ...	170		
100. <i>Pentacheles Hextii</i> , Alcock ...	172 ...	X	... 2
101. „ <i>gibbus</i> , Alcock ...	173 ...	VIII	... 4
102. „ <i>Carpenteri</i> , Alcock ...	174 ...	X	... 1
„ <i>Beaumontii</i> , Alcock ...	175 ...	VIII	... 3

	Page.	Plate.	Fig.
104. <i>Eryonicus indicus</i> , Alc. and Anders. ...	176 ...	L	... 3
105. <i>Willemoesia indica</i> , n. sp. ...	178		
Family Scyllaridæ :—			
* 106. <i>Arctus orientalis</i> , S. Bate ...	181		
107. „ <i>rubens</i> , Alc. and Anders. ...	182		
Family Palinuridæ :—			
* 108. <i>Panulirus angulatus</i> , S. Bate ...	185		
ii. THALASSINIDEA :—			
Family Axiidæ :—			
* 109. <i>Calocaris Macandreae</i> , Bell ...	189		
110. „ <i>alcocki</i> , McArdle ...	190 ...	L	... 4
111. (<i>Calastacus</i>) <i>investigatoris</i> , Anderson ...	191 ...	XXV	... 1
112. „ <i>felix</i> , Alc. and Anders. ...	192 ...	XLII	... 3
113. <i>Iconariopsis laccadivensis</i> , n. sp. ...	195		
114. „ <i>andamanensis</i> , n. sp. ...	196		
Family Callianassidæ :—			
115. <i>Callianassa cæcigena</i> , Alc. and Anders. ...	198 ...	XXVI	... 2
116. „ <i>lignicola</i> , Alc. and Anders. ...	200 ...	XLII	... 2
117. <i>Gebicula exigua</i> , n. sp. ...	202		

Four specimens, the largest of which has the carapace 33 millim. long and 29.5 millim. broad, from off the Travancore coast, 430 fathoms.

Colours in spirit orange, eyes intensely black.

Regd. No. $\frac{2383-2386}{10}$ (Types of the species).

13. *Paralomis indica*, Alcock and Anderson.

Paralomis indica, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 15.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLIII. FIG. 2.

Differs from *P. verrucosa* in the following respects :—

The antero-lateral and lateral borders of the carapace are more irregularly and much more acutely spiny.

The abdomen, behind the second segment, has its dorsal surface somewhat creased, but not tuberculous.

The eyes are relatively much larger.

The movable antennal acicle has only two spines, one of which is small, on its outer border; the antennary flagella are nearly as long as the carapace.

The chelipeds and legs are relatively longer and slenderer; the wrist is longer and its inner angle does not form a foliaceous lobe.

Carpace piriform, convex, very slightly longer than broad; gastric, cardiac, and branchial regions well defined, the gastric and branchial tumid and prominent, the cardiac, though convex, a good deal sunken. The surface of the carapace, as of the second abdominal segment, is studded with vesiculous, pustulous, and conical tubercles of various sizes.

Rostrum very distinctly and evenly trifold and having a denticle on either side near the base.

Lateral margins of carapace, from the spiniform orbital angle to the posterior border, armed with spines of various sizes; posterior border armed with conical tubercles of uniform size.

Eye-stalks with a few denticles dorsally. Antennular peduncles smooth. Antennal peduncle with the first two joints spiniform at the outer angle, the flagellum about as long as the carapace.

The movable antennal acicle, which reaches slightly beyond the end of the antennal peduncle, ends very acutely; its outer edge bears a spinule and a large spine, its inner edge bears three small spines.

Chelipeds and legs spiny, especially on the dorsal surfaces. The right cheliped is distinctly stouter, and the right legs are distinctly longer, than the left. The legs, which are nearly a dactylus longer than the chelipeds and rather less massive than the left cheliped, are about $1\frac{2}{3}$ times the length of the carapace.

The second abdominal segment consists of a single plate dorsally, which is dimpled on either side of the middle line.

The abdomen of the male has a slight twist to the right and is nearly symmetrically constituted; in the female, although it is unsymmetrical, it is not much more twisted.

Four specimens, the largest of which has the carapace 39.5 millim. long and 37 millim. broad, were taken off the Travancore coast at 430 fathoms.

Colours in spirit pale milky orange-pink, eyes intensely black.

Regd. No. $\frac{2380-2382}{10}$ (Types of the species).

GALATHEIDEA Henderson.

Galatheidæ, Boas. Vid. Selsk. Skr., 6 Raekke, Nat. og. Math. Afd. I. 2. 1880, p. 195.

Galattheidea, Henderson, Challenger Anomura, p. 103, (*et syn.*): Ortmann in Bronn's Thier Reich, Malacostraca, p. 1148.

Galathéidés, Milne Edwards and Bouvier, Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 191 *et seq.*, and Mem. Mus. Comp. Zool. XIX. 2. 1897, p. 12, and Crust. Decap. Hirondelle et Princesse Alice, Monaco, 1899, p. 70.

Carapace generally more or less depressed, commonly elongate, sometimes broad and crablike, the front not fused with the epistome: the rostrum is well developed and conceals the ophthalmic somite. Thoracic sternum broad.

The abdomen is broad well-calcified and symmetrical and ends in a broad symmetrical tail-fan formed of a broad telson and foliaceous caudal swimmerets: it is either folded on itself, or flexed against the thoracic sternum.

Antennal peduncle often four-jointed (the 2nd and 3rd joints having fused), the 2nd joint only occasionally carries a movable acicle.

The flagella of the maxillipeds, when present, are flexed inwards, and though in the deep-sea forms the external maxillipeds are generally pediform, in some littoral forms they are opercular.

The 1st pair of thoracic legs are massive and chelate, the next 3 pairs are all monodactylous and all about equally well developed, the 5th pair, which may be subchelate or minutely chelate, are weak and flexed.

It is usual but not universal to find, in the male, paired appendages modified for copulation, on the first 2 abdominal somites, and paired appendages (which are commonly more or less rudimentary) on the next 2 or 3 somites, and, in the female, paired appendages on the 2nd-5th somites.

Henderson divides the *Galattheidea* into two groups—the Brachyura-like PORCELLANODEA, which, in these seas, are, so far as our present knowledge goes, inhabitants of the rocks and reefs of the littoral zone, and the Macrura-like GALATHODEA, which are abundantly represented in the depths.

A. Milne Edwards and Bouvier (Ann. Sci. Nat., Zool., (7) XVI. 1894) include all the *Galattheidea* in one family, *Galathéidés*, which they subdivide into

3 subfamilies, *Galatheinés* (including Henderson's *Porcellanodea*), *Diptycinés*, and *Aeglénés* (for the S. American freshwater form *Aeglea*).

Ortmann adopts the group *Galatheidea*, which following Milne Edwards and Bouvier he divides into 4 sections which he ranks as families, *Aeglaeidae*, *Chirostylidae* (= *Diptycinés* of Milne Edwards and Bouvier), *Galatheidae*, and *Porcellanidae*, which seems to me to be a very sensible course, and it is followed here.

Only two of Ortmann's families, the *Galatheidae* and the *Uroptychidae* (= *Chirostylidae*) are, so far as is known, represented in the depths of these seas; the following is a synopsis of their distinctive characters.

Synopsis of the families of Galatheidea of the Indian Benthos and Oligobenthos.

- I. The telson, which is not folded beneath the preceding abdominal somites, is distinctly made up of plates which suggest a tergum and a pair of appendages modified: the last thoracic sternum is narrow, but well formed: the antennal peduncle appears to be four-jointed, the 2nd and 3rd joints being united: the incisor edge of the mandible is entire: a foliaceous epipodite is present on the 1st maxillipeds, and a flagelliform epipodite is almost always present on the external maxillipeds ... GALATHEIDÆ.
- II. The telson, which is transversely fissured, is, along with the caudal swimmerets, folded beneath the preceding abdominal somites: the last thoracic sternum is more or less atrophied: the antennal peduncle is five-jointed, the 3rd joint being quite distinct from the 2nd: the incisor edge of the mandible is serrated: no epipodites on any of the maxillipeds UROPTYCHIDÆ.

Family *Galatheidae*, Dana.

Galatheidae, Dana, U. S. Expl. Exp., pt. II. p. 1431: Henderson Challenger Anomura, p. 116 (part): Stebbing, Hist. Crust. p. 175 (part): Ortmann in Bronn's Thier Reich Malacostraca, p. 1150.

* *Galathéens*, Milne Edwards and Bouvier, Ann. Sci. Nat., Zool. (7) XVI. 1894, pp. 245, 312-313.

Carapace longer than broad, with the lateral borders well defined and the antero-lateral angles accented, its dorsum usually ornamented with transverse ridges or squamous tubercles, the regions usually well defined. Thoracic sternum broad, the independent last segment being distinct.

Rostrum well developed.

Abdomen simply folded on itself at the level of the 4th and 5th somites, the large symmetrical tail-fan not being in any way tucked up or concealed beneath the preceding somites. The 1st somite is almost completely hidden beneath the carapace. The pleura behind the 1st somite are well developed.

Eyestalks short: no orbits. Antennular peduncles loosely flexed, but not in any way concealed by fossæ, the basal joint, though shorter and much broader

than any of the others, is not widely dilated: the flagella are short, especially the lower one.

Antennal peduncle 4-jointed, owing to the fusion of the true 2nd and 3rd joints: the flagellum long.

The incisor edge of the mandible is entire.

Of the maxillipeds the 1st pair have a foliaceous epipodite and the 3rd external) pair a flagelliform epipodite.

The chelipeds and next 3 pairs of legs are well developed, but the last pair of legs are flexed and weak.

In the abdomen paired appendages are usually present on all the somites (except occasionally the 1st) in the male, and on all except the 1st in the female.

Key to the genera of Galatheidæ of the Indian Benthos.

- I. Integument crisp. The exopodite of the 1st maxillipeds terminates in a flagellum. Eyes faceted and well-pigmented:—
 1. Rostrum triangular with serrated edges GALATHEA.
 2. Rostrum acutely styliform, flanked on either side by a long acicular supraorbital spine MUNIDA.
- II. Integument thick, coarse, and very strongly calcified. The exopodite of the 1st maxillipeds does not end in a flagellum. Eyes opaque, non-faceted and non-pigmented:—
 1. Rostrum horizontal: no gigantic spine in the middle of the gastric region MUNIDOPSIS.
 2. The rostrum consists of a horizontal basal portion and an abruptly upstanding distal portion: there is a gigantic median spine on the gastric region GALACANTHA.

Two very small specimens of two species of *Galathea* have been dredged in the Andaman Sea at 120 and 405 fathoms. It is quite impossible to identify them.

MUNIDA, Leach.

Munida, Leach; Henderson, Challenger Anomura, p. 123 (and references): A. Milne Edwards and Bouvier Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 253, and Mem. Mus. Comp. Zool., XIX. No. 2, 1897, p. 20 (and references).

Carapace longer than broad, the transverse lines well developed and ciliated, the antero-lateral borders spinose, the cardiac area usually well defined. Thoracic sternum broad.

Rostrum slender and styliform, flanked on either side by an acicular supra-orbital spine.

Abdomen simply flexed, the terga usually with transverse sculpture: the

pleura behind the 1st are fairly well developed and commonly have some concentric sculpture. Tail-fan large and symmetrical, the telson being particularly broad and having some squamose sculpture.

Eyes generally large and well pigmented. Antennular peduncles weak and flexed, the flagella short, especially the lower one.

Antennal peduncle 4-jointed, the distal angles of the 2nd (=2nd + 3rd) joint spiniform: the flagellum long.

Mandible with 3-jointed incurved palp, and with the narrow molar process well separated from the trenchant (non-serrate) incisor process. Maxillæ with the coxa and basis well developed: the 1st maxilla with a short palp, the 2nd maxilla with the coxa and basis deeply cleft transversely and with a broad posteriorly-acute scaphognathite.

The exopodites of all three pairs of maxillipeds end in a flagellum, that of the 1st maxillipeds being short.

The 1st maxillipeds have a foliaceous angular epipodite which is directed forwards or outwards, and the external maxillipeds have a slender epipodite, but there are no epipodites on the legs.

The chelipeds and next three pairs of legs are long and slender, the chelipeds being longer and more massive than the legs. The last pair of legs, which are weak and are minutely chelate, are folded.

In the male paired appendages, modified for copulation, are present on the 2nd abdominal somite and usually on the 1st also, and small foliaceous paired appendages (which may be rudimentary) are present on somites 3-5. In the female slender paired appendages are present on somites 2-5.

The branchiæ, which are phyllobranchiæ, are 14 on either side, namely 5 pairs of arthrobranchiæ (somites IX-XIII) and 4 pleurobranchiæ (somites XI-XIV).

The eggs are small and rather numerous.

Key to the Indian species of Munida.

- I. None of the abdominal terga are armed with spines. The posterior border of the carapace is smooth. The eyes are not dilated. The 1st abdominal somite of the male carries a pair of appendages ... *M. comorina.*
- II. The 2nd abdominal tergum only has a row of spines on its anterior border. Posterior border of carapace smooth. Male with a pair of appendages on the 1st abdominal somite:—
 1. Eyes small, not wider than their stalks:—
 - i. The chelipeds of the male are not more than twice the length of the body *M. microps.*

- ii. The chelipeds of the male are more than twice the length of the body *M. microps* var. *lasiocheles*.
2. Eyes very large, their major diameter being about one-fourth the length of the carapace proper. The chelipeds of the male may be nearly as long as the body (though occasionally they are half again as long as the body) *M. andamanica*.
- III. The 2nd abdominal tergum has a row of spines on its anterior border, and the 3rd tergum also may have a pair of spines on this border. Posterior border of carapace smooth. Male with a pair of appendages on the 1st abdominal somite. Eyes very large. Chelipeds in both sexes much longer than the body *M. vigiliarum*.
- IV. The 2nd 3rd and 4th abdominal terga are armed with spines, as is the posterior border of the carapace. The eyes are very large. The 1st abdominal somite of the male is destitute of appendages:—
1. The 2nd and 3rd abdominal terga have each a single row of spines. The inner angle of the basal joint of the antennal peduncle is spiniform but not greatly produced *M. squamosa*.
2. The 2nd and 3rd abdominal terga are armed each with two rows of spines. The inner angle of the basal joint of the antennal peduncle is produced into a stout curved spine half as long as the carapace *M. tricarinata*.

14. *Munida comorina*, Alcock and Anderson.

Munida comorina, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 18.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLIII, FIG. 3.

Seems hardly to differ from the Caribbean *Munida caribæa*, A. M.-Edw. (which Faxon says is the same as *M. irasa*, A. M.-Edw.), having, like it, a long denticulated rostrum, no cardiac spine, and a smooth abdomen.

Dorsal surface of carapace transversely striated and bearing eight spinules, namely a pair behind each supraocular spine, one on either side behind and external to the first pair, and one on either side just beyond the bifurcation of the cervical groove; but all these spines need careful looking for with a lens.

Rostrum well over half the length of the rest of the carapace and about three times as long as supraocular spines (and, like them, acicular), finely and obscurely denticulated in its distal half.

Abdomen perfectly smooth.

The two spines on the dilated portion of the antennular peduncle are long and slender. Eye-stalks barrel-shaped, eyes not reniform.

Chelipeds slender, twice the length of the fully extended body and rostrum, and twice the length of the longest legs; distant spines along the inner aspects of the arm and wrist, and distant spinules along the inner border of the hand;

fingers straight, but in some males the fixed finger is excavated and slightly bent at base for the reception of one or two enlarged teeth of the dactylus.

The fully extended body is only 15 millim. long.

Arabian Sea, off the Travancore coast, 430 and 459 fathoms.

Regd. Nos. $\frac{1937-1939}{10}$: $\frac{2315-2329}{10}$ (Types of the species) : $\frac{1373-1377}{10}$.

15. *Munida microps*, Alcock.

Munida microps, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 326.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 5.

Very closely related to *M. microphthalma*, A. M.-Edw.

The breadth of the carapace is barely three-fourths of the length (without the rostrum). The rostrum, which is strongly upcurved and is indistinctly serrated at tip, is considerably more than half the length of the carapace and considerably more than double the length of the divergent supraorbital spines; it extends backwards as a faint carination of the anterior third of the gastric region. The frontal border on either side of the rostrum is convex and slightly oblique; the posterior border is raised but unarmed; the lateral margins are armed with 7 (2 + 3 + 2) spines. The transverse ridges are strongly developed, smooth, and thickly fringed with short setæ. The tumid gastric area bears in front a convex row of spines, only two of which, namely, those which stand immediately behind the supraorbital spines, are conspicuous, the outermost spine on each side being placed far back on a level with the centre of the hepatic region. The cardiac area is well defined and is bounded on each side by a spine standing immediately behind the bifurcation of the cervical groove. A spinule or two are found within the area enclosed by the bifurcation of the cervical groove.

Abdominal terga each with one or two smooth setose ridges; the second tergum only is armed, having 6 to 8 spines on its front edge.

The eyes are small, cinnamon-coloured, hardly compressed and little dilated, their major diameter being about one-eighth the length of the carapace.

The spines of the basal joint of the antennular peduncle are long and needle-like.

The antennal peduncles are smooth; the basal joint has its internal angle produced into a stout spine, which, however, is not visible from above, and the second joint has both its anterior angles produced into long acicles; the flagellum is of great length.

The external maxillipeds are slender, almost smooth, and but slightly hairy; the inner edge of the ischium is sharply toothed throughout and the inner edge of the merus near the proximal end bears a very prominent spine.

The thoracic legs are slender, smooth or very faintly squamous and very slightly hairy. The chelipeds vary in length in the male (in which sex they are not quite equal) from one and a half times to twice the length of the fully extended body: in the female they are between one and a third and one and a half times the length of the body: the merus and carpus, and the propodite in its palmar portion are covered with large thorns; the fingers, which do not quite equal the palm in length, are evenly and finely toothed, and the fixed finger has also several distant spines along its outer margin, and at the base of the terminal claw a pair of small teeth, between which the tip of the dactylus closes.

Of the second, third, and fourth thoracic legs the merus has both its margins and the carpus its front margin thorny, the posterior margin of the carpus having only a long terminal spine, while the propodite and dactylus have their posterior edge serrated for a series of minute articulating spinules.

The first pair of abdominal legs in the male have the usual development.

Colour in life milky pink.

In the largest male the length of the body is 45 millim., and that of the longer cheliped 87 millim.

Andaman Sea, 480, 490, 561 and 640 fathoms: Arabian Sea, off the Travancore and Ceylon coasts, 459 and 675 fathoms.

