

# On a collection of Macrurous Decapod Crustacea, chiefly Penaeidae and Alpheidae from the Indian Archipelago.

By

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(With 64 figures in the text.)

The species of this collection, that belongs to the Zoological Museum of the University of Amsterdam, to the number of 37, chiefly Penaeidae and Alpheidae, were collected by various persons in the Indian Archipelago. Of the new species, viz. *Penaeopsis assimilis*, *Synalpheus Sluiteri*, *Alpheus eurydactylus* and *Processa Jacobsoni*, preliminary descriptions have already appeared in the „Zoologische Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden, Deel V 1920 and Deel VI 1921“. Of one rare species, *Alpheus splendidus* Cout., that was not collected, the type specimen from Djibouti was examined by the author. The figures have partly been drawn by Mr. J. F. Obbes of the Hague, partly by myself.

## List of Species.

|   |   |
|---|---|
| <i>Penaeopsis monoceros</i> (Fabr.)       | <i>Synalpheus Sluiteri</i> de Man       |
| <i>P. affinis</i> (H. M.-Edw.)            | <i>S. Theophane</i> de Man              |
| <i>P. brevicornis</i> (H. M.-Edw.)        | <i>Alpheus collumianus</i> Stimps.      |
| <i>P. Lysianassa</i> (de Man)             | <i>A. splendidus</i> Cout.              |
| <i>P. assimilis</i> de Man                | <i>A. macrochirus</i> Richters          |
| <i>P. sp.</i>                             | <i>A. malleodigitus</i> (Bate)          |
| <i>P. Borradailei</i> de Man              | <i>A. gracilipes</i> Stimps.            |
| <i>Trachypenaeus anchoralis</i> (Bate)    | <i>A. brevirostris</i> (Oliv.)          |
| <i>Parapenaeopsis sculptilis</i> (Heller) | var. <i>angustodigitus</i> de Man       |
| <i>P. gracillima</i> Nobili               | <i>A. eurydactylus</i> de Man           |
| <i>Penaeus semisulcatus</i> de Haan       | <i>A. crassimanus</i> Heller            |
| <i>P. carinatus</i> Dana                  | <i>A. macrodactylus</i> Ortm.           |
| <i>P. merguiensis</i> de Man              | <i>A. parvirostris</i> Dana             |
| <i>P. penicillatus</i> W.-Mas.            | <i>Panulirus dasypus</i> (Latr.)        |
| <i>P. canaliculatus</i> Oliv.             | <i>Scyllarus tuberculatus</i> (Bate)    |
| <i>P. japonicus</i> Bate                  | <i>Scyllarides Haanii</i> (von Siebold) |
| <i>P. latisulcatus</i> Kish.              | <i>Parribacus ursus major</i> (Herbst)  |
| <i>Heteropenaeus longimanus</i> de Man    | <i>Enoplometopus occidentalis</i>       |
| <i>Sicyonia lancifera</i> (Oliv.)         | (Randall)                               |
| <i>Processa Jacobsoni</i> de Man          |   |

Family **Penaeidae.****Penaeopsis monoceros** (Fabr.)

Fig. 1—1 b.

*Penaeopsis monoceros* (Fabr.), J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 55, 1913 (plates) Pl. VI, fig. 14a—14c.

2 young females from Nias, collected by Mr. Kleiweg de Zwaan.

12 young specimens (8 males, 4 females) from West Nias, collected by Mr. Kleiweg de Zwaan.

2 young females from Goenoeng Sitoli, Nias, collected in 1910 by Mr. Kleiweg de Zwaan.

17 young specimens (6 males, 11 females) from Sinabang (Simalu) near Sumatra, collected in February 1913 by Mr. Edw. Jacobson.

3 females, of which one is of medium size and two young, collected March 1911 by Dr. P. Buitendijk in the Bay of Batavia.

42 young specimens purchased July 1915 by Dr. P. Buitendijk on the market of Tandjong Priok, near Batavia.

1 young male collected March 1912 by Dr. P. Buitendijk on the road of Samarang.

1 young male, bearing a Bopyrid in the right branchial chamber, 1 much smaller male and 1 young female collected at Balikpapan, Borneo, by Mr. Tissot van Patot.

2 very young specimens, male and female, from Takao, Formosa.

The larger female from Nias is 90 mm long. Rostrum as long as the antennular peduncle, 1 + 10-dentate, post-rostral crest traceable to near the posterior margin of the carapace. The dactylus of the 5th legs reaches to the distal third of the antennal scale. The 1st—3rd abdominal terga are still rounded, the carina of the 4th begins a little in front of the middle.

The largest male from West Nias is 85 mm long, the largest female 92 mm., the other females are nearly of the same size, but several males are shorter than 85 mm. Besides the epigastric tooth the rostrum bears 9—11 teeth, that of a small male only 8. Post-rostral crest continued to near the posterior border. In all these specimens the 1st—3rd abdominal terga are still rounded, without any trace of a crest and the 5th legs reach but little beyond the middle of the antennal scales. The petasma (Fig. 1) agrees better with Alcock's figure 7b on Plate III of his Monograph of the Prawns of the *Peneus* group, published in 1906, than with my figures 14a, 14b (l. c. 1913). I suppose, however, that these differences are owing to the difference of age: it somewhat resembles the petasma of *Penaeopsis elegans* de Man, of which one of the type specimens is lying before me, but, while in *Pen. elegans* the two „gargoyles“ in which the petasma terminates distally, are separated by a narrow interspace, in the specimens

from West Nias this interspace appears broader. The merus of the 5th legs is slightly notched at the base, but the tooth in front of it is not yet spiniform, but triangular, small and obtuse, and beyond the tooth the merus appears quite smooth.

The 17 specimens from Sinabang agree with the preceding, being about or almost of the same size. Of a male, long 85 mm, the petasma (Fig. 1b) is also figured, because it shows another form than that of the male from West Nias, a difference no doubt appearing during the growth of the animal.

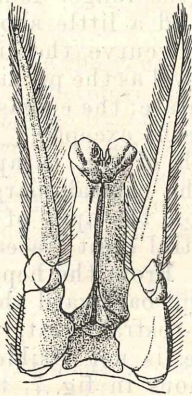


Fig. 1.

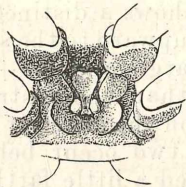


Fig 1a.

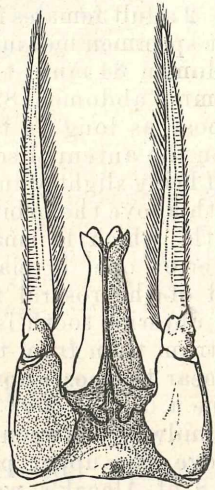


Fig. 1b.

The largest of the 3 females from the Bay of Batavia is 100 mm long. Of this female the 1st—3rd abdominal terga are bluntly carinated, or, properly speaking, the surface on each side of the glabrous and smooth middle line appears slightly lower and covered with a fine short tomentum. Also on the other abdominal somites and on the carapace the slightly impressed grooves and areae are covered with the same pubescence.

The 42 specimens from the market at Tandjong Priok apparently belong to the same species as the three females from the Bay of Batavia, presenting the same tomentose areae on carapace and abdomen, but they are much younger, only 65 mm long or less. In many of them the post-rostral crest is still inconspicuous.

The specimens from Balikpapan seem to belong to the same species, like also the two young specimens from Formosa, which are only 50 mm and 35 mm long.

***Penaeopsis affinis* (H. M.-Edw.)**

Fig. 2, 2a.

*Metapenaeus affinis* (H. M.-Edw.), A. Alcock, Catal. Indian Decap. Crustacea. Part III, Fasc. 1. The Prawns of the Peneus group. Calcutta, 1906, p. 20, Pl. III, fig. 8, 8a—8b.

*Penaeopsis affinis* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, Leiden 1911 (text), p. 57, 1913 (plates), Pl. VI, fig. 15a.

*Penaeopsis affinis* S. Kemp, Fauna of the Chilka Lake, Crust. Decap., Calcutta 1915, p. 321.

2 adult females from Deli, Sumatra, collected by Mr. de Bussy. One specimen measures 132 mm (rostrum 18 mm, carapace 30 mm, abdomen 84 mm), the other 128 mm (rostrum 18 mm, carapace 28 mm, abdomen 82 mm). The rostrum of the longer female, almost as long as the antennular peduncle and a little shorter than the antennal scale, shows a distinct double curve, the distal half being slightly curved upward to the same level as the proximal teeth above the orbital margin and is 1 + 7-dentate; the epigastric tooth, which is smaller than the rostral teeth excepting the anterior one, is placed on the anterior fourth of the carapace and of the rostral teeth two occur behind the orbital margin; the anterior tooth is placed a little farther from the apex of the rostrum than from the penultimate. Post-rostral crest traceable to near the posterior margin of the carapace. From the hepatic spine a deep groove runs obliquely upward and backward about to midway between this spine and the post-rostral crest, this groove, the upper part of the cervical groove, is not visible in fig. 8 of Alcock's work, while it is conspicuous in fig. 7, that represents *Pen. monoceros*.

First abdominal tergum rounded and also on the 2nd and 3rd the carination is indistinct. Telson almost just as long as the inner, but distinctly shorter than the outer uropod. The outer margin of the exopodite of the tailfan does not show the emargination, visible in Fig. 8 (l. c.), which perhaps is characteristic of the male.

There is no spine on the 3rd joint of the 1st pair of chelipeds, but a strong spine occurs on the base of the three anterior paeopods. The legs of the 5th pair are incomplete in both specimens. In this female the carpus of the left 5th leg reaches to the base of the terminal joint of the antennal peduncle, the carpus of the right leg to the base of the penultimate joint, in the other female the carpus of both legs reaches also only to the base of the penultimate joint.

In the other specimen the rostrum, as long as the antennular peduncle, is also slightly curved upward at the tip, but the upper margin bears, besides the epigastric, only 5 teeth, two of which stand on the carapace, while the fifth is placed above



the eye, so that the two distal thirds are unarmed. The carination of the three anterior abdominal terga is quite indistinct. Telson as much shorter than the inner uropod as the latter is shorter than the outer.

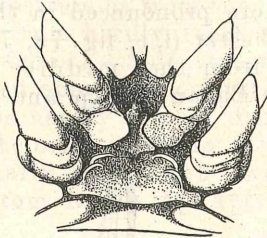


Fig. 2.

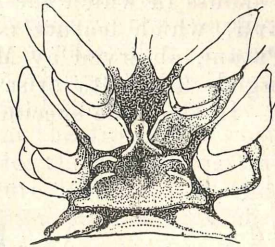


Fig. 2a.

The thelycum has not quite the same form in both specimens and is therefore figured (Fig. 2, 2a). It differs from that of *Pen. monoceros* by the lateral borders of that part which is situated between the legs of the 5th pair, being flattened and trilobate, while in *Pen. monoceros* the lateral borders show a salient free edge that is often incurved. *Penaeopsis affinis* occurs from the Indus Delta to Japan.

### *Penaeopsis brevicornis* (H. M.-Edw.)

Fig. 3—3f.

*Penaeus brevicornis* H. Milne-Edwards, Hist. Nat. Crustacés II 1837, p. 417.

*Penaeus brevicornis* C. Spence Bate, Annals Mag. Nat. Hist. 5th Ser., Vol. VIII, 1881, p. 180, Pl. XI, fig. 3. — J. G. de Man in: Zoolog. Jahrb. X. Abth. f. Syst. 1898, p. 681, fig. 74. — W. F. Lanchester, in: Proc. Zool. Soc. London, 1901, p. 571.

*Metapeneus brevicornis* A. Alcock, Catal. Indian Decap. Crust. Part III Macrura. Fasc. I. The Prawns of the Peneus group. Calcutta 1906, p. 22, Pl. IV, fig. 10, 10a, b.

*Penaeus* sp.? W. F. Lanchester, l. c. p. 571, Pl. XXXIV, fig. 7.

*Penaeus avirostris* J. D. Dana, U. S. Exploring Exped. Crustacea, p. 603, Pl. 40, fig. 3. — E. J. Miers, Annals Mag. Nat. Hist. S. 5, Vol. V, 1880, p. 45.

*Metapeneus avirostris* G. Nobili, Boll. Mus. di Zool. di Torino, Vol. XVIII, No. 447, 1903, p. 2.

3 males and 2 females collected by Mr. Herbst 1892 at Bagan Api Api, Sumatra.

1 young male collected by Dr. P. Buitendijk March 1911 in the Bay of Batavia.

The largest specimen is a female, long 113 mm, from Bagan Api Api, the other female measures 74 mm, while the three males

are 68 to 79 mm long; the male from the Bay of Batavia is only 64 mm long. These specimens agree with Professor Alcock's description, except as regards the shape of the petasma and the thelycum. According to the figure 10a of this author the two simple spouts in which the petasma ends distally, are directed outward, which feature is still more pronounced in the male from Patani, observed by Mr. Lanchester (l. c. fig. 7a, 7b), and the longish filaments arise nearly from the middle of the spouts. In the male specimens from Bagan Api Api and Batavia



Fig. 3.

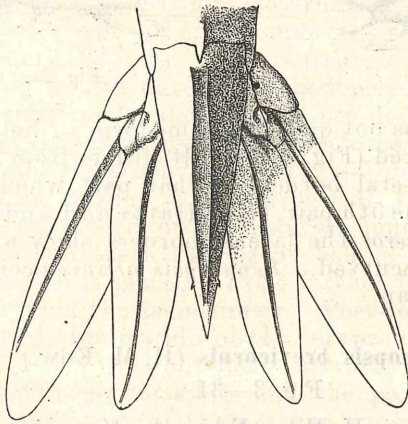


Fig. 3a.

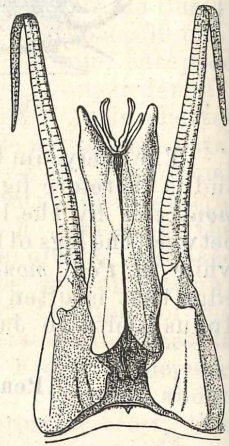


Fig. 3b.

