

REPORT  
TO THE GOVERNMENT OF CEYLON  
ON THE  
PEARL OYSTER FISHERIES  
OF THE  
GULF OF MANAAR,

BY  
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WITH SUPPLEMENTARY REPORTS  
UPON THE  
MARINE BIOLOGY OF CEYLON,  
BY OTHER NATURALISTS.

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PART IV.

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PUBLISHED AT THE REQUEST OF THE  
COLONIAL GOVERNMENT  
BY  
THE ROYAL SOCIETY.

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LONDON:  
1905,

REPORT  
ON THE  
MACRURA

COLLECTED BY

PROFESSOR HERDMAN, AT CEYLON, IN 1902.

BY

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[WITH TWO PLATES.]

PROFESSOR HERDMAN'S collection of Macrurous Crustaceans from Ceylon consists of 53 species, of which 4 are new to science.

With the probable exception of 3 species the collection is entirely typical of a representative Indo-Pacific shallow-water fauna. *Bithynis savignyi* (SP. BATE), *Athanas nitescens*, LEACH, and *Urocaris longicaudata*, STIMPSON, appear hitherto to have had a known distribution limited to the Atlantic and the Mediterranean.

The following is a list of the species described in this Report:—

TRIBE: PENÆIDEA.	FAMILY: Sergestidæ.
FAMILY: Penæidæ.	<i>Acetes indicus</i> (MILNE-EDW.).
<i>Penæus canaliculatus</i> (OLIVIER).	<i>Leucifer typus</i> (VAUGH. THOMPS.).
„ <i>monodon</i> , FABRICIUS.	
„ <i>indicus</i> , MILNE-EDW.	TRIBE: CARIDEA.
<i>Parapenæus anchoralis</i> (SP. BATE).	FAMILY: Atyidæ.
„ <i>incisipes</i> (SP. BATE).	<i>Caradina vitiensis</i> , BORRADAILE.
„ <i>dalei</i> , RATHBUN.	
„ <i>mogiensis</i> , RATHBUN.	FAMILY: Pontoniidæ.
„ <i>acclivis</i> , RATHBUN.	<i>Periclimenes vitiensis</i> , BORRADAILE.
„ <i>gallensis</i> , n. sp.	„ <i>danaë</i> (STIMPSON).
<i>Philonicus pectinatus</i> , SP. BATE.	<i>Conchodytes meleagrince</i> , PETERS.
<i>Sicyonia lancifer</i> (OLIVIER).	<i>Anchistus inermis</i> (MIERS).
„ <i>cristata</i> (DE HAAN).	
„ <i>sculpta</i> , MILNE-EDW.	

FAMILY: Palæmonidæ.  
*Bithynis savignyi* (SP. BATE).  
*Urocaris longicaudata*, STIMPSON.

FAMILY: Latreutidæ.  
*Nauticaris futillirostris*, SP. BATE.  
 „ *unirecedens*, SP. BATE.  
 „ *grandirostris*, n. sp.  
*Latreutes ceylonensis*, n. sp.

FAMILY: Alpheidæ.  
*Alpheus idiocheles*, COUTIÈRE.  
 „ *phrygianus*, COUTIÈRE.  
 „ *paraculeipes*, COUTIÈRE.  
 „ *paralcyone*, COUTIÈRE.  
 „ *miersi*, COUTIÈRE.  
 „ *pareucheirus*, COUTIÈRE.  
 „ *bis-incisus*, var. *malensis*, COUTIÈRE.  
 „ „ „ *stylirostris*, COUTIÈRE.  
 „ *audouini*, COUTIÈRE.  
 „ *macrodactylus*, ORTMANN.  
 „ *spongiarum*, COUTIÈRE.  
 „ *levis*, RANDALL.  
*Synalpheus gravieri*, COUTIÈRE.

*Synalpheus laticeps*, COUTIÈRE.  
 „ *biunguiculatus*, STIMPSON.  
 „ *comatulorum*, HASWELL.  
 „ *neomeris*, DE MAN.  
 „ *carinatus*, DE MAN.

*Athanas nitescens*, LEACH.  
 „ *orientalis*, n. sp.

FAMILY: Crangonidæ.  
*Ægeon cataphractus* (OLIVIER).

FAMILY: Processidæ.  
*Processa canaliculata*, LEACH.

TRIBE: SCYLLARIDEA.

FAMILY: Scyllaridæ.  
*Scyllarus tuberculatus* (SP. BATE).  
 „ *sordidus* (STIMPSON).

TRIBE: THALASSINIDEA.

FAMILY: Callianassidæ.  
*Callianassa rotundicaudata*, STEBBING.  
 „ *maldivensis*, BORRADAILE.  
*Upogebia intermedia* (DE MAN).

In addition to the above species, two fresh-water forms—*Bithynis lar* and *Bithynis grandimanus*—were obtained from the River Gin Ganga. They are not included in this Report.

#### LIST OF STATIONS

at which *Macrura* were obtained, with the species collected in each:—

**STATION I.**—Five miles west and south-west of Negombo; 12 to 20 fathoms; bottom coarse yellow sand with a few dead shells.

*Parapenæus mogiensis*.

**STATION III.**—Two and a-half to four miles off Chilaw; 9 to 14 fathoms; bottom coarse sand and small corals.

*Penæus canaliculatus*, *Parapenæus anchoralis*, *Parapenæus dalei*, *Parapenæus mogiensis*, *Parapenæus acclivis*, *Philonicus pectinatus*, *Sicyonia lancifer*, *Anchistus inermis*, *Periclimenes danæ*, *Alpheus miersi*, *Alpheus phrygianus*, *Alpheus audouini*, *Synalpheus gravieri*, *Synalpheus neomeris*, *Processa canaliculata*, *Callianassa maldivensis*.

**STATION VI.**—Across Muttuvaratu Paar; depth 6 to 9 fathoms; bottom sand, with hard patches of “rock” at intervals.

*Leucifer typus*, *Bithynis savignyi*, *Alpheus idiocheles*, *Athanas orientalis*, *Processa canaliculata*, *Upogebia intermedia*.

**STATION XVIII.**—South-west part of Palk Bay, off Rameswaram Island and Adam's Bridge ; 7 to 9 miles off shore ; bottom fine soft bluish-grey mud containing casts of various Molluscan shells ; depth 7 to 8 fathoms.

*Penæus monodon*, *Parapenæus mogiensis*, *Leucifer typus*.

**STATION XX.**—North part of Back Bay, Trincomalee ; depth 11 to 13 fathoms ; bottom hard.

*Parapenæus anchoralis*, *Parapenæus dalei*, *Parapenæus acclivis*, *Sicyonia sculpta*.

**STATION XXXV.**—Entrance to Galle Harbour ; depth  $4\frac{1}{2}$  to 7 fathoms ; bottom coarse sand.

*Nauticaris unirecedens*, *Nauticaris grandirostris*, *Ægeon cataphractus*, *Scyllarus tuberculatus*.

**STATION XXXVI.**—Galle Harbour, off Gibbet Island ; depth 2 to  $4\frac{3}{4}$  fathoms ; bottom fine sand and mud.

*Parapenæus dalei*, *Leucifer typus*, *Acetes indicus*, *Caradina vitiensis*, *Nauticaris futilirostris*.

**STATIONS XXXIX. to XLII.**—Deep water off Galle ; depth up to 100-fathom line ; bottom sand, shells, nullipores.

*Parapenæus dalei*, *Parapenæus mogiensis*, *Parapenæus acclivis*, *Parapenæus gallensis*, *Synalpheus laticeps*, *Synalpheus biunguiculatus*, *Synalpheus carinatus*, *Alpheus lævis*.

**STATION XLIII.**—Six miles west of Kaltura ; depth 22 fathoms ; bottom hard sand and nullipores.

*Parapenæus anchoralis*, *Philonicus pectinatus*.

**STATIONS XLVII. to XLIX.**—Cheval Paar ; depth  $6\frac{1}{2}$  to 13 fathoms ; bottom sand, nullipores and dead shells.

*Penæus indicus*, *Parapenæus anchoralis*, *Leucifer typus*, *Periclimenes vitiensis*, *Periclimenes danæ*, *Conchodytes meleagrina*, *Anchistus inermis*, *Alpheus phrygianus*, *Alpheus paraculeipes*, *Alpheus miersi*, *Alpheus spongiarum*, *Alpheus bis-incisus*, var. *malensis*, *Synalpheus gravieri*, *Synalpheus comatulorum*, *Athanas nitescens*, *Athanas orientalis*, *Processa canaliculata*, *Callianassa rotundicaudata*.

**STATION LIII.**—Ten to twelve miles north of Cheval Paar, and 12 miles west of Vankali Church ; depth  $7\frac{1}{2}$  to 9 fathoms ; bottom muddy sand with dead shells.

*Latreutes ceylonensis*.

**STATION LIV.**—South of Adam's Bridge ; depth 4 to 40 fathoms ; bottom varied, from sand to living coral.

*Conchodytes meleagrina*, *Alpheus pareucheirus*, *Upogebia intermedia*.

**STATIONS LV. to LX.**—Coral reefs and pearl banks, Gulf of Manaar; depths varying from 9 to 36 fathoms; bottom nullipores and dead coral.

*Parapenæus mogiensis*, *Sicyonia cristata*, *Conchodytes meleagrina*, *Alpheus miersi*, *Alpheus bis-incisus*, var. *stylirostris*, *Alpheus audouini*, *Synalpheus gravieri*, *Synalpheus comatulorum*, *Synalpheus laticeps*, *Synalpheus biunguiculatus*, *Athanas orientalis*, *Scyllarus sordidus*.

**STATION LXI.**—Northern end of Periya Paar; depth 12 to 14 fathoms; bottom sand, nullipores and coral.

*Leucifer typus*, *Sicyonia cristata*, *Synalpheus gravieri*, *Athanas orientalis*.

**STATION LXIV.**—From between South Modragam and Jagerboom paars along a line south-west towards Kodramallai Point; depth  $4\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms; bottom coarse sand, with much fine green weed and small pearl oysters.

*Periclimenes vitiensis*, *Processa canaliculata*.

Aripu Reef; depth 5 fathoms.