Regd. Nos. $\frac{6894-6895}{9}$ (Types of the species): $\frac{51}{7}$: $\frac{119-130}{7}$: $\frac{524-525}{7}$: $\frac{8759-8760}{9}$:
 $\frac{1371-1372}{10}$: $\frac{1719-1720}{10}$.

Munida microps var. *lasiocheles*, Alcock.

Munida microps var. *lasiocheles*, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 327.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 8.

Differs from *M. microps* only in the structure of the chelipeds, which (in the male) are markedly unequal, one (the right in one individual, the left in the other) exceeding its fellow by nearly the whole length of the dactylus, both being much longer than in typical *M. microps*.

The chelipeds are very densely furred, except on the short ischium, and are from nearly twice to two and a half times the length of the fully extended body measured with the rostrum; they are thorny, much as in *M. microps*, except that the thorns are relatively smaller, especially on the propodite, and most of all on the propodite of the larger cheliped, where they are almost entirely hidden in the thick fur. The fingers are not much more than half the length of the palm; and while in the smaller claw they are straight, closely apposed, and otherwise the same as in *M. microps*, in the larger claw they are separated throughout, but especially at the base, where there is found on the dactylus a large truncated

tubercle and on the fixed finger a corresponding excavation and bulging. The carpus of the shorter claw has a strong bend outwards.

Two males were dredged in the Andaman Sea, along with *M. microps*, at 480 fathoms. The largest measures 60 millim. from the tip of the rostrum to the end of the telson, its longer cheliped measuring 142 millim.

They are probably merely dimorphic males of *M. microps*. Similar instances of dimorphism in the males of *Munida* have been noticed by Henderson, A. Milne Edwards, and E. Bouvier.

Regd. Nos. $\frac{132-133}{7}$ (Types).

16. *Munida andamanica*, Alcock.

Munida militaris var. *andamanica*, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 321.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 2.

But for the short chelipeds this species closely resembles the Atlantic *M. iris*, A. M. Edw.

The length of the carapace is very little more than its greatest breadth. The uptilted rostrum is a good deal more than half the length of the carapace and more than double the length of the slightly divergent supraorbital spines; it extends backwards as a faint carination of the front half of the gastric region. The anterior border of the carapace on either side of the rostrum is convex and slightly oblique; the posterior border is smooth; the lateral borders are armed with 7 (2+3+2) spines. The transverse ridges are strongly developed and finely and faintly beaded, and are thickly fringed with setæ, some of which at regular distant intervals are long. The gastric area is armed in front with a convex row of spines, of which only two, namely those in the immediate rear of the supraorbital spines, are conspicuous, while of the others the outermost one on each side is the largest and stands far back.

A small spinelet is present on each side immediately behind the bifurcation of the cervical groove. The cardiac area is usually well defined by a zigzag incision.

The abdominal terga have the transverse ridges well developed and setose; the second only is armed, having on its anterior margin a row of 8 distant spinelets.

The eyes are large, the major diameter being between one-third and one-fourth the length of the carapace; conspicuous setæ fringe them and the pigmentation varies from slate-grey to cinnamon-brown.

The spines of the basal joint of the antennular peduncles are long and needle-like.

The antennal peduncles are smooth; the basal joint has its antero-internal angle produced into a spine which is not visible from above, and the second joint

has both its anterior angles produced into long sharp spines; the flagellum is about three times the length of the body.

Of the external maxillipeds the ischium has its inner edge finely, sharply, and very regularly toothed throughout, and the meropodite has two large spines on its inner edge.

The thoracic legs are comparatively short and stout. The chelipeds when fully extended only just exceed the fully extended body in length without the rostrum in the male, and in the female only just equal the body without the rostrum, and from the ischium outwards they are hairy and granular; the prismatic meropodite has the upper edge spiny throughout and the inner edge spiny in its distal half, and ends above in two huge spines, the inner edge and the granular outer edge ending in smaller spines; the carpus has spines in two rows on its upper and outer surface and two or three obliquely placed spinules on its inner surface; the propodite in the upper and outer surface of its palmar portion has three rows of spines; the fingers are rather longer than the palm and are closely and evenly toothed, the fixed finger having usually a large spine near the middle of its outer edge and terminating in a pair of large spines, between which the tip of the dactylopodite closes.

Of the second, third, and fourth thoracic legs the upper (anterior) edge is closely fringed with long hairs from the base of the ischium to the tip of the claw; in all the merus and the carpus have the upper (anterior) edge strongly spined, and the merus, propodite, and dactylus have the posterior edge serrate or spinulate.

The largest male measures 54 millim. and the largest female 56 millim. from the tip of the rostrum to the end of the telson.

Colours in life: cephalothoracic region and appendages pink, abdominal region white.

The characters are quite constant throughout a large series of individuals of both sexes.

From the Andaman Sea, 173, 198, 130-248, 240, 250, 270, 238-290, 295-360, 370-419, and 405 fathoms; and from the Arabian Sea, in the neighbourhood of the Laccadives and Maldives, 210 and 295-360 fathoms.

There is a single large male in the collection in which the rostrum is less than half the length of the carapace proper and the chelipeds are half as long again as the fully extended body.

Regd. Nos. $\frac{6896-6900}{9}$ (Types of the species): $\frac{9152}{6}$: $\frac{9932}{6}$: $\frac{15}{7}$: $\frac{19}{7}$: $\frac{514}{7}$: $\frac{548-549}{7}$
 $\frac{3190}{9}$: $\frac{8756-8758}{9}$: $\frac{1357-1361}{10}$: $\frac{1381}{10}$: $\frac{2609-2611}{10}$: $\frac{3758}{10}$.

17. *Munida vigiliarum*, n. sp.

Carapace a good deal longer than broad. Rostrum not half the length of

the rest of the carapace, more than twice the length of the supraorbital spines. Antero-lateral borders of carapace with 7 spines. No spines on dorsum of carapace except a curved transverse row immediately behind the rostrum, and a spine on either side behind the bifurcation of the cervical groove. Posterior border of carapace quite smooth. All the transverse ridges well developed and ciliated. Cardiac area ill-defined.

2nd abdominal tergum with a row of spinules on the anterior border: a pair of minute spinules is sometimes present on the same border of the 3rd tergum: the other terga are unarmed.

In the external maxillipeds the distal end of the ventral border of the ischium is produced to an acicular spine, and there is a similar spine of equal size on the same border of the merus.

The eyes are large, their major diameter being more than a fourth the length of the carapace proper.

The chelipeds in the male are about $1\frac{2}{3}$ times, in the female about $1\frac{1}{4}$ times the entire length of the body: all the joints including the dactylus are spiny. The 2nd pair of legs which are the longest are a little longer than the body, reaching just beyond the base of the palm of the male and more than two-thirds of the way along the palm in the female. In all the legs of the 2nd-4th pairs both borders of the merus and the anterior border of the carpus are spiny, the posterior border of the carpus terminates in a spine, and the posterior border of the propodite is armed with a series of fine articulating spinelets.

The dimensions of a male are as follows:—length from tip of rostrum to end of extended telson 23 millim., length of cheliped, 37 millim. In a female of the same length the chelipeds are 29 millim. long.

Bay of Bengal off the west coast of the Andamans in the neighbourhood of the Sentinel Is., 173, 240, 270 and 238-290 fathoms.

This species is very closely related to the Mediterranean and Atlantic species *M. bamffica*.

Regd. Nos. $\frac{9931}{6} : \frac{16}{7} : \frac{515}{7} : \frac{547}{7}$ (Types of the species).

18. *Munida squamosa*, Hndrsn. var. *prolixa*, Alc.

Munida squamosa var. *prolixa*, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 322.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 3.

The length and the greatest breadth of the carapace are nearly the same. The almost horizontal rostrum is one-third the length of the carapace, and the orbital spines, which are slightly inclined upwards, are two-thirds the length of the rostrum,—all three being very distinctly squamous. The anterior margin of the carapace on either side of the rostrum is concave and without any

obliquity; the posterior margin has a pair of spines, one on either side of the middle line; the lateral margins are armed each with five spines. The gastric area is very distinctly delimited and is armed in front with two (and only two) spines, which stand immediately behind the supraorbitals and are about a third the length of these. The cardiac area also is very distinctly defined, and is surmounted centrally by a large spine and flanked on each side, just behind the bifurcation of the cervical groove, by a similar spine. The transverse ridges are well developed and are strongly and sharply beaded and thickly and very finely setose.

The abdominal terga also are most beautifully sculptured with similar ridges, transverse and concentric; the second, third and fourth terga are armed on their anterior margin each with four distant spines, the middle pair of which are large and conspicuous, and the fourth also has in its hinder portion and in the middle line a single spine.

The eyes are large, their major diameter being more than one-fourth the length of the carapace, and the eye-stalks on the upper surface have several setose squames; the corneal region is compressed and closely fringed with setae at base.

The spines on the basal joint of the antennules are not large, only the outer terminal spine and the anterior of the two marginal spines being of noticeable size.

The antennal peduncles are scaly; the basal joint has a small tubercle at its internal angle, and the second and the third joints have each a spine in the same situation; the flagellum is very little longer than the chelipeds.

The external maxillipeds are very hairy and have the exposed surface of the ischium and merus scaly, the former joint being serrated, up to a large terminal spine, along the inner edge, and the latter having a similar spine near the middle of the inner edge.

The thoracic legs are long, slender, and most remarkably squamous, the scales being fringed with fine setae. The chelipeds, which are relatively both stouter and longer in the male, are in that sex one-third of their own extent longer than the body with the rostrum, being also a little unequal; the merus, which is almost square in transverse section, has three regular rows of spines on its upper and inner face; and the carpus and propodite, which are almost cylindrical, have each two irregular rows of spines on the inner face, the propodite also having two or three spines on the outer aspect; the fingers are about two-thirds the length of the palm and are finely toothed, the fixed finger having a second series of 5 or 6 large teeth and ending in a pair of claw-like spines, between which the tip of the dactylus shuts.

Of the second, third, and fourth thoracic legs the merus has both edges spiny, the anterior the more markedly so; the carpus has the anterior edge

spiny, the posterior edge having only a single terminal spine; the propodite has the posterior edge distantly spinulate; and the dactylus has the anterior edge crenulate.

The first abdominal appendages are absent in the male.

Colour in life dull red.

A male 54 millim. long has the larger cheliped 87 millim. in length.

Andaman Sea, 130, 185, 188-220, 194, and 240 fathoms. Arabian Sea, off Ceylon, 142-400 and 180-217 fathoms.

This species is very closely related to the Atlantic and Mediterranean *M. tenuimana*.

Regd. Nos. $\frac{6892-6893}{9}$ (Types of the species): $\frac{9153}{6}$: $\frac{147}{7}$: $\frac{8762-8780}{9}$: $\frac{770-773}{10}$:
 $\frac{2332-2337}{10}$: $\frac{2607-2608}{10}$.

19. *Munida tricarinata*, Alcock.

Munida tricarinata, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 324.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XII. FIG. 1.

Belonging to the group *Munida granulata*, *scabra*, and *proxima*, Henderson, and *Munida obesa*, Faxon.

The length of the carapace and the greatest breadth are equal. The entire carapace is covered with spinelets arranged in longitudinal and transverse rows. The rostrum is less than one-fourth the length of the rest of the carapace and not very much longer than the supraorbital spines; it is continued backwards to the after border of the carapace, first as a sharply spinulate carination of the front half of the gastric region, then as a row of 3 close-set spines traversing the posterior half of the gastric region, then as a row of 3 more distant spines traversing the cardiac region, and terminates as a large spine on the posterior margin of the carapace. On either side of this rostral series of spines the orbital spine also is continued backwards as a gently divergent series of rather smaller spines, so that the carapace is longitudinally traversed by three sharply spinate carinæ. The anterior margin on either side of the rostrum is concave, without any obliquity; the posterior margin is raised and closely spinate throughout; on the lateral margins the spinature is hardly to be distinguished from the general spinature of the surface, the antero-lateral spine alone being large.

Abdominal terga with the transverse and concentric ridges well developed; the first tergum is remarkably broadly exposed and has the entire surface sharply rugose; the second and third have their anterior edge and their principal transverse ridge spinate, two of the spines in every case, namely, those on either side of the middle line, being large; the fourth has the anterior edge only armed in an exactly similar manner.

The eyes are large—the major diameter one-fourth the length of the carapace—and much compressed; the corneal region is remarkably narrow and the setæ that fringe its basal margin overlap the eye in front; in addition to these setæ there are three half-rings of setæ on the eye-stalks.

The basal joint of the antennal peduncle has its antero-internal angle produced into a great serrated hairy spine about half as long as the carapace, the spines of the two sides converging in front of the eyes; the antennal flagellum is not much more than two-thirds the length of the body with the rostrum.

The external maxillipeds are very hairy, and the merus has a strong spine on the inner edge near the proximal end.

The chelipeds (in the female) are one-half longer than the body with the rostrum, are slender and cylindrical, and are remarkable for the great length of the carpus, which is equal in length to the palm of the propodite or more than two-thirds the length of the meropodite; all the joints are sharply squamous, the scales on the meropodite, and to a less extent on the carpus (except on the under surface of these joints), forming spines; the fingers are rather more than two-thirds the length of the palm, the opposed edges are finely and closely serrated, the fixed finger having also a second series of distant large teeth and ending in a pair of claws between which the tip of the dactylus closes.

The second, third and fourth legs have the merus and carpus strongly spinate along both edges, the propodite finely serrate on the posterior edge, and the dactylus crenate on the front edge.

In the male there are no appendages on the first abdominal somite.

In an egg-laden female the total length of the body is 35 millim., that of the chelipeds being 53 millim.

Andaman Sea, 112 fathoms: Arabian Sea, off the N. Maldivé Atoll, 210 fathoms.

Regd. Nos. $\frac{155}{7}$ (Type of the species): $\frac{1363-1370}{10}$.

MUNIDOPSIS, Whiteaves, Faxon.

Munidopsis, Whiteaves, Amer. Journ. Sci. (3) VII. 1874, p. 212: Faxon, Mem. Mus. Comp. Zool. XVIII. 1895, p. 81.

Galathodes, *Orophorhynchus*, *Elasmonotus*, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII. 1880, pp. 53, 58, 60.

Anoplomotus, S. I. Smith, Proc. U. S. Nat. Mus. VI. 1883, p. 50.

Munidopsis, *Galathodes*, *Elasmonotus*, *Orophorhynchus*, A. Milne Edwards and Bouvier, Ann. Sci. Nat., Zool. (7) XVI. 1894, pp. 271, 276, 279, 283, and Mem. Mus. Comp. Zool., XIX. No. 2, 1897, pp. 63, 94, 98, 110.

Galathopsis, Henderson, Ann. Mag. Nat. Hist. (5) XVI. 1885, p. 417.

Munidopsis and *Elasmonotus*, Henderson, Challenger, Anomura, pp. 148, 158.

Bathyankyristes, Alcock and Anderson, Journ. As. Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 173 (subgenus).

The integument is very strongly calcified.

Carapace longer than broad, occasionally smooth, usually rugulose, sometimes spinulose; the antero-lateral borders are usually spinose, or dentate, but are occasionally entire and subcristiform; the gastric and cardiac regions are usually well defined. Thoracic sternum broad.

Rostrum well developed: there is sometimes a small supra-antennal tooth or spine on either side of it but never a long supra-orbital spine.

Abdomen simply flexed: some of the anterior terga are, generally, transversely grooved: the pleura behind the 1st are well developed. Tail-fan large and symmetrical, the telson being broad and even more plainly than in *Munida* revealing its component parts (7th abdominal tergum and a pair of appendages incompletely fused together).

Eyes present, but not faceted and not pigmented. Antennular peduncles weak and flexed: the flagella short, especially the lower one.

Antennal peduncle 4-jointed.

The mouth-parts only differ from those of *Munida* in the fact that the exopodites of the 1st maxillipeds have no flagellum.

Epipodites are always present on the 1st and 3rd (external) maxillipeds and are sometimes present on the chelipeds and occasionally on the next 3 pairs of legs also.

The chelipeds are usually more massive than the next 3 pairs of legs: the last pair of legs are weak and are folded.

In the male, paired appendages are present on the first 5 abdominal somites, the first 2 pairs being modified for copulation, and the next 3 pairs being weak and often rudimentary. In the female, paired appendages are present on the 2nd-5th somites.

The branchiæ are 14 on either side arranged as in *Munida*.

The eggs are large and not numerous.

I quite agree with Faxon that the attempt to separate *Elasmonotus*, *Galathodes* and *Orophorhynchus* as well defined genera distinct from each other and from *Munidopsis* is a mistake, since they all grade into one another. In this memoir, one genus, *Munidopsis*, is recognized, but the species are arranged in five groups which may be regarded as subgenera, or not.

Group I. MUNIDOPSIS proper, with the antero-lateral angles of the carapace spiniform, even if the lateral borders are not anteriorly spinose or dentate; with the rostrum styliform or acutely triangular, without any lateral spines; with the chelipeds decidedly longer than the legs and usually, in the male, as long as, or longer than, the fully extended body; and with the eyes terminal on the eye-stalks, which are almost always freely movable.

Group II. Corresponding in the main with Milne Edward's GALATHODES. Antero-lateral angles of the carapace spiniform, even if the lateral borders are not anteriorly spinose: the distal moiety of the rostrum is acute and styliform, and the proximal moiety is broadened, often carinated, and ends anteriorly in a pair of spines one on each side of the base of the styliform portion, so that the rostrum as a whole is more or less distinctly trifid: chelipeds much longer than the legs and, in the male, as long as or longer than the fully extended body: eyes terminal on movable eyestalks.

Group III. The extreme forms of which are included in Milne Edward's genus OROPHORHYNCHUS. The chelipeds are hardly longer, or are even shorter than the ambulatory legs, and in neither sex are as much as three-fourths the length of the fully extended body. The eyestalks are fixed or hardly movable and are always prolonged beyond the eye as a spine or tooth.

Group IV. Corresponding in part with Milne Edward's genus ELASMONOTUS. The lateral borders of the carapace are entire and *subcristiform*, and the antero-lateral angles are not spiniform or dentiform: the rostrum is triangular and simple: the chelipeds are much longer than the legs and longer than the fully extended body: the eyes are terminal on movable eyestalks.

Group V. BATHYANKYRISTES. AS Group I., but the propodites of the 2nd, 3rd, and 4th pairs of legs are broadened and are armed at or near their distal end with a clump of spines against which the dactylus can be flexed after the fashion of subchelæ.

Key to the species included in Group I (Munidopsis).