(Fig. 3b, 3e) the spouts are directed almost straight forward, diverging only a little at their base and the filaments are implanted near the proximal extremity of the inner margin of the spouts. In the young male from the Bay of Batavia the two filaments between the spouts of the petasma look otherwise than in the young males from Bagan Api Api, they are more dilated distally and appear semicircular in a lateral view, because they are curved forward.

In the larger female the thelycum (Fig. 3d) is covered in the middle, between the legs of the 5th pair, with a white calcified substance, grooved longitudinally, narrowed in the middle, and with rounded angles; the thelycum (Fig. 3c) of the younger female which has not yet copulated, agrees better with Alcock's figure 10b. It is in the supposition that these slight differences are owing to the young age of our specimens that they are referred to *Pen. brevicornis*.

In the two females the rostral crest is rather high, so that the rostrum agrees with Dana's figure 3 of *Pen. avirostris*. Of



the larger female the rostrum (Fig. 3) extends horizontally forward to the middle of 3rd antennular article and is 1 + 6-dentate, four teeth (including the epigastric tooth) stand on the carapace, the 7th just above the eye and the apex of the foremost tooth is a trifle more than one and a half as far distant from the apex of the rostrum as from the orbital margin; in the younger female the rostrum hardly reaches to the middle of 2nd antennular article and is 1 + 5-dentate, the 4th tooth (including the epigastric) is placed above the orbital margin and the apex of the anterior tooth is hardly farther distant from the tip of the rostrum as from the orbital margin. In the males the rostral crest is lower and nearly agrees with Alcock's figure 10 (l. c.). In the largest male from Bagan Api Api the rostrum hardly extends beyond



Fig. 3c

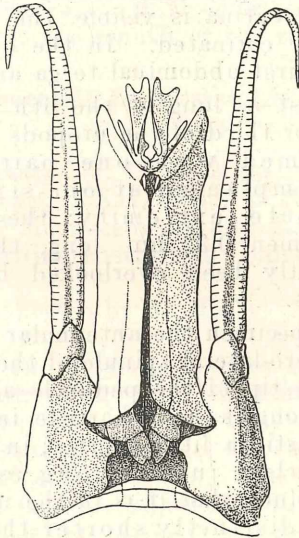


Fig. 3e.

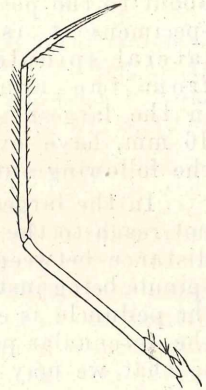


Fig. 3f.

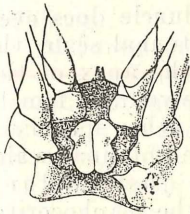


Fig. 3d.

basal antennular article and is 1 + 7-dentate, three teeth (including the epigastric) stand on the carapace, the 4th above the orbital margin, while the anterior tooth, placed above the corneae of the eyes, is almost one and a half as far distant from the orbital margin as from the tip; in the second male the rostrum hardly reaches the far end of basal antennular article and is 1 + 6-dentate, while the position of the teeth is the same as in the first; of the third the rostrum is broken off. The male from the Bay of Batavia resembles the second from Bagan Api Api as regards the tothing of the rostrum, but it reaches to the far end of basal antennular article. In the largest specimen the post-rostral crest is rather indistinct, though the carapace is

not regularly rounded, in the other specimens it is still less traceable.

As is clearly visible in fig. 10 of Professor Alcock's work the hepatic spine is a little larger than the post-antennular (antennal) spine. From the hepatic spine a distinct groove runs upward and backward to midway between this spine and the upper border of the carapace: in fig. 10 this furrow appears too short. A longitudinal groove that does not reach to the posterior margin of the carapace, occurs on the posterior half of the latter and bounds the branchial region above.

In the largest specimen, the female long 113 mm, the tergum of the 2nd abdominal somite appears slightly concave at either side of the middle; on that of the 3rd these concavities are more developed along the two posterior thirds, so that here a distinct, though still rounded carina is visible, the 4th, 5th and 6th, finally, are distinctly carinated. In the other, much younger specimens the three first abdominal terga are still rounded.

The telson is just as long as the 6th somite and reaches about to the posterior third of the uropods (Fig. 3a); in all the specimens it is armed with one pair of very small lateral spinules, implanted at one-sixth of its length from the acuminate extremity: these minute spinules, in the largest specimen 0,32 mm long, the telson measuring 16 mm, have evidently been overlooked by Dana and by all the following authors.

In the largest specimen the antennular peduncle does even not reach to the antero-lateral spinule of the antennal scale, the distance between the tip of the peduncle and the apex of the spinule being just as long as the 3rd article, in the younger female the peduncle is even still a little shorter; in the other specimens the antennular peduncle is just as long as the antennal scale, so that we may conclude that it is in the male just as long as, but in the female distinctly shorter than the scaphocerite. In the full-grown female the upper (outer) flagellum is still a little (one-fifth) longer than the peduncle, measured from the orbital margin, the proximal third part is dilated and the other flagellum appears one-third shorter than the upper.

Antennal peduncle a trifle shorter than the eyes; the antennal flagella of the largest specimen are wanting, in a male long 79 mm from Bagan Api Api they measure 220 mm, being almost 3-times as long as the body. The external maxillipeds extend in the largest female by half the dactylus beyond the antennal peduncle, the peraeopods of the 1st pair are a little shorter than this peduncle reaching to the far end of the penultimate joint of the outer maxillipeds, the peraeopods of the 2nd pair reach by the chela beyond the antennal peduncle, those of the 3rd pair by half the length of the fingers beyond the antennal scale; in the same



specimen the legs of the 4th pair reach by the dactylus and half the propodus beyond the antennal peduncle, those of the 5th by the dactylus and half the propodus beyond the antennal scale. The pereopods of the 1st, 2nd and 3rd pair are armed with a slender spine at the base, but those of the 1st bear moreover a much shorter spine on the ischium, which was already described by the lamented Nobili. In the male (not in the female) the merus of the 4th pereopods is slightly dilated, showing the greatest width at the proximal third, and the merus of the 5th has a notch on the posterior border at the proximal end, while the notch is bounded by a small obtuse tooth, beyond which there are no denticles; these characters are well developed in all the four males. Fifth legs without an exopodite, while on the thoracic legs epipodites are wanting on the 4th and 5th pair only.

*Penaeopsis brevicornis* (H. M.-Edw.) is distributed from Karachi to Buntal, at the mouth of the river Sarawak, Borneo.

### ***Penaeopsis Lysianassa* (de Man)**

Fig. 4—4 d.

*Penaeus Lysianassa* J. G. de Man, in: Journal Linnean Soc. London, Zoology, XXII, 1888, p. 290, Pl. 19, figs. 1—11 and in: Zoologische Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden, Dl. V, Afl. 3, 1920, p. 103.

1 young male collected by Mr. Herbst 1892 at Bagan Api Api, Sumatra.

2 young males and 2 young females collected October 1911 by Dr. P. Buitendijk on the road of Samarang.

These specimens were compared by me with three adult cotypes from the Mergui Archipelago, two males and one female, preserved in my private collection. The examination revealed the remarkable fact (fig. 4c, 4d), still unknown, that the lateral margins of the telson are armed in *Pen. Lysianassa* with numerous little spines up to a short distance from the acuminate tip; they seem to be 20—25 in number in the full-grown species, on the posterior half of the telson, and to increase in length from before backwards, the posterior being  $\frac{1}{4}$  to  $\frac{1}{3}$  mm long. A species with a similar telson has, ten years ago, already been described by the Reverend Stebbing, viz. *Penaeopsis spinulicauda* Stebb. from Durban Bay (South African Crustacea, Part VII, London, Dec. 1914, p. 17, Pl. LXVIII.)

The male from Bagan Api Api is 45 mm long and the rostrum is armed, like in the young specimens from Samarang, with 6 teeth including the tooth at the base. The merus of the 4th leg is still hardly expanded proximally, on that of the 5th the tooth is already present, though still small and obtuse while the notch behind it is still quite shallow. The petasma (fig. 4)

is already developed, but differs from that of the adult species by the two pairs of spines at the distal end being still absent.

The largest of the four specimens from Samarang is a male long 40 mm., the three others are a little smaller and of equal size. In the largest male the pleopods of the 1st pair are lost, in the other the two branches of the petasma are not yet united, small. Of one of the females, long 30 mm, the thelycum is figured (fig. 4a), because it shows a different form from that of the adult (fig. 4b): the lateral lobes are still separated by an interspace and the anterior median lobe looks otherwise.

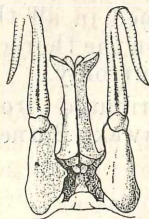


Fig. 4.

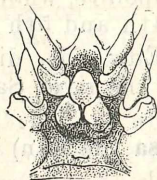


Fig. 4b.

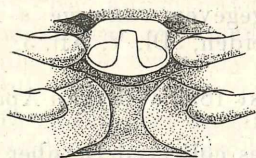


Fig. 4a.



Fig. 4c.

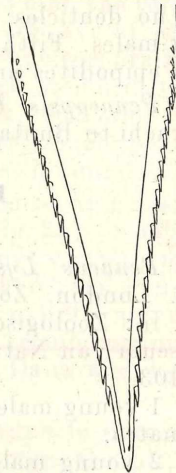


Fig. 4d.

The words „the lateral margins (of the telson), which are fringed with some hairs, are quite unarmed and not spiniferous“ at page 292 of my quoted description, are thus beside the truth: the telson, indeed, has evidently been examined by me in 1888 only by means of an ordinary feeble magnifying glass, not with the microscope, so that the minute spinules were overlooked.

### *Penaeopsis assimilis* de Man

Fig. 5—5c.

*Penaeopsis assimilis* J. G. de Man, in: Zoologische Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden. 1920, Deel V, Afl. 3, p. 105.

23 specimens (13 ♂, 10 ♀) collected by Dr. P. Buitendijk July 1915 near Pulu Weh, North point of Sumatra.

It is with some doubt that these specimens were described by me as a new species. In most characters namely they closely resemble *Penaeopsis gallensis* (Pearson), which occurs south

of Galle, Ceylon and which was described by J. Pearson in 1905 (Report on the Pearl Oyster Fisheries of the Gulf of Manaar by W. A. Herdman. Suppl. Report XXIV. On the Macrura, p. 72, Pl. I, fig. 3), because they differ almost exclusively by some characters of petasma and thelycum. Now it is not subject to doubt and it has already been demonstrated by Dr. Balss for *Penaeopsis mogiensis* (Rathb.) in: Die Decapoden des Roten Meeres I. Macruren. Wien 1915, p. 10, 11, that the thelycum shows other characters in young specimens than in those which are full-grown and these changes of form will probably also

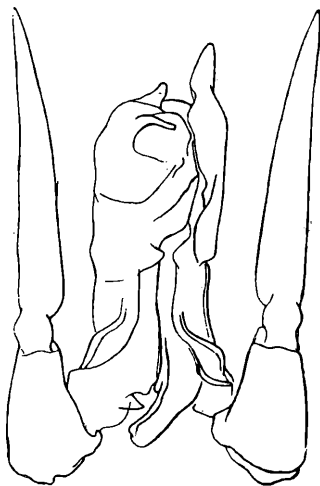


Fig. 5.



Fig. 5a.

prove to occur in the petasma. Mr. Pearson remarks about the petasma of *Pen. gallensis* that „the left branch 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.“ In the specimens (fig. 5, 5 a) from Pulu Weh, however, even in the largest males that are 35 mm long from apex of rostrum to tip of telson, the left branch reaches much farther beyond the right than in the figure 3b of Pearson's paper and the terminal part that projects beyond the right, shows more or less the form of a sugar-loaf and appears smooth and unarmed under the microscope; sometimes a minute denticle at the obtuse tip of the branch was observed. In a large specimen this terminal part is 0,7 mm long and 0,25 mm broad at base, nearly 3-times as long as broad and, the left branch being 4,1 mm long, the terminal projecting part proves to measure nearly one-sixth the whole length of the branch. The right branch bears at the tip a small pro-



minence that is turned towards the left and one observes on the anterior side of this branch a large regularly rounded lobe, which, like that prominence, does not occur in fig. 3b.

In the female there is a pair of ventral spines between the bases of the feet of the 2nd pair. Between the coxae of the legs of the 4th pair one observes, as in *Pen. gallensis*, a transverse crest, rounded in the middle and laterally, but between this crest and the posterior wall of the thelycum, which rises also in the middle to an acute point, are situated three lobes, one median and two lateral, that do not occur in Pearson's fig. 3a. The median lobe (fig. 5b) is situated immediately behind the transverse crest and is just as long as broad anteriorly; the anterior as well as the posterior border are emarginate, the anterolateral angles are subacute and this median lobe seems to be composed of two obtuse ridges that converge backward and again diverge from one another posteriorly. The two lateral lobes, situated posterior to the median lobe between the coxae of the 5th pair of legs, consist each of a transverse crest that laterally terminates in a subacute tooth; these two crests are in the middle separated from one another by a smooth interspace.

The rostrum which closely resembles that of *Pen. gallensis*, reaches almost to the far end of the eyes and of basal antennular article and usually runs horizontally forward; it is armed dorsally with 6 or 7 teeth besides the epigastric tooth, they stand all on the rostrum proper, a line uniting their apices curves slightly downward, while the lower margin ascends a little; sometimes the rostrum is slightly turned upward and the line that unites the apices of the teeth, runs then horizontally. The epigastric tooth, implanted just before the anterior fourth, is much smaller than the 1st rostral tooth and, posterior to the epigastric tooth, the carapace, covered with a close pubescence, is rounded. Post-ocular spine very small, post-antennular spine also small and of the same size as the hepatic, branchiostegal spine a little smaller. A shallow groove runs from the hepatic spine a short way obliquely upward and backward, another beneath this spine obliquely downward and forward and from this groove a third runs, beneath the hepatic spine, for a short way backward, though not reaching to the middle of the carapace.

