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XXXII.—Natural history notes from H.M. Indian marine survey steamer 'Investigator,' Commander R. F. Hoskyn, R.N., commanding.—Series II., No. 1. On the results of deep-sea dredging during the season 1890-91

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Cotella) and the Clavelinidæ (s. str.). Hitherto no true* Distomid has been known to possess free zooids—that is, zooids not completely imbedded in a common test. This new Ascidian, however, combines the structural characters of the Distomidæ with a social form of colony which is only slightly removed from that of the Clavelinidæ.

Further, *Archidistoma aggregatum* is of especial interest because it exhibits the first stage in the evolution of the cœnobitic type of colony from the social Ascidian type, in which the zooids are entirely free and irregularly placed: in *Archidistoma aggregatum*, the clumps of zooids (primitive cœnobia) have no common cloaca, but the cloacas of the individuals are usually situated towards the centres of the groups. The second stage is exhibited in such a Compound Ascidian as *Synoicum turgens* or *Circinalium conrescens*, in which each of the isolated clumps of zooids possesses a common central cloaca.

XXXII.—*Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator,' Commander R. F. Hoskyn, R.N., commanding.*—Series II., No. 1. *On the Results of Deep-sea Dredging during the Season 1890-91.* By J. WOOD-MASON, Superintendent of the Indian Museum, and Professor of Comparative Anatomy in the Medical College of Bengal, and A. ALCOCK, M.B., Surgeon I.M.S., Surgeon-Naturalist to the Survey.

[Continued from p. 138.]

Class ASCIDIACEA.

Family Cynthiidæ.

CULEOLUS, Herdman.

1. *Culeolus* sp. prox. *recumbens*, Herdman.

Eight specimens of varying sizes from Station 110, 1997 fathoms, come very close to this species from the higher latitudes of the Southern Ocean, if they are not identical with it.

These are the only specimens of Tunicata that we have as yet obtained from the deep sea.

* The position of *Chondrostachys* is uncertain, but its nearest affinity seems to be with *Stereoclavella* rather than with *Oxycorynia*. *Diazona* is separated from the Distomidæ by the presence of internal longitudinal bars in its branchial sac.

Phylum **APPENDICULATA.**Branch **ARTHROPODA.**Class **CRUSTACEA.**

By J. WOOD-MASON.

Grade **MALACOSTRACA.**Order **SCHIZOPODA.**Family **Lophogastridæ.****GNATHOPHAUSIA**, Willem.-Suhm.1. *Gnathophausia bengalensis*, sp. n.

♀. Closely allied to *G. calcarata*, Sars, from which it differs in the following points:—The carapace covers the whole of the first and a part of the second abdominal somite; the antennal, branchiostegal, and postero-inferior spines appear quite smooth to the naked eye, being only obsoletely or microscopically serrated, the supraorbital spine is readily distinguishable by its shape from the rostral denticles; the upper lateral keels are strongly roof-shaped, and the oblique subdorsal keels more pronounced; the antennal scale is more broadly emarginate at the apex; the pleural lappets of the last abdominal somite are terminated by two very unequal spines (of which the outer is long and sharp and the inner short and blunt), and are separated from one another posteriorly in the mid-ventral line by a long and narrow incision.

Length, from end of rostrum (extreme tip wanting) to apex of telson, 91 millim.; of carapace, from supraorbital to end of dorsal spine, 37 millim.; of abdomen 46.5 millim.; of telson 17.5 millim.

Colour in life deep purple-lake.

A single female, with just-commencing brood-pouch, was taken at Station 117, 1748 fathoms.

2. *Gnathophausia brevispinis*, sp. n.

Gnathophausia gracilis, var. *brevispinis*, W.-M., Ann. & Mag. Nat. Hist. (6) vii, 1891, p. 188, ♂.

♂ ♀. Differs from the Atlantic *G. gracilis*, Suhm, in the rostrum being recurved and shorter than the carapace; in the dorsal crest of the carapace being distinctly foliaceous throughout, and at the base of the rostrum expanded into a subtrian-

gular plate, terminating apically in a strongish forwardly-inclined spine; in the dorsal spine being shorter and more recurved; in the lower of the two postero-lateral spines being reduced to a minute point; in the dorsal spines of the first abdominal somite being subequal, those of the second separated by a distinct transverse groove and the hinder of them more deflexed, and those of the third, fourth, and fifth larger and more distinctly arched anteriorly; in the form of the pleura of the five basal somites, which are expanded at their posterior margin into a thin and rounded foliaceous lobe, having their marginal spines as a consequence closer together.

A single immature female (the last pair of incubatory lamellæ only 3 millim. long), measuring 92 millim. from end of rostrum (extreme tip wanting) to apex of telson, and coloured in life deep purple-lake, was taken at Station 117, 1748 fathoms.

Family Eucopiidæ.

EUCOPIA, Dana, G. O. Sars.

3. *Eucopia australis*, Dana, Sars.

Eucopia australis, Dana, U. S. Explor. Exped., Crustacea, pt. i. p. 609, Atlas, pl. xi. fig. 11, *a-m*; G. O. Sars, 'Challenger' Schizopoda, 1885, p. 55, pls. ix. and x.