- I. Epipodites are present on the chelipeds and next 3 pairs of legs ... *M. hemingi.*
- II. Epipodites are present on the chelipeds only *M. dasypus.*
- II. No epipodites on chelipeds or legs: the chelipeds very decidedly longer than the legs:—
 - 1. Dactyli of the 2nd–4th thoracic legs slender and acutely falcate, at least two-thirds the length of the propodites, and with the posterior edge sharp and entire *M. unguifera.*
 - 2. Dactyli of the 2nd–4th thoracic legs stout, less than two-thirds the length of the propodites, of which the posterior border is almost always serrated:—
 - i. Posterior border of carapace spinose:—
 - a. Rostrum slender, styliform: eyes freely movable *M. scobina.*
 - b. Rostrum triangular: eyes slightly movable, embedded in a distinct orbital notch ... *M. iridis.*

- ii. Posterior border of carapace smooth :—
 - a. Eyes movable: frontal border of carapace smooth :—
 - α. Chelipeds of male about as long as the body: transverse carinae of 2nd–4th abdominal terga smooth ... *M. stylärostris.*
 - β. Chelipeds of male much longer than the body: transverse carinae of 2nd and 3rd abdominal terga spinose near the middle line ... *M. wardeni.*
 - b. Eyes immovable: frontal border of carapace with a large spine on either side behind the base of the antenna ... *M. goodridgii.*
- IV. No epipodites on chelipeds or legs: the chelipeds very little longer than the legs and much shorter than the body ... *M. moresbyi.*

Key to the species included in Group II (Galathodes).

- I. Epipodites are present on the chelipeds: anterior border of 2nd–4th abdominal terga spiniferous :—
 - 1. Posterior border of carapace spiniferous ... *M. regia.*
 - 2. Posterior border of carapace smooth ... *M. triæna.*
- II. No epipodites on chelipeds or legs :—
 - 1. Anterior border of 2nd and 3rd abdominal terga and posterior border of carapace spiniferous ... *M. posidonia.*
 - 2. Abdominal terga without spines :—
 - i. Posterior border of carapace sharply serrulate ... *M. trachypus.*
 - ii. Posterior border of carapace smooth :—
 - a. A pair of large spines on the gastric region ... *M. trifida.*
 - b. No spines on dorsum of carapace ... *M. tridentata.*

Key to the species included in Group III (Orophorhynchus).

- I. The lateral borders of the carapace are non-spinose: the eyestalks are broadened and vertically compressed so that the eyes are distinctly lateral :—
 - 1. Epipodites are present on the chelipeds: integument tomentose: abdominal terga unarmed ... *M. edwardsi.*
 - 2. No epipodites on chelipeds or legs: integument coarsely granular: 2nd–4th abdominal terga with a coarse median spine ... *M. granosa.*
- II. The lateral borders of the carapace are spinose: the eyestalks are not sublaminar :—
 - 1. Epipodites are present on the chelipeds :—
 - i. Both the inner and the outer borders of the eyestalk are prolonged beyond the eye as spines ... *M. ciliata.*
 - ii. Only the inner border of the eyestalk is prolonged beyond the eye as a spine ... *M. subsquamosa.*

2. No epipodites on chelipeds or legs :—
- i. Posterior border of carapace spiniferous rostrum styli-
form, with lateral spines *M. arietina*.
 - ii. Posterior border of carapace smooth: rostrum short,
simple :—
 - a. No spines on the gastric region *M. ceratophthal-*
mus.
 - b. Two transverse rows of spines on gastric region *M. centrina*.

Group IV. (Elasmonotus) contains a single species.

Key to the species included in Group V (Bathyankyristes).

- I. Rostrum more than half the length of the carapace: much of the eyestalks
is visible in an ordinary dorsal view *M. tenax*.
- II. Rostrum half the length of the carapace: only the eyes are visible in a
dorsal view, not the eyestalks *M. levis*.

20. *Munidopsis Hemingi*, Alcock & Anderson.

Munidopsis hemingi, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 19.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE LV. FIG. 4.

Near *M. ornata*, Faxon.

Carapace convex, broader behind than in front, covered with squamiform tubercles in no very conspicuous transverse arrangement, the regions well defined; a pair of tubercles on the anterior part of the gastric region are acute.

Rostrum short, simple, triangular, carinate; anterior border of carapace with a blunt tooth, antero-lateral border cut into three teeth, posterior border unarmed.

Abdomen unarmed, smooth, the second and third terga transversely bicarinate.

Eyes slightly movable, a tiny papilliform spinule at their inner angle.

Inner border of merus of external maxillipeds armed with two large spines.

Chelipeds in the female (male unknown) equal, as long as the extended body without the telson and longer than the legs by their finger-length; their dorsal surfaces are covered with squamiform markings, the only spine is a small one near the distal end of the inner border of the wrist; the fingers are as long as the palm.

The first three pairs of legs have the dorsal surfaces of the meropodites and next two joints covered with squamiform markings; the dactyli are about half the length of their propodites.

Epipodites are present on the chelipeds and three next pairs of legs.

Two specimens—the largest a female 25 millim. long—from off the Travancore coast, 430 fathoms.

The eggs are of enormous size, being nearly 2 millim. in major diameter after contraction in spirit.

The difference between *Munidopsis Hemingi* and *M. ornata*, Faxon, is very slight; in the latter species the edges of the rostrum are serrate and the chelipeds and legs are armed with some spines.

Regd. Nos. $\frac{2353}{10}$: $\frac{2355}{10}$ (Types of the species).

21. *Munidopsis dasypus*, Alcock.

Munidopsis dasypus, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 329.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 9.

Body pubescent; thoracic legs densely covered with long hairs. Epipodites as large as those of the external maxillipeds are present on the chelipeds.

The greatest breadth of the carapace is about three-fourths the greatest length. The rostrum, which is styliform, gently ascendant, and slightly curved at tip, is a little more than half the length of the carapace; the front margin of the carapace is markedly oblique and is unarmed, except for a small antero-lateral spine; the lateral margins are parallel, with a slight convergence in the anterior third, where there are two spinelets behind the antero-lateral spine; the posterior margin is raised and bears four strong spines in its middle third; the general surface of the carapace is smooth and polished anteriorly, and is marked posteriorly by slight transverse ripples.

The anterior abdominal terga have a faint naked transverse groove, the edges of which are quite smooth.

The eyestalks, which are slender and comparatively long, are not prolonged beyond the globular eyes, are not united, and are freely movable.

The inflated basal joint of the antennular peduncle has only one of its spines, namely, that at the antero-external angle, long.

The antennal flagellum is not much longer than the chelipeds (in the female).

The ischiopodite of the external maxillipeds has the inner edge evenly toothed and the lower edge prolonged distally into a huge spine, while the meropodite has two strong spines on the lower edge in the proximal half.

The thoracic legs, except the fifth pair, are thickly covered with long hairs. The chelipeds are long, slender, and slightly asymmetrical, the longer one exceeding the length of the fully extended body (with the rostrum) by the extent of the dactylopodite; their ischiopodite has two strong distal spines, one above, the other below, their meropodite two rows of spines along the upper

and inner surface and a terminal ring of four spines, and the carpopodite has a terminal ring of three spines; the slender fingers, which are finely and evenly toothed to the very tip, slightly exceed the elongate palm in length.

The second, third, and fourth thoracic legs are relatively short, the second pair barely, and the others less than, half the length of the chelipeds; in all the meropodite and carpopodite have the anterior edge spinate, and the dactylopodite has the terminal claw but slightly curved and very much longer than the spines along the posterior edge.

The largest specimen, an egg-laden female, is 48 millim. in extreme length, its chelipeds being 59 millim. long.

Bay of Bengal, off the Andamans, 480 and 561 fathoms; Andaman Sea 498 fathoms; Arabian Sea, 636 fathoms.

Regd. Nos. $\frac{6901}{9}$ (Types of the species) : $\frac{9322}{9}$: $\frac{9330}{9}$: $\frac{134-137}{10}$: $\frac{2352}{10}$.

22. *Munidopsis unguifera*, Alcock & Anderson.

Munidopsis unguifera, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 172.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI. FIG. 4.

Distinguished from all its Indian congeners by the form of the dactyli of the 2nd-4th legs, which are long and talon-like, having the posterior edge sharp and entire.

There are no epipodites on any of the thoracic legs.

The carapace is quadrangular, its surface is coarsely granular, and it is traversed fore and aft by a broken median carina which is surmounted by a few coarse spines: the frontal margin is hardly convex and is quite unarmed, although below it, and between the eye and the antenna, is a spine: the parallel lateral margins are acutely bilobed in front of the cervical groove, while behind it they are denticulated: the posterior margin is multi-spinate: there is a pair of coarse spines on the gastric region.

The rostrum, which is about one-third the length of the carapace proper, is depressed, acute, carinated, and simple.

The abdominal terga are unarmed.

The eyestalks are movable: the inner margin forms a small papilla upon the summit of the cornea. The meropodite of the external maxillipeds has three small teeth on its inner edge. The chelipeds in both sexes are equal to the fully extended body, and are longer and stouter than the other legs: they are unarmed, except for a pair of small spines at the distal end of the meropodite: the fingers are not much shorter than the palm, and have the cutting edges dentate only near the distal end. The 2nd-4th legs have the posterior border of the meropodite serrated: in all the dactyli are remarkable for their great length

—two-thirds that of the propodites, or more—for their long acute points, and for the trenchant posterior edges.

This is a small species, egg-laden females measuring not more than 25 millim.

Colours, salmon-red to chestnut-brown.

Bay of Bengal, 145–250 and 193 fathoms : Andaman Sea, 490 fathoms.

Regd. Nos. $\frac{4226-4231}{7}$ (Types of the species) : $\frac{50}{7}$: $\frac{6256-6258}{7}$.

23. *Munidopsis scobina*, Alcock.

Munidopsis scobina, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 330.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII, FIG. 1.

Body and appendages almost devoid of hairs, but with the spinature sharp and distinct. No epipodites are present on any of the appendages behind the external maxillipeds.

The greatest breadth of the carapace is about six-sevenths of its length. The rostrum, which is styliform and slightly recurved at tip, is not quite half the length of the carapace; the frontal border is very slightly oblique and, except for one or two small spinelets above the base of the antennæ, is smooth; the lateral borders, which are convergent anteriorly, are from six- to ten-spined; the posterior border is raised and is surmounted by a series of about ten spines; the gastric region bears a pair of spines at the base of the rostrum and a row of spines along the middle line, and this row is continued along the cardiac region, some of the spines there being bifid or trifid; on the branchial regions are numerous sharp tubercles and spines.

The abdominal terga and pleura are glabrous; the second, third, and fourth terga are deeply channelled transversely, the edges of the channel forming sharp and very evenly spinate crests.

The eyestalks are very short, free and freely movable, and not prolonged beyond the ovoid eyes.

The basal joint of the antennular peduncles has three large terminal spikes of nearly equal length, the innermost of which may be bifid or trifid.

The spines on the joints of the antennal peduncles are remarkably distinct and the flagellum is about twice as long as the body.

The ischiopodite of the external maxillipeds is evenly toothed along the inner edge and has a terminal spine on the lower edge, and the meropodite has two spines near the proximal end on the lower edge.

The thoracic legs are granular, or squamous, or spinate. The chelipeds are somewhat longer, but hardly stouter, than the second, third, and fourth legs, and in the male they are somewhat longer and in the female somewhat shorter than

the fully extended body (with the rostrum); all their joints except the first and last are more or less thorny; the fingers are long, slender, and finely toothed, being in the male a little longer than, and in the female about the same length as, the palm.

The second, third, and fourth legs have the anterior edge of the ischiopodite and carpus thorny and the teeth on the posterior edge of the dactylopodite small.

The abdominal legs of all but the first two pairs are rudimentary in the male; those of the first pair are absent in the female.

Colours in life dirty white, or reddish, with orange red markings.

The extreme length of the largest male is 51 millim.; its chelipeds are also 51 millim.

Northern end of Bay of Bengal, 193, 240, 272, 405-285 and 409 fathoms.

Regd. Nos. $\frac{6902-6903}{9}$ (Types of the species) : $\frac{474-482}{7}$: $\frac{484-488}{7}$: $\frac{491-501}{7}$: $\frac{4232}{7}$: $\frac{6259}{9}$.

24. *Munidopsis iridis*, Alcock & Anderson.

Munidopsis iridis, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 20.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLIV, FIG. 1.

Extremely closely related to *M. margarita*, Faxon.

There are no epipodites on any of the thoracic legs.

Carapace subquadrilateral, convex, its regions well delimited and tumid, its surface armed with numerous acute subsquamiform tubercles and symmetrically disposed spines, of which a pair on the anterior part of the gastric region and one in the middle of the cardiac region are slightly enlarged.

Rostrum short, simple, triangular, carinate, its edges indistinctly serrulate in their distal half; anterior border of carapace armed with an acute spine at the outer angle of the orbital notch; lateral borders armed with four acute spines, posterior border with several spines; a row of spinules above the postero-lateral border.

Second, third, and fourth abdominal terga transversely bicarinate, the first three or five carinae bearing symmetrically disposed spines; the corresponding pleura are unicarinate, the anterior of them (second) having a single upstanding spine.

Eyes almost immovable; an inconspicuous spinule at their inner angle.

Three spines, two of which are large, on the inner border of the merus of the external maxillipeds.

Chelipeds markedly unequal in the male, very rarely slightly unequal in the female; in both sexes the dorsal surfaces of the arm and wrist are spiny, a

few of the spines along the inner edge being enlarged, and the inner edge of the palm is spinulose.

In the adult male both chelipeds are vastly stouter than the legs: the larger is about half as long again as the fully extended body and from a dactylus to half a dactylus longer than its fellow, and has the hand enlarged and the immovable finger so arched that the fingers meet only at tip; the smaller cheliped is very variable, sometimes it is hardly different from its fellow, but usually it is more slender, especially in respect of the hand, and usually the fingers meet throughout the greater part of their extent.

In the female the chelipeds are stouter, but not vastly stouter, than the legs, and are about as long as the fully extended body, and the fingers are nearly straight.

The legs are about as long as the body in its natural pose (with the abdomen bent) and are scabrous; the anterior border of the merus and carpus is spiny, the dactylus is nearly half the length of its propodite and has its posterior border almost imperceptibly serrulate.

The sternum and neighbouring joints of the legs are beautifully iridescent, as also sometimes is the dorsal surface of the bent-up portion of the abdomen.

Fifty-two specimens from off the Travancore coast, 430 fathoms.

An adult male has the body 26.5 millim. in extreme length and the larger cheliped 38 millim. long. An egg-laden female is 21 millim. long and its chelipeds measure the same.

Regd. Nos. $\frac{1926-1928}{10}$: $\frac{1940}{10}$: $\frac{2177-2181}{10}$: $\frac{2183-2201}{10}$ (Types of the species).

25. *Munidopsis stylirostris*, Wood-Mason.

Munidopsis stylirostris, Wood-Mason, Ann. Mag. Nat. Hist., Feb. 1891, p. 201: Alcock, Ann. Mag. Nat. Hist., April 1894, p. 328.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII, FIG. 6.

The general surface of the body is finely pubescent dorsally. There are no epipodites on any of the thoracic legs.

The greatest breadth of the carapace is about three-fourths of the greatest length (without the rostrum). The rostrum, which is styliform and strongly upcurved, is nearly two-thirds of the carapace in length; the front margin of the carapace is slightly oblique, and is unarmed except for a strong oblique spine at the antero-lateral angle, and the lateral margins, which are parallel throughout or even a little divergent anteriorly, are, except for the antero-lateral spine, either unarmed or only slightly rugose anteriorly; the posterior margin is raised, but is quite smooth; the tumid gastric region is marked by the presence of rugosities which anteriorly culminate in a pair of coarse spinelets or tubercles, one on each side of the middle line.

The abdominal terga from the second to the fourth inclusive are transversely channelled, both margins of the channel being raised into microscopically ctenate crests.

The eyestalks, which are very stout and very short, are not united, are freely movable, and are not prolonged beyond the globular eyes.

The greatly inflated basal joint of the antennular peduncles has the two external terminal spines very strong and long, projecting far beyond the eyes.

The antennal flagellum is not much longer than the chelipeds.

The external maxillipeds have the inner edge of the ischiopodite evenly toothed throughout and the lower edge of the meropodite furnished with two large unciform spines near the proximal end.

The thoracic legs, except the ischiopodite of the first pair, are almost devoid of hairs.

The chelipeds are robust and are not quite symmetrical on both sides, the longer one being about an eye-length shorter than the fully extended body (measured with the rostrum); their meropodite and carpopodite have each a terminal ring of four spines, the meropodite also having a series of distant spinelets along the upper margin in continuity with a terminal spine on the upper edge of the ischiopodite, and the last-named joint having also a terminal spine below; their fingers, which are barely equal in length to the inflated palm, are finely and evenly toothed up to the very tip, are capable of very complete apposition, and when shut form a pronounced spoon.

The second, third, and fourth thoracic legs are at least two-thirds the length of the chelipeds, and have the meropodite and carpopodite granular (the former joint with a pair of terminal spines above, the latter with a single one), and the curved dactylopodite furnished on its posterior margin with a row of spines hardly smaller than the terminal claw.

The abdominal legs of the male, excepting the first and second pairs, are quite rudimentary.

The length of the largest male from the tip of the rostrum to the end of the telson is 44 millim., and of the chelipeds 44 millim.

Colours in life milky orange, fading to milk-white on the carapace and sternum; eyes milky yellow.

Arabian Sea, 738, 824, 836 and 947 fathoms.

Regd. Nos. $\frac{543}{7}$ (Type of the species) : $\frac{537}{7}$: $\frac{9323}{9}$: $\frac{110-112}{10}$: $\frac{2351}{10}$: $\frac{2361-2362}{10}$.

26. *Munidopsis Wardeni*, Anderson.

Munidopsis Wardeni, Anderson, Journ. Asiatic Soc. Bengal, Vol. LXV. pt. 2, 1896, p. 99.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE LV. FIG. 1.

This species is very closely related to *M. stylirostris*, W. M., but differs in

the following particulars. 1. The chelipeds are much longer. 2. The carapace is hairier, flatter and broader. 3. The rostrum is relatively shorter and slopes gently downwards, its curve being nearly continuous with that of the anterior part of the carapace; its extreme tip is upturned. 4. The eyes are cylindrical and slightly curved. 5. The spine at the antero-lateral angle of the carapace is much smaller and directed forwards and not obliquely outwards at an angle of about 45°. 6. The cervical groove is bounded posteriorly on the lateral margin, by a small spine; in *M. stylirostris* both groove and spine are very inconspicuous. 7. The merus of the cheliped has two rows of spines on its upper surface, one on the inner the other near the outer margin. 8. All the joints of the 2nd, 3rd and 4th thoracic legs are hairy. 9. The ridge bounding the transverse furrow of the 2nd and 3rd abdominal terga is spinulose in the middle line, as is also sometimes that of the 4th.