*Parapenæus acclivis*, *Parapenæus anchoralis*, *Philonicus pectinatus*, *Urocaris longicaudata*, *Scyllarus tuberculatus*.

**STATION LXVII.**—Off south end of Mutwal Island; depth 10 to 14 fathoms; bottom dead coral and nullipore.

*Synalpheus gravieri*, *Alpheus paralcyone*, *Alpheus miersi*, *Alpheus macrodactylus*.

**STATION LXVIII.**—From off Coppeluddi southwards to Navakaddua Paar; depth 8 to  $18\frac{1}{2}$  fathoms; bottom nullipores, coral and muddy orbitolites sand.

*Synalpheus comatulorum*.

**STATION LXIX.**—North end of Chilaw Paar; depth 8 to 11 fathoms; bottom yellow quartz sand with some coral fragments.

*Synalpheus biunguiculatus*, *Synalpheus comatulorum*, *Nauticaris unirecedens*.

## MACRURA.

TRIBE: PENÆIDEA.

FAMILY: PENÆIDÆ.

*Penæus*, FABRICIUS, 1798.

*Penæus canaliculatus* (OLIVIER).

*Palæmon canaliculatus*, OLIVIER, 'Ency. Méthod.,' VIII., p. 660, 1811.

*Penæus canaliculatus*, MILNE-EDWARDS, 'Hist. Nat. Crust.,' II., p. 414, 1837.

*Penæus canaliculatus*, var. *japonicus*, SP. BATE, "Challenger" Macrura, p. 245, 1888.

Locality:—Pearl banks, Gulf of Manaar (Station III.), 1 specimen very much damaged.

General distribution:—Japan, Mauritius, Fiji, Australia, Ceylon.

**Penæus monodon**, FABRICIUS.

*Penæus monodon*, FABRICIUS, 'Suppl. Ent. Syst.,' p. 408, 1798.

*Penæus semisulcatus*, DE HAAN, 'Fauna Japonica,' p. 191, 1849.

*Penæus carinatus*, DANA, 'U.S. Expl. Exp.,' p. 602, 1852.

Locality :—Palk Strait (Station XVIII.), several specimens.

Measurements of two males and two females :—

	Males.		Females.	
From end of telson to tip of rostrum . . }	162 millims.,	131 millims.	195 millims.,	135 millims.
Length of carapace and rostrum . . }	52	41	60	43

Both male and female specimens possess a well-marked median groove extending from behind the rostrum to the posterior end of the carapace. SPENCE BATE found this groove absent in the single male which he examined. There is no doubt that the position of the ventral rostral teeth relative to the upper rostral teeth is subject to variation.

General distribution :—India, Ceylon, Singapore, Japan, Pacific and South Africa.

**Penæus indicus**, MILNE-EDW.—Plate I, fig. 1.

*Penæus indicus*, MILNE-EDW., 'Hist. Nat. Crust.,' II., p. 415, 1837.

(?) *Penæus merguensis*, DE MAN, 'Journ. Linn. Soc.' (Zool.), vol. 22, p. 287, 1888.

Locality :—Gulf of Manaar (Station XLIX.), 5 specimens. Lengths varying from 14 millims. to 40 millims. All immature.

The rostrum in these specimens differs from the type species and has a formula  $\frac{1+(6 \text{ to } 7)}{6}$ . The anterior half of the rostrum bears no teeth dorsally. The rostrum is very slender and extends in front of the antennular peduncle a distance equal to half the length of the peduncle. In spite of these differences from the type species, I have referred these specimens to the above species, because there seems to be little doubt that the rostrum is subject to a great deal of variation in this form. The "Challenger" specimens differed in the form of the rostrum from MILNE-EDWARD'S species, and DE MAN'S species, *P. merguensis*, appears to differ in no important respects from *P. indicus*.

An examination of the various forms grouped together under this species would be valuable and instructive, and would throw some light on the value of the rostrum in classification.

General distribution :—India, Philippines, Mergui (?), Ceylon.

**Parapenæus, SMITH, 1885.**

I have followed SMITH\* in separating certain species from the genus *Penæus*. The characters of the genus *Parapenæus*, which distinguish it from the genus *Penæus*, are:—(1) Endopodite of 1st maxilla is short and unsegmented; (2) 3rd maxilliped without an epipodite, and (3) the absence of branchiæ from the last thoracic segment.

**Parapenæus anchoralis (SP. BATE).**

*Penæus anchoralis*, SP. BATE, ‘“Challenger” Macrura,’ p. 258, 1888.

Localities:—Pearl banks, Gulf of Manaar (Station III.), 1 specimen (♀); Trincomalee (Station XX.), 1 specimen (♀); off Kaltura (Station XLIII.), 1 ♂; Galle (Station XXXVII.), 1 ♀; Aripu Reef (Station XLIV.), 1 ♂ and 2 ♀.

Male:—Total length 40 millims., carapace and rostrum 15 millims.

Female:—Total length 64 millims., carapace and rostrum 23 millims.

Rostral formula is  $\frac{(8 \text{ to } 9)+1}{0}$ .

The rostrum in the females appears to be slightly longer than in the males. The female rostrum reaches to the end of the second antennular segment. In the male it only reaches slightly past the first segment.

The dorsal groove of the telson appears to be deeper in the female than in the male.

General distribution:—Pacific, Japan, Ceylon.

**Parapenæus incisipes (SP. BATE).**

*Penæus incisipes*, SP. BATE, ‘“Challenger” Macrura,’ p. 257, 1888.

*Parapenæus incisipes*, RATHBUN, ‘Proc. U.S. Nat. Mus.,’ vol. xxvi., p. 38, 1902.

Locality:—Gulf of Manaar, 1 specimen, ♂.

The rostrum is straight and not so deep as in the preceding species. It extends to the middle of the 3rd joint of the antennular peduncle. Rostral formula is  $\frac{9+1}{0}$ .

The flagella of the antennule are short and equal in length to the 2nd and 3rd joints of the peduncle.

Two obliquely longitudinal grooves cross each side of the carapace. The anterior groove becomes comparatively deep ventrally. The carapace tends to become much shallower dorso-ventrally at the anterior end.

The meropodite of the 5th pereopod is notched at its proximal end. There is a tubercle present on the endopodite of the 2nd abdominal appendage. The 6th abdominal segment is  $1\frac{1}{2}$  times as long as the 5th. The uropods are slightly notched at their outer proximal margins.

General distribution:—Philippines, Japan, Ceylon.

\* SMITH, ‘Proc. U.S. Nat. Mus.,’ VIII., p. 170, 1885.

**Parapenæus dalei**, RATHBUN.\*

*Parapenæus dalei*, M. RATHBUN, 'Proc. U.S. Nat. Mus.,' vol. xxvi., p. 40, 1902.

Localities:—Pearl banks, Gulf of Manaar (Station III.), 1 ♂; Galle (Station XXXVI.), 2 ♂; south of Galle (Station XXXIX.), 1 ♂; Trincomalee (Station XX.), 1 ♂.

These specimens appear to agree with Miss RATHBUN's diagnosis of the species. The antennular flagella are thicker than in the other species of the *velutinus* group.

Length of largest specimen (♂):—

Total length from end of rostrum to tip of telson . . . . .	40	millims.
From tip of rostrum to end of carapace . . . . .	11	„
Side length of carapace . . . . .	9	„

Rostral formula  $\frac{6+1}{0}$ .

General distribution:—Japan, Ceylon.

**Parapenæus mogiensis**, RATHBUN—Plate I., fig. 2.

*Parapenæus mogiensis*, M. RATHBUN, 'Proc. U.S. Nat. Mus.,' vol. xxvi., p. 39, 1902.

Localities:—Pearl banks, Gulf of Manaar (Station III.), 31 specimens; west of Negombo, hauls 1 to 4 (Station I.), 15 specimens; Palk Straits (Station XVIII.), 2 specimens; south of Galle (Station XXXIX.), 1 specimen; Coral reef, Gulf of Manaar (Station LIV.), 7 specimens.

The petasma agrees with the type, but the thelycum in all the specimens shows a slight difference (see fig. 2). The appendages are more richly setose than is the case with the other species of this group. The 3rd maxillipeds do not extend as far as the tips of the antennal scales, but are situated behind them a distance equal to the length of the distal joint of the 3rd maxilliped. The antennal scale is slightly longer than the antennular peduncle.

Dimensions of males (3 specimens):—

Total length . . . . .	56	millims.,	48	millims.,	61	millims.
Length of rostrum and carapace . . . . .	18	„	15	„	19	„
Lateral length of carapace . . . . .	15	„	12	„	14	„

Dimensions of females (3 specimens):—

Total length . . . . .	75	millims.,	67	millims.,	61	millims.
Length of rostrum and carapace . . . . .	24	„	23	„	20	„
Lateral length of carapace . . . . .	19	„	18	„	16	„

Rostral formula  $\frac{8+1}{0}$ .

General distribution:—Japan, Ceylon.

\* This and the three following species belong to the *Parapenæus velutinus* group. This collection of Ceylon Crustaceans has given me an opportunity of examining a large number of specimens belonging to

**Parapenæus acclivis, RATHBUN.**

*Parapenæus acclivis*, RATHBUN, 'Proc. U.S. Nat. Mus.,' vol. xxvi., p. 41, 1902.

Localities :—Pearl banks, Gulf of Manaar (Station III.), 1 specimen ; Trincomalee (Station XX.), 1 specimen ; south of Galle (Station XXXIX.), 1 specimen ; Aripu Reef (Station LXIV.), 1 specimen.

The 3rd maxillipeds do not extend as far as the ends of the antennal scales, but they are longer than those of *Parapenæus mogiensis*. The antennal scale is slightly shorter than the antennular peduncle.

Dimensions of two females :—

Total length . . . . .	88 millims.,	80 millims.
Length of rostrum and carapace . . . . .	29	26
Lateral length of carapace . . . . .	25	21

Rostral formula  $\frac{(7 \text{ to } 8)+1}{0}$ .

General distribution :—Japan, Ceylon.

**Parapenæus gallensis, n. sp.—Plate I., fig. 3.**

Locality :—South of Galle (Station XXXIX.), many specimens.