Chalaraspis unguiculata, Willemoes-Suhm, Trans. Linn. Soc. Lond., Zool. ser. 2, vol. i. 1875, p. 37, pl. viii.

A soft and somewhat distorted young female with very incompletely developed brood-pouch, non-pigmented eyes, and eye-peduncles, through the walls of which the subjacent ophthalmic tract is plainly visible by transparence, as in Sars's figure, was obtained at Station 112, 561 fathoms; and a mature, or all but mature, female with integuments of firmer consistence, red-pigmented eyes, and opaque eye-peduncles, at Station 109, 738 fathoms. But whether we have here to do with two distinct species, or only with two different conditions of one and the same species, the material at our disposal is insufficient to enable me to determine.

Family Euphausiidæ.

THYSANOPODA, H. M.-Edw.

4. *Thysanopoda microphthalma*, G. O. Sars.

Thysanopoda microphthalma, G. O. Sars, 'Challenger' Schizopoda, 1885, p. 116, woodcut, fig. 3, ♀.

An adult male, without legs, from Station 111, 1644 fathoms, is probably referable to this species.

Order DECAPODA.

Suborder NATANTIA.

PENÆIDEA.

Family Penæidæ.

Subfamily PENÆINA.

No representatives of this group have as yet been found amongst either the infra-littoral or the bathybial fauna.

Subfamily PARAPENÆINA.

Obs. Spence Bate's *Artemisia longinaria* belongs here; it is not in the remotest degree related to the *Aristæina*.

METAPENÆUS, gen. nov.

Allied to *Parapenæus*, S. I. Smith, differing therefrom in having neither tergo-pleural nor cephalothoracico-pleural suture to its carapace, and in the branchial system, which is invariably furnished with an epipodite in the twelfth somite and with a filamentous vestige of an anterior arthrobranchia in the thirteenth.

Type *Penæus affinis*, H. Milne-Edw.

The first two of the three following species are referred with some confidence to this genus as little-modified deep-sea representatives of it, the third with some doubt, as it lacks the branchial rudiment.

5. [*Metapenæus philippinensis*, var. *andamanensis*, nov.]

Penæus philippinensis, Sp. Bate, 'Challenger' Macrura, 1888, p. 261, pl. xxxv. figs. 2, ♀, 3, ♂.

Differs from the specimens described and figured by Spence Bate in its much smaller size and in the median part of the *annulus ventralis* being shorter and devoid of lateral notches. The rostrum is in both sexes almost straight and scarcely ascendant; in the largest female it extends somewhat beyond, in the other females and in a male barely to, the end of the penultimate joint of the antennular peduncle. The legs of the first pair are furnished with a spine at the ventral apex of their second and third joints. In the female there is a pair of sternal spines between the second pair of legs similar to, but very much smaller than, those present in *M. velutinus*.

(Dana). The inner flagellum of the antennules is short and but little longer than the outer, and is unmodified at base in the male. The dorsal carina of the abdomen commences in the second somite as a faint and blunt elevation of the anterior half of the tergum, and is continuous and distinct from the base of the third to the extremity of the last tergum, at which it ends in a single minute point, being cleft so as to terminate in two points in each of the three penultimate terga. In addition to the median carina the three terminal somites present on each side of the middle line a tolerably distinct blunt subdorsal angulation, hence appearing to be tricarinate.

The caudal swimmerets when laid back extend much beyond the apex of the telson, and the outer margin of their exopodites runs out into a spine a good way from the apex of the joint—primitive features which are not noticed in Spence Bate's description, though the former of them is brought out in the accompanying drawings of the typical form.

The largest female measures about 63 millim., the only male about 51 millim., in a straight line from the apex of the rostrum to that of the telson.

One nearly mature male with four females from north of Port Blair, Andaman Sea, in 112 to 244 fathoms, on 29th Nov., 1888.]

6. *Metapenæus coniger*, sp. n.

Differs from the preceding in the following points:—The inner flagellum of its longer antennules is fully twice as long as the outer, and in the male bears at its inner and upper margin near the base a short, stout, and highly indurated spine of a peculiar form, the part from which the spine springs being conically thickened and elevated, with its constituent joints firmly ankylosed together. The three terminal abdominal terga are much more strongly angulated subdorsally. The *annulus ventralis* of the female is built precisely upon the same plan as in *M. philippinensis*, and represents, there is little doubt, a primitive phase in the evolution of the organ, though at first sight it appears to be so strikingly different; its posterior moiety is a roughly semicircular concave plate with prominent raised anterior and lateral margins, and it abuts by its deeply bifid anterior margin against the anterior moiety, which has the form of a short and broad band; its raised anterior border has an outline intermediate between that of a capital T and a capital T, the ends of the cross stroke of which are in the same curved line with the raised lateral margins, and do not nip the sides of

the grooved downstroke, as in *M. philippinensis*. It is easy to be seen that the condition of parts manifested by the preceding species has been brought about by the expansion, leaf-like, of the T-shaped ridge in all its parts, whereby the anterior ends of the lateral margins have been thrust inwards and backwards against the expanded anterior margin, so that the latter appears to be "held in position by clamp-like lateral processes." The legs of the first pair have a spine on the second and third joints below. There is a very minute pair of sternal spines between the second pair of legs in the female; they are, however, much smaller than in the preceding species, and it is hence possible that they may be really absent or so small as to be readily overlooked in the specimens described by Spence Bate, who expressly states that none are present.