Colours in life were the same as those of *M. stylirostris*; milky orange dorsally, white ventrally, eyes yellow.

As in *M. stylirostris*, there are no epipodites on any of the appendages behind the external maxillipeds.

The length of the largest male, from tip of rostrum to end of telson is 54 millim., its chelipeds being 92 millim.

Arabian Sea, 406, 457-589, 459 and 531 fathoms: Bay of Bengal, 480 and 594-225 fathoms.

There are in the collection two small specimens, of this species, dredged off the Andamans in 500 fathoms, in which the abdominal terga have no spines.

Regd. Nos. $\frac{116-117}{10}$ (Types of the species): $\frac{139}{7}$: $\frac{782}{10}$: $\frac{1353-1355}{10}$: $\frac{1389}{10}$: $\frac{3417}{10}$: $\frac{3754}{10}$: $\frac{3755-3757}{10}$.

27. *Munidopsis Goodridgii*, Alcock & Anderson.

Munidopsis goodridgii, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 21.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLIV. FIG. 2.

Differs from all known Indian species in having the eyes absolutely immovable, yet furnished with neither spine nor spinule. Its nearest relative is, perhaps, the Philippine species *M. Milleri*, Henderson.

Carapace subquadrangular, convex, slightly broader behind than in front, its regions well delimited, its posterior half deeply sculptured transversely.

Gastric region with some not very conspicuous squamiform sculpture and with a pair of large spines situated anteriorly; a spine on either side of, and a pair of spinules in the middle of, the anterior cardiac region.

Rostrum short, simple, rather slender, smooth. A large acute spine on the anterior margin of the carapace; lateral borders with two large spines and a spinule, posterior border smooth.

Abdomen smooth, the second tergum transversely bicarinate, the third transversely grooved.

Eyes quite immovable, without spine or spinule. Two large spines on the inner edge of the merus of the external maxillipeds.

Chelipeds in the female (male unknown) slender, unequal, the larger one slightly longer, the smaller one very slightly shorter, than the fully extended body; two rows of spines on the arm, both series continued, but much less conspicuously, along the wrist, but not along the hand; the fingers meet throughout their length. No epipodite on any of the thoracic legs.

Legs long, the first three pairs being scarcely shorter than the fully extended body: their merus has a few spinules at the proximal end of its anterior border, and both its borders terminate acutely; their carpus is carinate and ends in a spine; their dactylus is more than half the length of the propodite and has its posterior border spinulate.

A single female from off the Travancore coast, 430 fathoms.

The length of the carapace is 21.5 millim., of the larger cheliped 24 millim., of the smaller cheliped 21 millim.

Regd. No. $\frac{2354}{10}$ (Type of the species).

28. *Munidopsis Moresbyi*, Alcock & Anderson.

Munidopsis moresbyi, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 22.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XL. FIG. 3.

Carapace convex, broader behind than in front, covered as far as the tip of the rostrum with transverse, squamiform, ciliated sculpture, spineless, the regions inconspicuous.

Rostrum of moderate length, simple, broadly and acutely triangular, dorsally carinate. A blunt tooth on the anterior border of the carapace; lateral borders cut into two blunt lobes exclusive of the subacute antero-lateral angle, but these lobes may be almost indistinguishable; posterior border smooth.

Abdomen unarmed, the second to the fifth terga transversely grooved; the fifth and sixth terga, the telson and the outer half of the blades of the swimmeret, and the margins of the pleura with a fine, rather irregular, squamiform sculpturing.

Eyes freely movable, spineless, more or less retractile beneath the rostrum.

Two very inconspicuous teeth on the inner edge of the merus of the external maxillipeds.

Chelipeds and legs covered with ciliated squamiform sculpturing, unarmed.

Chelipeds moderately stout, equal in both sexes, much shorter than the fully extended body, not half a dactylus longer than the legs; palm and fingers

as long as the three preceding joints combined, the fingers slightly longer than the palm.

The dactyli of the legs are about half the length of the propodites and have the posterior border serrated.

There are no epipodites on any of the thoracic legs.

Colour in life pink.

In the male the length of the fully extended body is 38 millim., and that of the chelipeds 27 millim.

Arabian Sea, off the Travancore coast, 430 fathoms.

Regd. Nos. $\frac{2346-2347}{10}$ (Types of the species).

29. *Munidopsis (Galathodes) trifida*, Henderson.

Munidopsis trifida, Henderson, Ann. Mag. Nat. Hist. (5) XVI. 1885, p. 415, and Challenger Anomura, p. 156, pl. xvi. fig. 2: Alcock and Anderson, J.A.S.B. Vol. LXIII. pt. 2, 1894, p. 168.

Galathodes trifidus, Milne Edwards and Bouvier, Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 279.

No epipodites on any of the thoracic legs.

Body and appendages tomentose. Carapace when denuded transversely rugose, especially postero-laterally.

Rostrum about half the length of the carapace proper: its distal half is acutely styliform, but its basal half is broad and vertically compressed and ends in a pair of spines, one on each side of the styliform ending.

The very oblique frontal border of the carapace is armed with a spinule, post-antennal in position, and there is a large spine below the frontal margin, between the eye and the antenna. The lateral margins are armed with 4 large procurved spines. The posterior border is smooth. The only spines on the dorsum of the carapace are a large pair on the anterior portion of the gastric region. There are no spines on the abdomen.

The eyes are movable and are terminal on the eyestalks.

The chelipeds in both sexes are longer than the body, and in the male have massive hands: the ischium has three longitudinal rows of large spines and 4 large terminal spines: the carpus has two rows of spines and 3 terminal spines: both edges of the outer surface of the palm are spinose: the fingers are as long as the palm, and in the male the cutting edge of the fixed finger is excavated at its proximal end to give room to a large molariform tooth on the opposed edge of the dactylus: in the female the fingers are straight.

The next three pairs of legs are much shorter than the chelipeds: their merus and carpus are spinose along the anterior margin, and their dactylus, which is about half the length of the propodite, has the posterior margin serrated.

In the external maxillipeds the dorsal and ventral borders of the ischium end each in a spine, and there are two very strong spines on the ventral border of the merus, while the dorsal border of the same joint ends in a small spine.

Length of fully extended body of male 44 millim., of egg-laden female 43 millim.; of chelipeds of male 53 millim., of female 48 millim.

Arabian Sea, north of the Laccadives, 636 fathoms; Bay of Bengal, off the Andamans, 480 fathoms; Andaman Sea, 498 fathoms.

Regd. Nos. $\frac{141}{7}$: $\frac{9324}{9}$: $\frac{2330-2331}{10}$.

30. *Munidopsis (Galathodes) triæna*, Alcock & Anderson.

Munidopsis triæna, Alcock and Anderson, Journal Asiatic Soc. Bengal, LXIII. pt. 2, 1894, p. 168.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI. FIG. 5.

Differs from *M. trifida* only in the following particulars:—

The appendages are much less pilose and the body is almost devoid of tomentum: the rostrum is a good deal more than half the length of the carapace: there is a large spine on the cardiac region: the front edges of the second to fourth abdominal terga are armed in the middle line, the second with a large hook-shaped spine; the third and fourth with a pair of spines: the chelipeds are much less spiny, the hand being quite smooth, and the carpus having only a pair of distal spines: the carpopodites of the second to fourth legs have only a single spine, terminal in position, on the front border.

There is an epipodite on the chelipeds as large as that of the external maxillipeds.

Length of fully extended body of female 23 millim.; of chelipeds 19.5 millim.

Bay of Bengal, off the Andaman coast, 240–290 and 375 fathoms.

Regd. Nos. $\frac{6261-6263}{9}$ (Types of the species) : $\frac{3221}{9}$.

31. *Munidopsis (Galathodes) regia*, Alcock & Anderson.

Munidopsis regia, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 168.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI. FIG. 1.

The entire dorsal surface both of body and of appendages is covered with a remarkably thick velvety down. Epipodites, which are as large as those of the external maxillipeds, are present on the chelipeds.

The rostrum, which is half the length of the carapace proper, is moderately broad, convex, carinated, and armed in its anterior half with a single pair of strong divergent spines.

The carapace is semi-elliptical, and strongly convex, and is traversed fore and aft in the middle line by a raised row of coarse granules or spinules, of which

one in the postcardium is constant,—in addition to a pair of large spines, disposed transversely, in the front part of the gastric region: the frontal margin is convex, and is armed with two spines, one above the antenna on each side, while below the frontal margin a large spine is interposed between the eye and the antenna: the lateral margins are deeply trilobed in front of the cervical groove, each lobe culminating in a spine, while behind the cervical groove is a row of three smaller and successively decreasing spines: the posterior border is broadly raised and armed with some spines.

Of the abdominal terga the second has, in the middle line, on the front edge, one strong tooth, while the third and fourth have in the same situation a pair.

The eyestalks are freely movable, and are not prolonged beyond their cornea. The thoracic appendages have many long setæ in addition to the general investment of down. The external maxillipeds have the meropodite armed, on the inner border, near the proximal end, with two very large unciform spines, and, on the outer border, distally, with a strong spine. The chelipeds are considerably longer than the fully-extended body, but are stout: the ischiopodite has two distal spines, one above, the other below: the meropodite has three series of strong spines along its inner and upper surface: the carpopodite has a distal ring of teeth, and a few sharp tubercles on its upper and outer surface: the hand is unarmed, the fingers being about two-thirds the length of the palm. The second to fourth thoracic legs have the meropodite and carpopodite spiny: in all the dactylus is remarkably long (about two-thirds the length of the propodite) and remarkably hairy on both edges, the posterior edge also being multi-spinate. The telson, which, as is usual in this genus, appears quite plainly to consist of a somite and incompletely fused appendages, has its postero-lateral angles remarkably thickened and recurved, and its lateral borders thickly clothed with setæ of a peculiarly firm consistence and of a dark colour.

Colour in life, chalky pink.

In the largest specimen the length of the fully extended body is 111 millim., and that of the chelipeds 205 millim.

Arabian Sea, off Colombo, 142–400 fathoms: Andaman Sea, 405 fathoms.

In one specimen there are two spines on one side of the rostrum.

Regd. Nos. $\frac{8815}{9}$ (Type of the species): $\frac{1351-1352}{10}$

32. *Munidopsis (Galathodes) trachypus*, Alcock & Anderson.

Munidopsis trachypus, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 169.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI, FIG. 2.

Carapace and appendages everywhere closely, sharply, and evenly spinate. No epipodites are present on any of the thoracic legs.

The rostrum, which is about one-third the length of the carapace, is broadly lamellar and trifold, is finely serrated at the sides, and is traversed by a finely serrated carina that extends uninterruptedly to the cervical groove.

The carapace is markedly convex and semi-elliptical: the frontal margin is strongly convex and is armed with two spines, one above the base of the antenna on each side: the lateral margins are multiserrate: the posterior margin is raised, and like the rest of the carapace, is sharply and evenly granular: all the regions of the carapace are well delimited.

The abdominal terga are smooth, the telson alone, like the outer halves of the caudal swimmerets, being finely granular.

The eyes are movable, and the eyestalks are not prolonged beyond their cornea: there is a considerable interval between them and the antenna, but no spine.

The antennal peduncles are remarkably slender, and are not longer than the eyes (which are not half the length of the rostrum): the flagella appear to have been not longer than the carapace. The external maxillipeds are small and slender: the meropodite has two large unciform spines (the proximal one slightly bicuspid) on the inner edge near the base, and a large terminal spine on the outer edge.

The chelipeds are remarkably long and slender, being, even in the female nearly twice the length of the fully extended body: they are closely thorny, on every surface, up to the base of the fingers: the palm is more than three times the length of the fingers. The longest of the second to fourth thoracic legs is not much more than half the length of the chelipeds: all are densely spiny up to the remarkably short dactyli, which are hardly one-fourth the length of the propodites: a spine at the distal end of the meropodite is pre-eminent in all.

Length of fully extended body 54 millim., of chelipeds 100 millim. Colours in life, pale salmon.

Arabian Sea, north of the Laccadives, 636 fathoms.

Regd. No. $\frac{9325}{9}$ (Type of the species).

33. *Munidopsis (Galathodes) posidonia*, Alcock & Anderson.

Munidopsis posidonia, Alcock and Anderson, Journ. Asiatic Soc. Bengal, LXIII, pt. 2, 1894, p. 167.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XII. FIG. 2.

The dorsal integument of body and appendages is finely scabrous beneath the usual pubescence.

The rostrum, which is about one-third the length of the carapace proper, is vertically compressed, carinated, and trifold at tip.

The carapace is elliptical, convex, and traversed fore-and-aft by a median multispinate ridge,—some of the spines being bifid and trifid: the frontal margin is convex and bears two spines, one above the base of either antenna, while just below the frontal margin, between the antenna and the eye, is a spine nearly as long as the eye: the lateral margins in front of the cervical groove are sharply quadridentate—the anterior of the four spines having a second spine to its inner side—while behind the cervical groove they are spinate: the posterior margin, like the front edge of the second and third abdominal terga, is spinate: in addition to the spines already noticed there is a pair of large spines on the gastric region, and there are some small spinules on the after margin of the cervical groove.

The eyestalks are not prolonged beyond the cornea, and are movable. The meropodite of the external maxillipeds has, on its inner edge near the proximal end, two large unciform spines, and, at the distal end of its outer edge, another large spine. The chelipeds slightly exceed the fully extended body in length, and are slender: the ischiopodite has two distal spinelets, one above, the other below: the meropodite has three series of thornlike spines along its upper and inner surface: the carpopodite has a distal ring of spines, and a row of spinules along its inner edge: the hand is smooth, the fingers being about three-fourths the length of the palm. The second to the fourth thoracic legs have the meropodite and carpopodite spiny along the front edge, and the dactyli, which are about half the length of the propodites, of the usual form. There are no epipodites on any of the thoracic legs.

Length of fully extended body 53·5 millim., of chelipeds 58 millim.

Bay of Bengal, off Madras coast, 210 fathoms.

Regd. No. $\frac{4225}{7}$ (Type of the species).

34. *Munidopsis (Galathodes) ? tridentata*, Esmark.

Galathea tridentata, Esmark, Forhdl. Skandin. Naturf. 7 Möde (1856), p. 157.

Galathodes rosaceus, A. Milne Edwards, Rec. de Fig. de Crust. pl. xiii. fig. 1. 1883.

Galathodes tridentata, A. M. Edw. and Bouvier, Crust. Hirondelle et Princesse Alice, Monaco, 1899, p. 83 (and ref.).

Munidopsis rosacea, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 19.

No epipodites are present on any of the thoracic legs.

Carapace and legs transversely rugulose. Rostrum hardly half the length of the carapace proper, broad, vertically compressed, carinated, ending in a trifid tip of which the middle spine is the longest.

Frontal border of carapace with an acute tooth post-antennal in position: lateral border with 4 small teeth; posterior border smooth.

No spines on dorsum of carapace or on the abdomen.

Eyes movable, terminal on the eyestalks, almost hidden by the rostrum.

The ventral border of the ischium of the external maxillipeds ends in a spine, and there are two large spines on the same border of the merus.

The chelipeds in both sexes are massive and are longer than the fully extended body, and they vary very greatly in form: on the merus there are generally two longitudinal rows of spines, the inner of which is the most conspicuous and most constant, and there is always a large subterminal spine on the inner border of the carpus: the fingers, which are shorter than the palm, may either be quite straight (as they usually are in the female), or the fixed finger of one or both hands may be arched outwards and excavated along its cutting edge, so as to meet its fellow only at tip (as is usually the case in adult males).

In the next 3 pairs of legs the anterior border of the merus and carpus is coarsely serrated, and the dactylus, which is not much more than half the length of the propodite, is stout and has the posterior border serrated.

In an egg-laden female the length of the fully extended body is 25 millim., and of the chelipeds 27 millim. In males of the same size the chelipeds are 30 millim. long.

237 specimens were taken in the Arabian Sea, off the Travancore coast, in 430 fathoms. Also taken off the N. Maldive Atoll in 210 fathoms, and in the Bay of Bengal off Ceylon in 296-320 fathoms.

Regd. Nos. $\frac{783}{10}$: $\frac{1380}{10}$: $\frac{2215-2314}{10}$.

35. *Munidopsis (Orophorhynchus) Edwardsii* (Wood-Mason).
Plate III. fig. 4.

Elasmonotus edwardsii, Wood-Mason, Ann. Mag. Nat. Hist., Feb. 1891, p. 201.

Orophorhynchus edwardsii, Milne Edwards and Bouvier, Ann. Sci. Nat., Zool., (7) XVI. 1894, p. 287.

Body and appendages covered with a velvety tomentum.

Rostrum broad, acutely triangular, simple, less than half the length of the carapace, dorsally carinated.

Frontal border of carapace oblique, with a sharp supra-antennal tooth: antero-lateral angle of carapace subacute, behind it the lateral margin is bilobed, the anterior lobe, which occupies all the space between the two branches of the cervical groove, having a salient subacute cristiform margin: posterior border of carapace smooth: dorsum of carapace unarmed, as also is the abdomen.

Eyestalks vertically compressed, sublaminar, fused and fixed, produced beyond the small laterally-compressed eye into a coarse spine.

Ventral border of merus of external maxillipeds obscurely serrated.

Chelipeds of the male hardly longer than the combined carapace and rostrum: the ischium has a subterminal spine on the produced ventral border;

the merus has a row of spinules along its dorsal border, and all its borders end in spines; the carpus has some granules and denticles on its upper surface, and a strongish spine on its inner border; the hand is smooth, with the fingers blunt, spooned, and about as long as the palm.

An epipodite is present on the chelipeds.

The next 3 pairs of legs are longer than the chelipeds, the anterior border of their merus and carpus is strongly spinose, and the dactylus is strong, more than half the length of the propodite, and serrated along the posterior margin.

Colour in the fresh state milk-white.

Length of fully extended body of male 43 millim., length of chelipeds 24 millim.

Bay of Bengal, 1300 and 1310 fathoms.

Regd. Nos. $\frac{6010}{9}$ (Type of the species): $\frac{7668}{6}$.

36. *Munidopsis (Orophorhynchus) granosa*, n. sp.

Plate III. fig. 1.

Carapace and abdomen as well as the chelipeds and legs closely covered with small confluent crystalline tubercles, without any setæ.

Rostrum very broad, triangular, acute, simple, not a third the length of the rest of the carapace, dorsally carinated, the carina continued on to the gastric region: its basal angle forms a small supra-antennal tooth.

The antero-lateral angle of the carapace forms a sharp right angle. The lateral borders are inflated and, like the posterior border, share in the general granulation of the carapace.