This species is of the *velutinus* type, and possesses certain characters which distinguish it from DANA'S species and also from the species formed by Miss RATHBUN.

In the form of the rostrum this species resembles somewhat closely *P. dalei*. The length of the rostrum, however, is slightly shorter than in the latter species. In typical specimens the rostrum reaches to the end of the 1st segment of the antennular peduncle. In *P. dalei* the rostrum reaches to the middle of the 2nd segment. The rostrum in *P. gallensis* is generally less toothed than in *P. dalei*, having a formula of  $\frac{(5 \text{ to } 6)+1}{0}$ . The anterior tooth is much smaller than the others, and in some cases is

hardly perceptible. But in the form of the petasma and thelycum it differs distinctly from *P. dalei*, and approaches nearer to *P. akayebi*, showing, however, distinct differences from the latter species. The rostrum is much shorter than in *P. akayebi* and has fewer teeth. The left branch of the petasma is much more delicate and slightly longer than the right branch, and ends in a few small denticles, which, however, are only observed when the petasma is examined under a microscope. The antennal scale reaches as far forward as the extremity of the antennular peduncle. The 3rd maxillipeds are slightly longer than those of the three previous species, reaching almost to the end of the antennal scale. There is a pair of well-developed

to the *velutinus* group, and I think Miss RATHBUN is justified in separating from the old species certain forms possessing various definite and distinctive characters. But it is doubtful whether these characters are of sufficient importance to warrant the formation of new *species*, and I am not sure whether their separation from *Parapenæus velutinus* merely as new varieties would not have been preferable.

spines present between the bases of the feet of the second pair. These only appear to be present in the female. The last four abdominal segments have a dorsal carina which ends in a well-developed tooth at the posterior end of the 6th segment. The sixth abdominal segment is about  $1\frac{1}{2}$  times as long as the fifth and slightly shorter than the telson. The telson is slightly shorter than the uropods and has the usual number of spines, which is characteristic of the *velutinus* group. The anterior pair of spines are much smaller than the posterior three pairs, and in some specimens are only observed with difficulty.

The general surface of the body is smooth. The dimensions are :—

	millims.	millims.	millims.	millims.	millims.	millims.
Total length along mid-dorsal line from } tip of rostrum to end of telson . . . }	49	43	50	48	59	40
Length of carapace and rostrum along } mid-dorsal line . . . . . }	15	13	15	14	17	10.5
Side length of carapace to tip of } antennular tooth . . . . . }	13	10	12	12	15	9
Length of sixth segment of abdomen, } mid-dorsal line . . . . . }	7	6	7	6	7.5	5
Sex . . . . .	♀	♀	♀	♀	♀	♂

It would appear that this species is in an intermediate position between *Parapenaeus akayebi* and *P. dalei*.

The characters of the rostrum and of the petasma and thelycum appear to be the most reliable characters on which to base the identification of the various species of this group. Of these characters the former is not altogether trustworthy, as it is subject to some variation, and it is not impossible to obtain a series based upon the length of the rostrum and the number of rostral teeth which will connect all the species of this group. Still, in a broad manner, Miss RATHBUN'S method of separation holds good.

The form of the genital opercula appears to be much more constant, and each of the species is quite distinct in this respect.

The comparative length of the sixth abdominal segment does not seem to be constant enough to be of value as a basis of identification.

So that, as I have already suggested, it is, perhaps, placing too high a value upon the distinguishing characters of the various forms of the *velutinus* group to give these forms the rank of species. For the present, however, I follow Miss RATHBUN.

#### Philonicus, SPENCE BATE, 1888.

##### *Philonicus pectinatus*, SP. BATE.

*Philonicus pectinatus*, SP. BATE, "Challenger," *Macrura*, p. 279, 1888.

Localities :—Deep water off Galle (Station XL.), 1 specimen ♀, 35 millims.; off

Kaltura (Station XLIII.), 2 ♀, 35 millims. and 48 millims.; Pearl banks, Gulf of Manaar (Station III.), 1 ♀, 48 millims.; Aripu Reef (Station LXIV.), 1 ♂, 35 millims.

All the specimens are much damaged, the exoskeleton apparently being poorly calcified. In all the female specimens the thoracic legs are incomplete.

In the male the petasma is comb-like as described by SP. BATE. The antennular flagella, which were absent in the "Challenger" specimen, are typical of the genus. There are two long flagella on each antennular peduncle, the upper one being thin and the lower being very broad. The antennal scale is well developed and is longer than the antennular peduncle and twice as long as the antennal peduncle. The antennal flagellum is long and is slightly thicker than the upper antennular flagellum. The form of the rostrum and carapace agrees with SPENCE BATE'S description. In the "Challenger" specimen the 3rd maxillipeds and the thoracic legs were absent.

In the Ceylon specimens the 3rd maxillipeds are very long, reaching well in front of the antennal scale. The distal end of the propodite is about on a level with the end of the antennal scale. All the joints are richly covered with setæ, some of which are so robust as to have the appearance of long slender spines. Of the thoracic legs the first is the shortest and only reaches to the end of the carpos of the 3rd maxilliped. The second leg reaches to the end of the propodite of the 3rd maxilliped. The third pair is missing. The fourth is very long and slender, reaching almost as far forward as the end of the 3rd maxilliped. The last pair of thoracic legs are short, being only slightly longer than the 1st pair and more slender.

Comparative lengths of appendages in male specimen :—

3rd maxilliped . . . . .	12 millims.
1st thoracic leg . . . . .	9 ,,
2nd ,, ,, . . . . .	11.5 ,,
3rd (wanting) . . . . .	—
4th thoracic leg . . . . .	14 millims.
5th ,, ,, . . . . .	10 ,,

General distribution :—Papua, Ceylon.

#### *Sicyonia*, MILNE-EDW., 1830.

##### *Sicyonia lancifer* (OLIVIER).

*Palæmon lancifer*, OLIVIER, 'Encyclop.' t. vi., p. 664.

*Sicyonia lancifer*, DE HAAN, 'Fauna Japonica,' p. 194, 1849.

*Sicyonia lancifer*, SP. BATE, "'Challenger" Macrura,' p. 297, 1888.

Locality :—Pearl banks, Gulf of Manaar (Station III.), 3 ♀ and 1 ♂, average length 40 millims.

There is very little to add to SPENCE BATE'S description and figures.

In the male the petasma is symmetrical, and there is a conspicuous triangular plate between the bases of the last three pairs of thoracic legs, having the apex produced

into a long pointed tooth anteriorly like the thelycum in the female. As in the female, there is a pair of spines present at the base of each of the first two pairs of walking legs. The 3rd maxillipeds are similar in both sexes, and are more massive than the thoracic walking legs and extend slightly further forward than the tip of the antennal scale. They are richly setose and have the joints somewhat flattened. The first three pairs of walking legs are chelate and the carpopodite is only slightly longer than the propodite. The fingers are slightly longer than the palm.

General distribution :—New Guinea, Japan, Indian Ocean.

***Sicyonia cristata* (DE HAAN) (?).**

*Hippolyte cristatus*, DE HAAN, 'Fauna Japonica,' pl. xlv., 1849.

*Sicyonia cristata*, DE HAAN, 'Fauna Japonica,' p. 194, 1849.

Localities :—West of Periya Paar (Station LXI.), 1 ♂, 25 millims.; off Dutch Modragam (Station LVII.), 1 ♂, 25 millims.; Coral reef, Gulf of Manaar (Station LIV.), 1 ♀, 35 millims.

I refer these specimens to the above species, although a little doubtful as to their identity. I have not been able to see figures of DE HAAN'S species, but these specimens agree closely with the description. SP. BATE evidently considered this species to be identical with *Sicyonia lancifer*. The Ceylon specimens resemble the latter species closely, but they possess characters differing from *S. lancifer*. The carapace is more arched than in *S. lancifer*. The rostrum does not turn up at the end and only reaches to the end of the eyes. The abdomen differs only from that of *S. lancifer* in not having pleural spines on each segment. The three distal joints of the 3rd maxillipeds appear to be more flattened than in *S. lancifer*, and the hepatic spine on the carapace is not so well developed as in that species.

General distribution :—Japan, Ceylon.

***Sicyonia sculpta*, MILNE-EDW.**

*Sicyonia sculpta*, MILNE-EDW., 'Ann. des Sci. Nat.,' sér. 1, t. 19, p. 339, 1830.

Locality :—Trincomalee (Station XX.), 1 ♀, 17 millims.

General distribution :—Atlantic, Mediterranean, Ceylon.

FAMILY: SERGESTIDÆ.

***Acetes*, MILNE-EDW., 1830.**

***Acetes indicus*, MILNE-EDW.**

*Acetes indicus*, MILNE-EDW., 'Ann. des Sci. Nat.,' t. 19, p. 350, 1830.

Locality :—Galle Harbour (Station XXXVI.), 1 specimen, 14 millims. long, in a damaged condition, but evidently belonging to this species.

This species is generally found either in fresh water or in the brackish water of estuaries.

Distribution :—Mouth of River Ganges, Ceylon.

**Leucifer, MILNE-EDW., 1837**  
(= **Lucifer, VAUGHAN THOMPSON, 1829.**)

**Leucifer typus (VAUGHAN THOMPSON).**

**Lucifer typus, VAUGHAN THOMPSON, 'Zool. Researches,' p. 58, 1829.**

**Leucifer typus, MILNE-EDW., 'Hist. Nat. Crust.,' t. ii., p. 469, 1837.**

Localities :—Muttuvaratu Paar (Station VI.); Palk Strait (Station XVIII.); Galle Harbour (Station XXXVI.); south of Cheval (Station XLVII.); Cheval Paar (Station XLIX.); Periya Paar (Station LXI.). A large number of specimens from the various localities. It is probable that most of these specimens were taken in the tow-net, although the labels do not definitely say so, except in one instance.

Altogether there are some hundreds of specimens, and I am satisfied that they all belong to this species. It is worthy of note that in the separate gatherings the specimens are almost entirely of one sex.

The differences from SPENCE BATE'S description are very slight. In the male the eyes do not quite reach to the end of the 1st segment of the antennular peduncle. BATE describes them as reaching nearly to the end of the 2nd segment.