The branchial formula is:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VIII.	1	1	1	0	= 3
IX.	0	1	1	1	= 3
X.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XI.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XII.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XIII.	0	<i>r.</i>	1	1	= 2+ <i>r.</i>
XIV.	0	0	0	0	= 0
<hr/>					
1+3 <i>ep.</i> + 5+ <i>r.</i> + 6 + 5 = 17+ <i>r.</i> +3 <i>ep.</i>					

The branchiæ are voluminous and remarkably laxly constructed and feathery, with an unusually well-developed terminal plume. The anterior arthrobranchia of the penultimate somite is represented by a simple filament. The last epipodite (XII.) is branched.

Length, from tip of rostrum to tip of telson, ♂ 77 millim., ♀ 88 millim.; of carapace, from supra-orbital margin to middle of posterior margin in a straight line, ♂ 18 millim., ♀ 20.5 millim.; of abdomen, ♂ 45 millim., ♀ 49 millim.; of inner flagellum of antennules, ♂ 16.5 millim., ♀ 17.5 millim.; of outer flagellum of antennules, ♂ 8 millim., ♀ 7.5 millim.

Nine males and eleven females from Station 119, 95 fathoms. It had previously been obtained in considerable numbers off the Mahánaddi Delta in 68 fathoms (32 ♂ and 26 ♀), and at Station 96, 98 to 102 fathoms (4 ♂ and 10 ♀), the colour of which last was noted as transparent grey irregularly suffused with pink.

Both the preceding are remarkable for the membranous condition of the lower part of the branchiostegite in apparent correlation with the voluminous and feathery character of the branchiæ.

7. *Metapenceus rectacutus* (Sp. Bate).

Penæus rectacutus, Sp. Bate, 'Challenger' Macrura, 1888, p. 266, pl. xxvi. fig. 2 (excl. 2s), ♀.

Two fine females from Station 115, 188 to 220 fathoms.

Colour in life red.

The carapace and abdomen are perfectly glabrous throughout. The former is armed with three spines, an antennal, an hepatic, and a branchiostegal. From the last-named of these a sharp crest curves boldly upwards and backwards, forming the lower boundary of the anterior end of the cervical groove as far as the level of the hepatic spine, whence it is continued nearly to the posterior end of the carapace as a blunt ridge—the cardio-branchial—which, with the branchiostegal crest, marks out the upper boundary of the subjacent branchial chamber; similarly, a sharp crest continued straight upwards and backwards from the hepatic spine accentuates the gastro-hepatic groove.

The 13- to 14-toothed rostrum is neither quite so stout nor quite so straight as represented by Spence Bate. The exopodites of the thoracic legs are rudimentary. The all but equal antennular flagella are about as much shorter than the carapace, measured from the frontal to the middle of the posterior margin in a straight line, as they are longer than the rostrum measured from the same point in the same manner.

The telson is strongly trifurcate and armed at the sides, in front of the lateral prongs, with three pairs of small movably-articulated spines, which are separated from one another and from the lateral prongs by intervals equal to about twice their own length.

The branchial formula is:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VIII.	1	1	1	0	= 3
IX.	0	1	1	1	= 3
X.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XI.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XII.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XIII.	0	0	1	1	= 2
XIV.	0	0	0	0	= 0
<hr/> <div style="display: flex; justify-content: space-around; align-items: center;"> 1+3 <i>ep.</i> + 5 + 6 + 5 =17+3 <i>ep.</i> </div>					

The last epipodite (XII.) is simple and unbranched, and there is no vestige of an anterior arthrobranchia in the thirteenth somite.

Length, from rip of rostrum to tip of telson, 113 to 129 millim.; length of carapace 25.5 to 29.5 millim.; of rostrum 21.5 to 24 millim.; of antennular flagella 23 to 26 millim.

The three preceding species, in common with other infralittoral allies of littoral forms, seem to be in many respects in a more primitive phase of evolution than their littoral allies. Their primitive characters are (1) that the last abdominal segment is elongate, (2) that the caudal swimmeret is more natatory, as evidenced by its being prolonged far beyond the level of the marginal spine of the exopodite, and (3) that the telson is trifurcate and spinulose at the sides.

In the first two of these characters they recall many of the true deep-sea Penæidæ, many of the Schizopoda (e. g. *Gnathophausia*), and the final larval stages of their own kind; while the lateral prongs and spines of their telson are to be interpreted as the modified vestiges of the larval caudal fork, which, it may be remarked, persists throughout life almost unchanged in at least one Penæid, viz. *Sicyonia furcata*.

Subfamily SOLENOCERINA.