In addition to the general granulation, the 2nd, 3rd and 4th abdominal terga culminate in the middle line each in a sharp coarse tooth.

Eyestalks vertically compressed, sublaminar, slightly movable, only slightly produced beyond the small laterally-placed eye.

Chelipeds in the male only slightly longer than the carapace and rostrum, closely granular but without any spines, fingers blunt, spooned, about as long as the palm.

The next 3 pairs of legs are slightly longer than the chelipeds, and like them are closely granular but unarmed: the dactyli, which are strong, are nearly as long as the propodites, and are sharply toothed at the distal end of the posterior border.

There are no epipodites on the chelipeds or legs.

Length of fully-extended body of male 41 millim., length of chelipeds 22 millim.

Bay of Bengal 1520 fathoms.

Regd. No. $\frac{77}{7}$ (Type of the species).

37. *Munidopsis (Orophorhynchus) ciliata*, Wood-Mason.

Munidopsis ciliata, Wood-Mason, Ann. Mag. Nat. Hist., Feb. 1891, p. 200; Faxon, Mem. Mus. Comp. Zool. XVIII. 1895, p. 84.

Munidopsis brevimana, Henderson, Ann. Mag. Nat. Hist. (5) XVI. 1885, p. 414, and Challenger Anomura, p. 154, pl. xvii. figs. 1, 2.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI. FIG. 3.

The specimen in the Indian Museum, which was dredged in the Bay of Bengal, in 1310 fathoms, agrees in every particular with Henderson's description. Faxon has explained the necessity for adopting Wood-Mason's name, and has pointed out the close relation of this species to *M. nitida* A. M. Edw. from the West Indies.

To Henderson's description, which is quoted below, I may add that an epipodite is present on the chelipeds.

In our specimen, which is a male, the length of the fully extended body is 35 millim., and that of the chelipeds 19 millim.

The colour in the fresh state was milk white.

"The carapace is glabrous and covered with short transverse ridge-like elevations, which exist in greatest number on the posterior half; in some specimens also short hairs are sparingly met with. The gastric area is swollen, and armed in front with two prominent spines placed behind the base of the rostrum, while the short transverse ridges are comparatively few in number; the cardiac area is circumscribed, and a deep furrow crosses it transversely near the middle; the ridges are strongly marked, and lengthen out somewhat on the branchial regions. The rostrum is narrow and acute, slightly elevated towards the apex, and carinated superiorly, its length being less than half that of the carapace. The lateral margin of the carapace is armed with five spines, three of which are situated between the two divisions of the cervical groove, and the first of this trio reaches the greatest size; a single spine is placed on the antero-lateral margin behind the antennal peduncle; the posterior margin is prominent, but unarmed.

"The chelipedes are stout and remarkably short, with the joints pubescent, and the merus and carpus somewhat spiny above. The lower surface of the ischium is produced anteriorly, and a spinule is present near the apex of this process; the propodus is almost smooth, and dilated both from side to side and from above downwards; the fingers are short and stout, with their opposed surfaces deeply excavated, and the apical margins finely toothed; numerous short tufted hairs are present towards the apices, and the outer surface of the

immobile finger carries a denticulate carina. The ambulatory limbs are of moderate length, and the posterior surfaces of the meri and carpi are tuberculate, while their anterior margins are strongly spinose; the posterior surface of the propodi is carinated; the dactyli are only curved towards the apex, and their posterior margins are denticulate, the teeth increasing in size towards the terminal claw.

“The eyes still retain a certain amount of mobility, and are separated ventrally by from one to three small calcified pieces; the cornea is rounded, and the peduncle is prolonged into two slender lateral spines, the inner of which is about twice the length of the other. The antennal flagellum is more than twice the length of the body. The merus of the external maxillipeds has its inner margin irregularly dentate.

“The abdominal segments are comparatively smooth, a few granulations being present merely on the posterior ones; the second, third, and fourth each bear a curved transverse sulcus, the convexity of which is directed forwards.”

Regd. No. $\frac{6011}{9}$.

38. *Munidopsis (Orophorhynchus) subsquamosa*,
Hndrsn. var. *pallida*, Alcock.

Munidopsis subsquamosa var. *pallida*, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 331.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 7.

The carapace to the very tip of the rostrum is covered with hairy squames arranged in transverse series; its greatest breadth is about six-sevenths of its length. The rostrum, the length of which is about two-fifths that of the carapace, is broad, being at its base nearly one-third the breadth of the carapace, triangular, and strongly carinated, and upcurved and serrated at tip; the frontal border is in the same convex curve with the anterior portion of the lateral borders, it bears on each side a strong supra-antennal spine, and there is also a strong antero-lateral spine, behind which, on the lateral border, is a still stronger spine followed by two or three spinules: the posterior border is raised and quite smooth; the gastric and cardiac regions are well defined, the former having a pair of spines on the middle line in front.

The abdominal terga and pleura are squamous and hairy, but are not spinate; the second, third, and fourth terga are grooved transversely.

The eyestalks, which are short and stout, are united with one another at base and are almost immobile, each is prolonged beyond the cornea into a stout spine, which projects obliquely from beneath the base of the rostrum, to which, at first sight, it appears to belong.

The basal joint of the antennular peduncles is stout, but not inflated; of the two external terminal spines only one—the lower—is large and conspicuous.

The antennal flagellum is three times as long as the cheliped.

The external maxillipeds are short and slender, the ischium having the inner border finely ctenate and the meropodite having the lower border irregularly crenulate.

The thoracic legs are granular, or squamous, or spinulate, and moderately hairy.

The chelipeds are shorter and not very much stouter than the second, third, and fourth legs, their length being considerably less than half that of the body (with the rostrum); in the male they are slightly asymmetrical; the meropodite and carpus have each a terminal ring of spinelets, and the fingers, which are longer than the inflated palm, are coarse, and are excavated *en cuillère* at tip, being closely crenulate round both edges of the spoon-shaped tips, but not toothed in the proximal half.

The second, third, and fourth thoracic legs have the joints remarkably prismatic and the carpus and propodite strongly fluted; in all the anterior border of the meropodite and carpopodite is spinate, and the teeth on the posterior border of the dactylopodite are small, the dactylopodites being more than half as long as the propodites.

The chelipeds carry a large epipodite.

Colour in life brilliant white.

In the male the length of the fully extended body is 59 millim., that of the chelipeds is 36 millim.

Bay of Bengal, 1803 fathoms.

This variety appears to differ from the type in having only a pair of gastric spines and in the greater distinctness of the cardiac region.

Regd. No. $\frac{6907}{9}$.

39. *Munidopsis (Orophorhynchus) arietina*, Alcock.

Munidopsis arietina, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII, pt. 2, 1894, p. 171.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XII. FIG. 3.

Belongs to the *Munidopsis abbreviata* and *brevimana* group, but is distinguished from all its congeners by its enormous up-curved spiny *Heterocarpus*-like rostrum.

Carapace semi-elliptical. The rostrum, which is acutely styliform and strongly up-curved, is equal in length to the carapace, its tip reaching almost to the end of the fully extended chelipeds: its sides are acutely but unsymmetrically spinate.

The convex frontal margin is unarmed, except for the antero-lateral spine: the lateral margins besides this spine are armed with a second spine in the

hepatic region, and a third in the branchial: the posterior margin is strongly spinate: on the gastric region are two pairs of spines—a large pair in front, and a small inconspicuous pair behind: on the cardiac region also is a pair of small spines.

The abdominal terga are unarmed.

The eyestalks, which are slightly mobile, are prolonged internally beyond the cornea to form a spine. The meropodite of the external maxillipeds has its inner edge faintly serrated. The chelipeds are rather shorter than the ambulatory legs, and have short broad hands. The 2nd–4th legs have dactyli of the usual form.

No epipodites are present on any of the thoracic legs.

Length of fully extended body 27.5 millim., of chelipeds 15 millim. Bay of Bengal, 1520 fathoms.

Regd. No. $\frac{78}{7}$ (Type of the species).

40. *Munidopsis (Orophorhynchus) centrina*,

Alcock & Anderson.

Munidopsis centrina, Alcock and Anderson, Journ. Asiatic Soc. Bengal, Vol. LXIII. pt. 2, 1894, p. 170.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XI. FIG. 6.

Belongs to the group *Munidopsis abbreviata*, A. M.-E., *M. brevimana*, Hndrsn., *M. ciliata*, W.-M., and *M. vicina*, Faxon.

The carapace and appendages are remarkably acutely spinose, besides bearing many long coarse stiff setæ.

The carapace is strongly semi-elliptical, and is about three times the length of the narrow, depressed, acute, simple, carinated, rostrum. The strongly convex frontal margin bears four spines, a large one above the antenna on each side, and a smaller one between and behind this and the antero-lateral spine: the lateral margins are armed with 5 large spines besides the antero-lateral spine, 3 of which are in the hepatic, and 2 in the branchial region: the posterior margin is raised but smooth: on the gastric region are two transverse rows of spines, four in each row, those of the middle pair of the front row being about two-thirds the length of the rostrum.

The abdominal terga are unarmed, but deeply grooved transversely.

The eyestalks are short and immobile: their lower, their outer, and their inner border are all prolonged as spines beyond the cornea, the inner spine being more than half the length of the rostrum. The spines of the antennular and antennal peduncles are of remarkable size. The meropodite of the external maxillipeds is faintly three-toothed along the inner edge. The chelipeds are rather shorter than the ambulatory legs: they are acutely spiny up to the

hand, which has only the inner edge of the inflated palm slightly spinate: the fingers are very short, very broad and strongly spooned at tip. The 2nd to 4th legs are acutely spinate in every joint except the dactylus, which however has the usual dentations on its posterior margin. There are no epipodites on any of the thoracic legs.

Length of fully extended body 39 millim., of chelipeds 26.5 millim. Bay of Bengal, 1520 fathoms.

Regd. No. $\frac{80}{7}$ (Type of the species).

41. *Munidopsis (Orophorhynchus) ceratophthalmus*, n. sp.
Plate III. fig. 2.

Closely related to *M. spinoculata* A. M. Edw., from which it seems to differ only in having the chelipeds and legs armed with a few spines on the merus and carpus. Young specimens are hardly to be distinguished from *M. pilosa*, Henderson.

Rostrum about a third the length of the rest of the carapace, nearly triangular, carinated, simple.

Frontal border of carapace oblique, with a very strong supra-antennal spine: lateral border with a very strong spine behind the antero-lateral spine and an obscure denticle behind the posterior branch of the cervical groove: posterior border unarmed: dorsum with transverse ripple-like markings, which are most distinct postero-laterally, but without any spines.

Abdomen quite unarmed.

Eyes absolutely fixed: the eyestalk prolonged beyond the eye, on the inner side, as a spike more than half the length of the rostrum.

Merus of external maxillipeds with two little denticles on the ventral margin.

Chelipeds of the male much shorter than the body, faintly rugulose transversely and sparsely hairy, as are the legs: ischium with a strong spine at the inner distal angle, merus with a distal ring of 4 spines and a longitudinal dorsal row of spinules, carpus with a strong spine at the inner distal angle, hands unarmed, the fingers shorter than the palm, blunt, and strongly spooned. Legs about as long as the chelipeds, the merus spinose along the anterior border and with a terminal spine on the posterior border, the carpus with a pair of terminal spines on the anterior border, the dactylus short and stout.

There are no epipodites on any of the legs.

The abdominal appendages of the male are comparatively well developed.

In the largest male the length of the fully extended body is 42 millim., of the chelipeds 30 millim.

Andaman Sea, 480 fathoms.

Regd. Nos. $\frac{138}{7}$: $\frac{140}{7}$ (Type of the species).

42. *Munidopsis (Elasmonotus) cylindrophthalmus*, Alc.

Elasmonotus cylindrophthalmus, Alcock, Ann. Mag. Nat. Hist., April 1894, p. 333.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XIII. FIG. 4.

The carapace is quadrangular, with the antero-lateral angles simply rounded and the surface and borders quite unarmed, the lateral borders being quite parallel. The rostrum is triangular, flat, and horizontal, with the extreme tip slightly upturned; the frontal margin, which is faintly lobed on either side of the rostrum, meets the subcristiform lateral margins at right angles; the raised posterior margin is smooth; two deep grooves, one of which crosses the cardiac region, pass across the carapace transversely.

The abdominal terga and pleura are perfectly smooth; the terga, from the second to the fourth, are transversely grooved, the edges of the groove being salient but smooth; in the case of the fourth tergum the posterior edge of the groove forms a strongly convex eminence.

The eyestalks, which are slender and extremely short, are free and freely movable; the corneæ are remarkably long and cylindrical, their length being from nearly half to about two-thirds that of the rostrum.

The basal joint of the antennular peduncles has two external terminal spines, these being the only spines found upon the animal, with the exception of the spiniform antero-external angles of the 2nd and 3rd joints of the antennal peduncles.

The antennal peduncles are long and slender, the antero-external angle of each of the second to fourth joints forming a tooth.

The external maxillipeds are long and slender, the ischium having the inner edge finely toothed, and the meropodite having two small tubercles on its lower edge near the proximal end.

The thoracic legs are perfectly smooth and hardly pubescent. The chelipeds are long—one half longer than the body and more than three times as long as the other legs in the female, more than twice as long as the fully extended body in the male—slender, and cylindrical; the fingers, which are not two-thirds the length of the palm, are singular in being rather hairy.

The second to fourth thoracic legs are slender and extremely short, being not quite as long as the carapace (with the rostrum); they all have the meropodite carinated along the anterior border and the dactylopodite (which has the usual spiny posterior border) short.

Colours in life milky red above, milk-white below.

In an adult male the length of the fully extended body is 25 millim., that of the larger cheliped 51 millim.

Andaman Sea, 188-220, 250 and 265 fathoms; Arabian Sea, 406 fathoms.

Regd. Nos. $\frac{6906}{9}$ (Type of the species): $\frac{9154}{6}$: $\frac{3130}{9}$: $\frac{3189}{9}$: $\frac{115}{10}$.

In the next two species, the propodites of the 3rd, and still more those of the 4th, and to a certain extent those of the 2nd, thoracic legs are dilated towards the distal end, where, on the posterior border, is a prominent group of spines, against which the proximal half of the dactylus can be folded after the fashion of a subchela.

43. *Munidopsis (Bathyankeiristes) tenax*, n. n.

Bathyankeiristes spinosus, Alcock, Journ. Asiatic Soc. Bengal, Vol. LXIII, pt. 2, 1894, p. 174, pl. ix. fig. 2.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE LV. FIG. 2.

Carapace broad, depressed, rather broader behind than in front, but not at all elliptical in shape: its surface pilose, and transversely rugose, especially on the branchial regions, but not spinate. The rostrum, which is more than half the length of the carapace, is stoutly styliform, upturned, and very acute. The frontal margin of the carapace is slightly excavated above the eye (somewhat as in *Aeglea*), and almost transverse; it is unarmed, but a little ventrad of it, between the eye and the antenna, is a stout spine: the lateral margins of the carapace are deeply bilobed in front of the cervical groove, each lobe ending in an acute spine, and a third smaller spine occurs immediately behind the cervical groove: the posterior border is broadly moulded, and unarmed. The abdominal terga are perfectly smooth beneath a close fine pubescence, and ungrooved.

The eyes are unpigmented: the eyestalks are not prolonged beyond the cornea. The antennules have the basal joint inflated and strongly spinate. All the joints of the antennal peduncle are strongly spinate, the spine at the antero-external angle of the true third joint being of large size. The expodite of the 1st or anterior maxillipeds is without a flagellum. The antero-external angles of the ischiopodite and meropodite of the external maxillipeds are strongly spiniform, as is also the antero-inferior angle of the ischiopodite: near the middle of the inner border of the meropodite is a single strong spine. The trunk-legs are stout and densely hairy. The chelipeds are longer than the other legs, but shorter than the fully extended body: the ischiopodite has the inner border serrulate up to a distal terminal spine, and has also a distal tooth superiorly: the meropodite is strongly and acutely spiny along its upper and inner, and the carpopodite along its inner side, both of these joints having a distal ring of spines: the hand, which is a little longer than the fingers, has a few spinules

along the inner border: the fingers are finely and evenly toothed, and excavated ventrally. The 2nd-4th legs have the meropodite and carpopodite strongly spiniferous anteriorly: in all, but especially in the fourth, the propodite is enlarged at its distal end and there has its posterior border produced to form a compressed spiniferous tubercle, against which the basal portion of the dactylus can be flexed to form a sub-chela: in the second pair of legs the tubercle carries two or three teeth, in the third pair five or six, and in the fourth pair, which are almost typical sub-chelae, six or seven: the dactyli are stout, and are minutely serrated only in that part of their posterior border which is opposed to the tubercle on the propodite. The fifth pair of trunk-legs is of the ordinary Galatheid form. There are no epipodites on any of the thoracic legs.

In the female the 2nd-5th pairs of (uniramous) abdominal appendages are present, increasing in size from before backwards.

Length of fully-extended body 70 millim., of chelipeds 59 millim.

Andaman Sea, off Ross Island, 265 fathoms.

The specific name *spinus* having been used by Milne Edwards, in 1880, for a species of the subgenus *Orophorhynchus*, is not applicable to this species.

Regd. No. $\frac{3129}{9}$ (Type of the species).

44. *Munidopsis (Bathyankyristes) levis*, Alcock & Anderson.

Bathyankyristes levis, Alcock and Anderson, Journ. Asiatic Soc. Bengal, LXIII. pt. 2, 1894, p. 175.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE LV. FIG. 3.

Closely resembles the preceding species, from which it differs only in the following particulars:—The rostrum is broader and more depressed, and is only half the length of the carapace: the eye is relatively much larger—no part of the eyestalk being visible from above: the chelipeds are much less spiny: the 2nd-4th pairs of trunk-legs have the meropodite and carpopodite quite unarmed, except for a distal spine above and below: the abdominal terga are in closer contact.

In the male the 1st and 2nd pairs of abdominal appendages resemble those of *Munidopsis*, and the 3rd-5th pairs are rudiments.

Length 29 millim.: of chelipeds 27 millim.

Arabian Sea, in the neighbourhood of the Laccadives, 636 fathoms.

Regd. No. $\frac{9329}{9}$ (Type of the species).

GALACANTHA, A. M. Edw.

Galacantha, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII. 1880, p. 52: Henderson, Challenger Anomura, p. 166: Milne Edwards and Bouvier, Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 268, and Mem. Mus. Comp. Zool., XIX. No. 2, 1897, p. 55: Faxon, Mem. Mus. Comp. Zool. XVIII. 1895, p. 78.

Integument very strongly calcified.