First abdominal tergum rounded, the 2nd appears on either side of the middle slightly depressed and pubescent, it looks therefore as if obtusely though indistinctly carinated on its anterior half; the following are all conspicuously carinated. The carina of the 3rd tergum that extends to the anterior fourth, is distinctly sulcate; the two anterior fifths of the carina of the 4th tergum are a little wider than the three posterior, into which they gradually pass, and anteriorly this carina appears also slightly sulcate or flattened; those of the 5th and 6th tergum are rather sharp and the carina of the 6th, which is almost twice

as long as the 5th, the proportion being as 9:5, ends in a very small tooth. Telson (fig.5c) a little, viz.  $\frac{1}{9}$  longer than the 6th somite, faintly grooved dorsally; it ends very acutely and is armed on each side with 4 spines, of which the posterior or 4th alone is fixed, the 3rd, the longest of all, is contiguous to the 4th and reaches a little beyond it, the 2nd nearly half as long as the 3rd, the 1st half as long as the 2nd. Telson much shorter than the uropods.

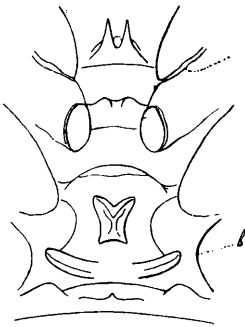


Fig. 5b.



Fig. 5c.

Eyes large, a little more than half as long as the carapace.

Joints of antennular peduncle as in *Pen. gallensis*, flagella subequal and about as long as the 2nd and 3rd joint taken together. Scaphocerite as long or hardly longer than the antennular peduncle, antennal peduncle short, not yet reaching to the middle of basal antennular article.

The external maxillipeds are shorter than in *Pen. gallensis*, for they reach only along the two proximal third parts of the antennal scale or even hardly beyond the middle; they extend about to the distal extremity of basal antennular article, sometimes a little shorter, sometimes projecting by half their terminal joint beyond that extremity; exopodite little longer than ischium.

The legs of the 1st pair reach to the middle of the antennal peduncle or to the base, those of the 3rd pair to the distal fourth or fifth of the antennal scale, while the legs of the 5th pair reach by their dactyli beyond the antennal peduncle. The peraeopods of the 1st and 2nd pair are armed with a spine at their base, those of the 1st bear moreover a spine on the ischium.

The largest female is 37 mm long (carapace 6,75 mm, rostrum 3,5 mm), the largest male 35 mm (carapace 6 mm, rostrum 3,25 mm). The total length of the specimens of *Pen. gallensis*, measured by Pearson, varied between 40 and 59 mm.

**Penaeopsis sp.**

**Fig. 6, 6a.**

1 male collected 1909 by Mr. Laurence at Haingsisi (Pulu Samau), south-west from Timor.

This specimen, that appertains to the *Akayebi*-group, belongs perhaps to the species from the Andamans etc., referred by Professor Alcock to *Pen. mogiensis* (Rathb.), or to *Pen. distinctus*

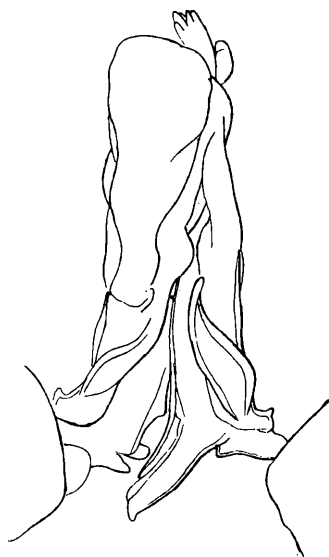


Fig. 6.

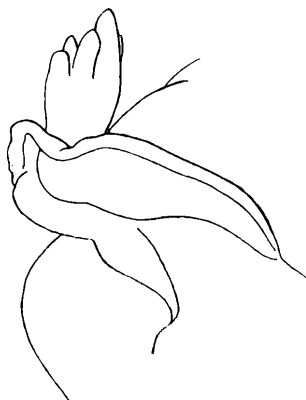


Fig. 6a.

de Man from the Paternoster-islands and from the south-coast of Manipa-island, but I wish to confine myself to a description of the specimen, without giving it a name. According to Alcock's description, in: *Catal. Indian Decap. Crust.*, Part III, *Macrura*, Fasc. I. The Prawns of the Peneus group, Calcutta 1906, p. 29, the left lobe of the petasma „ends in a slender filament the tip of which is frayed out or denticulate“, in his figure 15a, however, the left lobe extends but a trifle beyond the rounded right branch, towards which it is turned, while no denticulations are visible, but one observes behind the distal extremity of the right branch a rounded lobule, that bears a minute denticle. In the male from Haingsisi (fig. 6, 6a) the right branch is truncate



at the tip and there is no rounded lobule posterior to it; the left branch, on the contrary, is bifurcate at the distal end, the lobules of the bifurcation reaching beyond the truncate tip of the right branch; of the two lobules of the left branch the posterior is hand-shaped and terminates into 5 finger-like teeth, the inner one of which is very small and much smaller than the remaining ones that are subequal; the anterior lobule is undivided and truncate.

For the rest this specimen, that is 54 or 55 mm long, agrees with the figure 15 of Alcock's work. The rostrum is 1 + 8-dentate, obliquely directed upward, straight and tapering; it reaches hardly beyond the middle of 2nd antennular article. First abdominal tergum rounded; carina of the 2nd low, rounded, on each side of it the surface is slightly impressed and tomentose; 3rd to 6th distinctly carinated. Length of the 6th somite three-fourths of the carapace, 6th somite one and a half as long as broad.

The external maxillipeds reach to the tip of the antennular scales and the five pereopods, of which the 5th has also an exopodite, agree with Alcock's figure 15.

As already remarked, this specimen may perhaps prove to be the still unknown male of *Penaeopsis distinctus*.

In the typical *Pen. mogiensis* (Rathb.) from Japan the left branch of the petasma is much shorter than the right.

### **Penaeopsis Borradailei de Man**

Fig. 7, 7a.

*Penaeopsis Borradailei* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text), p. 73, 1913 (plates) Pl. VIII, fig. 24—24b and in: Zoolog. Mededeelingen etc. Dl. V, Afl. 3, 1920, p. 104.

1 male collected December 16th 1909 by Mr. Laurence on the reef of one of the Little Sunda Islands.

1 female collected April 1913 by Mr. E. Jacobson at Telok Berandang, Pulu Babi, near Sumatra (2° 7' N. Lat., 96° 40' E.) in the open.

The female is 38,5 mm long, the carapace, rostrum included; 13 mm. The rostrum, reaching almost to the end of the antennular peduncle, is 1 + 9-dentate; the epigastric tooth has nearly the same size as the 1st rostral tooth, which is placed above the orbital margin, and from the 4th the rostral teeth become gradually smaller. Antennular peduncle nearly as much shorter as the antennular scale as the 3rd article is long. The 5th somite of the abdomen is obtusely carinated along its whole length and is half as long as the 6th, the two somites being 2,7 mm and 5,4 mm long; in the Siboga type specimens the proximal fourth of the 5th tergum was not carinated and the 5th somite was a little more than half as long as the 6th. Sixth somite proximally

3,4 mm. broad, appearing a little broader than in the type specimens, the proportion between length and width being like 7:4,4, in the latter like 7:4.

The rostrum of the male, which is 40 mm long, the carapace, rostrum included, measuring 12 mm, extends to the far end of 2nd antennular article and is 1 + 8-dentate. In *Pen. Borradailei* also the 4th abdominal tergum is rounded, not carinated; in this male specimen, however, one observes (fig. 7) on the posterior half of this tergum, on either side and close to the middle line, a shallow tomentose groove that reaches from near the posterior border to a little beyond the middle and the narrow part of the surface, situated between the two grooves, widens somewhat from behind forward. In the female the 4th somite appears quite smooth and glabrous, without any trace of these grooves. Fifth somite 3,1 mm long, a little more than half as long as the 6th, which is 5,5 mm long and 3,2 mm broad; telson 5 mm long.

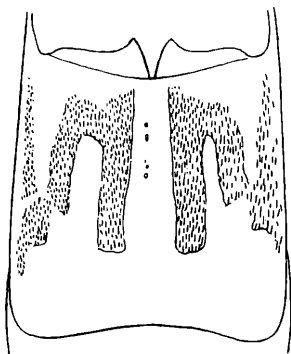


Fig. 7.



Fig. 7a.

Left branch of the petasma (fig. 7a) subacute at the tip, somewhat shorter than the right, by which it is concealed, when the petasma is looked at from behind; right branch obtuse at the tip and very convex in the middle of its posterior surface.

*Penaeopsis Borradailei* de Man, already known from the seas north and south of Ceram and between Mindanao and Halmaheira, proves thus to be distributed throughout the whole Archipelago.

### **Trachypenaeus anchoralis** (Bate)

*Trachypenaeus anchoralis* (Sp. Bate), J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text), p. 88, 1913 (plates), Pl. VIII, fig. 28.

1 adult female and 1 younger male from Goenoeng Sitoli, Nias, collected 1910 by Mr. Kleiweg de Zwaan.

The female is 81 mm long, the male 53 mm. In the male the rostrum is 1 + 8-dentate, in the female 1 + 9; in the male it extends to the middle, in the female to the distal extremity of 2nd antennular article and in both it is a little obliquely directed upward. The post-rostral ridge extends almost to the posterior margin of the carapace, in the male it is rather acute, in the female posteriorly obtuse. A short obtuse carina exists on the anterior third of the 2nd abdominal tergum of the male, in the female it is still less developed; the four following terga are sharply carinated.

Antennular peduncle as long as the antennal scale.

The petasma fully resembles the figure 1'' on Plate XXXV of Bate's work, the two small submedian teeth reaching as far forward as the lateral lobes, and the thelycum of the female agrees with fig. 28 (l. c.).

The external maxillipeds and the thoracic legs of the male are a little shorter than those of the male long 69 mm from the Timor Sea, described by me (l. c.), so e. g. the external maxillipeds reach almost to the middle and the peraeopods of the 3rd pair almost to the end of the antennal scale. In the female the external maxillipeds reach just beyond the middle of the antennal scale, the peraeopods of the 1st pair to the base of the antennal peduncle, those of the 3rd pair project with a part of the fingers beyond the antennal scale, the other legs are wanting or incomplete.

The question whether *Trachyp. granulatus* (Hasw.) from Torres Strait is identical with this species, is still undecided: in case of identity Haswell's name of 1879 should have the priority.

### **Parapenaopsis sculptilis** (Heller)

Fig. 8.

*Penaus sculptilis* C. Heller, Crustaceen der Novara-Reise 1865, p. 122, Pl. XI, fig. 1.

*Parapenaopsis sculptilis* A. Alcock, Catal. Indian Decap. Crustacea, Part III Macrura. Fasc. 1. Calcutta 1906, p. 37, Pl. VII, fig. 22, 22a—d.

7 specimens, all but one females, from Bagan Api Api, Sumatra, collected 1912 by Mr. Herbst.

1 adult female from Deli, Sumatra, collected by Mr. de Bussy.

The female from Deli (fig. 8) is 155 mm long (rostrum 23 mm, carapace 40 mm, abdomen 92 mm) and much agrees with the cited figures. The tip of the rostrum that projects 1,5 mm beyond the antennal scale, is curved upward from the base of the penultimate tooth to the tip, reaching almost the level of the upper border of the carapace; it bears 8 teeth besides the epigastric tooth, the 8 teeth are equidistant, except the anterior one, which is one and a half as far distant from the penultimate as the penultimate from the antepenultimate and one and a half as far



distant from the apex of the rostrum as from the penultimate tooth. The longitudinal suture of the carapace, that in Alcock's figure ends just above the transverse, extends in this full-grown specimen a little beyond it, and the distance of its posterior extremity to the posterior margin measures only one-seventh the length of the carapace.

The peraeopods of the 4th pair reach by half the dactylus beyond the antero-inferior angle of the carapace, those of the 5th are incomplete. The largest specimen from Bagan Api Api, a female, has the same size as the female from Deli, with which it fully agrees, except the rostrum armed only with 7 teeth besides the epigastric tooth; the anterior tooth is  $2\frac{1}{3}$ -times as far distant from the apex of the rostrum as from the penultimate and the latter almost one and a half as far distant from the anterior as from the antepenultimate. The other females bear also 7 teeth besides the epigastric, except one of medium size with 9 teeth,

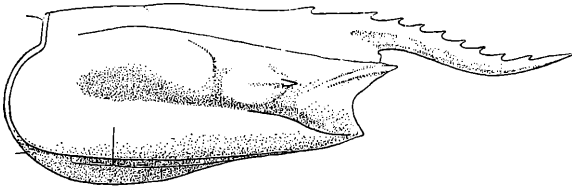


Fig. 8.

including the epigastric one: in this female, long 111 mm (rostrum 21,5 mm, carapace 27 mm, abdomen 63 mm) the rostrum projects by one-fourth its length beyond the antennal scale and the anterior tooth, the smallest of all, is placed opposite the distal extremity of 2nd antennular article, so that the slightly recurved, styliform, distal part measures two-thirds the distance between this tooth and the orbital margin and in one or two other females the unarmed distal part of the rostrum shows nearly the same length. In another full-grown female the distal unarmed part of the rostrum, that is a little longer than the antennal scale, is rather strongly recurved, the apex reaching even slightly above the proximal teeth.

The male is young, only 78 mm long (rostrum 12,5 mm, carapace 18,5 mm, abdomen 47 mm). The petasma is, however, already developed and resembles the figure 22 c of Alcock's work. The rostrum that just reaches beyond the antennal scale, is armed with 8 teeth besides the epigastric tooth and the anterior tooth is placed just behind the middle of 2nd antennular article, so that the styliform unarmed part, which is not recurved, measures two-fifths the length of the rostrum.