SOLENOCERA, Lucas.

8. *Solenocera Hextii*, W.-M.

Solenocera Hextii, Wood-Mason, Ann. & Mag. Nat. Hist. (6) vii. 1891, p. 188, ♂ ♀.

Nine males and six females from Station 119, 95 fathoms, including a full-grown pair, which prove that the rostrum of the fully adult female is shorter, broader, and more ascendant than in the juvenile stages, and that that of the male, while retaining the length and breadth it has in youth, is deflexed with the line of the teeth decidedly convex; length of the large female about 75 millim., of the male about 67 millim.

Also a mutilated male from Station 120, 240 to 276 fathoms.

This species has a distinct supra-orbital angle, which is not, however, spinose, a post-orbital spine, a small hepatic spine, and a third spine smaller than this on the edge of the gastro-hepatic crest, but no branchiostegal spine.

The telson is trifurcate.

The common Indian littoral form (? *P. crassicornis*, M.-

Edw.) also is without branchiostegal spines, and, moreover, has the telson simple and unarmed.

The branchial formula is the same in both species, namely:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VIII.	1	1	1	0	= 3
IX.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
X.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XI.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XII.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XIII.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XIV.	0	0	0	1	= 1
<hr/> <div style="display: flex; justify-content: space-around; align-items: center;"> 1+5 <i>ep.</i> + 6 + 6 + 6 = 19+5 <i>ep.</i> </div>					

PARASOLENOCERA, gen. nov.

Carapace grooved as in *Solenocera*, furnished with supra-orbital, postorbital, and hepatic spines; without post-rostral ridge. Abdomen narrow and elongated, with a conspicuous hump, giving to the body a decided wasp-waisted appearance, dorsally carinated from the base of the third tergum to the apex of the last—the carina very distinctly and increasingly cristiform from the base of the fourth to the apex of the last, where it ends in a sharp decurved spine. Telson trifurcate, as long as the swimmerets. Flagella of antennules foliaceously expanded, tapering gradually to a very fine setaceous point, the inner much the broader and a little the longer, ensheathing the outer.

This genus forms a connecting-link between *Solenocera* on the one hand and *Hymenopenæus*, *Philonicus*, and *Haliporus* on the other.

9. *Parasolenocera annectens*, sp. n.

The strongly ascendant and very slightly upcurved rostrum is regularly and rather gradually produced to a very sharp point, which reaches almost to the end of the penultimate joint of the antennular peduncle. It is armed with a decreasing series of eight excessively acute teeth, the first of which is placed on the gastric region and about as distant from the second as this is from the fourth of the series.

The first branchiostegal spine when viewed from the side presents itself as a stout, compressed, acute, triangular pro-

longation of the anterior end of the inflated outer wall of the efferent branchial channel, or—what comes to the same thing—of the branchiostegal crest, which is not continued to the anterior margin of the carapace.

The eyes are large and reniform.

A single female from Station 116, 405 fathoms.

Colour in life red.

Length, from apex of rostrum to apex of telson 66 millim.; of abdomen 40 millim.; of carapace, from supra-orbital to posterior margin, 16 millim.; of rostrum, from same point, 8 millim.; of outer antennular flagellum 19 millim., of inner 21 millim.

HYMENOPENÆUS, S. I. Smith.

10. *Hymenopenæus microps*, S. I. Smith.

Hymenopenæus microps, S. I. Smith, Ann. Rep. Comm. Fish. 1884, p. 413 (69), pl. x. fig. 1; Wood-Mason, Ann. & Mag. Nat. Hist. (6) vii. p. 188.

A female from Station 112, 561 fathoms.

HALIPORUS, Sp. Bate.

This genus is probably identical with *Hymenopenæus*, Smith.

11. *Haliporus æqualis*, Sp. Bate.

Haliporus æqualis, Sp. Bate, 'Challenger' Macrura, 1888, p. 285, pl. xli. fig. 1.

We do not verify the sexual difference between the male and female in the direction of the rostrum, which is armed with from seven to nine teeth, of which those on the gastric region are constantly two.

The propodite of the last pair of legs in the male at all events is more than four times the length of the dactylo-podite, while in the penultimate pair it is only twice as long. The almost level crest of the last abdominal somite ends in a small spine. The trifurcate telson is much shorter than the swimmerets.

The outer flagellum of the antennules is at least three times as long as the inner, which are equal in length to the carapace measured from the tip of the rostrum to the middle of the hinder margin.

Four males and a female from Station 115, 188 to 220

fathoms ; and one male and a young one from Station 116, 405 fathoms.

Colour in life pink.

12. *Haliporus neptunus*, Sp. Bate.

Haliporus neptunus, Sp. Bate, 'Challenger' Macrura, 1888, p. 291, pl. xlii. fig. 3.

In our specimens the rostrum is sharper and more ascendant, and the crests of the last three abdominal terga are spinose at the extremity, the spine in the first two springing from the bottom of the median cleft.

The telson, which is trifurcate, reaches about midway between the outer and inner lamellæ of the swimmerets when these are laid back.