The antennal scale is shorter than the 1st segment of the antennular peduncle and about equal in length to the eye. In the females the eyes are slightly shorter than in the male, and in the females the spines at the base of the abdominal appendages are not so well developed as in SP. BATE'S figures.

General distribution :—North and South Atlantic, Pacific, Australia, Ceylon.

TRIBE : CARIDEA.

FAMILY : ATYIDÆ.

**Caradina, MILNE-EDW., 1837.**

**Caradina vitiensis, BORRADAILE—Plate I., fig. 4.**

**Caradina vitiensis, BORRADAILE, 'P.Z.S.,' 1898, p. 1003.**

Locality :—Galle (Station XXXVI.), 5 specimens, average length 13 millims.

These specimens appear to agree closely with BORRADAILE'S description, but the rostrum is not quite so richly toothed, having a formula  $\frac{18-20}{6}$ . The ventral rostral teeth are smaller than the dorsal ones. The anterior border of the eyes appears to be slightly concave in all the specimens. The chelæ of the first two pairs of thoracic legs are typical of the genus. The distal joint of the last thoracic legs has a large number of closely packed spines on its posterior border. The sixth abdominal segment is almost twice as long as the fifth, and the telson is equal in length to the sixth segment. The telson bears five pairs of small spines on its dorsal side. Each corner of the posterior border bears a small spine, and there are four pairs of longer spines arranged along the posterior border.

The Ceylon specimens are marine. BORRADAILE's Figi specimens were obtained from fresh water.

General distribution :—Figi and Ceylon.

FAMILY: PONTONIIDÆ.

**Conchodytes**, PETERS, 1851.

**Conchodytes meleagrina**, PETERS.

*Conchodytes meleagrina*, PETERS, 'Ges. naturf. Freunde, Berlin,' 1851.

*Pontonia meleagrina*, BATE, "Challenger" Macrura, p. 707, 1888.

Localities :—Cheval Paar (Station XLVIII.), four ♂ ; Cheval Paar (Station LIV.), two ♂ and two ♀ within *Pinna* ; West Cheval (Station LVIII.) two ♂ and two ♀ from shell of *Pinna*.

The mouth parts agree with SPENCE BATE's description of the thoracic legs, the second pair are very massive and are longer than the body. The ischium, meros and carpos are subequal in length, and the three together are shorter than the palm, which is long and massive and more than twice as long as the fingers. The 1st, 3rd, 4th and 5th pairs are small, decreasing slightly in length from before backwards. The distal joint of the last three pairs is trianguiculate.

Dimensions of male specimen :—

Total length from rostrum to end of telson . . . . .	24 millims.
Length of carapace and rostrum . . . . .	10 „
1st thoracic leg . . . . .	12 „
2nd „ . . . . .	27 „
3rd „ . . . . .	11 „
4th „ . . . . .	10 „
5th „ . . . . .	10 „

General distribution :—East Africa, Torres Straits, New Guinea, Pacific, Ceylon.

**Anchistus**, BORRADAILE, 1898.

**Anchistus inermis** (MIERS).

*Harpilus inermis*, MIERS, 'Zool. Coll. of "Alert,"' 1884.

*Anchistus inermis*, BORRADAILE, 'Ann. Mag. Nat. Hist.' (7), ii., 1898.

Localities :—Pearl banks, Gulf of Manaar (Station III.), three ♂ and two ♀ ; Cheval Paar (Station XLVIII.), three ♂ and three ♀.

There is nothing to add to the original description. In most of the specimens the sides of the carapace and abdomen are only very slightly calcified.

General distribution :—West Australia, Ceylon.

**Periclimenes, COSTA, 1844.****Periclimenes vitiensis, BORRADAILE.**

*Periclimenes vitiensis*, BORRADAILE, 'Ann. Mag. Nat. Hist.' (7) ii., p. 383, 1898.

Localities :—Cheval Paar (Station XLVIII.), 1 specimen ; south-east of Modragam (Station LXIV.), 1 specimen "on weed bearing oyster spat," length 18 millims.

General distribution :—Pacific, Ceylon.

## FAMILY: PALÆMONIDÆ.

**Bithynis, PHILIPPI, 1860.****Bithynis savignyi (SP. BATE).**

*Brachycarpus savignyi*, SP. BATE, "Challenger" Macrura, p. 798, 1888.

*Bithynis savignyi*, RATHBUN, 'Bull. U.S. Fish Comm.,' vol. 2, p. 124, 1900.

Locality :—Muttuvaratu Paar (Station VI.), 1 specimen, 12 millims.

Rostrum reaching to the end of the antennular peduncle and having a formula  $\frac{7}{3}$ .

The antennular peduncle has the 1st joint broad and much flattened and equal in length to the sum of the 2nd and 3rd joints, which are cylindrical. The flagella are slightly longer than the peduncle. The scale of the antenna is as long as the rostrum. Thoracic legs are mostly missing, but the specimen agrees closely with BATE's description.

Up to the present this species appears to have only been recorded from the Atlantic.

General distribution :—Bermudas, West Indies, Ceylon.

**Urocaris, STIMPSON, 1860.****Urocaris longicaudata, STIMPSON—Plate I., fig. 5.**

*Urocaris longicaudata*, STIMPSON, 'Proc. Ac. Nat. Sci. Phil.,' XII., p. 39, 1860.

*Urocaris longicaudata*, RATHBUN, 'Bull. U.S. Fish Com.,' vol. 2, p. 126, 1900.

Locality :—Aripu Paar (Station LXIV.), 1 specimen. Female bearing eggs.

Dimensions :—

Total length from tip of rostrum to end of telson . . .	32 millims.
Length of carapace and rostrum along mid-dorsal line . .	8 "
"                  "          along mid-dorsal line . . . . .	4.5 "
"          1st abdominal segment along mid-dorsal line .	2 "
"          2nd          "          "          "          " .	2 "
"          3rd          "          "          "          " .	5 "
"          4th          "          "          "          " .	3 "
"          5th          "          "          "          " .	3 "
"          6th          "          "          "          " .	4 "
"          telson          "          "          "          " .	4 "

The rostrum is straight and slightly arched, semi-transparent except on the ventral side, which is strengthened by a thick ridge. There are nine dorsal teeth, the posterior of which is a little remote from the others and is situated on the carapace. There are two minute teeth at the tip of the rostrum on the ventral side. The rostrum reaches almost to the end of the 2nd segment of the antennular peduncle. The antennular peduncle has the 1st joint broad and flattened and equal to the sum of the 2nd and 3rd. There are two flagella, the outer of which is thicker and shows signs of bifurcation at its distal extremity. The flagella are slightly longer than the peduncle. The antennal peduncle is half as long as the 1st joint of the antennular peduncle. The flagellum is about as long as the body. The antennal scale is slightly longer than the antennular peduncle. The eye stalks are long and the eyes project laterally. The carapace bears on its anterior margin a well-developed spine below the eye and also a smaller spine ventral to this. There is also a large hepatic spine. Running along the carapace are two slight grooves. The dorsal groove starts behind the antennal spine and extends half the length of the carapace. The ventral groove starts at the anterior ventral border and traverses the entire length of the carapace in a sinuous manner. The first two pairs of legs are chelate, the second pair being longer and stouter than the first. The last three pairs are long and slender and have the dactylos biunguiculate. The abdomen is more than three-fourths the length of the body and is suddenly bent at right angles at the 3rd segment, the dorsal part of which is much swollen. The dorsal side of the last three abdominal segments forms a straight line. The 6th segment is long, being about one and a half times as long as the 5th, and equal in length to the telson. The telson is slightly shorter than the uropods and ends in two spines.

General distribution :—Atlantic coasts of North America, Ceylon.

FAMILY: LATREUTIDÆ.

*Nauticaris*, SP. BATE, 1888.

*Nauticaris grandirostris*, n. sp.—Plate I., fig. 6.

Locality :—Galle (Station XXXV.), 2 males.

The carapace has a prominent antennal spine and a spine at the antero-lateral border, as well as a spine on the anterior border half-way between these two spines. The median dorsal surface of the carapace is occupied by well-marked teeth, which are continued on to the rostrum. There is a well-developed rostrum, two-thirds as long as the carapace. The rostrum is deep and is turned upwards at the tip. There are six teeth occupying the whole of the mid-dorsal line of the carapace and the posterior half of the rostrum. Of these teeth the posterior one is very small and not easily made out. The others are well developed, the anterior tooth being slightly smaller than the rest. Only the first two of these teeth are situated on the rostrum. The anterior half of the rostrum bears no dorsal teeth. The extremity is marked by three small teeth. On the ventral side there are six teeth, the posterior four being

exceptionally well marked and deep. The antennular peduncle is short, and is only half the length of the rostrum. Its proximal joint is the largest, being equal to the sum of the other two. There are two branches to the flagellum. The inner branch reaches slightly beyond the rostrum, and the outer branch, which is slightly shorter, is much thicker and plumose, and shows signs of bifurcation at the tip. The antennular scale is almost as long as the peduncle. The antennal peduncle is as long as that of the antennule. The flagella are broken in both specimens. The scale is stout and reaches to the end of the rostrum. The mouth parts are similar in all important respects to those of *Nauticaris marionis*.

The 3rd maxillipeds reach past the end of the rostrum and have the distal joint tipped by about five well-marked spines. The proportionate lengths of the joints are similar to those of *N. marionis*. There are only four joints, and the second bears a large spine at its distal end. The 3rd joint is richly setose on its anterior face. The legs are robust, excepting the 2nd pair. The 1st pair are chelate and reach a little past the end of the antennal peduncle. The 2nd pair are long and slender and have a multi-articulate wrist. They reach to the extremity of the rostrum, the 3rd, 4th, and 5th pairs are similar to one another in form, decreasing slightly in length from before backwards. The 5th leg reaches to the base of the antennal scale. The carpos of each of the last three pairs bears a blunt process at the anterior distal border. The dactylos ends in two larger spines, and bears several smaller spines on its posterior border. The abdomen is robust and bent at right angles at the 3rd segment. There are two spines on the ventral side of each of the first four abdominal segments, and on the ventral side of the 5th and 6th segments there is a long median spine pointing backwards. The 6th abdominal segment has a well-marked movable spine at each of its posterior lateral borders, and also bears two well-marked spinous processes on its posterior border overhanging the telson. The uropods are slightly longer than the telson. The 2nd abdominal segment has a small transverse groove in the mid-dorsal line.