In the male and in the females of medium size the longitudinal suture of the carapace does not or hardly reach beyond the transverse. The upper extremity of the cervical groove at

the post-rostral carina is situated nearly on the posterior third of the carapace, its distance from the orbital margin being in proportion to its distance from the posterior like 7:3. From the post-rostral carina the groove first runs forward, then curves immediately outward and downward, but seems to fade away before reaching the longitudinal suture, this uppermost part of the groove, however, 4 mm long in full-grown females, is, though shallow, quite well visible: a little below the suture the groove reappears, at first curved forward, though less distinct than the uppermost part, but before passing into that portion of the cervical groove, which is situated below the hepatic spine, it disappears again for a short distance; the latter portion is rather deep, sinuous, not continued to the more or less acute antero-lateral or branchiostegal angle and is defined in its anterior half by a ridge. On the posterior half of the carapace a shallow groove is visible — the sutura cardiaco-branchialis of Stimpson — that runs straight from near the posterior extremity of the longitudinal suture, below it, forward and slightly downward, directed towards the hepatic spine, but ending already at the posterior third of the carapace. A little below this groove, finally, one observes moreover a longitudinal groove or depression on the posterior half of the carapace, that already disappears on the posterior fourth; in full-grown specimens, as e. g. in the female from Deli, this groove is sometimes continued forward, passing into that part of the cervical groove, which proceeds below the hepatic spine. In all the specimens the post-rostral ridge is a little widened just posterior to the cervical groove and also again midway between this groove and the epigastric tooth.

According to Alcock the antennular flagella should be a little longer than their peduncle, in the present specimens they are a little shorter than it.

Antennal flagellum of the adult female one and a half as long as the entire length, rostrum included.

### **Parapenaeopsis gracillima Nobili**

Fig. 9—9 e.

*Parapenaeopsis gracillimus* G. Nobili, in: Boll. Mus. Zool. ed Anat. Compar. Torino. Vol. XVIII, No. 447, 1903, p. 4, fig. 1.

*Parapenaeopsis dofleini* H. Balss in: Zoologischer Anzeiger XLII, No. 5, 1913, p. 234.

*Parapenaeopsis gracillima* H. Balss, Ostasiatische Decapoden, II, München, 1914, p. 12, fig. 5, 6.

4 males, 12 females and 1 „hermaphrodite“ specimen from Bagan Api Api, Sumatra, collected by Mr. Herbst in 1912.

This interesting species agrees with *Parap. tenella* (Bate) = *crucifera* (Ortm.) and with *Parap. acclivirostris* Alcock by the absence of an isolated epigastric spine on the carapace,

but is easily distinguished from both by the existence of epipodites on the 1st and 2nd pair of peraeopods and by the long, slender, setiform legs of the 4th and 5th pair. A good figure of the female and of the thelycum were given by Dr. Balss (l. c.), — the male, however, was hitherto still unknown. In the male the rostrum has another form than in the female. In full-grown females, long 100—106 mm, the rostrum (fig. 9b) reaches to the middle or almost to the distal extremity of 3rd antennular article, in females of medium size, 87 mm long, it is a little shorter reaching not yet to the far end of the 2nd article or even only extending just beyond that of 1st (H. Balss, l. c. fig. 5); in the

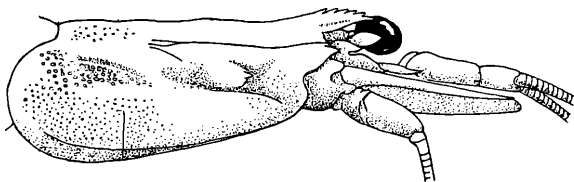


Fig. 9.



Fig. 9a

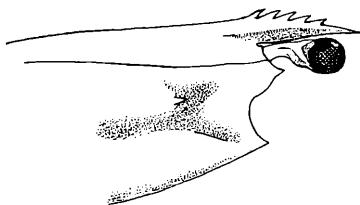


Fig. 9c.

full-grown female the distal part is usually slightly upturned, so that the rostrum shows a double curve, in the females of medium size, however, it runs horizontally forward or slightly downward. Proximally the rostrum of the female specimens from Bagan Api Api is armed with 5 or 6 teeth, of which constantly the 2nd, a little larger than the 1st, stands above the orbital margin, while the anterior tooth is placed on the level of the anterior margin of the eye or just in front of it; a line uniting the apices of the teeth is curved slightly downward and the distal unarmed part is longer than the rest of the rostrum, in the full-grown female one and a half as long. In the two females of medium size from Buntal, a place situated at the mouth of the river Sarawak, Borneo, on which this species was established by Dr. Nobili, like also in the four females, described by Balss, the rostrum presented only four teeth, but in the figure, published

by the latter, distinctly five teeth are discernible. In the four male specimens, that, only 70 mm long, are much smaller than the females, the rostrum (fig. 9, 9a) is much shorter, reaches hardly beyond the middle of the eye, in a lateral view, and shows no styliform prolongation at all; in the four males the rostrum is armed with 5 teeth and, like in the female, the 2nd tooth is always placed above the orbital margin.

The post-rostral carina that reaches to the posterior margin of the carapace, is rather obtuse and somewhat flattened. Post-ocular tooth acute, though much smaller than the post-antennular

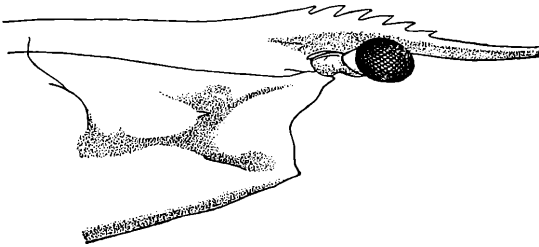


Fig. 9b.

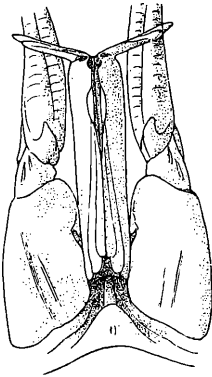


Fig. 9d.

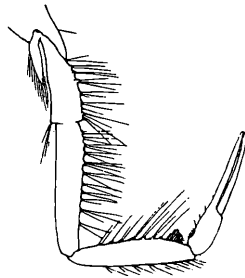


Fig. 9c.

spine, from which it is a little more than twice as far distant as from the rostrum; post-antennular spine of moderate size, not buttressed by a carina. Antero-inferior angle of the carapace in the female rectangular, sometimes rather sharp, in the male obtuse and blunt. For the rest the carapace of the male resembles that of the female.

Fourth, fifth and sixth abdominal terga carinated, excepting the anterior third part of the 4th, tooth at the end of the carina of the 6th small. Telson reaching to the middle of the exopodite and a little beyond the middle of the endopodite of the tailfan,

grooved longitudinally on the anterior half. Eyes chestnut-coloured, eyestalk purple.

Antennular peduncle a little shorter than the antennal scale, in one male just as long as the latter; 2nd joint nearly one and a half, almost twice as long as 3rd; outer flagellum in the male two-, in the female three-times as long as the carapace, rostrum excluded, inner flagellum shorter.

Spine at the outer angle of basal joint of outer antennae very small, antennal peduncle as long as the basal joint of the inner, flagellum almost twice as long as the body, rostrum included.

The three chelipeds are unarmed at base and ischium, but, according to Nobili, those of the 1st pair should be denticulate along merus and carpus: this is, however, not the case. One observes (fig. 9e) on the inner margin of ischium, merus and carpus small, obtuse prominences, on which the long setae are implanted, with which these legs are fringed; these prominences were regarded by him as teeth. The fingers of the 1st pair are a little more than one and a half, in the female (fig. 9e) even sometimes twice as long as the palm, those of the 2nd and 3rd pair in the male respectively one and a half and almost one and a half, in the female a little more than one and a half as long as the palm; the two minute spinules which are implanted on the articulation between the carpus and the chela of the 2nd and 3rd legs and which were denied by Balss (l. c.), are indeed present, though sometimes rather indistinct. The epipodite of the 2nd pair is not rudimentary, as suggested by Balss, but as well developed as that of the 1st.

The peraeopods of the 4th pair reach in the male to the distal fourth of the scaphocerite, projecting by the dactylus beyond the antennal peduncle, in the full-grown female they reach to the tip of the scaphocerite or project by half the dactylus beyond it, while the dactylus and almost the whole propodus extend beyond the antennal peduncle. Carpus in the male nearly as long, in the female a little shorter than the merus, propodus, both in the male and in the female, one-fourth shorter than the carpus, dactylus almost half as long as the propodus.

The peraeopods of the 5th pair reach both in the male and in the female by the dactylus and two-thirds of the propodus, or a little more, beyond the antennal scale. Carpus a little longer than merus, propodus in the male about as long, in the female a little shorter than the carpus, dactylus about one-third of the propodus.

The petasma (fig. 9d) much resembles that of *Parapenaeopsis nana* Alcock (A. Alcock, l. c. 1906, Pl. VIII, fig. 26a), while it differs from that of *Parapenaeopsis tenella* (Bate) (K. Kishinouye, Japanese species of the genus *Penaeus*, Tokyo, 1900, Pl. VII, fig. 8) by a more slender form and by the different shape and direction of the long, straight filaments on the tip.



One specimen is remarkable and described separately, because it shows characters both of the male and the female. It is 87 or 88 mm. long from apex of rostrum to tip of telson (rostrum 6,5 mm, carapace 22 mm, abdomen 59 mm). The rostrum (fig. 9c) that reaches to the far end of 1st antennular article, is armed with 5 teeth, the 2nd of which stands above the orbital margin, like in the other specimens; the anterior tooth is twice as far distant from the orbital margin as from the apex of the rostrum and the upper margin runs obliquely downward. Different from the male the rostrum just reaches beyond the eyes and the distal third of the upper margin is unarmed. Genital apertures on a protuberance of the coxae of the 3rd pair of legs, thelycum exactly like in the female. Different, however, from the female the pleopods of the 1st pair are each provided with a long narrow lamella, that is notched near the base on the outer margin and, gradually narrowing, ends in a straight filament, that measures almost one-third the rest of the lamella and that is directed obliquely forward and outward: the two lamellae are apparently the two still separated lobes of the petasma. Otherwise, however, than in the male the terminal filaments are directed much more obliquely forward, the two lobes are, for the rest, implanted on the stalk of the pleopod as in the male. Pleopods of 2nd pair with appendix masculina like in the male.

*Parapenaepsis gracillima* Nobili has until at present been observed at Buntal, a locality situated at the mouth of the river Sarawak, Borneo, and at Singapore.

### ***Penaeus semisulcatus* de Haan**

*Penaeus semisulcatus* W. de Haan, Fauna Japonica, Crustacea, 1849, p. 191, Pl. XLVI, fig. 1.

*Penaeus semisulcatus* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 97, 1913 (plates), Pl. IX, figs. 31a, 31b.

1 female of medium size and 2 very young females from Nias, collected 1910 by Mr. Kleiweg de Zwaan.

1 male of medium size collected 1910 at Goenoeng Sitoli, Nias, by Mr. Kleiweg de Zwaan.

1 young female collected by Mr. Tissot van Patot at Balikpapan, Borneo.

1 young female and 1 still younger male collected 1898 by Mr. Kruyt at Posso, Celebes.

The specimens are all of a small size, the largest being the male from Goenoeng Sitoli, long 100 mm. The rostrum of this male is just as long as the antennular peduncle and  $\frac{7}{8}$ -dentate, the 2nd tooth of the lower margin is placed just before the anterior tooth of the upper. Fingers of 3rd legs a trifle longer than the palm. In all the other specimens the rostrum is  $\frac{7}{8}$ -dentate. In

all the specimens the lateral ridge of the rostrum reaches for some distance (in the male from Goenoeng Sitoli 3,3 mm) beyond the apex of the 1st (epigastric) tooth, the straight subhepatic ridge is oblique and the well-defined cervical groove runs from the hepatic spine obliquely upward to a little beyond the middle of the distance between this spine and the upper border of the carapace and ends abruptly just below the 1st (epigastric) tooth.

### ***Penaeus carinatus* Dana**

*Penaeus carinatus* J. D. Dana, U. S. Explor. Exped. Crustacea, p. 602, Pl. 40, fig. 2.

*Penaeus carinatus* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 108, 1913 (plates), Pl. IX, fig. 35a, 35b.

*Penaeus carinatus* Stanley Kemp, in: Memoirs of the Indian Museum, vol. V, 1915, p. 317.

1 adult male from Takao, Formosa.

1 young female from West-Nias, collected by Mr. Kleiweg de Zwaan.

1 young male from Nias, collected by Mr. Kleiweg de Zwaan.

1 almost adult male, collected January 1913 by Mr. Buitendijk in a river of the middle of Java, province of Samarang.

1 female of medium size, collected March 1911 by Mr. P. Buitendijk in the Bay of Batavia.

2 males of medium size from unknown locality.

I am of the same opinion as Mr. Stanley Kemp, when he remarks (l. c.) that it is probably the best that the Fabrician name of monodon should be ignored, unless the type specimen should be found back and make it possible to identify with it one of the three species known at present as *P. indicus*, *semisulcatus* and *carinatus*.

The full-grown male from Takao measures 200 mm. The rostrum,  $\frac{2}{3}$ -dentate, extends but 2 mm beyond the antennular peduncle and the terminal part is hardly turned upward; the 1st tooth of the lower margin is situated just below the penultimate of the upper, the 3rd placed just in front of the anterior tooth. Post-rostral ridge distinctly sulcate. Subhepatic carina horizontal, only slightly sinuate posteriorly.

Antennular flagella subequal, the upper (32 mm) one-fifth longer than the peduncle, i. e. the distance between the orbital margin of the carapace and the distal end of the peduncle. Fingers of the 3rd peraeopods 8 mm long, distinctly longer than the palm (7 mm).

The rostrum of the young female, long 75 mm, from West-Nias, extends 1,5 mm beyond the antennal scales and the terminal part is distinctly upturned and slender; it is  $\frac{7}{8}$ -dentate, the teeth of the lower margin situated all before the foremost tooth of the upper. The post-rostral carina shows but a trace of a

groove, anteriorly, for the rest it is still flattened. The fingers of the 3rd peraeopods are still a trifle shorter than the palm. Of the young male from Nias the rostrum is broken off, fingers of the 3rd peraeopods just as long as the palm.

The male from the river in the province of Samarang is 155 mm long. Rostrum almost as long as the antennal scales with a distinct double curve,  $\frac{7}{8}$ -dentate, the 2nd and 3rd tooth of the lower margin are situated before the anterior tooth of the upper. Post-rostral carina distinctly sulcate. Fingers of the 3rd legs still as long as the palm. The two moieties of the petasma are not yet united.

Rostrum of the female from the Bay of Batavia as long as the antennal scales, for the rest fully agreeing with that of the preceding male. Post-rostral carina still only slightly sulcate, in the middle even flattened. Fingers of the 3rd peraeopods as long as the palm.