In addition to an extra-ocular plate and antennal, post-antennal, hepatic, and post-branchiostegal spines, there is a true branchiostegal spine.

There is a still greater disproportion between the propodite and dactylopodite of the last pair of legs than in the last species.

One female from Station 111, 1644 fathoms, and two from Station 117, 1748 fathoms.

Colour in life lurid orange.

Subfamily *ARISTÆINA*.

ARISTÆUS, Duvernoy.

Aristeus, Duvernoy, Ann. des Sc. Nat., Zool. 1841 (ii.), xv. pp. 101 et seq.

Hemipenæus, Sp. Bate, 'Challenger' Macrura, 1888, p. 299 (ex parte).

Rostrum three-toothed ; carapace without hepatic spine ; antennal scale large ; mandibular palp thin and foliaceous, with terminal joint triangular ; dorsal carina of last three abdominal terga terminating posteriorly in a spine ; postero-lateral angles of abdominal pleura simple and unarmed ; legs without exopodites ; dactylopodites of the last two pairs of legs setaceous.

The branchial formula of *Aristæus virilis*, Spence Bate, is as follows :—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VIII.	1	0	1	0	= 2
IX.	1	1	1	r.	= 3+r.
X.	1	1	1	r.	= 3+r.
XI.	1	1	1	r.	= 3+r.
XII.	0 (ep.)	1	1	r.	= 2+r.+ep.
XIII.	0	1	1	r.	= 2+r.
XIV.	0	0	0	1	= 1
<hr/>					
	4+ep.	+	5	+	6
					+
					1+5 r. = 16+5 r.+ep.

The functional branchiæ are sixteen in number, arranged in two series, an outer and an inner. The outer series consists of eleven, namely podobranchia VIII., anterior arthrobranchia IX., podobr. IX., anterior arthrobr. X., podobr. X., anterior arthrobr. XI., podobr. XI., anterior arthrobr. XII., anterior arthrobr. XIII., posterior arthrobr. XIII., pleurobranchia XIV.; and the inner series of five, namely posterior arthrobr. VIII., posterior arthrobr. IX., posterior arthrobr. X., posterior arthrobr. XI., and posterior arthrobr. XII. The number of functional branchiæ thus corresponds exactly with the description and figures of Duvernoy, while their arrangement differs but slightly therefrom—the difference consisting in posterior arthrobranchia XII. occupying the last place in the inner series instead of the ninth place in the outer series, as in the typical form. There is but one fully developed and functional pleurobranchia, namely that of somite XIV., the remaining five being reduced to minute rudimentary plumes of no functional importance.

Type *Aristæus antennatus*, Duvernoy.

13. *Aristæus virilis* (Sp. Bate).

Hemipenæus virilis, Sp. Bate, 'Challenger' Macrura, 1888, p. 303, pl. xlv. fig. 4, ♂.

Hemipenæus tomentosus, id. ibid. p. 307, pl. xlix. figs. 2, 3, pl. l., ♀.

These two species have been separated by Spence Bate on differences which prove to be sexual.

The remarkable structure of the base of the inner flagellum of the antennules (which probably forms an apparatus for holding the female, and recalls the structure of the same part in our *Metapenæus coniger*) and the thickening of the tissues of the outer apex of the antennal scale (of which the remarkable prolongation of the apex of the same part in *Aristæopsis Edwardsiana* is only an extension) have been indicated by Mr. Spence Bate.

To the above we may add that the rostrum, which in

females and in the young of both sexes ends in a long styli-form process extending far beyond the peduncles of the antennules, in the adult male is so shortened as to scarcely pass beyond the end of the first joint of these appendages. The only absolute difference which I have been able to detect between our specimens and Duvernoy's figures and descriptions is in the arrangement of the branchial plumes above described.

Very many specimens of both sexes from Station 115, 188 to 220 fathoms. Several specimens had been previously obtained in the same part of the Andaman Sea in 271 fathoms. Colour in life red.

14. *Aristæus semidentatus* (Sp. Bate).

Hemipenæus semidentatus, Sp. Bate, 'Challenger' Macrura, p. 305, pl. xlix. fig. 1, ♀.

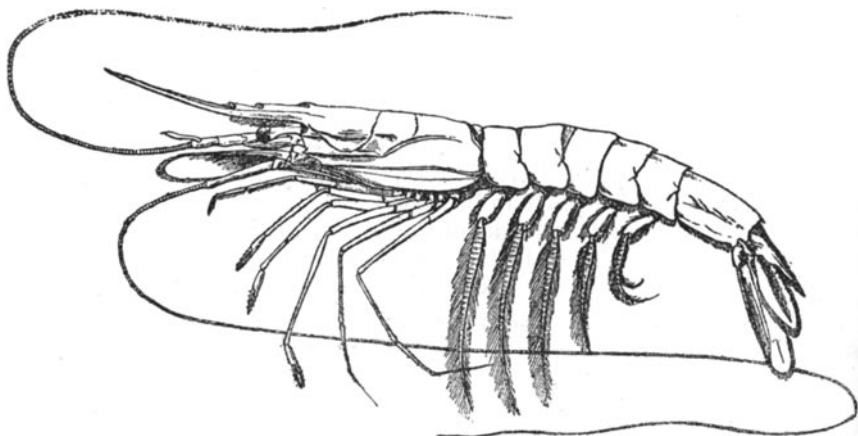
Very many specimens of both sexes from Station 120, 240 to 276 fathoms. Previously obtained in lat. 20° 17' 30'' N., long. 80° 50' E., in 193 fathoms, and from the Swatch-of-No-ground in 405 to 285 fathoms.