The telson tapers somewhat posteriorly and has a slightly grooved dorsal surface carrying two pairs of spines. The posterior border bears two pairs of spines and numerous long hairs.

Dimensions (measured along mid-dorsal line):—

From tip of rostrum to end of telson . . . . .	50 millims.
Rostrum and carapace . . . . .	20 "
Carapace . . . . .	11 "
1st abdominal segment . . . . .	2 "
2nd " " . . . . .	4 "
3rd " " . . . . .	8 "
4th " " . . . . .	5½ "
5th " " . . . . .	2 "
6th " " . . . . .	3½ "
Telson . . . . .	5½ "

**Nauticaris unirecedens**, SP. BATE.

*Nauticaris unirecedens*, SP. BATE, "Challenger" Macrura, p. 608, 1888.

Localities:—Galle (Station XXXV.), 5 specimens; Jokkenpiddi Paar, 1 specimen.

These specimens agree closely with SP. BATE'S description, but the rostral formula is slightly different. The Ceylon specimens are not so richly toothed as the "Challenger" specimens.

Rostral formula  $\frac{5+1}{2}$ .

Average length 35 millims. (3 males and 3 females).

General distribution:—Hong Kong, Ceylon.

**Nauticaris futihirostris**, SP. BATE—Plate II., fig. 8.

*Nauticaris futihirostris*, SP. BATE, "Challenger" Macrura, p. 606, 1888.

Locality:—Galle Harbour (Station XXXVI.), 4 specimens taken in the tow-net. Average length 11 millims.

These specimens agree with SPENCE BATE'S description; the posterior rostral tooth is slightly more remote from the others than in BATE'S figure.

General distribution:—Off Japan, Ceylon.

**Latreutes**, STIMPSON, 1860.**Latreutes ceylonensis**, n. sp.—Plate II., fig. 7.

Locality:—Cheval Paar (Station LIII.), 1 specimen, 8 millims. long.

The latero-anterior edge of the carapace is furnished with 4 spines at each side. There is a deep rostrum, almost equal in length to the carapace. The carapace and rostrum together equal half the length of the body. The rostrum dips slightly downwards and bears dorsally two prominent teeth above the eyes and a tooth of equal size slightly behind the pointed anterior extremity. In addition to these there are about a dozen smaller teeth on the dorsal side which are only detected under a microscope. The under side of the rostrum is smooth. Each antennular peduncle is short, the proximal joint being as long as the sum of the other two. Each antennule has two flagella which reach to the end of the rostrum, and are slightly longer than the peduncle. The inner flagellum is slightly thicker and shorter than the outer. The antennal peduncles are slightly longer than those of the antennules. The antennal scale is large and broad, and extends slightly beyond the rostrum. Each scale is furnished with half-a-dozen small spines along its outer border. The antennal flagella are missing.

The first two pairs of thoracic legs are chelate. The 2nd pair are longer than the 1st pair and have the wrist 3-jointed. The remaining three pairs of legs are more strongly made, the meros and carpos being very broad. The dactylos terminates in two very robust spines.

The 3rd, 4th, and 5th abdominal segments each has the posterior part of its dorsal surface raised into a blunt keel. The abdominal segments are all subequal. The telson is long and narrow, and is twice as long as the 6th abdominal segment. It ends posteriorly in a blunt median spine, and is furnished with a lateral spine half-way along each side. The uropods are as long as the telson.

FAMILY: ALPHEIDÆ.

*Synalpheus*, SP. BATE, 1888.

*Synalpheus gravieri*, COUTIÈRE.

*Synalpheus gravieri*, H. COUTIÈRE, 'Fauna of Maldives and Laccadives,' p. 870, 1905.

Localities:—Pearl banks, Gulf of Manaar (Station III.), 7 specimens; Cheval Paar (Station XLVIII.), 19 specimens; Coral reef, Gulf of Manaar (Station LIV.), 2 specimens; west of Periya Paar (Station LXI.), 2 specimens, "commensal with dendritic Alcyonarian;" off Mutwal Island (Station LXVII.), 2 specimens.

The rostral and orbital spines are equal in length, the latter sometimes being slightly divergent. The rostrum does not reach the end of the 1st joint of the antennular peduncle. The 1st joint of the antennular peduncle is equal to the sum of the other two, the 2nd joint is twice as long as the 3rd. The antennular scale is a little longer than the 1st joint of the peduncle. The antennal peduncle is one and one-third times as long as the antennular peduncle. The outer spine of the antennal scale is as long as the antennular peduncle.

The 3rd pair of legs has a small spine on the dorsal side of the dactylos. The meros has 4 spines on its ventral posterior border. The propodite has about 8 spines on its posterior border.

General distribution:—Maldives, Ceylon.

*Synalpheus laticeps*, COUTIÈRE.

*Synalpheus laticeps*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 874, 1905.

Localities:—Coral reef, Gulf of Manaar (Station LIV.), 1 specimen; deep water off Galle (Station XL.), 4 specimens.

Orbital spines equal in length to rostrum, but slightly broader. Rostrum shorter than 1st joint of antennular peduncle. First joint of antennal peduncle longest, the 2nd and 3rd joints subequal. Antennular scale a little longer than the 1st joint of the antennular peduncle. The antennal peduncle one and one-fifth times as long as the antennular peduncle. Antennal scale as long as antennal peduncle.

Third legs having the dactylos biunguiculate, posterior border of propodite armed with about a dozen spines.

This species approaches closely to *S. biunguiculatus*.

General distribution:—Maldives, Ceylon.

**Synalpheus biunguiculatus**, STIMPSON.

*Synalpheus biunguiculatus*, STIMPSON, 'Proc. Acad. Phil.,' p. 31, 1860.

Localities :—Deep water off Galle (Station XL.), 2 specimens; Coral reef, Gulf of Manaar (Station LIV.), 14 specimens; Chilaw Paar (Station LXIX.), 1 specimen.

This species differs principally from the preceding species in (1) the rostrum and orbital spines being shorter in comparison with the 1st joint of the antennular peduncle; (2) the antennal scale is shorter, and only reaches to the end of the antennular peduncle; (3) the posterior border of the telson has a deeper curve.

General distribution :—Maldives, Philippines, Pacific, Ceylon.

**Synalpheus carinatus**, DE MAN—Plate II., fig. 9.

*Synalpheus carinatus*, DE MAN, 'Arch. f. Naturg.,' I., 1887.

*Synalpheus carinatus*, COUTIÈRE, 'Ann. des Sci. Nat.,' (8), t. ix., 1899.

Locality :—Deep water off Galle (Station XLI.), 2 specimens.

The rostral spine is more than twice the length of the orbital spines and reaches nearly to the end of the 1st segment of the antennular peduncle. The rostrum and the orbital spines point slightly upwards. The 1st segment of the antennular peduncle is slightly longer than the 2nd and twice as long as the 3rd. The antennular spine reaches to the end of the 1st peduncular segment. The antennal peduncle is slightly longer than the antennular peduncle. The antennal scale reaches to the end of the antennular peduncle. The large chela is on the left side. The carpopodite has a strong ventral spine. The dorsal side of the palm ends in a fairly prominent spine, immediately in front of the digits. This spine seems more strongly developed than in the type species.

In the 3rd pair of legs there is a spine on the ischiopodite, the meros is almost as long as the carpos and propodite combined, and bears 8 well-developed spines on the posterior border. The carpos bears a single spine at the distal end of its posterior border. The propodite has 8 spines on the posterior border. The dactylos is bifid.

In the male each of the abdominal pleura is produced posteriorly into a spine. In the female the pleura are rounded. The telson is as long as the uropods and tapers slightly. It carries two pairs of spines on the dorsal side and there are 3 spines at each of the posterior corners.

General distribution :—Indian Ocean.

**Synalpheus comatulorum**, HASWELL.

*Synalpheus comatulorum*, HASWELL, 'Cat. Austr. Crust.,' p. 187, 1882.

*Synalpheus falcatus*, SP. BATE, "'Challenger" Macrura,' p. 574, 1888.

Localities :—Navakaddua Paar (Station LXVIII.), 4 specimens; Gulf of Manaar (Station LIV.), 3 specimens; Chilaw Paar (Station LXIX.), 1 specimen "on *Antedon*"; south end of Cheval Paar (Station XLVIII.), 1 specimen.

Rostrum twice as long as the orbital spines, and reaching to end of the 2nd

segment of antennular peduncle. Antennular scale reaching past the middle of the 2nd peduncular joint. The antennal peduncle is longer than the antennular peduncle. The antennal scale is as long as the antennular peduncle.

General distribution :—Australia, Maldives, Ceylon, Pacific.

**Synalpheus neomeris, DE MAN.**

*Synalpheus neomeris*, DE MAN, 'Zool. Jahr.,' 9. Bd., p. 734, 1897.

Locality :—Gulf of Manaar (Station III.), 1 specimen.

I have referred the single specimen to the above species. It appears to differ but slightly from *Synalpheus gravieri*.

General distribution :—Red Sea, Bay of Bengal, Madagascar, Australia, Japan, Maldives, Pacific, Ceylon.

**Alpheus, FABRICIUS, 1778.**

**Alpheus idiocheles, COUTIÈRE.**

*Alpheus idiocheles*, H. COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 883, 1905.

Locality :—Muttuvaratu Paar (Station VI.), 3 specimens.

Carapace deep. Rostrum short, and separated from the orbits by deep grooves. The orbits are well formed and unarmed. In the antennule the 1st and 3rd segments of the peduncle are subequal, each being half as long as the 2nd segment. The antennular scale reaches to the middle of the 1st peduncular segment. The antenna is short, only reaching three-fourths of the way along the 2nd joint of the antennular peduncle. The antennal scale is nearly as long as the antennal peduncle. The large chela is peculiar, having the dactylos portion of the digit hammer-shaped, and the propodite part short as in *Alpheus malleodigitatus*. The 3rd and 4th legs are robust and have the propodite armed with 5 spines, and end in a simple dactylopropodite.