Rostrum of the male, long 146 mm, from unknown locality, reaching 0,5 mm beyond the antennal scale,  $\frac{7}{8}$ -dentate, quite typical, post-rostral carina sulcate. Subhepatic ridge horizontal, slightly sinuate. Fingers of 3rd peraeopods still a trifle shorter than the palm.

In the other male, finally, long 176 mm, from unknown locality the rostrum, likewise  $\frac{7}{8}$ -dentate, is as long as the antennal scales and quite typical, resembling that of the male from the river of Java. Post-rostral carina sulcate, though not deeply. Subhepatic ridge almost straight. Fingers of the 3rd legs a trifle longer than the palm. The two moieties of the petasma not yet united.

Mr. Stanley Kemp (l. c.) rightly remarks that my identification of this species with Dana's *P. carinatus* from Singapore is open to criticism, for Dana neither figures nor mentions the subhepatic crest of the carapace. I may still even add that this author describes the antennular flagella as being not longer than the two preceding joints of the peduncle. The only form, however, with which Dana's species, long seven inches, can be identical, is just *P. semisulcatus* de Haan, for, though in *P. merquiensis* (J. G. de Man, l. c. p. 105) the rostrum is also very rarely  $\frac{7}{8}$ -dentate, this species at first sight differs by the rostral crest which is so high as to assume a broadly-triangular form. Dana's species, however, differs from *P. semisulcatus* by the groove on either side of the rostrum being less distinct and ending in front of the last (epigastric) tooth, a feature clearly visible on his figure 2. As regards the short antennular flagella, we may suppose that in Dana's specimen they were broken off, which often occurs, and, though they are shorter in *P. semisulcatus* than in the species referred by me to *P. carinatus*, the antennular flagella are also in de Haan's species longer than the 2nd and 3rd antennular articles taken together. As regards the subhepatic

crest not figured by Dana, I may refer to this author's figures 3, 5 and 6 on the same Plate 40, where likewise no grooves or ridges are visible.

### ***Penaeus merguiensis* de Man**

*Penaeus merguiensis* J. G. de Man, Journal Linnean Soc. London, Zoology XXII, 1888, p. 287, Pl. 18, fig. 8 and Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 104, 1913 (plates), Pl. IX, figs. 33a—33c.

1 young female collected July 1915 by Dr. Buitendijk on the market of Tandjong Priok.

4 full-grown specimens, 1 male and 3 females, collected December 1909 and January 1910 in the Cheribon Sea.

1 not yet adult male, collected by Mr. E. R. Jacobson in the sea at Tjilatjap, Java, March 1911.

1 female of medium size and a still younger male collected by Mr. Tissot van Patot at Balikpapan, Borneo.

The four specimens from the Cheribon Sea are of equal size and 175—180 mm long. This species is at first sight distinguished by the character, firstly mentioned by Professor Alcock, of the dactylus of the external maxillipeds being in the adult male hardly half the length of the propodus; *Pen. merguiensis* is furthermore characterized by the rostral crest which in large adult specimens is so high as to assume a broadly-triangular form and by the more slender shape of the chelate thoracic legs (A. Alcock, Catal. Indian Decap. Crust. Part III Macrura. Fasc. I. The Prawns of the *Peneus* group. Calcutta 1906, p. 13 and J. G. de Man, l. c.). In the male the rostrum is  $\frac{7}{3}$ -dentate and reaches almost to the far end of the 2nd antennular article; in two females it is  $\frac{7}{4}$ - and  $\frac{7}{5}$ -dentate and extends a little beyond this article, in the third female the rostrum is broken off above the eyes. In all the specimens 3 teeth stand on the carapace. The exopodite of the 5th pair of peraeopods is 2 mm long, that of the 4th pair 3 mm. The longer antennular flagellum is in the male one-fifth longer than the peduncle, i. e. the distance between its distal extremity and the orbital margin.

While these four specimens certainly belong to *Pen. merguiensis*, it appears uncertain whether the other younger specimens should also be referred to this species or to *Pen. indicus* H. M.-Edw. Good characters by which also young specimens of both species could be distinguished, are namely still unknown. The young male from Balikpapan, 76 mm long, is referred to *Pen. merguiensis* because the anterior of the 8 teeth of the upper border of the rostrum is placed midway between the distal extremity of the antennular peduncle and that of the antennal scales (J. G. de Man, l. c. p. 105), but with some doubt, because this feature does not seem to be constant. The rostrum projects straight for-

ward to a little beyond the antennal scales and is not at all curved upward; the rostral crest is still little elevated and the lower margin is armed with 6 teeth, of which the two anterior are placed before the foremost tooth of the upper.

The female from the same locality, that measures 135 mm, is also referred to this species, firstly because it was collected together with the young male and because the chelate legs seem to be as slender as in the adult specimens from the Cheribon Sea. Like in the male the rostrum projects straight forward, not at all curved upward, to just beyond the antennal scales and is 3-dentate; the foremost tooth of the upper border is placed above the distal end of 2nd antennular article and above the antepenultimate tooth of the lower margin, so that the two anterior teeth of the latter are placed before the anterior tooth of the upper; the rostral crest is still low.

The young female from Tandjong Priok is 70 mm long. The rostrum that projects straight forward, 2,3 mm beyond the antennal scales, is  $\frac{7}{4}$ -dentate; the anterior tooth of the upper margin is placed above the penultimate of the lower and above the 3rd antennular article, rostral crest very low.

The male from Tjilatjap, where this Prawn bears the name of Oerang djai according to Mr. Jacobson, is 108 mm long. The two branches of the petasma are not yet united. The rostrum that somewhat extends beyond the antennal scales, is  $\frac{7}{5}$ -dentate, the three first teeth stand on the carapace, while the foremost tooth, which stands at the end of the antennular peduncle, is a little more distant from the apex of the rostrum than from the penultimate. The five teeth of the lower margin are equidistant, the two foremost teeth are placed between the anterior tooth of the upper margin and the apex of the rostrum. Rostral crest only slightly elevated at the base.

According to Col. Alcock *Pen. merguensis* attains a length of over 8 inches.

### **Penaeus penicillatus** Wood-Mason

*Peneus indicus* var. *penicillatus* Wood-Mason, A. Alcock, Catal. Indian Decapod Crust. Part III Macrura. Fasc. I. The Prawns of the Peneus group. Calcutta 1906, p. 13, Pl. II, fig. 5.

8 adult specimens (4 males, 4 females), collected in 1912 by Mr. Herbst at Bagan Api Api, Sumatra.

1 adult male from Takao, Formosa.

The male from Takao is 192 mm long (carapace 61 mm, abdomen 131 mm), the males from Bagan Api Api are somewhat smaller, their length varying from 161 to 118 mm; the largest female from Bagan Api Api measures 182 mm, (carapace 58,5 mm, abdomen 123,5 mm), the smallest 135 mm (carapace 45,5 mm, abdomen 89,5 mm): these numbers prove that the abdomen is twice as long as the carapace. This form was considered by



Wood-Mason as a proper species, but by Col. Alcock as a variety of *Pen. indicus* H. M.-Edw.: when, however, *Pen. merguensis* is regarded as a proper species, then with the same right it must also be the case with *Pen. penicillatus*. The rostrum of the full-grown male from Takao is as long as the antennular peduncle and  $\frac{7}{4}$ -dentate; the rostral crest appears a little less high than in the full-grown male of *Pen. merguensis* de Man from the Cheribon Sea, the height of the apex of the 2nd tooth above the lateral ridge of the rostrum being in the latter 4 mm, in the male from Takao 3 mm.

In the males from Bagan Api Api the upper border of the rostrum is armed with 7, the lower with 4 teeth, excepting the largest specimen in which the lower bears only 2 teeth; in two females the rostrum is  $\frac{7}{3}$ -dentate, in the two others  $\frac{8}{4}$  and  $\frac{8}{3}$ . Of the largest male the rostrum extends to the far end of 2nd antennular article, in the younger males it is as long as the antennal scales or projects a little beyond them; this is also the case in the younger females, while in the largest female the rostrum reaches to the middle of 3rd antennular article..

Besides by the striking characters of the external maxillipeds, this species differs also from *Pen. merguensis* by the lateral ridge of the rostrum, which in *Pen. penicillatus*, like in *Pen. semisulcatus*, distinctly extends backward beyond the apex of the 1st (epigastric) tooth, while in *Pen. merguensis*, like in *Pen. carinatus*, this ridge fades away in front of this tooth. This character may the best been observed, when the carapace is looked at obliquely from before and above.

I did not succeed in finding any other differential character between the two species.

*Penaeus penicillatus* W. Mas. is distributed from Karachi and Bombay throughout the Indian Seas and the Strait of Malacca as far as Formosa.

### ***Penaeus canaliculatus* Oliv.**

*Penaeus canaliculatus* A. G. Olivier, Encyclop. Méthod. 1811, p. 660.

*Penaeus canaliculatus* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 106, 1913 (plates), Pl. IX, fig. 34a, 34b.

1 young female, long 62 mm, collected 1910 by Mr. Kleiweg de Zwaan at Nias.

1 male, long 105 mm, collected 1910 by Mr. Kleiweg de Zwaan at Goenoeng Sitoli, Nias.

1 young female, long 80 mm, collected 1910 by Mr. Kleiweg de Zwaan at Pulu Nako.

1 female, long 124 mm, and 1 male, long 75 mm, from Sabang Bay, presented by Mr. Herman.

1 female, long 115 mm, and 3 somewhat younger males collected 1898 by Mr. Kruyt at Posso, Celebes: the indigenous name of this animal is here Lâmbari.

The rostrum of the male from Goenoeng Sitoli extends to the middle of 3rd antennular article and is  $\frac{1}{4}$ -dentate, 4 teeth are on the carapace and the 1st is a little more than one and a half as far distant from the 2nd as the 2nd from the 3rd. Dorsal median groove of the carapace much less broad than the lateral ones. The two moieties of the petasma are not yet united.

The rostrum of the female from Posso reaches to midway the distal extremity of the antennular peduncle and that of the antennal scales; it is also  $\frac{1}{4}$ -dentate, but 5 teeth stand on the carapace and the distance (4,5 mm) between the 1st and the 2nd tooth is almost twice as long as the distance (2,5 mm) between the 2nd and the 3rd. The tooth on the lower border is placed immediately before the foremost tooth of the upper. Dorsal grooves of the carapace like in the preceding specimen. The rostrum of the largest male, long 103 mm, from Posso in all respects resembles that of the male from Goenoeng Sitoli, this is also the case with the two other males, but the tooth on the lower margin is situated in the latter midway between the penultimate and the foremost tooth of the upper.

### ***Penaeus japonicus* Bate**

*Penaeus canaliculatus* Oliv. var. *japonicus* C. Spence Bate, Report Challenger Macrura, 1888, p. 245, Pl. XXXI, XXXII, fig. 4, XXXVII, fig. 2.

*Penaeus japonicus* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae 1911 (text) p. 107.

1 male, long 80 mm, collected by Mr. Tissot van Patot at Balikpapan, Borneo.

Rostrum as long as the antennular peduncle,  $\frac{1}{4}$ -dentate; 4 teeth stand on the carapace, 1st tooth almost twice as far from the 2nd as the 2nd from the 3rd, tooth of the lower border immediately behind the foremost tooth of the upper. The two moieties of the petasma are not yet united, the characteristic fleshy lobule at the distal end is already developed.

Dorsal median groove of the carapace much less broad than the lateral grooves.

### ***Penaeus latisulcatus* Kish.**

*Penaeus latisulcatus* K. Kishinouye, in: Journal Fisheries Bureau, Vol. VIII, No. 1, Tokyo, 1900, p. 12, Pl. II, fig. 2 and Pl. VII, fig. 2.

*Penaeus latisulcatus* J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 108, 1913 (plates) Pl. IX, fig. 35a, 35b.

6 young specimens, viz. 4 males and 2 females, collected by Dr. Justersen at the island of Boeton.

The largest male and the largest female are 55 mm long. The 3 pairs of dorso-lateral spinules are distinct in all the specimens, like also the 3 dorsal grooves on the carapace, that reach to near the posterior margin. The post-ocular ridge forms posteriorly only one narrow loop, not two that occur in *Pen. plebejus* Hess from Sydney. The two moieties of the petasma are not yet united and I see no trace of the fleshy lobule at the distal end characteristic of *Pen. japonicus*; the two lobes of the thelycum are still separated by an interspace, which is almost as broad as the lobes themselves.

In two males the rostrum is  $\frac{1}{2}$ -dentate, in the third  $\frac{1}{3}$  and in the fourth like in the two females  $\frac{1}{2}$ . In all the specimens four teeth stand on the carapace, excepting the largest female, in which five stand on it.

I don't know whether in such young females of *Pen. japonicus* the thelycum presents already the form of a pocket like in the adult, for it may be possible that the lobes are in such specimens also not yet fused and coalesced like in the preceding specimens.

### **Heteropenaeus longimanus** de Man

Fig. 10.

*Heteropenaeus longimanus* J. G. de Man, in: Zoolog. Jahrb. X. Abth. f. Syst. 1898, p. 684, Pl. 38, fig. 75—75d.

1 female from Ternate.

This specimen is 82 mm long, not yet full-grown, for this species attains the length of 100 mm. The rostrum, as long as the antennal scales, is  $\frac{1+8}{4}$ -dentate; besides the epigastric,

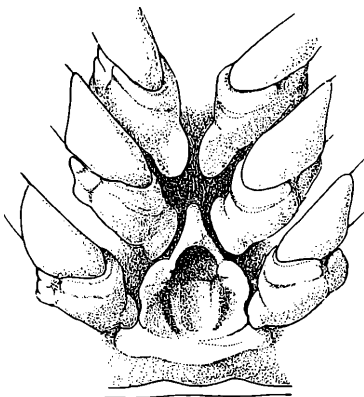


Fig. 10.

also the 1st rostral tooth stands on the carapace, while the apex of the 2nd is situated in front of the orbital margin; the two foremost teeth are placed close to one another and near the tip, the penultimate tooth almost twice as far distant from the antepenultimate as from the tip of the rostrum. The 1st tooth of the lower margin is placed just below the 5th rostral tooth of the upper, while the fourth occurs just posterior to the penultimate tooth of the upper margin. The position of the grooves and

furrows on carapace and abdomen is quite typical. The external maxillipeds reach a little beyond the middle of 2nd antennular article, the peraeopods of the 1st pair to the distal extremity, those of the 4th almost to the middle of their antepenultimate joint; the other legs are broken off, or incomplete.