This species presents precisely the same sexual characters as the preceding, from which, so far as we have been at present able to make out, it only differs in being quite glabrous and as a rule smaller.

15. *Aristæus coruscans*, sp. n.

Body elongate, slender, glabrous. Rostrum long, extending by nearly one half of its length beyond the peduncles of

Fig. 6.



Aristæus coruscans, ♀, $\frac{2}{3}$ nat. size.

the antennules, its basal toothed portion almost horizontal, its apical portion long, slender, styliform, straight, and ascendant: the first tooth arises just at the level of the supraorbital margin, its ridge extending as a sharpish and diminishing dorsal crest nearly to the hinder edge of the carapace; the second arises about the length of an eye-peduncle from the first, and the third about half that distance from the second. A long postorbital crest commences close behind the orbital margin, and extends without interruption to the gastro-hepatic groove, where it ends, to reappear again in the interval between the gastro-hepatic and cervical grooves; the crest of the antennal spine is short, extending only to the antennal groove; the long crest of the branchiostegal spine runs horizontally backwards as far as the curved cardio-branchial ridge and groove, which with it demarcates the upper boundary of the subjacent branchial chamber; below the branchiostegal crest a ridge of nearly the same strength delimits the indurated superior from the membranous inferior part of the sides of the carapace and anteriorly runs to the anterior margin, while posteriorly it is continuous with the raised rim of the posterior margin on each side.

The legs are slender and weak.

A fine female from Station 112, 561 fathoms.

Colour in life bright orange.

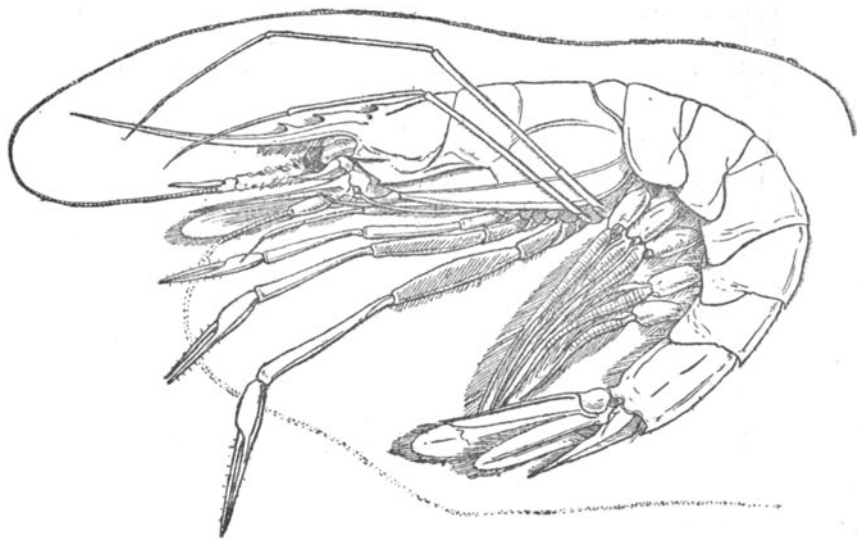
The specimen was strongly luminous when first brought on board.

16. *Aristæus crassipes*, sp. n.

Body pubescent. Rostrum long, extending by fully one half of its length beyond the peduncles of the antennules; its basal toothed portion slightly descendant, its apical portion, which is excessively slender and styliform, ascends in a faint curve to its excessively fine and sharp point; the first tooth arises well to the rear of the orbital margin, the second about the length of an eye-peduncle from the first, and the third about two-thirds of that distance from the second; the crest of the first extends backwards as a blunt dorsal ridge to about midway between the cervical groove and the hinder margin of the carapace; a blunt postorbital crest defines the antennal groove superiorly, and an almost equally blunt short crest to the antennal spine limits it below; the crest of the branchiostegal spine is somewhat stronger and sharper than in the preceding species, but presents similar relations to the cardio-branchial groove, at its junction with which a groove passes off obliquely downwards and backwards towards but not up

to the ridge separating the hard and the soft parts of the sides of the carapace from one another; both gastro-hepatic and cervical grooves are rather more strongly marked than in the preceding species, especially the latter of them, which is

Fig. 7.



Aristaeus crassipes, ♀, natural size.

accentuated by a slight thickening of the integument immediately behind it on each side of the middle line; neither, however, actually indents the dorsal ridge, though both appear to do so from the lateral aspect, as is seen in the accompanying figure.

The thick and robust first three pairs of chelate limbs present the most marked contrast to the thin and filiform last two pairs.