General distribution :—Maldives, Ceylon.

**Alpheus phrygianus, COUTIÈRE.**

*Alpheus phrygianus*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 886, 1905.

Localities :—Gulf of Manaar (Station III.), 2 specimens; Cheval Paar (Station XLVIII.), 2 specimens.

Somewhat similar to *A. idiocheles*. The eyes are not so prominent. The antennæ are comparatively longer, reaching to the end of the 2nd segment of the antennular peduncle. The antennal scale reaches to the middle of the 2nd segment of the antennular peduncle. The digits of the large chela are similar in shape to the preceding species, but the palm is broader.

General distribution :—Maldives, Ceylon.

**Alpheus paraculeipes, COUTIÈRE.**

*Alpheus paraculeipes*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 894, 1905.

Locality :—Cheval Paar (Station XLVIII.), 1 specimen.

Rostrum poorly developed. Orbits unarmed. 1st and 3rd segment of the antennular peduncle equal. 2nd segment twice as long as each of the others. Antennular scale not reaching to the end of the 1st segment. Antennal peduncle one and one-fourth times as long as the antennular peduncle. Spine of antennal scale as long as antennular peduncle.

The 3rd legs have the ischiopodite unarmed. The posterior border of the meropodite is fringed with about 20 very delicate spines and ends distally in a strong spine. The carpopodite has on its posterior external border 1 spine and about 5 hairs, and on its internal border about 15 long, fine spines. The propodite has 7 pairs of spines on its posterior border and is fringed with hairs anteriorly. The dactylos is slightly biunguiculate.

General distribution :—Maldives, Ceylon.

***Alpheus spongiarum*, COUTIÈRE.**

*Alpheus spongiarum*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 895, 1905.

Locality :—Cheval Paar (Station XLVIII.), 1 specimen.

This species is very closely allied to *A. paraculeipes*, but differs in the form of the 3rd pair of legs. The meropodite is not so stout as in the latter species. Along the posterior border of the meropodite there are 7 very long hairs with about 15 short hairs between. The carpopodite has no spine on the posterior border and the dactylos is not bifid.

General distribution :—Maldives and Ceylon.

***Alpheus paralcione*, COUTIÈRE.**

*Alpheus paralcione*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 895, 1905.

Locality :—Off Mutwal Island (Station LXVII.), 2 specimens.

Rostrum is well defined and slightly carinated behind. The 1st and 3rd segments of the antennular peduncle are subequal, and the 2nd segment is one and a half times as long as each of the others. Antennular scale very small, antennal peduncle one and one-third times as long as the antennular peduncle. The spine of the antennal scale reaches past the end of the antennular peduncle. The palm of the large chela is massive, narrowing distally, and the digits are very short.

In the 3rd pair of legs the ischiopodite is armed with a single spine, the meropodite is large and ends distally at the posterior border in a large spine. The carpopodite has about 4 spines on its posterior border, and the propodite has 8 pairs of spines. The dactylos is bifid.

General distribution :—Maldives, Ceylon.

***Alpheus miersi*, COUTIÈRE.**

*Alpheus miersi*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 903, 1905.

*Alpheus rapax*, var. *miersi*, COUTIÈRE, 'Bull. Soc. Entom. de France,' No. 7, p. 166, 1898.

Localities :—Pearl banks, Gulf of Manaar (Station III.), 3 specimens; Cheval Paar

(Station XLVIII.), 3 specimens; Coral reef, Manaar (Station LIV.), 2 specimens; off Mutwal Island (Station LXVII.), 1 specimen.

Rostrum well developed, reaching to the end of the 1st segment of the antennular peduncle. The 2nd segment of the antennular peduncle is slightly longer than the 1st or 3rd, which are subequal. The antennal peduncle and scale are equal in length and slightly longer than the antennular peduncle. In the Ceylon specimens the large chela is massive and the palm is broad. The meropodite is spiny on its inferior border.

The 3rd pair of legs has the ischiopodite with a single spine. The meros is smooth except for a small spine at the posterior distal border. The carpos is smooth. The propodite bears five pairs of spines. The dactylopodite is half the length of the propodite and slightly curved.

General distribution:—Pacific, Japan, Maldives, Ceylon.

***Alpheus pareucheirus*, COUTIÈRE.**

*Alpheus pareucheirus*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 906, 1905.

Locality:—Haul 6, south of Adam's Bridge (Station LIV.), 1 specimen.

The antennules and antennæ do not differ greatly from those of the preceding species. Their peduncles are not so stout. The rostrum is only two-thirds as long as the 1st segment of the antennular peduncle. The large chela differs in having the palm grooved on both sides. The meropodite is smooth. In the 3rd legs the ischiopodite does not bear a spine. The meropodite is smooth and not so robust as in the previous species. The carpos is smooth and the propodite bears 8 long spines on the posterior border. The dactylopodite is long and slightly curved.

General distribution:—Maldives and Ceylon.

***Alpheus bis-incisus*, var. *malensis*, COUTIÈRE.**

*Alpheus bis-incisus*, var. *malensis*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 910, 1905.

Locality:—Cheval Paar (Station LXIX.), 1 specimen.

The rostrum is triangular, and separated from the orbits by two well-marked grooves. It reaches to the middle of the 1st segment of the antennular peduncle. The 1st and 2nd segments of the antennular peduncle are subequal and slightly longer than the 3rd. The antennular scale almost as long as the 1st peduncular segment. The peduncle and scale of the antennal are equal in length and slightly longer than the antennular peduncle.

I have placed this specimen in COUTIÈRE'S variety merely on the characters of the rostrum and antennæ. The large chela and most of the legs are missing.

General distribution:—Maldives and Ceylon.

***Alpheus bis-incisus*, var. *stylisostris*, COUTIÈRE.**

*Alpheus bis-incisus*, var. *stylisostris*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 911, 1905.

Locality:—Coral reef, Gulf of Manaar (Station LIV.), 1 specimen.

This specimen appears to differ mainly from the variety *malensis* in the form of the rostrum, which is much narrower in proportion to its length.

General distribution :—Maldives and Ceylon.

***Alpheus audouini*, COUTIÈRE.**

*Alpheus edwardsi*, AUDOUIN (see COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 911).

*Alpheus audouini*, COUTIÈRE, 'Fauna of Mald. and Lacc.,' p. 911, 1905.

Localitiës :—Off Mutwal Island (Station LXVII.), 2 specimens ; Pearl banks, Gulf of Manaar (Station III.), 6 specimens ; Coral reef, Manaar (Station LIV.), 3 specimens.

This species, which COUTIÈRE has separated from *Alpheus edwardsi*, resembles the latter species in the form of the rostrum and in the appearance of the antennæ. The large chela has the dorsal and ventral projections of the palm rounded, thus differing from those of *A. edwardsi*, which are spiny.

General distribution :—Red Sea, Indian Ocean, Malay Archipelago, New Zealand, Sandwich Islands.

***Alpheus macrodactylus*, ORTMANN.**

*Alpheus macrodactylus*, ORTMANN, 'Zool. Jahrb.,' V., p. 473, 1890.

Locality :—Off Mutwal Island (Station LXVII.), 1 specimen. Related to *A. edwardsi* and *A. euphrosyne*.

The rostrum is well pronounced and more than half as long as the 1st segment of the antennular peduncle. Of the joints of the antennular peduncle the 2nd is the longest, being twice as long as the 3rd and nearly twice as long as the 1st. The antennular scale is broad and reaches nearly to the end of the 1st segment of the peduncle. The antennal peduncle and scale are equal in length and extend as far forward as the end of the antennular peduncle. The large chela differs from that of *A. edwardsi* in the absence of a dorsal spine and in the comparatively greater length of the digits.

General distribution :—Australia, Ceylon.

***Alpheus lævis*, RANDALL.**

*Alpheus lævis*, RANDALL, 'Journ. Acad. Nat. Sci. Phil.,' vol. viii., p. 141.

Localities :—Galle (Station XXXV.), 4 specimens ; Coral reef near Galle (Station XL.), 5 specimens.

Well-developed rostrum reaching to the end of the 1st segment of the antennular peduncle. Orbits armed with two small spines. Segments of the antennular peduncle subequal. Antennular scale slightly longer than the 1st peduncular segment. Antennal peduncle and scale equal to one another and slightly longer than the antennular peduncle. The large chela has a massive palm, laterally compressed, with no dorsal or ventral notches. The carapace is deep.

General distribution :—Indian Ocean, Pacific, Australia.

**Athanas, LEACH, 1813.****Athanas nitescens, LEACH.**

*Athanas nitescens*, LEACH, 'Edin. Encycl.,' vol. vii., p. 432, 1813.

*Athanas veloculus*, SP. BATE, "'Challenger" Macrura,' p. 529, 1888.

Locality :—Cheval Paar (Station XLVII.), 1 specimen.

This specimen clearly belongs to the well-known species in which must be included—according to COUTIÈRE—BATE's species *Athanas veloculus*.

This record is of interest, inasmuch as the distribution of this species up to the present has been limited, so far as I can ascertain, to the Atlantic and Mediterranean.

General distribution :—Atlantic coasts of America, Cape Verd Islands, north-west Europe, Mediterranean, Ceylon.

**Athanas orientalis, n. sp.—Plate II., fig. 10.**

Localities :—Cheval Paar (Station XLVIII.), 2 specimens; Muttuvaratu Paar (Station VI.), 1 specimen; Coral reef, Gulf of Manaar (Station LIV.), 2 specimens; west of Periya Paar (Station LXI.), 2 specimens.

This species is in many respects very closely allied to *Athanas dimorphus*, ORTMANN, and *A. minikoensis*, COUTIÈRE, but there are differences in the form of the extra- and infra-orbital spines, as well as in the form of the 1st pair of legs which lead me to place it in a new species.

The rostrum extends as far as the end of the 2nd joint of the antennular peduncle. The infra-corneal spine reaches slightly beyond the eye, and the extra-corneal spine just reaches to the anterior end of the eye, so that it is difficult to make out in side view. There is no supra-corneal spine.