Carapace convex, longer than broad, a little broader anteriorly than posteriorly, its surface rough; its gastric and cardiac regions well defined, each with a large antrorse median spine, largest on the gastric region; its anterolateral angles are acutely spiniform. Thoracic sternum broad.

Rostrum well developed, its proximal portion horizontal, its distal portion abruptly uptilted.

Abdomen simply flexed, the 2nd-4th terga usually with a median antrorse tooth or spine, the pleura behind the 1st well developed. Tail-fan large and symmetrical: telson as in *Munidopsis*.

Eyes without facets or pigment. Antennules and antennæ as in *Munidopsis*.

The mouth parts only differ from those of *Munida* in having a broad molar facet on the mandibles and no flagellum to the exopodite of the 1st maxillipeds.

Functional flagelliform epipodites are present on the external maxillipeds, on the chelipeds, and on the next two pairs of legs.

The chelipeds are more massive and slightly shorter than the next three pairs of legs: the last pair of legs are weak and are folded.

Abdominal appendages as in *Munidopsis*.

The gills are 14 on either side, arranged as in *Munida* and *Munidopsis*.

The eggs are few and large.

The species are all inhabitants of great depths.

Key to the Indian species of *Galacantha*.

- I. Carapace covered with small discrete subacute or subsquamiform tubercles, its posterior border non-spinulose:—
 1. 5th and 6th abdominal terga smooth *G. rostrata*.
 2. 5th and 6th abdominal terga covered with small tubercles *G. rostrata* var. *investigatoris*.
- II. Carapace covered with antrorse spinules, its posterior border spinulose ... *G. spinosa*.

45. *Galacantha rostrata*, A. M. Edw.

Galacantha rostrata, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII. 1880, p. 52: S. I. Smith, Bull. Mus. Comp. Zool. X. 1882, p. 21, pl. ix. fig. 2: Milne Edwards and Bouvier, Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 271, and Mem. Mus. Comp. Zool. XIX. No. 2, 1897, p. 60, pl. iv. figs. 21-24: Faxon, Mem. Mus. Comp. Zool., XVIII 1895, p. 78, pl. B. fig. 1.

Galacantha talismani, A. M. Edw., Henderson, Challenger Anomura, p. 167, pl. xx. fig. 1 (vide Milne Edwards and Bouvier, Mem. Mus. Comp. Zool. l.c.).

Galacantha bellis, Henderson, Challenger Anomura, p. 167, pl. xix. fig. 6.

Galacantha areolata, Wood-Mason, Ann. Mag. Nat. Hist., Feb. 1891, p. 200.

Munidopsis rostrata, S. I. Smith, P. U. S. Nat. Mus. VII. 1885, p. 493, and Report U. S. Fish. Comm. for 1885 (1886), Albatross Crust., p. 45, pl. vi. fig. 1.

Carapace, chelipeds (except fingers) and legs (except dactyli) everywhere closely covered with small discrete tubercles which on the carapace are subacute, on the chelipeds are subsquamiform, and on the legs have a strong tendency to a linear arrangement.

Rostrum from two-fifths to less than a third the length of the carapace, its horizontal portion has an obscurely bifid ending.

The great median gastric spine is very much larger than the cardiac spine, which again is a little larger than the paired gastric spines. Of the two oblique spines of the lateral borders the hepatic is much larger than the antero-lateral. Posterior border quite smooth.

The 2nd-4th abdominal terga are deeply grooved transversely and are only obscurely granular, each is armed with a median procurved spine, of which the third is smaller and blunter than the first two. The pleura of the 2nd abdominal somite are tubercular, like the carapace: those of the 3rd and 4th are only obscurely so. The last two terga and the telson are smooth and polished, except for a few scattered vesiculous granules on and near the telson.

Eyes large, freely movable, somewhat reniform on the inner side. The basal joint of the antennular peduncle ends externally in two spines, one of which is large. The antennal peduncle is non-spinose, and the flagellum is much longer than the body.

The ventral border of the merus of the external maxillipeds is subcristiform and cut into 2 or 3 spines, 2 of which are very large.

The chelipeds are much shorter than the extended body: the borders of the merus and carpus end in teeth or spines none of which are conspicuous except one on the carpus: the fingers are longer than the palm, straight, incurved at tip, and deeply excavated on the inner surface.

The legs are a little longer than the chelipeds: they are non-spinose except for the terminal teeth or spines of the merus, and their dactyli have the posterior edge serrated.

The colours in life, as observed in these seas, varies from dull chalky-orange to bright orange red with whitish patches.

Bay of Bengal, 1300, 1310 and 1520 fathoms; Arabian Sea, 1022 and 1070 fathoms.

In the largest specimen—an egg-laden female—the total length of the fully extended body is 51 millim., that of the chelipeds 32 millim.

Regd. Nos. $\frac{7667}{6} : \frac{8874}{6} : \frac{79}{7} : \frac{6108}{9} : \frac{9326}{9} : \frac{3413-3416}{10}$.

Galacantha rostrata var. *Investigatoris*, Alc. & Anderson.

Galacantha investigatoris, Alcock and Anderson, Journ. Asiatic Soc. Bengal, LXIII. pt. 2, 1894, p. 173.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XII. FIG. 4.

Differs only in the following unimportant particulars:—

All the abdominal terga behind the 1st (including the telson) and pleura are

closely covered with subacute or subsquamiform tubercles similar to those of the carapace.

The horizontal portion of the rostrum is deeply bifid at tip, and the two spines of the antero-lateral margins of the carapace are much longer.

The length of the fully-extended body, in the female, is 56 millim., that of the chelipeds 36 millim.

Colour in life, chalky orange.

Arabian Sea, off the island of Minnikoy, 1200 fathoms.

Regd. No. $\frac{8816}{9}$.

46. *Galacantha spinosa*, A. M. Edw. var. *trachynotus*, Anderson.

Galacantha trachynotus, Anderson, Journ. Asiatic Soc. Bengal, Vol. LXV. pt. 2, 1896, p. 100.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XXV. FIG. 3.

Differs from *G. rostrata* only in the following particulars:—

Instead of tubercles the carapace and chelipeds are covered, but not so closely, with spines and spinules, which, on the carapace, have a very definite arrangement.

The horizontal portion of the rostrum is more decidedly bifid.

Besides the large gastric and cardiac spines, and the large antero-lateral and hepatic spines, and the numerous spinelets, there is on the lateral border, immediately behind the cervical groove, a spine of considerable size. The posterior border of the carapace is armed with a row of small spines.

The 2nd–4th abdominal terga are deeply grooved transversely and the raised edges of the grooves are strongly serrated, the middle tooth of the anterior ridge of each tergum being enlarged: a row of teeth is continued on to the corresponding terga. There are some scattered tubercles on the 5th and 6th terga, and on the telson, and the anterior border of the 5th tergum is serrated.

The angles of the 2nd, 3rd and 4th joints of the antennal peduncle are spiniform.

The terminal spines of the borders of the merus and carpus of the legs and chelipeds are conspicuous.

Colour in life milky orange.

In the largest specimen the length of the fully extended body is 30 millim., that of the chelipeds 21 millim.

Arabian Sea, 912, 912–931 and 947 fathoms.

The only difference between the Indian specimens and the one figured by Milne Edwards and Bouvier (in Mem. Mus. Comp. Zool. XIX. No. 2, 1897, pl. iv. figs. 14–20) is that in the Indian specimens the spines of the antero-lateral

borders are smaller, the horizontal portion of the rostrum is very distinctly bifid, and the spinelets of the dorsal surface of the chelipeds and legs are larger, while the epipodite of the 4th (penultimate) thoracic legs is, as in *G. rostrata*, a mere tubercle without a lash.

Regd. Nos. $\frac{113}{10} : \frac{114}{10} : \frac{118}{10}$.

Family *Uroptychidæ*.

Diptycinés, A. Milne Edwards and Bouvier, Ann. Sci. Nat., Zool. (7) XVI. 1894, pp. 296, 312-313.

Galatheidæ (part), Henderson, Challenger Anomura, and Stebbing, Hist. Crust.

Chirostylidæ, Ortmann in Bronn's Thier Reich Malacostraca, p. 1149.

Carapace longer than broad, either depressed with the lateral borders well defined, or convex and subcylindrical, its surface either spinose or perfectly smooth.* Thoracic sternum broad, the last segment more or less atrophied. Rostrum well developed.

In addition to the abdomen being folded on itself, the tail-fan is tucked in beneath the preceding abdominal somites, the telson being transversely divided. The 1st somite is only partly hidden by the carapace, and the infolded angles of the carapace are held down (as in many *Macrura*) between the outer angles of this somite and the very prominent antero-external angles of the 2nd somite. The pleura behind the 1st somite are very well developed.

Eyestalks short, no orbits. Antennular peduncles weak, the basal joint not widely dilated: the flagella, especially the lower one short.

Antennal peduncle 5-jointed, the 3rd joint being quite distinct: the flagellum of no great length. A movable acicle is often present at the outer angle of the 2nd joint of the peduncle.

The incisor edge of the mandible is serrated. No epipodite is present on the external maxillipeds.

Chelipeds and next 3 pairs of legs well developed, sometimes very long and slender: the last pair of legs weak and flexed.

In the males, and often also in the females, a reduced number of the abdominal somites are furnished with appendages.

Key to the genera of Uroptychidæ of the Indian Oligobenthos.

- I. Carapace convex, the lateral borders inflated and not sharply defined: rostrum spiniform: antennal acicle wanting: chelipeds and first 3 pairs of legs slender and of enormous length PTYCHOGASTER.
- II. Carapace with the lateral borders very sharply defined: rostrum acutely triangular: antennal acicle long and conspicuous: chelipeds long, next 3 pairs of legs of moderate length UROPTYCHUS.

* In no Indian *Uroptychidæ* is the carapace transversely rugulose.

PTYCHOGASTER, A. M. Edw.

Ptychogaster, A. Milne Edwards, Bull. Mus. Comp. Zool. VIII. 1880, p. 63: Henderson, Challenger Anomura, p. 170: Milne Edwards and Bouvier, Ann. Sci. Nat. Zool. (7) XVI. 1894, p. 301, and Mem. Mus. Comp. Zool. XIX. No. 2, 1897, p. 117: Bouvier, Bull. Soc. Entomol. France, LXV. 1896, pp. 307-312.

Chirostylus, Ortmann, Zool. Jahrb., Syst. VI. 1891-92, p. 244.

Gastroptychus, Caullery, Caudan Crust. Ann. Univ. Lyon., 1896, p. 390.

Carapace convex, subcylindrical, broader behind than in front, usually spinose, the gastric region well defined: it is held down by the incurved posterolateral angles. Thoracic sternum broad its last segment very much reduced. Rostrum slender and spiniform.

Abdomen folded on itself, the pleura behind the 1st well developed: tail-fan symmetrical; telson transversely fissured and folded under the preceding somites with the caudal swimmerets.

Eyes well pigmented. Antennular peduncles weak and flexed, the last joint elongate; the lower flagellum very much shorter and slenderer than the upper. Antennal peduncles slender, five-jointed without a movable acicle: the flagellum of no great length.

Mandibles with an incurved palp and with the edge of the incisor process serrated.

The exopodites of all the maxillipeds are flagellated, and the external maxillipeds are pediform. None of the maxillipeds and none of the thoracic legs have epipodites.

The chelipeds and next 3 pairs of legs are slender, spiny and of enormous length; the last pair of legs are weak and infolded.

In the male the 1st and 2nd abdominal somites carry paired appendages modified for copulation, and rudimentary paired appendages are present on the next three somites: in the female slender paired appendages are present on the 2nd-5th somites.

The eggs are large and not numerous.

In both the Indian species the branchial formula is as follows:—

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ.		Pleurobranchiæ.	
		Anterior.	Posterior.		
VII	0	0	0	0	= 0
VIII	0	0	0	0	= 0
IX	0	1	1	0	= 2
X	0	1	1	0	= 2
XI	0	1	1	1	= 3
XII	0	1	1	1	= 3
XIII	0	1	1	1	= 3
XIV	0	1	0	0	= 1
Total.	0	6	5	3	= 14 (no epipodites).

The arthrobranchiæ of somite IX are small and slender and are crushed up against the bases of the 2nd maxillipeds to which, at first sight, they appear to belong.

Key to the Indian species of Ptychogaster.

- I. The first segment of the telson is not much more than half the antero-posterior diameter of the second segment *P. hendersoni*.
- II. The antero-posterior diameter of the first segment of the telson is much more than half that of the second *P. investigatoris*.

47. *Ptychogaster Hendersoni*, Alcock & Anderson.

Ptychogaster hendersoni, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan., 1899, p. 23.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLV. FIG. 2.

Carapace (including rostrum) equal in length to the first six fully extended abdominal terga, covered with spinules and spines, in which a definite serial arrangement of the larger spines is hardly manifest.

All the abdominal terga (telson excepted) and pleura bear spines: the first tergum has a transverse spiny carina continuous with a similar carina on the anterior edge of the second pleura; the second has two such carinæ; the third has a longitudinal row of spines at the junction with either pleura but is otherwise smooth; the fourth and fifth have two transverse series of spines, besides an occasional spine on their posterior edge; the sixth has numerous spines, including three conspicuous transverse series.

First segment of the telson not much more than half the length of, and slightly broader than, the second.

External maxillipeds unarmed, except for the fine teeth along the inner edge of the ischium, hairy along inner edge, especially at distal end.

Chelipeds and legs long, slender, and spiny; in the female (male unknown) the chelipeds are more than $2\frac{3}{4}$ times the length of the fully extended body and nearly half as long again as the legs; the first two pair of legs are nearly of one length, but the third pair are the longest by nearly a dactylus, owing to the elongation of their propodite, which is nearly five times as long as the dactylus.

A female from off the Travancore coast, 430 fathoms, is 30 millim. in extreme length when fully extended, and has chelipeds 86 millim. long and the third pair of legs 55 millim. long.

Colour salmon-pink, eyes deeply pigmented.

Regd. No. $\frac{2348}{10}$ (Type of the species).

48. *Ptychogaster investigatoris*, Alcock & Anderson.

Ptychogaster investigatoris, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 24.
ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLV. FIG. 1.

Carapace short, its length (including the rostrum, which is between a half and a third that of the rest of the carapace) is only equal to that of the first five and a half fully extended abdominal terga; its surface is everywhere studded with spinules and spines, the largest of which show a tolerably plain arrangement in four longitudinal series.

The only abdominal tergum (besides the telson) that is perfectly free from spines is the third: the first tergum has a transverse spiny carina continuous with a similar carina on the edge of either pleura of the second segment; the second has a transverse raised row of four large spines, besides several teeth; both the fourth and fifth are separated from their pleura on either side by a longitudinal row of two or three spines or serrations but are otherwise smooth; the sixth is covered with retrorse spinules and spines, including three conspicuous transverse series, of which the last far overhang the telson.

The first segment of the telson is hardly perceptibly shorter, and slightly narrower, than the second; the surface of both bears some inconspicuous capillary spinelets or bristles.

The pleura of the third and fourth abdominal somites are devoid of spines.

The external maxillipeds are unarmed, except for the ischial serrations, and are very hairy in their distal half.

Chelipeds and legs long, slender, and spiny; the chelipeds in the female (male unknown) are about $2\frac{2}{5}$ times the length of the fully extended body and half as long again as the legs; the racquet-like form of the hand, due to the bowing of the basal half of the fingers, is more than ordinary conspicuous.

Of the first three pair of legs the first is slightly the longest and the second slightly the shortest; the dactyli of all are hardly more than a quarter the length of the propodites.

A female from the Andaman Sea, 405 fathoms, is 55 millim. in length when fully extended, and has chelipeds 132 millim. and first legs 91 millim. long.

The eyes are large and rather pale.

Regd. No. $\frac{1378}{10}$ (Type of the species).

UROPTYCHUS, Henderson.

Diptychus, A. Milne Edwards, Bull. Mus. Comp. Zool., VIII. 1880, p. 61, and Milne Edwards and Bouvier, Ann. Sci. Nat. Zool., (7) XVI. 1894, p. 303, and Mem. Mus. Comp. Zool. XIX. No. 2, 1897, p. 123 (*nom. præocc.*).
Uroptychus, Henderson, Challenger Anomura, p. 173.

Carapace somewhat depressed with the lateral borders well defined, broader

behind than in front, held down by the incurved postero-lateral angles. Thoracic sternum broad, its last segment atrophied.

Rostrum acutely triangular.

Abdomen folded on itself, the telson, which is transversely fissured and very small, is, with the symmetrical caudal swimmerets, folded under the preceding somites. The pleura behind the first are fairly well developed.

Eyes well pigmented, the eyestalks short and stout and not dilated. Antennular peduncles weak and flexed; the lower flagellum very much shorter and slenderer than the upper.

Antennal peduncles five-jointed, the second joint with a movable acicle: the flagellum of no great length.

The mandibles, which carry an incurved 3-jointed palp, have the molar process hardly apparent and the edge of the incisor process serrated.

The exopodites of all the maxillipeds are flagellated.

There are no epipodites on any of the maxillipeds or thoracic legs.

The external maxillipeds are pediform with the propodite elongate.

Chelipeds very much longer and considerably stouter than the legs: the last pair of legs weak and infolded.

In the male the first 2 abdominal somites carry paired appendages modified for copulation, and rudimentary paired appendages are present on the 3rd and 4th somites. In the female paired appendages are present on the 3rd and 4th somites.

The eggs are large and not numerous.

The branchial formula is as follows:—

Somites and their appendages.	Podobranchiæ and epipodites.	Arthrobranchiæ.		Pleurobranchiæ.	
		Anterior.	Posterior.		
VII	0	0	0	0	= 0
VIII	0	0	0	0	= 0
IX	0	1	1	0	= 2
X	0	1	1	0	= 2
XI	0	1	1	1	= 3
XII	0	1	1	1	= 3
XIII	0	1	1	1	= 3
XIV	0	1	0	0	= 1
Total	0	6	5	3	= 14 (no epipodites).

Key to the species of Uroptychus of the Indian Benthos and Oligobenthos.

- I. Carapace and chelipeds spinose *U. fusimanus.*
 II. A pair of spines on the gastric region: chelipeds non-spinose ... *U. nigricapillis.*

III. No spines on dorsum of carapace: chelipeds non-spinose:—

1. Major diameter of eye about a third the length of the rostrum :
propodites of 2nd, 3rd and 4th legs with numerous spinelets on
the posterior border *U. australis.*
2. Major diameter of eye about a fifth the length of the rostrum :
propodites of 2nd, 3rd and 4th legs with a single (terminal)
spinelet on the posterior border *U. bacillimanus*

49. *Uroptychus fusimanus*, Alcock & Anderson.