The lateral plates of the thelycum (Fig. 10), between the peraeopods of the 5th pair, are separated by a much broader interspace, owing to this female being not yet full-grown, so that the thelycum shows a somewhat different form from my figure 75d (l. c.).

This rare species is at present known from Singapore, the Java Sea and Ternate.

### ***Sicyonia lancifera* (Oliv.)**

*Sicyonia lancifer* (Oliv.), J. G. de Man, Siboga Exp., Monogr. 39a, Part I, Family Penaeidae, 1911 (text) p. 123 (ubi litteratura).

1 adult female collected in 1912 by Mr. H. van der Horst at Banka.

This female is 53 mm long (carapace, rostrum included, 23 mm, abdomen 30 mm), as large as the female that was captured by the „Challenger“ in the Arafura Sea. The rostrum that reaches to the middle of 2nd antennular article, presents also exactly the same armature; it is armed above with 6 teeth, of which the 1st is placed above the orbital margin, while the 5th and 6th stand close together immediately behind the small acute apex that is curved downward. The extremity of the rostrum appears therefore tridentate; the 6th tooth projects almost as far forward as the tip, the tooth of the lower border reaches almost as far as the 5th and one observes a small tubercle nearly midway between this tooth and the tip. Four larger teeth on the carapace that are equidistant and as far from one another as the 4th from the 1st rostral tooth.

The pleura of the 1st and 2nd abdominal somites are unispinose at the tip, the spine of the 2nd a little larger than that of the 1st, which is small; the three following pleura are also armed with a spine at the lower extremity, but their posterior margin is moreover armed with 2 spines, of which the upper is smaller than the lower, that is farther distant from the spine at the tip than from the upper one. Sixth somite bispinose at either side, telson a little more than one and a half as long as the 6th somite.

A pair of small spines on the thoracic sterna between the peraeopods of the 1st and 2nd pair and another pair of two larger spines between the 2nd and 3rd legs. Thelycum agreeing with Bate's figure 4“ The sterna of the 1st—5th abdominal somites with a strong spine in the middle.

**Processa Jacobsoni** de Man

Fig. 11—11f.

*Processa Jacobsoni* J. G. de Man, in: Zoolog. Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden, 1921, Deel VI, Afl. 2, p. 95.

1 male collected February 1913 by Mr. E. Jacobson at Sinabang, island of Simalur, near the west-coast of Atjeh, Sumatra.

A new species at first sight distinguished by the shape of the rostrum. Carapace, rostrum included, 6 mm long, abdomen 14 mm, entire length 20 mm. The rostrum (Fig. 11, 11a) which

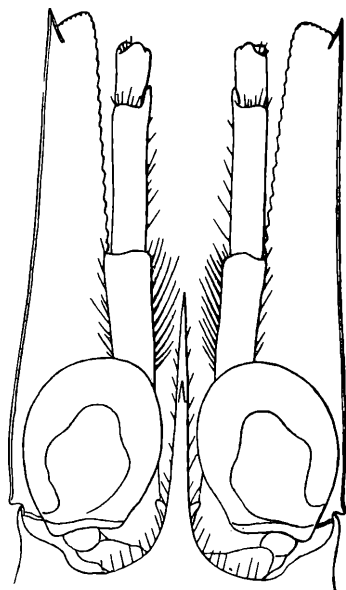


Fig. 11.

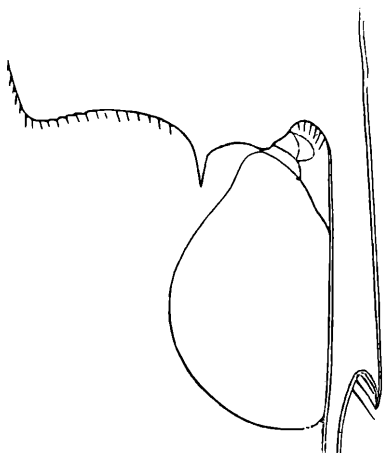


Fig. 11 a.

is 2,15 mm long, a trifle more than half the length of the rest of the carapace, extends, beyond the eye-peduncles, almost to the distal extremity of basal antennular article; the upper border runs at first straight, though slightly ascending, forward, terminating in an acute tooth, that almost reaches to the anterior extremity of the eyes. Between this tooth, which is 0,18 mm long, about  $\frac{1}{11}$  the entire length of the rostrum, and the acuminate apex of the latter, the upper border appears slightly concave; at the level of the apex of the acute tooth the rostrum is 0,27 mm high, one-eighth the length of the rostrum, near the base it appears the lowest, viz. one-tenth the whole length. The carapace, which is 3,1 mm high, has a stout shape, the height being nearly half the length, the rostrum including; antennal spine well developed, antero-lateral angle obtuse.



Abdomen a little more than twice as long as the carapace. The lower border of the 5th somite, that is fringed with long feathered setae, ends posteriorly (fig. 11b) in a small acute tooth. Telson (fig. 11c) 3,14 mm long, tapering rather much, the width at the base (0,78 mm) being almost 3-times as broad as that of the tip (0,28 mm); anterior pair of dorso-lateral spinules 0,25 mm long, distance between this pair and the base of the telson 0,92 mm, i. e. a little more than one-fourth the entire length; posterior pair 0,23 mm long, distance between this pair and the base 2,14 mm, i. e. two-thirds the entire length, so that the posterior pair is a little farther distant from the anterior pair than from the acute posterior extremity of the telson. Of the two spinules at either side of the tip the outer is 0,17 mm long, the inner 0,52 mm, being 3-times as long. Inner uropod reaching a little beyond the inner longer terminal spinules of the telson, outer uropod reaching as far beyond the inner.



Fig. 11b.

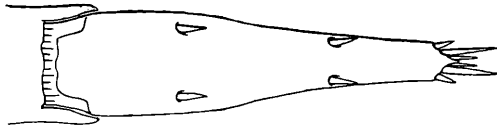


Fig. 11c.

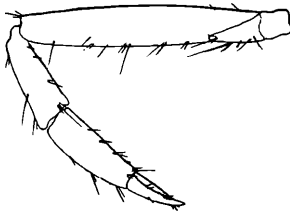


Fig. 11d.



Fig. 11e.

Eyes (fig. 11) hardly reaching beyond the middle of the strongly excavated, basal joint of the antennular peduncle; measured laterally the 2nd joint proves to be 1,12 mm long and in the middle 0,24 mm thick, almost 5-times as long as thick; 3rd joint 0,5 mm long, almost half as long as 2nd, stylocerite appearing in a lateral view acute, reaching to the middle of the eye; antennular peduncle nearly as much shorter than the antennal scale as the 3rd joint is long. Distal margin of antennal scale nearly transverse, distinctly surpassed by the antero-lateral

spine; outer spine of antennal peduncle small, the peduncle a little shorter than basal antennular article.

The external maxillipeds project by little more than the terminal joint beyond the antennal scale, terminal joint nearly as long as penultimate. Merus of right chelate leg (fig. 11d) of 1st pair 2,5 mm long, slender, 6-times as long as wide in the middle; carpus 1 mm long, two-fifths of the merus, 0,38 mm thick at the distal extremity, a little more than one-third the length; chela 1,68 mm long, two-thirds the length of the merus, fingers 0,6 mm long, about half as long as the palm; measured in the plane of the fingers the chela proves to be 0,35 mm broad at the far end of the palm, so that the chela shows a slender form, almost 5-times as long as wide.

Merus of the slender left, simple leg (fig. 11e) 2,4 mm long, 0,37 mm broad in the middle, 6,5-times as long as wide; carpus 1,1 mm long, 0,27 mm thick at distal extremity, 4-times as long as thick; propodus 1,7 mm long, one and a half as long as the carpus, strongly tapering, 0,25 mm broad proximally, 0,12 mm at the distal extremity, 8-times as long as wide in the middle; dactylus 0,4 mm long, one-fourth of the propodus. This leg is rather much setose, especially the propodus.



Fig. 11f.

There is only one leg of the 2nd pair. Like in other species of this genus the ischium bears proximally (fig. 11f) a rounded expansion, on which a few short setae are implanted; merus 2,3 mm long, divided into 7 segments, the 1st or proximal one of which is 0,7 mm long, the 2nd and 3rd each 0,29 mm, the 4th 0,35 mm, the 5th 0,28 mm, the 6th 0,17 mm, the last 0,2 mm; carpus 4,5 mm long, gradually and slightly thickening towards the distal extremity as usual and divided into 25 segments, of which the 1st or proximal is short, 0,28 mm long, the 2nd 0,1 mm, the 3rd 0,17 mm, those in the middle as long (0,18 mm) as broad or slightly longer than broad, the last 0,3 mm long and about one and a half as long as broad; chela 0,68 mm long, 3-times as long as broad, fingers a little shorter than the palm.

The measurements of the three posterior peraeopods are indicated in the Table. Whereas in the 3rd and 4th pair the carpus is longer than the merus and the propodus, in the legs of the 5th pair merus and propodus are longer than the carpus. Ischium of 3rd pair with a spine, long 0,28 mm, a little behind the distal extremity, merus with 4 spines long 0,22—0,24 mm; ischium of 4th pair with a spine

long 0,27 mm near the far end and another, long 0,3 mm, near the base, merus with 5 spines long 0,22—0,25 mm; dactyli about one-fourth of the propodi, those of the 5th pair a little more slender than those of the 3rd and 4th pair. The propodi of the 5th pair, of which ischium and merus are unarmed, differ from those of the 3rd and 4th pair by the distal half of their posterior margin being armed with three spiniform setae, respectively 0,22 mm, 0,23 mm and 0,25 mm long from the posterior to the anterior one, for the rest the three posterior legs are but little setiferous.

In the second pleopod the appendix masculina is 0,72 mm long, slender, 18-times as long as broad in the middle, with 5 unequal setae on the tip the longest of which is 0,27 mm long and two short ones, 0,7 mm long, just behind the tip, while it is for the rest quite glabrous; stylamblys half as long as the appendix masculina, with well-developed cincinnuli. The appendix masculina reaches almost to the apex of the endopodite that is 1,32 mm long, while the exopodite has a length of 1,44 mm.

Measurements of the three posterior legs  
in millimeters

|                       | 3rd pair | 4th pair | 5th pair |
|-----------------------|----------|----------|----------|
| Length of the ischium | 1,8      | 1,6      | 1,4      |
| merus                 | 2,8      | 2,3      | 2,3      |
| carpus                | 4        | 2,9      | 1,8      |
| propodus              | 2,45     | 1,66     | 2,45     |
| dactylus              | 0,56     | 0,46     | 0,65     |

**Synalpheus Sluiteri** de Man

Fig. 12—12e.

*Synalpheus Sluiteri* J. G. de Man, in: Zoolog. Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden. 1920. Deel V, Afl. 3, p. 107.

1 full-grown egg-bearing female and a younger specimen collected by Prof. Sluiter in the Bay of Batavia.

An apparently new species, closely related to *Syn. para-neomeris* Cout. and its varieties. The rostrum (fig. 12) of the female, that is 13 mm long from tip of rostrum to tip of telson, is  $2\frac{1}{2}$ -times as long as broad at base and reaches to the distal extremity of basal antennular article; the straight lateral borders gradually converge to the subacute tip. Lateral teeth triangular, one-fourth shorter than the rostrum, with the acute tips slightly turned inward.

Antennular peduncle of a stout shape, only 3-times as long as the 2nd article is wide; 2nd and 3rd article together almost one and a half as long as the visible part of 1st; 2nd just as long as wide anteriorly, 3rd article almost of the same size as 2nd. Stylocerite reaching to the distal fourth part of 2nd article.

Upper angle of basicerite (fig. 12b, 12c) subacute, a little prominent, though not produced into a spine; lower spine of basicerite a trifle shorter than the stylocerite and as long as the outer border of the basicerite. Carpocerite 3,85-times as long as wide, projecting beyond the antennular peduncle by the whole length of 3rd article; terminal spine of scaphocerite a little shorter than the carpocerite, the lamella almost as long as the antennular peduncle.

In the younger specimen the 2nd and 3rd joint of the antennular peduncle are together as long as the visible part of the 1st and the terminal spine of the scaphocerite reaches to the tip of the carpocerite.

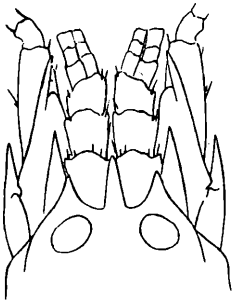


Fig. 12.

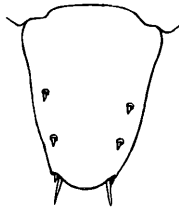


Fig. 12a.



Fig. 12c.



Fig. 12b.

The telson (fig. 12a), the measurements of which are indicated in the Table, resembles that of *Syn. paraneomeris* (H. Coutière, Alpheidae Mald. and Laccad. Archip. 1905, Pl. LXXI, fig. 7e), but the dorso-lateral spinules that are only 0,1 mm long, are implanted nearer to the lateral margins. The postero-lateral angles of the telson are acute, though very short, and the distance between the line uniting these angles and the posterior margin measures, in the middle line, one-fifth the distance between the two angles, the posterior margin being moderately convex.

A large cheliped, lying loose in the tube, belongs no doubt to this specimen (fig. 12d). The upper border of the merus, the outer surface of which is 2,4-times as long as wide, ends distally in a small acute tooth, curved inward. Chela 6,3 mm long, the fingers are 1,8 mm long, proportion between the length of the chela and that of the fingers like 7:2 and proportion between the length of the palm and that of the fingers like 5:2; measured in the plane of the fingers the chela appears just 3-times as long as high. The rather convex, upper border of the palm does not terminate, above the articulation of the fingers, in a spine, but one observes here a little prominence, that in a lateral view looks

like a small obtuse tooth; upper border of the dactylus strongly curved. The small cheliped is wanting.