A fine female specimen from Station 116, 405 fathoms.

Colour in life crimson.

An equally fine example of the same sex had previously been obtained in lat. $6^{\circ} 29' N.$, long. $79^{\circ} 34' E.$, in 597 fathoms.

ARISTÆOPSIS, gen. nov.

Aristeus, Sp. Bate, 'Challenger' Macrura, 1888, p. 309 (non Duvernoy).

Rostrum three-toothed; carapace without hepatic spine;

antennal scale large; mandibular palp robust, with terminal joint bifurcate; dorsal carina of the last four abdominal terga terminating posteriorly in a spine; postero-lateral angles of second or third to fifth abdominal pleura minutely mucronate; legs with or without minute exopodites; dactylopodites of the last two pairs of legs lanceolate, smooth and convex below, flat or concave and fringed with hairs on both edges above.

Branchial formula of *Aristeopsis Edwardsiana* (Johnson):—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VIII.	1	0	1	0	= 2
IX.	1	1	1	1	= 4
X.	1	1	1	1	= 4
XI.	1	1	1	1	= 4
XII.	1	1	1	1	= 4
XIII.	0 (<i>ep.</i>)	1	1	1	= 3+ <i>ep.</i>
XIV.	0	0	0	1	= 1
<hr/>					
	5+ <i>ep.</i>	+	5	+	6
					6 = 22+ <i>ep.</i>

It differs from *Aristæus* in having a fully developed (=plume and epipodite) podobranchia XII. and an epipodite XIII., with a regularly decreasing series of pleurobranchiæ, the anterior five of which are degenerate as to their pinnules, but not reduced in length, and hence cannot be called rudimentary.

Type *Penæus Edwardsianus*, Johnson, P. Z. S. 1867, p. 897, ♀ = *Aristæus coralinus*, A. M.-Edw. in 'Challenger' Macrura, 1888, pl. xxxii. fig. 10, ♂.

[*Obs. Funchalia*, which is entered by Spence Baté as a synonym of his *Aristæus* (= *Aristæopsis*), has, as Johnson's description proves, nothing whatever to do with either *Aristæopsis* or *Aristæus*, and probably does not even belong to the Aristæine alliance at all, having, among other things, an unarmed abdomen and the mandibles in the form of "long sickle-shaped shears which cross each other from opposite sides of the mouth." Now all the Aristæine Penæids without exception have an armed abdomen and mandibles which depart little, if at all, from the normal form.]

17. *Aristeopsis Edwardsiana*, Johns.

Penæus Edwardsianus, Johnson, P. Z. S. 1867, p. 897, ♀.

Aristæus Edwardsianus, Miers, P. Z. S. 1878, pp. 308, 309, pl. xvii. fig. 3, mandibular palpus.

Aristeus coralinus, A. M.-Edw. in 'Challenger' Macrura, 1888, pl. xxxii. fig. 10, ♂, antennal scale.

An adult male and an adolescent male with commencing process of the antennal scale, and an adult female, from Station 115, 188 to 220 fathoms.

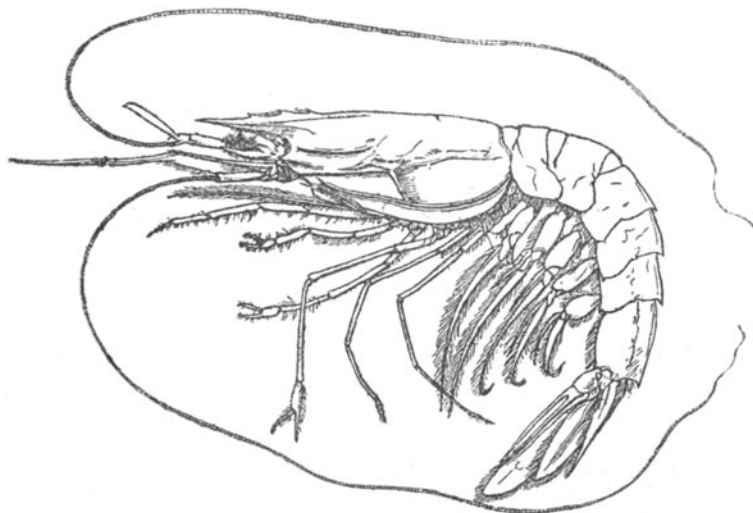
Colour in life deep crimson.

Two males and a very fine full-grown female had been taken off Port Blair in 271 fathoms, and a young specimen in the Gulf of Manaar in 597 fathoms.

Our specimens of the female agree absolutely with Johnson's admirable description.

Adult males present some remarkable sexual differences; not only is their rostrum short and porrect, not extending beyond the apex of the antennular peduncles, but their antennal scale is prolonged at the apex into a slender cylindrical fleshy process as long as the scale itself. This process,

Fig. 8.