Uroptychus fusimanus, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 26.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLIV. FIG. 4.

Dorsal surface of carapace studded with numerous spines in more or less distinct rows, the well-defined cristiform lateral borders acutely spinate. Abdomen perfectly smooth.

Carapace (without rostrum) slightly longer than broad; cervical suture very well defined; rostrum acutely triangular, simple, the frontal margin on either side of it deeply concave for the eye, forming a distinct orbital notch. Eye of good size and well pigmented.

Antennal acicle large, reaching as far as the tip of the peduncle.

Chelipeds in both sexes equal, about $1\frac{2}{3}$ times the length of the fully extended body, much stouter and rather more than one-third of their extent longer than the legs, subcylindrical as far as the compressed and broadened hands; along the upper and inner surfaces of the arm and wrist are longitudinal rows of spines, those in at least two rows being conspicuously enlarged and sharply raised; hands smooth, broadened, the edges of the palm almost cristiform.

First three pair of legs slender, smooth, the meropodites somewhat dilated, the third pair about a dactylus shorter than the other two; the dactyli are less than a third the length of their propodites, and they have the posterior border finely toothed in the distal two-thirds: an acicular spine is found at the end of the posterior border of the propodite.

Seven specimens (one an egg-laden female), from off the Travancore coast, 430 fathoms.

The fully extended body of the largest female measures 31 millim. and the chelipeds 53 millim.; that of the largest male measures 27 millim. and the chelipeds 42 millim.

Regd. Nos. $\frac{2339-2345}{10}$ (Types of the species).

50. *Uroptychus nigricapillis*, n. sp. Plate III. fig. 3.

Carapace smooth except for a pair of largish spines on the gastric region on either side and behind the base of the rostrum. The antero-lateral angles

and the anterior pterygostomian angles of the carapace are spiniform, and the lateral borders behind the cervical groove are serrated, the first tooth, which is hepatic in position, being of fair size. Abdomen perfectly smooth.

Rostrum acutely triangular, with trenchant edges, not more than a third of its length lies beyond the eyes.

Eyes of good size, their major diameter about a third the length of the rostrum.

The antennal acicle reaches about two-thirds of the way along the antennal peduncle.

External maxillipeds unarmed.

Chelipeds in the female more than three times the length of the carapace (rostrum included), smooth, glabrous except a tuft of silky black setæ concealing the tips of the fingers.

In the next 3 pairs of legs there are some silky setæ on the dactyli, the posterior border of the dactyli is serrated, and there are a series of acicular spinelets along the middle of the posterior border of the propodites.

The outer ends of the individual thoracic sterna are well defined and serrulate.

Andaman Sea, 669 fathoms.

Regd. No. $\frac{3443}{10}$ (Type of the species).

51. *Uroptychus australis*, Henderson, var. *indicus*, nov.

Appears to differ from the form described by Henderson (Challenger Anomura, p. 179, pl. xxi. fig. 4) only in the sculpture of the chelipeds, which are smooth except for some vesiculous granules on the ventral surface of the ischium merus and carpus of the chelipeds: the antero-lateral angles of the carapace and the anterior pterygostomian angle also seem to be more decidedly spiniform.

Carapace smooth unarmed, except for the spiniform antero-lateral and pterygostomian angles, its lateral borders to the naked eye are smooth and unbroken, but under the lens are in places very finely crenulate. Rostrum triangular, acute, with trenchant edges, not quite a third of its length lies beyond the eyes.

Abdomen smooth and polished.

Eyes of good size, their major diameter more than a third the length of the rostrum.

The antennal acicle nearly reaches to the end of the antennal peduncle.

External maxillipeds unarmed.

The chelipeds are from $3\frac{1}{2}$ to nearly 4 times the length of the carapace (rostrum included) and are stouter in the male than in the female: they are glabrous except for a few silky setæ in the distal half of the fingers, and they

are perfectly smooth except for some vesiculous granules on the ventral surface of the ischium merus and carpus: in the male the palm is a little broadened and inflated, and in both sexes there is an enlarged bicuspid tooth at the basal end of the cutting edge of the dactylus.

The legs are about half the length of the chelipeds: they have a few scattered silky setæ of enormous length; their propodites are slightly expanded in their distal half, where the posterior border is serrated; their dactyli are strongly serrated along the posterior border.

The thoracic sternum has its edges deeply lobed in correspondence with the segments of which it consists: the segment corresponding with the external maxillipeds has a pair of median teeth, and that of the chelipeds has its anterior angles strongly spiniform.

Length of fully extended body of an adult male 30 millim., of chelipeds 70 millim.

Arabian Sea, off Cape Comorin, 459 fathoms: Bay of Bengal, off Ceylon, 805 fathoms.

Regd. Nos. $\frac{9328}{9}$: $\frac{1356}{10}$: $\frac{1362}{10}$: $\frac{3759}{10}$: $\frac{3760}{10}$.

52. *Uroptychus bacillimanus*, Alcock & Anderson.

Uroptychus bacillimanus, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 25.

ILLUSTRATIONS OF THE ZOOLOGY OF THE INVESTIGATOR, CRUSTACEA, PLATE XLV. FIG. 3.

Nearest to *U. gracilimanus*, Henderson, from which it seems to differ only in having the carapace pitted and the posterior border of the propodites of the legs unarmed, and to the Atlantic *U. rubrovittatus*, A. M.-Edw., from which it differs in having slender chelipeds and also the posterior border of the propodites of the legs unarmed.

Carapace unarmed, except for a tiny spinule at either antero-lateral angle and another even smaller at the outer angle of either orbital notch; its surface covered with a fine squamiform pitting, its lateral borders with a regular squamiform crenulation.

Rostrum triangular, simple, acute, more than a third of its length projecting beyond the eyes.

Abdomen smooth; the third to sixth pleura rounded.

Eyes small, their major diameter less than a fifth the length of the rostrum, brown in colour.

Antennal acicle acutely triangular, reaching about two-thirds the distance along the terminal joint of the antennal peduncle.

Chelipeds in both sexes about twice the length of the fully extended body, very slender in the male, still more slender in the female, perfectly smooth, but

bearing (as do also the legs) some curiously long and delicate silky hairs; the hand is longer and slightly broader than the wrist, the fingers are considerably less than half the length of the palm.

Legs slender, less than half the length of the chelipeds; a few spinules on the posterior border of the dactyli, but only a single one (situated terminally) on the posterior border of the propodites.

A young male and female from off the Travancore coast, 430 fathoms, and an egg-laden female from off Ceylon, 820-296 fathoms.

Length of fully extended body of female 29 millim., of chelipeds 54 millim.

Regd. Nos. $\frac{2349-2350}{10}$ (Types of the species): $\frac{768}{10}$.

INDEX.

	<i>Page.</i>		<i>Page.</i>
Acanthephyra	75	Bathyan kyristes	249
" armata	78	" levis	274
" cristata	82	" tenax	273
" curtirostris	81	Benthesicymus	42
" eximia	76	" Bartletti	45
" " var. brachytelsonis	78	" investigatoris	44
" microphthalmus	80	Brachycarpus	137
" sanguinea	79	" laccadivensis	138
Aegeon	117	Calastacus	191
" affine	118	" felix	192
" andamanese	121	" investigatoris	191
" bengalense	122	Callianassa	197
" medium	120	" cæcigena	198
ALPHEIDÆ	139	" lignicola	200
Alpheus	139	CALLIANASSIDÆ	197
" macroscelus	140	Calocaris	187
" Shearmeri	141	" alcocki	190
ANOMALA	206	" felix	192
Arctus	180	" investigatoris	191
" orientalis	181	" macandreae	189
" rubens	182	CARIDÆA	54
ARISTEINÆ	12	Chlænopagurus	228
Aristæomorpha	38	" Andersoni	229
" rostridentatus	39	Chlorotocus	100
Aristæopsis	40	" gracilipes var. andamanensis	101
" armatus	41	CRANGONIDÆ	114
Aristæus	27	CRANGONOIDA	56
" armatus	41	Dorodotes	109
" Carpenteri	32	" reflexus	109
" coruscans	37	Elasmonotus	249
" crassipes	33	" cylindrophthalmus	272
" Edwardsianus	36	Engystenopus	143
" rostridentatus	39	" palmipes	144
" semidentatus	31	Ephyrina	83
" tener	42	" Hoskynii	84
" virilis	30	Eryonicus	176
ASTACIDÆA	150	" indicus	176
AXIIDÆ	187	ERYONIDÆ	164

	<i>Page.</i>		<i>Page.</i>
ERYONIDEA ... ..	... 151	HOPLOPHOROIDA ... ..	... 55
Galacantha ... ..	... 274	Hoplophorus ... ..	... 72
" rostrata ... ..	... 275	" gracilirostris ... ..	... 73
" " var. investigatoris ...	... 276	Iconaxiopsis ... ..	... 193
" spinosa " trachynotus ...	... 277	" andamanensis ... ..	... 196
GALATHEIDÆ ... ..	... 236	" laccadivensis ... ..	... 195
GALATHEIDEA ... ..	... 235	LITHODEA ... ..	... 231
Galathodes ... ..	... 249	Lithodes ... ..	... 232
" posidonia ... ..	... 263	" Agassizii ... ..	... 232
" regia ... ..	... 261	LORICATA ... ..	... 151
" trachypus ... ..	... 262	MACRURA ... ..	... 8
" triæna ... ..	... 261	" ASTACIDES ... ..	... 149
" ? tridentata ... ..	... 264	" CARIDIDES ... ..	... 9
" trifida ... ..	... 260	Metapeneus ... ..	... 14
Gebicula ... ..	... 201	" couiger ... ..	... 16
" exigua ... ..	... 202	" " var. andamanensis ...	... 17
Gennadas ... ..	... 45	Munida ... ..	... 237
" carinatus ... ..	... 46	" andamanica ... ..	... 242
" parvus ... ..	... 46	" comorina ... ..	... 239
Glyphocrangon ... ..	... 125	" microps ... ..	... 240
" cæca ... ..	... 135	" " var. lasiocheles ... ..	... 241
" cæcescens ... ..	... 133	" squamosa var. prolixa ...	... 244
" cerea ... ..	... 136	" tricarinata ... ..	... 246
" Gilesii ... ..	... 132	" vigiliarum ... ..	... 243
" hastacauda ... ..	... 131	Munidopsis ... ..	... 247
" investigatoris ... ..	... 127	" arietina ... ..	... 269
" priononota ... ..	... 129	" centrina ... ..	... 270
" Smithii ... ..	... 129	" ceratophthalmus ... ..	... 271
" unguiculata ... ..	... 130	" ciliata ... ..	... 267
GLYPHOCRANGONIDÆ ... ..	... 124	" cylindrophthalmus ... ..	... 272
Haliporus ... ..	... 22	" dasypus ... ..	... 252
" æqualis ... ..	... 23	" Edwardsii ... ..	... 265
" microps ... ..	... 25	" Goodridgii ... ..	... 258
" neptunus ... ..	... 24	" granosa ... ..	... 266
" taprobanensis ... ..	... 25	" Hemingi ... ..	... 251
" villosus ... ..	... 26	" iris ... ..	... 255
Hemipeneus ... ..	... 31	" levis ... ..	... 274
" Carpenteri ... ..	... 32	" Moresbyi ... ..	... 259
" crassipes ... ..	... 33	" posidonia ... ..	... 263
Hepomadus ... ..	... 42	" regia ... ..	... 261
" tener ... ..	... 42	" scobina ... ..	... 254
Heterocarpus ... ..	... 102	" subsquamosa var. pallida ...	... 268
" alphonsi ... ..	... 106	" stylirostris ... ..	... 256
" ensifer ... ..	... 107	" tenax ... ..	... 273
" gibbosus ... ..	... 103	" trachypus ... ..	... 262
" lævigatus ... ..	... 105	" triæna ... ..	... 261
" tricarinatus ... ..	... 107	" ? tridentata ... ..	... 264
" Wood-Masoni ... ..	... 108	" trifida ... ..	... 260
HOPLOPHORIDÆ ... ..	... 72	" unguifera ... ..	... 253

	<i>Page.</i>		<i>Page.</i>
Munidopsis Wardeni ...	257	Panulirus ...	184
NEMATOCARCINIDÆ ...	85	" angulatus ...	185
Nematocarcinus ...	86	Paralomis ...	232
" cursor ...	89	" indica ...	234
" " var. paucidentatus ...	90	" investigatoris ...	233
" gracilis ...	90	Parapagurus ...	216
" tenuipes ...	87	" Andersoni ...	220
" tenuirostris ...	88	" " var. brevimanus ...	221
Nephrops ...	153	" minutus ...	222
" thomsoni var. andamanica ...	153	" pilosimanus ...	218
NEPHROPSIDÆ ...	151	Parapandalus ...	99
NEPHROPSIDEA ...	150	" spinipes ...	100
Nephropsis ...	157	Parapasiphæa ...	64
" atlantica ...	161	" Gilesii ...	66
" Carpenteri ...	160	" latirostris ...	65
" ensirostris ...	162	Parapeneopsis ...	14
" Stewarti ...	159	Parapeneus ...	14
" Suhmi ...	163	" investigatoris ...	18
Orophorhynchus ...	249	" rectacutus ...	17
" arietina ...	269	Parapontocaris ...	120
" centrina ...	270	" andamanense ...	121
" ceratophthalmus ...	271	" bengalense ...	122
" ciliata ...	267	Parapylocheles ...	213
" Edwardsii ...	265	" scorpio ...	214
" granosa ...	266	Parasolenocera ...	21
" subsquamosa var. pallida ...	268	" annectens ...	21
PAGURIDÆ ...	215	Pasiphæa ...	58
PAGURIDEA ...	208	" alcocki ...	61
Paguristes ...	225	" sivado... ...	59
" puniceus ...	226	" unispinosa ...	60
PAGURODEA ...	209	PASIPHÆIDÆ ...	57
Pagurodes ...	224	PASIPHÆOIDA ...	55
" sp. ? inarmatus ...	225	PENEIDÆ ...	11
" " ? limatulus ...	225	PENEIDEA ...	10
Palæmon laccadivensis ...	138	PENEINÆ ...	11
PALEMONIDÆ ...	137	Peneus ...	13
PALEMONOIDA ...	56	" coniger ...	16
PALINURIDÆ ...	183	" " var. andamanensis ...	17
PANDALIDÆ ...	91	" investigatoris ...	18
PANDALOIDA ...	55	" rectacutus ...	17
Pandalopsis ...	93	Pentacheles ...	171
Pandalus ...	92	" Beaumontii ...	175
" alcocki ...	97	" Carpenteri ...	174
" bifurca ...	98	" gibbus ...	173
" ensis ...	96	" Hextii ...	172
" martius ...	95	Phoberus ...	155
" ocellus ...	98	" cæcus var. tenuimanus ...	156
" spinipes ...	100	Phye ...	61
" unidens ...	97	" alcocki ...	61

	<i>Page.</i>		<i>Page.</i>
Plastocrangon ...	... 133	Ptychogaster investigatoris ...	... 281
" cæca ...	... 135	Pylocheles ...	... 210
" cæcescens ...	... 133	" Miersii ...	... 212
" cerea ...	... 136	PYLOCHELIDÆ ...	... 209
Plesionika ...	... 94	Richardina ...	... 146
" alcocki ...	... 97	" spongicola ...	... 146
" bifurca ...	... 98	SCYLLARIDÆ ...	... 179
" ensis ...	... 96	Sergestes ...	... 48
" martius ...	... 95	" bisulcatus ...	... 49
" ocellus ...	... 98	" hamifer ...	... 53
" unidens ...	... 97	" inous ...	... 50
Plesiopeneus ...	... 35	" rubroguttatus ...	... 51
" coruscans ...	... 37	SERGESTIDÆ ...	... 47
" Edwardsianus ...	... 36	SICYONINÆ ...	... 12
Polycheles ...	... 166	Solenocera ...	... 19
" andamanensis ...	... 169	" annectens ...	... 21
" ceratus ...	... 170	" Hextii ...	... 20
" phosphorus ...	... 168	Spongicola ...	... 148
" sculptus ...	... 170	" andamanica ...	... 148
Pontophilus ...	... 115	STENOPIDÆ ...	... 143
" abyssi ...	... 116	STENOPIDEA ...	... 142
" gracilis ...	... 115	Sympagurus ...	... 223
Prionocrangon ...	... 123	" monstrosus ...	... 223
" ommatosteres ...	... 123	Sympasiphæa ...	... 62
PSALIDOPODIDÆ ...	... 110	" annectens ...	... 63
PSALIDOPODOIDA ...	... 56	THALASSINIDEA ...	... 150
Psalidopus ...	... 111	Trachypeneus ...	... 15
" Huxleyi ...	... 112	UROPTYCHIDÆ ...	... 278
" spiniventris ...	... 113	Uroptychus ...	... 281
Psathyrocaris ...	... 67	" australis var. indicus ...	... 284
" fragilis ...	... 69	" bacillimanus ...	... 285
" infirmis ...	... 71	" fusimanus ...	... 283
" platyophthalmus ...	... 70	" nigricapillis ...	... 283
" plumosa ...	... 70	Willemoesia ...	... 178
Ptychogaster ...	... 279	" indica ...	... 178
" Hendersoni ...	... 280	Xiphopeneus ...	... 15

EXPLANATION OF PLATES.

PLATE I.

Figs. 1, 1a. *Willemoesia indica*, natural size.

Figs. 2, 2a. *Nephropsis ensirostris*, $\times 1\frac{1}{2}$.

PLATE II.

Fig. 1. *Iconaxiopsis andamanensis*, $\times 2$.

Fig. 1a. Part of the antenna of *Iconaxiopsis andamanensis*, $\times 4$.

Fig. 2. *Spongicola andamanica*, $\times 6$.

Fig. 3. *Engystenopus palmipes*, $\times 2$.

Fig. 4. *Gebicula exigua*, $\times 6$.

PLATE III.