For the measurements of the 2nd, 3rd and 4th legs I refer to the Tables. The 1st segment of the carpus of the 2nd legs is a little longer than the sum of the four following, 2nd and 3rd equal, 4th a little shorter, 5th as long as the 2nd and the 3rd together; chela as long as the sum of the four last joints taken together, fingers a little longer than the palm.

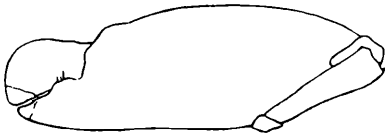


Fig. 12d.

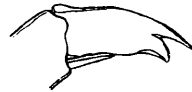


Fig. 12e.

Merus of 3rd legs unarmed, carpus with a movable spine at the far end of the lower margin, propodus with four spinules, long 0,15—0,17 mm, on the lower margin besides the two at the distal extremity. Measured from the proximal extremity of the anterior margin, in a straight line, to the extremity of the ventral hook, the length of the dactylus proves to be little more than one-fifth the length of the propodus; dactylus (fig. 12e) of a rather stout shape, the width at the base being two-fifths the length; ventral hook conical, stout, one-third longer than broad at base, dorsal hook a little longer but less thick at its base, the thickness at its base being two-thirds that of the ventral hook. The dactylus fully resembles that of the variety *halmaherensis* of *Syn. paraneomeris* Cout. (J. G. de Man, Siboga Exped., Monogr. XXXIX a', Alpheidae, 1915 (plates), Pl. VIII, fig. 36 c).

Ova few in number, large, 1,3—1,35 mm long.

Measurements of the two specimens.

Table A.

|   |      |      |
|---|------|------|
| Proportion between length of telson and width of the posterior margin . . . . .                                       | 1    | 2    |
|   | 2,9  | 2,65 |
| Proportion between the greatest width and that of the posterior margin . . . . .                                      | 2,18 | 2,1  |
| Proportion between the length of the telson and the distance of the anterior pair from the posterior margin . . . . . | 2    | 2,2  |
| Proportion between the distances of both pairs of spinules from the posterior margin                                  | 1,8  | 1,9  |

Table B.

Measurements of the 2nd pair of legs.

In the female the merus is 5,5-times as long as wide. The segments of the carpus are 1,3 mm, 0,22 mm, 0,22 mm, 0,2 mm and 0,42 mm long, the 1st segment 4,64-times as long as thick



at distal extremity; chela 1 mm long (palm 0,45 mm, fingers 0,55 mm). The 1st segment is 1,22-times as long as the sum of the four following.

In the younger specimen the merus is 5,6-times as long as wide. The segments of the carpus are 1 mm, 0,16 mm, 0,16 mm, 0,14 mm and 0,36 mm long; the 1st segment 5-times as long as thick at distal extremity; chela 0,82 mm long (palm 0,38 mm, fingers 0,44 mm). First segment, like in the female, 1,22-times as long as the sum of the four following.

Table C.

Measurements of the legs of the 3rd pair of the female.

|  |      |
|--|------|
| Length of the merus  | 2,24 |
| Width of the merus   | 0,58 |
| Proportion between length and width of the merus   | 3,86 |
| Length of the carpus   | 1    |
| Width of the carpus at distal extremity  | 0,39 |
| Proportion between length and width of the carpus  | 2,6  |
| Length of the propodus   | 1,95 |
| Width of the propodus  | 0,32 |
| Proportion between length and width of the propodus  | 6    |
| Length of the dactylus from the proximal extremity<br>of the anterior margin to the apex of the ventral hook | 0,52 |
| Width of the dactylus at base  | 0,18 |
| Proportion between length and width of the dactylus  | 2,9  |

The typical *Syn. paraneomeris* Cout. differs, according to Coutière's description and figures, by the stouter shape of the rostrum, by the antennular peduncle being four times as long as wide, by the upper angle of the basicerite being straight, not subacute, by the dorso-lateral spinules of the telson being implanted farther distant from the lateral margins, by the upper border of the merus of the larger cheliped being unarmed, obtuse, by the 3rd carpal segment of the 2nd legs being longer than the 2nd and by the 3rd pair of legs being a little more slender, the merus being 4,5-, the propodus 8-times as long as wide. Unfortunately the size of the ova was not indicated.

The three varieties of *Syn. paraneomeris* Cout. differ also.

### **Synalpheus Theophane** de Man var.

Fig. 13.

*Synalpheus Theophane* J. G. de Man, Siboga Exped., Monogr. XXXIXa', Family Alpheidae, 1911 (text) p. 261, 1915 (plates), Pl. X, fig. 44-44e.

1 female with eggs and 1 younger mutilated specimen from the Bay of Batavia, collected by Prof. Sluiter.

The female, long 10,5 mm, shows a few differences from the typical species and should be considered as a variety. The

rostrum, which is  $3\frac{1}{3}$ -times as long as wide at its base, reaches to the distal extremity of basal antennular article; the lateral spines, that project straight forward, are one-third shorter than the rostrum and reach until the distal third of the visible part of basal article. Antennular peduncle four times as long as wide at the far end of 2nd article, the peduncle being 1,4 mm long and 0,35 mm wide; the 2nd article, 0,4 mm long and 0,35 mm wide, is but a trifle longer than wide and measures about two-thirds of the visible part of basal article; 3rd article as long as 2nd. The stylocerite, slightly curved inward at the tip, reaches almost to the distal extremity of 2nd article.

Carpocerite 4,4-times as long as thick, a little longer than the antennular peduncle; lower spine of basicerite as long as basal antennular article, upper spine well developed, a little shorter than the lateral frontal spines; different from the typical species the terminal spine of the scaphocerite does not or hardly surpass the antennal peduncle.

The telson differs from fig. 44a by the dorso-lateral spinules being implanted a little more backward, nearly as in fig. 43 of Plate IX. Proportion between the length of the telson and the distance between the postero-lateral angles 2,73, proportion between the greatest width and that distance 2, proportion between the length of the telson and the distance of the anterior pair of spinules from the posterior margin 1,87, proportion between the distances of both pairs from the posterior margin 1,66. The dorso-lateral spinules are 0,12—0,14 mm long, the anterior pair implanted immediately before the middle, but as regards the distances between the two pairs and between the spinules of each pair this specimen agrees with the typical form; the distance 0,48 mm between the posterior pair and the posterior margin is almost as large as the distance, 0,55 mm, between the postero-lateral angles. The latter are acute, but small, measuring only  $\frac{1}{9}$  of the length of the outer terminal spinules. The distance between the two dorsolateral spinules of the anterior pair is in proportion to the distance between those of the posterior like 5:4. The posterior margin appears as much convex as in fig. 44a; the length of the convex part between a line uniting the postero-lateral angles and the posterior margin is 0,16 mm long, the distance between the postero-lateral angles 0,55 mm, the latter 3,5-times as long.



Fig. 13.

The large cheliped (fig. 13), that was still unknown, is placed at the right side. Outer surface of merus twice as long as broad, an acute tooth at the distal end of the upper border. Chela 6 mm long, fingers half as long as the palm, that appears

about half as high as long in the plane of the fingers, and that is armed with an acute spine at the distal extremity of the rather convex upper border. Small cheliped wanting.

Merus of 2nd pair of peraeopods 5-times as long as wide. The 1st segment of the carpus is 0,85 mm long and 4,2-times as long as thick at the distal extremity, the 4 following segments are together 0,92 mm long, i. e. 1,08-times as long as the 1st; the chela appears in the left leg nearly as long as the 4 last segments of the carpus taken together, namely 0,9 mm (palm 0,4 mm, fingers 0,5 mm), in the right leg as long as the 1st segment; fingers a little longer than the palm. In the typical species the 1st segment was of a somewhat slender form, 5,6-times as long as thick and not shorter, but distinctly longer than the sum of the four following, namely 1,23-times longer.

The relative measurements of the 3rd pair are: merus 2,25, carpus 1, propodus 2,2. Merus in the right leg 4,5-times, in the left 4,4-times as long as wide in the middle, carpus 2,8-times as long as thick at the distal extremity, propodus in the right leg 8-, in the left 8,3-times as long as broad in the middle. Carpus with a small spine at the far end of the lower margin, propodus with 8 spinules. The dactylus, measured from the proximal end of the anterior margin to the tip of the ventral hook, proved to measure one-fifth the propodus and to be 3-, respectively 3,3-times as long as wide at its base. The 3rd legs agree therefore with those of the typical species, except the propodus, that has a somewhat more slender form.

The female has lost all the eggs, excepting one that proved to be 0,8 mm long, like in the type.

The nearest related species are *Syn. tumidomanus* (Paulson) of the Red Sea, *Syn. hululensis* Cout. from the Maldive and Laccadive Archipelagoes and the form which was referred by me in 1911 to *Syn. tumidomanus*. Paulson's species apparently differs by the much stronger development of the posterolateral spines and by the greater convexity of the posterior margin of the telson, the rostrum has another form and the antennal peduncle is somewhat more slender; these differences are taken from the figures in Paulson's work. *Syn. hululensis* Cout. = *Syn. tumidomanus* of Coutière in his work on the Alpheidae of the Maldive and Laccadive Archipelagoes 1905, p. 876, Pl. LXXIII, fig. 14—14d, seems to differ by the antennular peduncle being five times as long as wide, by the 2nd article of this peduncle being about one and a half as long as thick, by the posterior margin of the telson being less prominent, less convex and by the stouter shape of the dactyli of the three posterior peraeopods.

The species, finally, referred by me in 1911 to *Syn. tumidomanus* Paulson, differs from *Syn. Theophane* by the antennular peduncle being five times as long as wide, by the 2nd article

being 1,4-times as long as thick, by the much shorter fingers of the large chela, by the stouter and different shape of the dactyli of the 3 posterior legs etc.

*Synalpheus Theophane* apparently occurs throughout the whole Archipelago, being also known from the Strait of Makassar, from the south coast of Halmaheira and from the N. E.-point of Timor.

#### ***Alpheus collumianus* Stimps.**

*Alpheus collumianus* Stimpson, J. G. de Man, Siboga Exp. Monogr. 39a', Family Alpheidae, 1911 (text) p. 334, 1915 (plates) Pl. XIV, fig. 65—65b.

1 male collected August 1908 by Mr. van de Sande on a coralreef near the north-coast of Flores below low water-line at 8° 20' 28" S., 121° 36' 17" E.

This specimen, 15,5 mm long from tip of rostrum to tip of telson, agrees with the male collected by the „Siboga“ at Stat. 282, which is lying before me. The carpal segments of the left leg of the 2nd pair (the right is wanting) are 1,5 mm, 1,05 mm, 0,44 mm, 0,55 mm and 0,8 mm long; the chela is 1,4 mm long, the palm just as long as the fingers. The endopodite of the 2nd pleopod is 1,55 mm long and 5-times as long as wide; the stylamblys, implanted at a distance of 0,6 mm from the base, is 0,4 mm long with a few cincinnuli at the tip, though glabrous, the appendix masculina, however, which is nearly one and a half as long, and of which the tip is situated midway between those of the stylamblys and the branch, is provided with long setae, especially anteriorly, that reach beyond the apex of the endopodite. Exopodite as long as the inner branch but a little broader.

#### ***Alpheus splendidus* Cout.**

Fig. 14.

*Alpheus splendidus* H. Coutière, Bulletin Mus. Paris, 1897, No. 6, p. 235. Confer: J. G. de Man, Siboga Exped., Monogr. XXXIXa', Family Alpheidae, 1911, p. 343.

As we read in my description of *Alpheus facetus* (J. G. de Man, l. c.)<sup>1)</sup>, *Alpheus splendidus* Cout. from Djibouti, of which through the courtesy of Professor Coutière I was enabled to examine the type, differs at first sight from *A. facetus* by the orbital spines arising from the upper surface of the eye-hoods, at some distance from their arcuate anterior margin, whereas one observes no prominence between the rostrum and

<sup>1)</sup> In this description a slight erratum occurs. On p. 342 line 12 from below instead of „with a minute tooth“ read „with two minute teeth“ and on the following line instead of „this tooth“ read „the posterior tooth.“

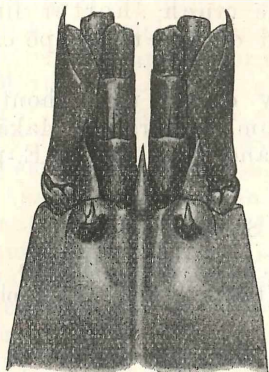


Fig. 14.

the eye-hoods. The rostrum is obliquely directed upward, the stylocerite a little shorter and the groove on the upper border of the palm is much less conspicuous.

As far as I know this rare species has not yet been figured. The figure of the type, drawn by me June 1908, may therefore be welcome, but I call attention to the stylocerite which is not shorter but slightly longer than the rostrum.

### ***Alpheus macrochirus* Richters**

*Alpheus macrochirus* Richters, J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911, p. 343.

1 male and 1 ova-bearing female, dredged May 1909 by Col. Tydeman on the road of Ampenan, west-coast of Lombok, from a depth of 13 fathoms. The male is 28 mm, the female 27 mm long from apex of rostrum to tip of telson.

### ***Alpheus malleodigitus* (Bate)**

*Alpheus malleodigitus* (Sp. Bate), J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911 (text) p. 347, 1915 (plates), Pl. XIV, fig. 70—70d.

1 specimen collected by Prof. Sluiter in the Bay of Batavia.

1 male collected August 1908 by Mr. van de Sande on a coralreef, below low water-mark, on the north-coast of Flores (8° 20' 28" S., 121° 36' 17" E.).

5 specimens collected by Mr. E. Jacobson February 1913 at Sinabang, (Simalur).

The specimen from the Bay of Batavia is nearly 25 mm long. The 2nd joint of the antennular peduncle is 4,2-times as long as thick, the carpoperite is still a trifle longer than the 2nd joint, the terminal spine of the scaphocerite extends almost to the distal extremity of this joint, but the lamella reaches hardly beyond the middle. The 4th carpal segment of the longer leg of the 2nd pair is 3,3-times as long as thick in the middle and the merus of the 3rd pereiopod 4-times as long as broad, so that this specimen belongs to the typical species; the shorter leg is wanting. The large cheliped is also lost, of the smaller, on the left side, the chela is 6 mm long (palm 3,5 mm, fingers 2,5 mm), the fingers being in proportion to the palm as 5:7.