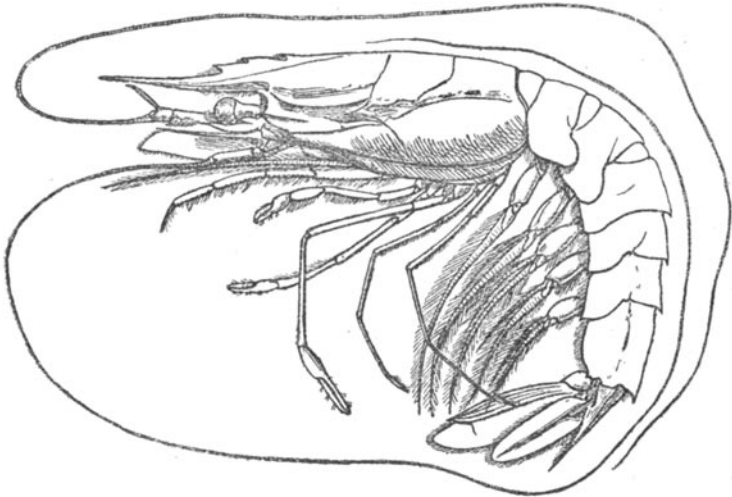
Aristæopsis Edwardsiana, ♂, $\times \frac{1}{2}$.

which is an extension of the thickening of the tissues seen in *Aristeus virilis* and others, is longitudinally grooved dorsally and is of uniform width from near the base to the blunt apex.

With growth the rostrum of the female also undergoes considerable reduction in length; but it always exceeds the antennular peduncle.

The dorsal ridge of the abdomen commences on the second tergum. The second (Atlantic) or third (Indian) to fifth pleura are minutely mucronate; in one of our specimens a very minute mucro can be made out on one of the pleura of the second tergum.

Fig. 9.

*Aristaeopsis Edwardsiana*, ♀, $\times \frac{1}{3}$.

18. *Aristaeopsis armata* (Sp. Bate).

Aristeus armatus, Sp. Bate, Ann. & Mag. Nat. Hist. (5) viii. 1881, p. 188; id. 'Challenger' Macrura, 1888, p. 312, pls. xlv., xlvi., ♂ ♀.
Aristeus? *tridens*, S. I. Smith, Ann. Rep. U. S. Comm. Fish. 1884, p. 404, ♂ ♀, (60), pl. x. fig. 1, ♂.

A magnificent example of an apparently adult male from Station 117, 1748 fathoms.

Colour in life deep crimson.

It measures no less than 270 millim. in length from the tip of the rostrum to the tip of the telson.

It exhibits a thickening of the tissues of the apex of the antennal scale, but shows no sign of reduction in the length of the rostrum met with in other species.

The dorsal ridge of the abdomen commences in the third tergum. The abdominal pleura from the third or fourth to the fifth are minutely mucronate.

Mandibles as in S. I. Smith's figures.

The inner branches of the caudal swimmeret when laid back reach to the end of the telson.

ARISTÆOMORPHA, gen. nov.

Rostrum many-toothed ; an hepatic spine is present ; mandibular palp robust, with terminal joint subbifurcate ; antennal scale small ; postero-lateral angles of abdominal pleura second to fifth simple and unarmed ; dorsal carina of the last four abdominal terga ending in a spine ; legs without exopodites ; dactylopodites of the last two pairs setaceous ; branchial formula as in *Aristæopsis*, according to Spence Bate.

Type *Aristeus rostridentatus*, Sp. Bate.

[19. *Aristæomorpha rostridentata* (Sp. Bate).

Aristeus rostridentatus, Sp. Bate, 'Challenger' Macrura, 1888, p. 317, pl. li., ♀.

A fine female was taken in a previous season off Port Blair in the Andaman Sea, 271 fathoms.]

HEMIPENÆUS, Sp. Bate (p.).

20. *Hemipenæus Carpenteri*, W.-M.

Hemipenæus Carpenteri, W.-M., Ann. & Mag. Nat. Hist. (6) vii. 1891, p. 189, ♀.

A female from Station 106, 1091 fathoms.

Colour in life transparent orange.

It has four spines to the rostrum, the additional spine being developed in front of the normal three.

A young specimen from Station 111, 1644 fathoms, colour in life orange, has the normal number of spines to the rostrum.

A female from the Bay of Bengal, 1300 fathoms, has only two teeth to the rostrum, the apical one being apparently absent.

Having only four females, and those differing, we are not in a position to attempt the determination of the relation of this species to other forms, and so leave it for the present in Spence Bate's genus.

Subfamily ? *BENTHESICYMINA*.

GENNADAS, Sp. Bate.

21. *Gennados parvus*, Sp. Bate.

Gennadas parvus, Sp. Bate, Ann. & Mag. Nat. Hist. (5) viii. 1881, p. 191 ; id. 'Challenger' Macrura, 1888, p. 340, pl. lix.

Gennadas parvus, Wood-Mason, Ann. & Mag. Nat. Hist. (6) vii. p. 189, ♂ ♀.

? *Amalopenæus elegans*, W.-M., loc. cit.

One male from Station 108, 1043 fathoms ; another from Station 109, 738 fathoms ; and a third from Station 111, 1644 fathoms ; all of a uniform deep lake-colour.

[To be continued.]