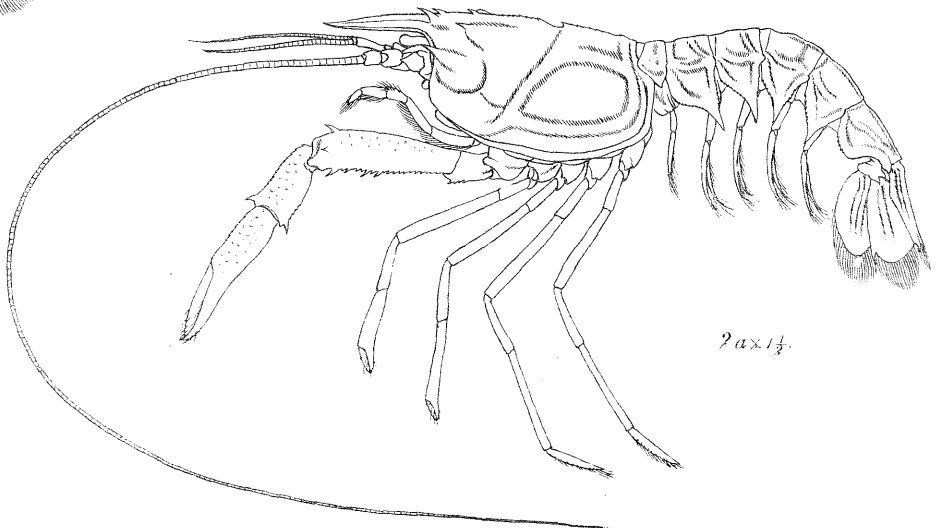
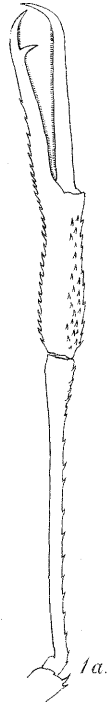
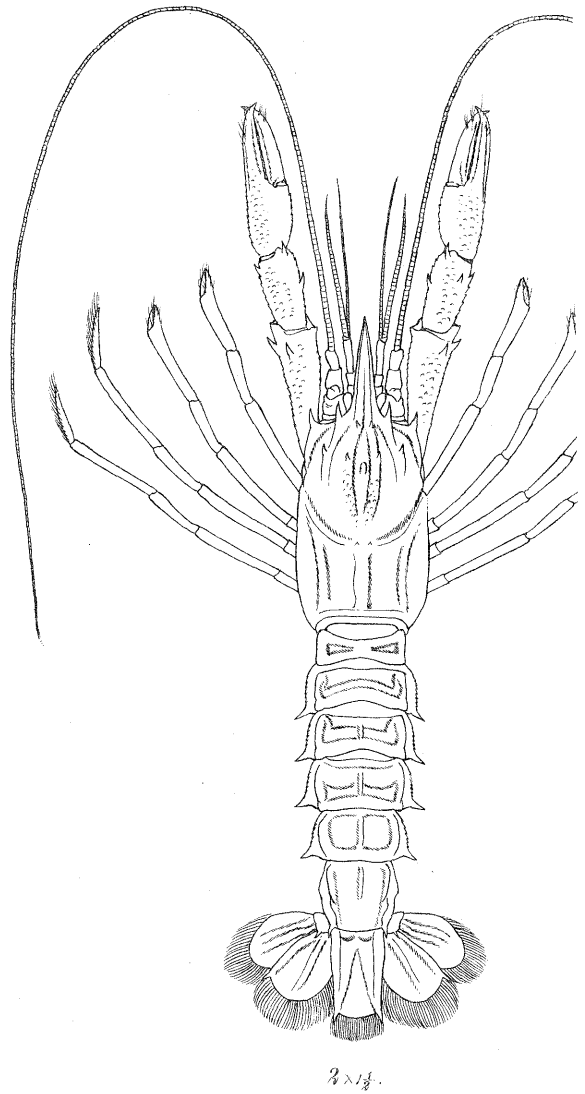
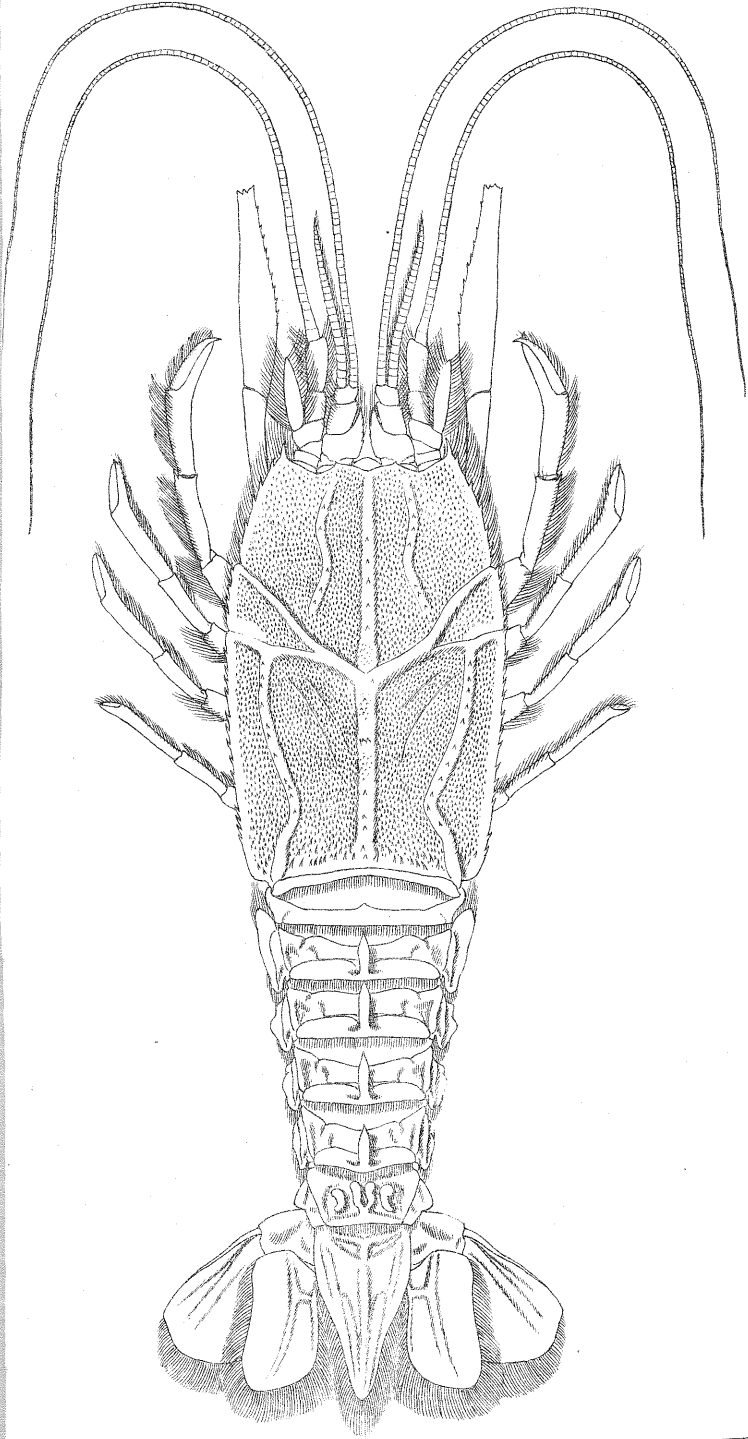
Fig. 1. *Munidopsis (Orophorhynchus) granosa*, $\times 2$.

Fig. 2. *Munidopsis (Orophorhynchus) ceratophthalmus*, $\times 1\frac{1}{2}$.

Fig. 3. Carapace etc. of *Uroptychus nigricapillis*, $\times 6$.

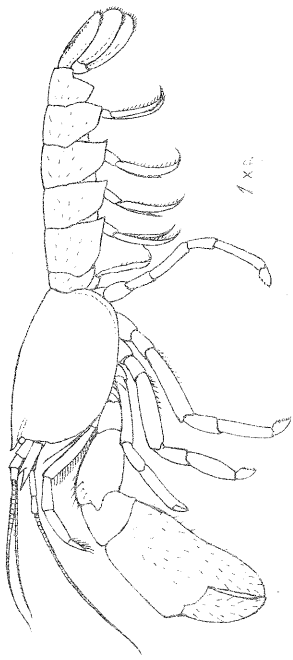
Fig. 3a. Hand of *Uroptychus nigricapillis*, $\times 3$.

Fig. 4. *Munidopsis (Orophorhynchus) Edwardsi*, $\times 1\frac{1}{2}$.

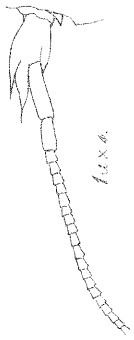


1. 1 a. Willemoesia indica ♂.

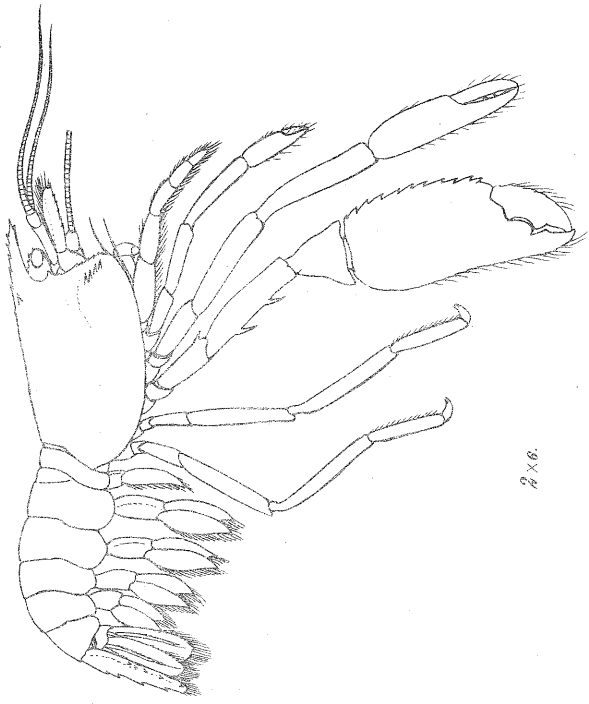
2. 2 a. Nephropsis caudostris ♀.



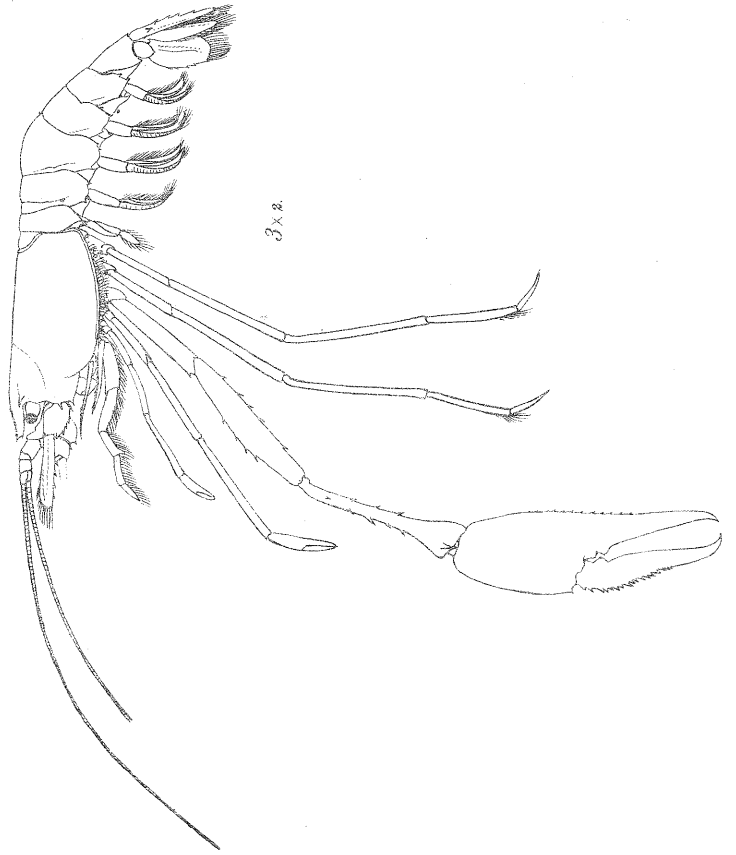
1x.



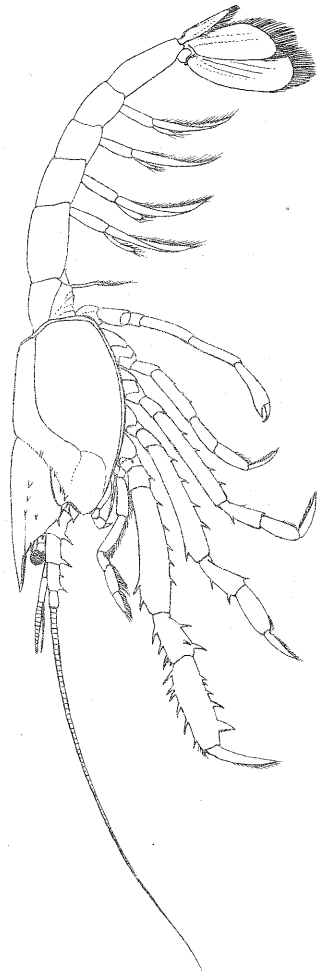
10x.



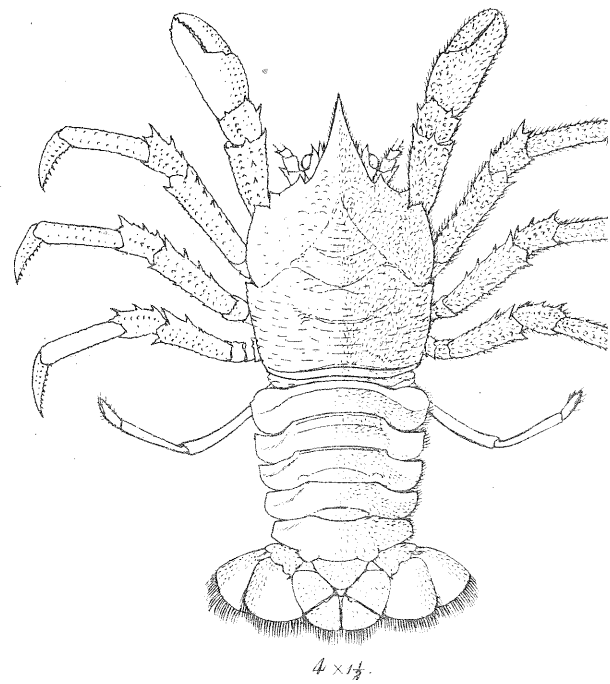
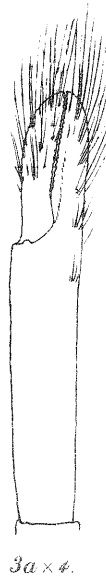
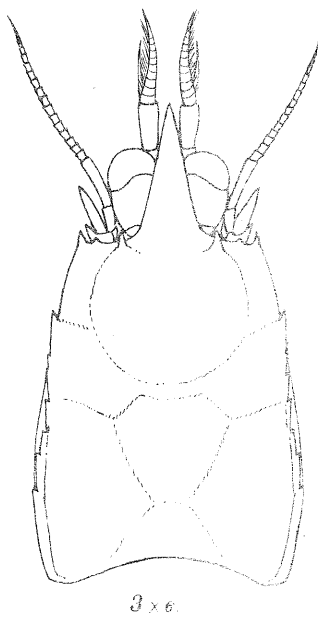
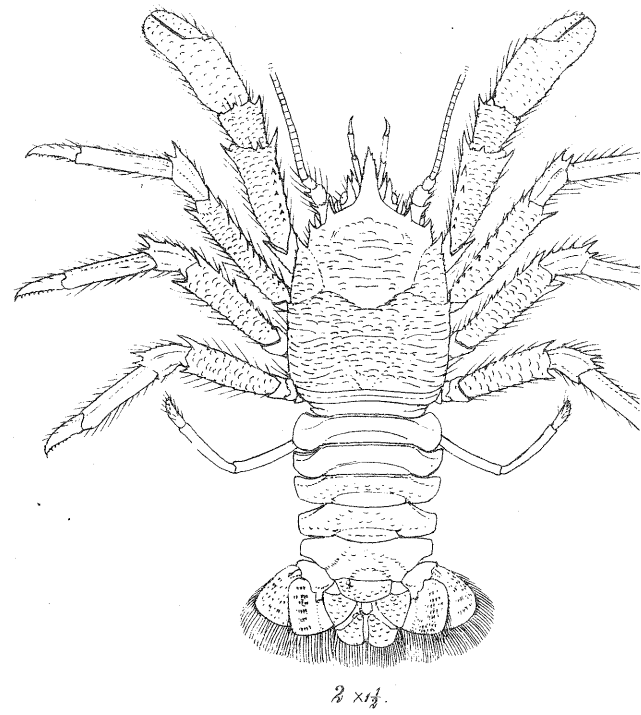
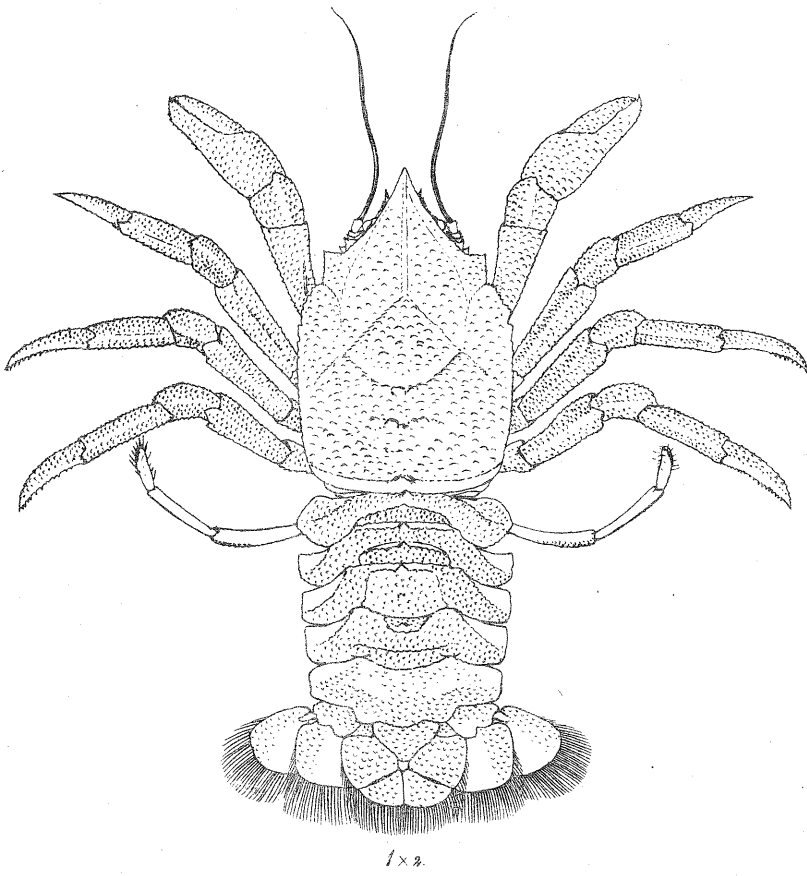
2x.



3x.



4x.



1. *Munidopsis granosa*.
 3. *Urontychus nigricanillis*

2. *Munidopsis ceratophthalmus*.
 4. *Munidopsis edwardsii*