The antennule has the 3 joints of its peduncle subequal, and its scale reaches as far forward as the end of the 2nd peduncular joint and the tip of the rostrum. The antennal peduncle reaches to the end of the 2nd joint of the antennular peduncle, and its scale, which is very broad, reaches slightly beyond the end of the antennular peduncle. In the small leg of the female the carpopodite and the propodite are about equal in length, but the latter is more robust. The meropodite is one and a half times as long as the carpopodite. The ischiopodite has a long delicate spine at the distal end of its dorsal border, and there are five smaller spines along the same border. This is the only specimen bearing the 1st pair of legs, so that it is not possible to compare these appendages in the male.

This species differs from the two allied species in the length of the rostrum and also in the relative lengths of the extra- and infra-orbital spines, as well as in the length and robustness of the joints of the small leg. The other two species are devoid of spines on the ischiopodite of that limb.

## FAMILY: CRANGONIDÆ.

**Ægeon**, GUÉRIN-MÉNEVILLE, 1835(= **Egeon**, RISSO, 1816).**Ægeon cataphractus** (OLIVIER).**Cancer cataphractus**, OLIVIER, 'Zool. Adriatica,' p. 30, 1792.**Egeon loricatus**, RISSO, 'Crust. de Nice,' p. 100, 1816.**Crangon cataphractus**, MILNE-EDW., 'Hist. Nat. Crust.,' vol. 2, p. 343, 1837.**Ægeon cataphractus**, ORTMANN, 'Zool. Jahrb.,' vol. 5, p. 535, 1890.

Locality :—Galle (Station XXXV.), 1 specimen.

This single specimen agrees closely with the type species, and also with HENDERSON'S species, *Ægeon orientalis*,\* in most respects. The latter species differs from the above species only slightly with regard to the teeth present on the carapace, and in the absence of the small hepatic groove on the sides of the carapace. Since the Indian species was formed from the characters of a single specimen, it is by no means improbable that this specimen merely represents an extreme variation of the parent species. In all other characters, excepting the two above mentioned, *Ægeon orientalis* agrees with *Ægeon cataphractus*.

General distribution :—Mediterranean, Senegambia, South Africa, Ceylon.

## FAMILY: PROCESSIDÆ.

**Processa**, LEACH, 1815(= **Nika**, RISSO, 1816).**Processa canaliculata**, LEACH.**Processa canaliculata**, LEACH, 'Malac. Podoph. Brit.,' p. 641, 1815.**Nika edulis**, RISSO, 'Crustacés de Nice,' p. 85, 1816.**Nika canaliculata**, DESMARET, 'Consid. gén. Crust.,' p. 231, 1825.**Nika bermudensis**, RANKIN, 'Ann. N.Y. Acad. Sci.,' XII, p. 536, 1900.

Localities :—Pearl banks, Gulf of Manaar (Station III.), 6 specimens; Muttuvaratu Paar (Station VI.), 1 specimen; 10 miles west of Cheval (Station XLVII.), 2 specimens; Cheval Paar (Station XLVIII.), 4 specimens; south-east of Modragam (Station LXIV.), 2 specimens.

None of these specimens appear to differ in any marked degree from the ordinary characters of the species.

General distribution :—Madeira, Japan, West Indies, Gulf of Mexico, South Africa, North-west Europe, Ceylon.

\* J. R. HENDERSON, 'Trans. Linn. Soc.,' 2nd series (Zoology), vol. v., part 10, p. 446, and plate 40, figs. 16 and 17, 1893.

## TRIBE : SCYLLARIDEA.

## FAMILY : SCYLLARIDÆ.

**Scyllarus**, FABRICIUS, 1793(= **Arctus**, DANA, 1852).**Scyllarus tuberculatus** (SP. BATE).**Arctus tuberculatus**, SP. BATE, 'Challenger' Macrura, p. 70, 1888.

Localities :—Pearl banks, Gulf of Manaar (Station III.), 1 specimen, female ; Galle (Station XXXV.), 3 females and 1 male ; Aripu Reef (Station LXIV.), 1 specimen.

Characterised by large tuberculations on the mid-dorsal line of the carapace and of the first 3 pairs of abdominal segments. Those of the second abdominal segment are very distinctive of the species.

In this genus all the legs of the male end in a simple dactylos, and in the female there is a poor developed chela on each of the 5th legs. The propodite digit is not very well developed.

General distribution :—Australia and Ceylon.

**Scyllarus sordidus** (STIMPSON).**Arctus sordidus**, STIMPSON, 'Proc. Acad. Nat. Sci., Phil.,' p. 8, 1860.

Locality :—Coral reef, Gulf of Manaar (Station LIV.), 3 females and 1 male.

General distribution :—Pacific and Ceylon.

## TRIBE : THALASSINIDEA.

## FAMILY : CALLIANASSIDÆ.

**Callianassa**, LEACH, 1813.**Callianassa rotundicaudata**, STEBBING.**Callianassa rotundicaudata**, STEBBING, 'Marine Invest. of S. Africa.' Crust., ii., p. 41, 1903.

Locality :—Cheval Paar (Station XLVIII.), 1 specimen, 18 millims. long.

General distribution :—South Africa, Ceylon.

**Callianassa maldivensis**, BORRADAILE.**Callianassa maldivensis**, BORRADAILE, 'Fauna of Mald. and Lacc.,' vol. ii., part 3, p. 753.

Locality :—Gulf of Manaar (Station III.), 1 specimen, 24 millims. long.

This specimen is imperfect, but it agrees closely with the above species.

General distribution :—Maldives and Ceylon.

**Upogebia**, LEACH, 1813.**Upogebia intermedia** (DE MAN).

*Gebiopsis intermedia*, DE MAN, 'Journ. Linn. Soc.,' vol. 22 (Zool.), 1888.

Localities :—Haul 6, south of Adam's Bridge (Station LIV.), 2 males and 1 female ; Muttuvaratu Paar (Station VI.), 1 male.

This species is characterised by the possession of a large number of denticulations on the cephalic portion of the carapace, and also by the anterior thoracic legs being richly clothed with long and very fine setæ.

The anterior portion of the carapace covers the small eyes and projects almost to the end of the antennular peduncle. The peduncle of the antennule is 3-jointed, the 3rd being slightly longer than the 1st and two and a half times as long as the 2nd. The 3rd joint is more slender than the other two. There are 2 flagella one and a half times as long as the peduncle. The inner flagellum is slightly longer and less robust than the outer. The antennal peduncle is slightly longer than that of the antennule and is also 3-jointed. The 1st and 2nd joints are equal and slightly longer than the 3rd joint, which is also less robust than the other two. The 1st and 2nd joints are richly clothed with long fine setæ. The eyes are small and project nearly to the end of the 2nd antennular peduncle. The middle of the carpos of the 1st legs reaches to the end of the rostrum. The appendages agree with DE MAN'S description. The abdomen is large, being twice as long as the carapace and proportionally broad. The segments are subequal, the 2nd and 6th being slightly longer than the others. The telson is broader than long and equal in length to the uropods.

— General distribution :—Mergui, Ceylon.

## EXPLANATION OF THE PLATES.

## PLATE I.

- Fig. 1. *Peneus indicus*, MILNE-EDW., head, side view.  $\times 4$ .  
 ,, 2. *Parapeneus mogiensis*, RATHBUN, thelycum in Ceylon specimen.  $\times 8$ .  
 ,, 3. ,, *gallensis*, n. sp., head, side view.  $\times 5$ .  
 ,, 3A. ,, ,, thelycum.  $\times 4$ .  
 ,, 3B. ,, ,, petasma.  $\times 10$ .  
 ,, 4. *Caradina vitiensis*, BORRADAILE, rostrum, side view.  $\times 12$ .  
 ,, 5. *Urocaris longicaudata*, STIMPSON, head, from above.  $\times 7$ .  
 ,, 5A. ,, ,, rostrum and carapace, side view.  $\times 7$ .  
 ,, 6. *Nauticaris grandirostris*, n. sp., side view.  $\times 3$ .  
 ,, 6A. ,, ,, rostrum, side view.  $\times 3$ .  
 ,, 6B. ,, ,, head, from above.  $\times 5$ .  
 ,, 6C. ,, ,, telson, from above.  $\times 3$ .

## PLATE II.

- Fig. 7. *Latreutes ceylonensis*, n. sp., rostrum and anterior edge of carapace.  $\times 65$ .  
 ,, 7A. ,, ,, head, from above.  $\times 65$ .  
 ,, 7B. ,, ,, 3rd maxilliped.  $\times 36$ .  
 ,, 7C. ,, ,, 2nd thoracic leg.  $\times 36$ .  
 ,, 7D. ,, ,, 3rd thoracic leg.  $\times 36$ .  
 ,, 7E. ,, ,, telson, dorsal view.  $\times 28$ .  
 ,, 8. *Nauticaris futilirostris*, SP. BATE, 4th thoracic leg.  $\times 30$ .  
 ,, 9. *Synalpheus carinatus*, DE MAN, head, from above.  $\times 12$ .  
 ,, 9A. ,, ,, 3rd thoracic leg.  $\times 54$ .  
 ,, 9B. ,, ,, telson and right uropod.  $\times 20$ .  
 ,, 10. *Athanas orientalis*, n. sp., head, from above.  $\times 30$ .  
 ,, 10A. ,, ,, side of head.  $\times 30$ .  
 ,, 10B. ,, ,, 1st thoracic legs; small chela.  $\times 25$ .

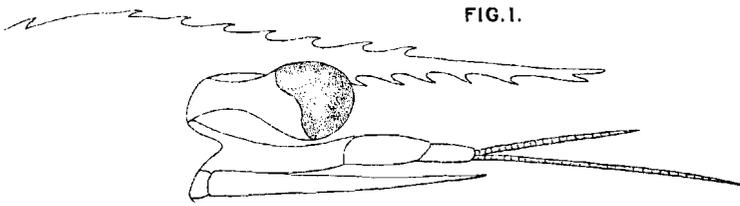


FIG. 1.

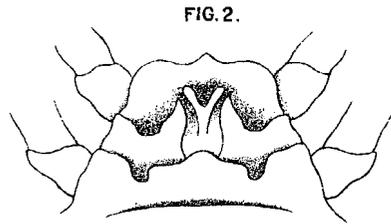


FIG. 2.



FIG. 3.

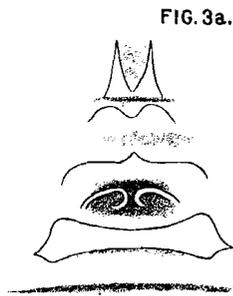


FIG. 3a.

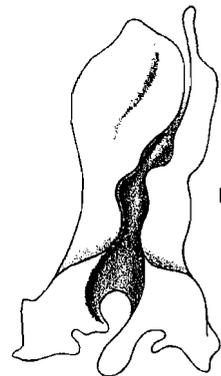


FIG. 3b.

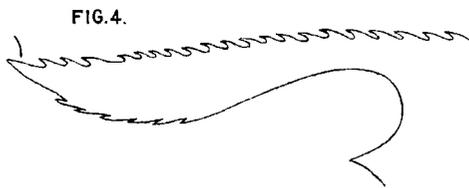


FIG. 4.

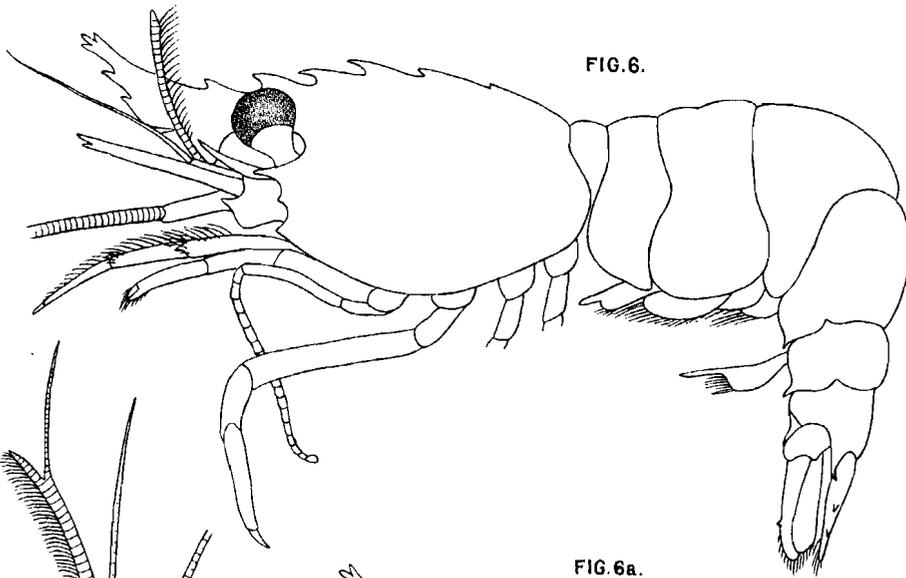


FIG. 6.

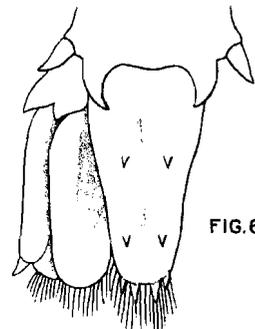


FIG. 6c.

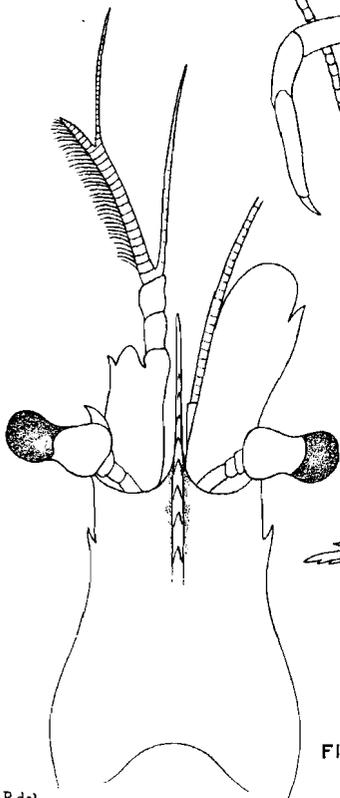


FIG. 5.

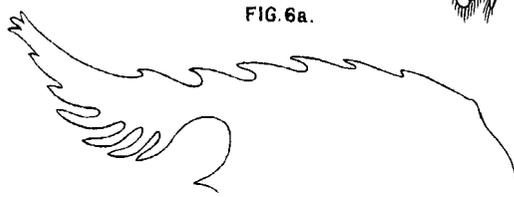


FIG. 6a.

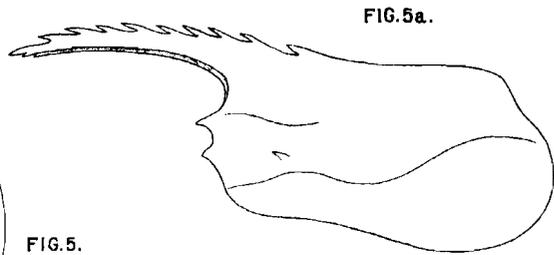


FIG. 5a.

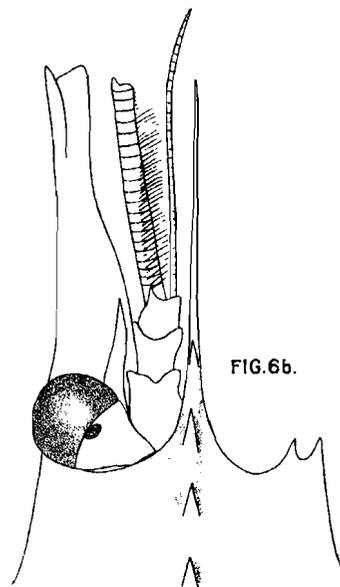


FIG. 6b.

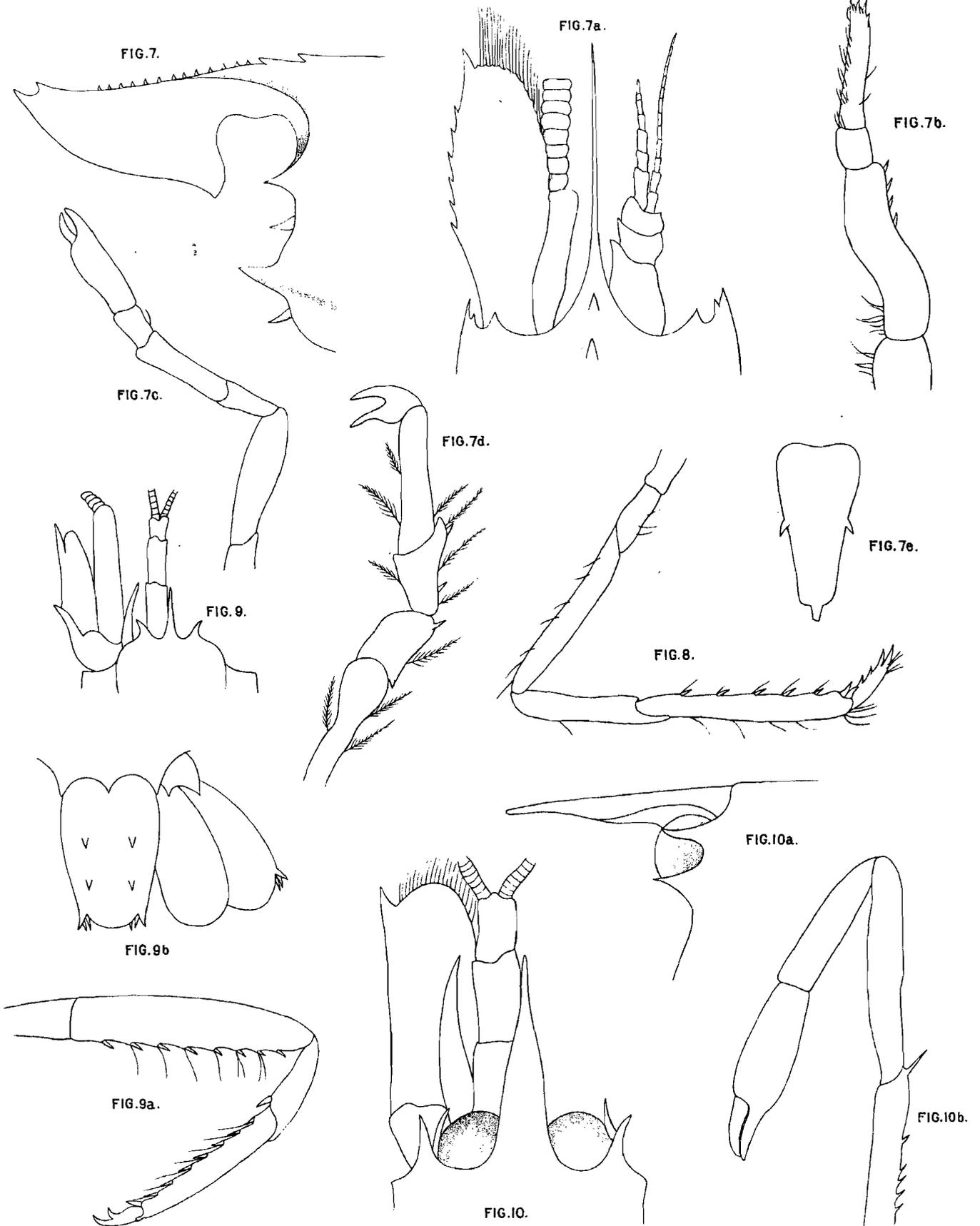
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FIG. 1, *PENÆUS INDICUS*, M. Edw. ;  
FIG. 4, *CARADINA VITIENSIS*, Borradaile ;

FIG. 2, *PARAPENÆUS MOGIENSIS*, Rathbun ;  
FIG. 5, *UROCARIS LONGICAUDATA*, Stimpson ;

FIG. 3, *PARAPENÆUS GALLENSIS*, n. sp. ;  
FIG. 6, *NAUTICARIS GRANDIROSTRIS*, n. sp. ;



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FIG. 7, LATREUTES CEYLONENSIS, n. sp.;

FIG. 8, NAUSICARIS FUTILIROSTRIS, Sp. Bate ;  
FIG. 10, ATHANAS ORIENTALIS, n. sp.

FIG. 9, SYNALPHEUS CARINATUS, de Man ;