The male from the north-coast of Flores is 15,5 mm long. This specimen agrees with the preceding as regards the peduncles of the upper and lower antennae, but the scaphocerite is a little shorter. In the longer leg, on the right side, of the 2nd pair the 4th carpal segment is 4,4-, in the shorter leg 2,2-times as long as thick and the merus of the 3rd pair is 4,3-times as long as broad. Large cheliped on the left side, the small one wanting. Both the appendix masculina and the stylamblys are implanted on the middle of the inner branch of the 2nd pleopod, the former is a little longer than the stylamblys and tipped with several long setae.

The largest specimen from Sinabang is 18,5 mm long. The peduncles as in the specimen from Batavia, but the scaphocerite is shorter and agrees with the figure 70 of my work. The small cheliped and the longer leg of the 2nd pair are lost, in the shorter leg the 4th carpal segment has a stout form, like the other segments, and is only 1,62-times as long as thick in the middle. The merus of the 3rd pair is 4,2-times as long as broad. A similar stout carpus was observed and described by me in the ova-bearing female, collected by the Siboga-Expedition at Stat. 115. The other specimens from Sinabang are much younger. In one specimen the 4th carpal segment of the longer leg is 4,7-, of the shorter 2,7-times as long as thick; in another specimen this proportion for the 4th segment is 2,4 for the shorter leg, in a third specimen for the longer leg 4.

### ***Alpheus gracilipes* Stimpson**

Fig. 15—15e.

*Alpheus gracilipes* Stimpson, J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911, p. 380.

3 young males and 4 ova-bearing females collected by Mr. E. Jacobson March 1913 at Sinabang, Simalur, near Sumatra.

1 male and 1 ova-bearing female collected by Prof. Sluiter in the Bay of Batavia.

The figures 15 and 15a represent the anterior part of the carapace of the two largest females from Sinabang, not only because a good figure of the frontal border of the carapace of this species does not yet exist, but also because the two specimens do not exactly agree with one another. In one of the two females, which is 28 mm long from apex of rostrum to tip of telson, the rounded eye is produced at the antero-internal angle as a triangular tubercle, that is flattened on the outer side; from the subacute tip of this tubercle a compressed sharp carina runs downward and curves inward towards the lower border of the rostrum, with which it unites; this carina shows a small notch or emargination a little below the tip of the tubercle. The rostrum,

distinctly concave above, extends to the 2nd third part of the 2nd antennular article.

In the other female, long 30 mm, one observes the same, but the carina is not emarginate just below the tip of the tubercle

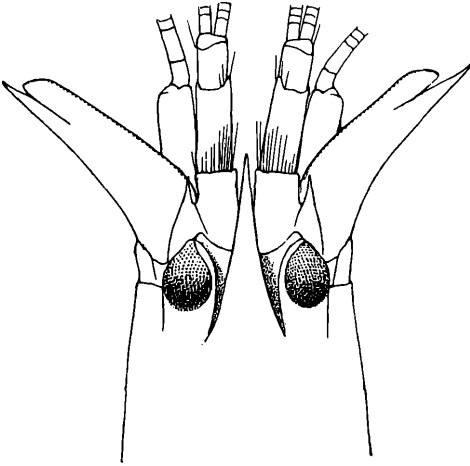


Fig. 15.

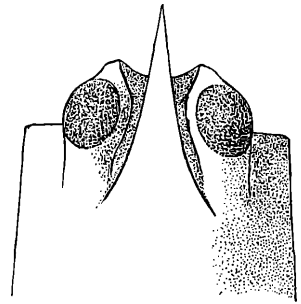


Fig. 15a.

and does not reach more forward than the latter, while this is distinctly the case in the former female; the rostrum extends here only to the distal extremity of basal article. These slight differences are individual.

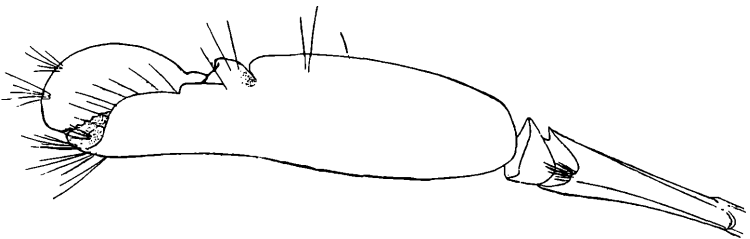


Fig. 15b.

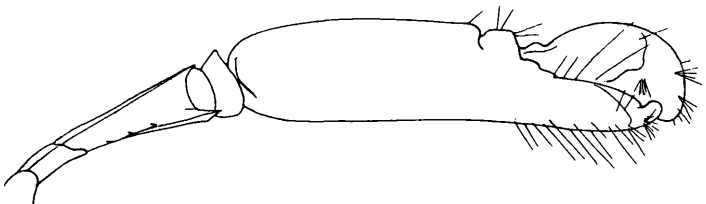


Fig. 15c.



In the female, long 28 mm, the 2nd antennular article is one and a half as long as the visible part of the 1st, stylocerite as long as 1st article. The spine on the 2nd joint of the antennal peduncle is comparatively large in this species, though it is still a little shorter than the stylocerite. The third ova-bearing female from Sinabang is 18,5 mm long and the two young males are nearly of the same size. The egg-bearing female from the Bay of Batavia is 28 mm long. All the specimens bear still both legs of the 1st pair or one of them, only in the male from Batavia both are lost. In all these specimens (fig. 15b, 15c) the large cheliped is placed on the right side, except only in the female long 30 mm from Sinabang, in which the small cheliped is borne on the right side, the other is lost.

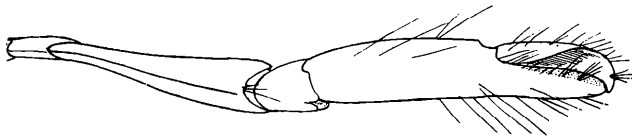


Fig. 15d.



Fig. 15e.

According to my description of 1911 the palm of the small chela of the male from the Kwandang-bay is marked with a transverse groove just behind the articulation of the dactylus, in none of the present specimens this transverse groove is developed. The small chela (fig. 15d, 15e) of the present specimens is 5—5,6-times as long as high, the fingers are constantly a little shorter than the palm and the dactylus appears both in the male and in the female *Balaeniceps*-shaped.

***Alpheus brevirostris* (Oliv.) var. *angustodigitus* de Man**

Fig. 16, 16a.

*Alpheus brevirostris* (Oliv.) var. *angustodigitus* J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911 (text), p. 385, 1915 (plates), Pl. XIX, fig. 87—87 d.

1 female of medium size without eggs from Java.

This specimen is quite interesting, because it bears the small cheliped, that was still unknown (fig. 16a). Of the two type specimens from Balikpapan, east-coast of Borneo, that

are lying before me, a male and a female, the latter, indeed, has lost all the pereopods. Measured from the tip of rostrum to the posterior margin the carapace proves to be 17,5 mm long, the abdomen is 32,5 mm long, entire length 50 mm: it has nearly the same size as the male from Balikpapan, that measures 45 mm, while it is much smaller than the typical female, long 62 mm. The rostrum (fig. 16) reaches to the middle of the visible part of basal antennular article; the rostral carina, which is traceable almost to the middle of the carapace, shows at a distance of 5 mm from the apex of the rostrum, just behind the orbital hoods, a small impressed point or pit, which is also found in the two type specimens. The telson, especially as regards the situation of the dorso-lateral spinules, agrees with the figure 87 (l. c.), that represents the telson of the male: the slight differences

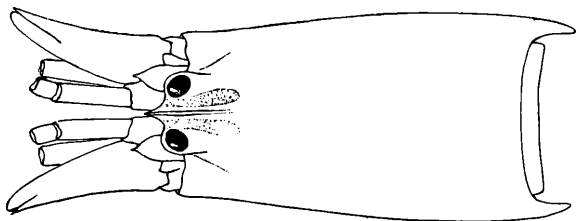


Fig. 16.

presented by the telson of the type specimens may be individual or perhaps owing to difference of age. We read in the original description that the antennal peduncle is just as long as that of the inner antennae; this is not quite accurate, the antennular peduncle surpassing that of the lower antennae by one-third of the 3rd article and this is also the case in the female from Java. In the typical female the antennal scale extends beyond the antennular peduncle by a distance hardly as long as the 3rd article, in the female from Java, however, by a little more than the length of 3rd article, a slight difference probably owing to the smaller size of this specimen. The antennal peduncle, which in the full-grown typical female reaches to the middle of the terminal joint of the external maxillipeds, reaches in the female from Java, like in the male from Balikpapan, to the distal third or fourth of this joint, also a difference caused by the younger age of the female.

The large cheliped is wanting. While in the male from Balikpapan the small cheliped occurs on the left side, it is borne by the female from Java on the right. The merus (fig. 16a) appears a little more slender than in the male, but agrees for the rest: the upper margin ends in a small spine and the infero-internal margin bears 5 small movable spinules at gradually

increasing distances, while a somewhat larger immovable spine occurs at the distal extremity; measured along the upper margin the merus proves to be 8,5 mm long. The chela, which much resembles the small chela of the female of *A. rapax* Fabr. (J. G. de Man, in: Mémoires Soc. Zool. de France, XXII, 1909, Pl. VII, fig. 6), is 14,75 mm long, measuring six-sevenths the length of the carapace, rostrum included; the palm is 5,5 mm long and 3,2 mm high, while the fingers are 9,25 mm long. These numbers show that the fingers are a little more than one and a half as long as the palm and that the palm is a little more than one and a half as long as high. The upper



Fig. 16a.

border of the palm has no transverse groove near the articulation of the dactylus, both the outer and the inner side are finely granulate, the microscopical granules showing a tendency to fall into short transverse rows, and this granulation is continued for a short distance on the fingers. Like the palm also the fingers are compressed laterally; they are gaping, leaving an interspace between them, which is filled up by the long hairs implanted on their prehensile edges; except at the base the fingers are smooth, though punctate, the immobile finger is broader at its base than the dactylus and here flattened, especially on the outer side, while the pointed extremities are crossing one another. Both the upper and the lower border of palm and fingers are clothed on the inner side with long hairs.

Of the other pereiopods only one leg of the 3rd or 4th pair is preserved, which agrees with the type.

#### Measurements in millimeters.

|   |      |
|---|------|
| Length of the telson  | 5,9  |
| Width at the base . . . . .   | 3,4  |
| Width of the posterior margin . . . . .   | 1,9  |
| Proportion between the length of the telson and the width at the base . . . . .   | 1,74 |
| Proportion between the length of the telson and the width of the posterior margin . . . . .                                       | 3,1  |
| Proportion between the length of the telson and the distance of the anterior pair of spinules from the posterior margin . . . . . | 1,55 |
| Proportion between the distances of both pairs of spinules from the posterior margin . . . . .                                    | 1,3  |
| General distribution: Balikpapan, east-coast of Borneo.   |      |

**Alpheus eurydactylus** de Man

Fig. 17, 17a.

*Alpheus eurydactylus* J. G. de Man, in: Zoolog. Mededeelingen uitgegeven vanwege 's Rijks Museum van Natuurlijke Historie te Leiden, 1920, Deel V, Afl. 3, p. 109.

1 adult male and 1 ova-bearing female from Java, collected in 1883.

This species bears such a close resemblance to *A. Euphrosyne* de Man from the Java Sea, the Flores Sea and Bangkok that I did hesitate to describe it as new. Of *A. Euphrosyne* only four specimens are known, an ova-bearing female, long 46 mm, from apex of rostrum to tip of telson and a younger female both from the Java Sea, on which this remarkable species was founded by me in 1897, the male from Bangkok, long 34 mm, described by me in 1898 (Mémoires Soc. Zool. de France, Paris 1898, p. 317, Pl. IV, fig. 2) and the full-grown specimen, long 58 mm, from the Postillon Islands in the Flores Sea, collected by the Siboga Expedition; nothing is therefore known about the sphere of individual variability, perhaps proper to this species, so that I am unable to decide whether the existing differences are of a specific character or not. In this case it appears advisable to describe these specimens as a new species, which afterwards may be cancelled, when the differences should prove to be of a varietal character.

The male is 40 mm long, the female 45 mm. In both specimens the rostrum appears a little shorter than in *A. Euphrosyne* (J. G. de Man, Zoolog. Jahrb. IX, Abth. f. Syst. 1897, p. 745, Pl. 36, fig. 64), not yet reaching the middle of the visible part of 1st antennular article and in both it is continued into a distinct carina, which is separated by broad and rather deep grooves from the eyes; this carina, however, is rounded and passes at the end of the orbital hoods into the smooth surface of the carapace. In *A. Euphrosyne* a rostral carina does not exist. The telson of the male is broken. In the female the telson is 5,5 mm long, the distance between the posterolateral angles 2,4 mm, the greatest width proximally 3,5 mm; like in the adult female of *A. Euphrosyne*, described in 1897, the postero-lateral angles are rather indistinct. Different from this female, the anterior pair of dorso-lateral spinules are implanted a little before the middle and the posterior pair are also implanted more forward than in the figure 64a of my description of 1897. Both the outer and the inner uropod appear a little longer in proportion to their width than in the figure 64a. For the rest carapace and abdomen apparently resemble those of *A. Euphrosyne*.

As regards the two pairs of antennae this species fully agrees with *A. Euphrosyne*, the figure 64 representing exactly what

is seen in *A. eurydactylus*. External maxillipeds as in *A. Euphrosyne*, reaching the far end of the antennal peduncle. The main differences are presented by the 1st pair of legs. In both specimens the large cheliped is placed on the left side. Merus everywhere unarmed, as in *A. Euphrosyne*. Both in the male and in the female the chela is 20,7 mm long, the palm 11,5 mm long and 8,2 mm high, the two chelae being exactly of the same size and shape. In the female of *A. Euphrosyne* these numbers were, in the same succession, 21 mm, 11,5 mm and 7,5 mm, in the male from Bangkok 16 mm, 9 mm and 6,25 mm; they prove that in *A. eurydactylus* the height of the palm is a little larger than in *A. Euphrosyne*, but in its other characters this chela fully agrees with that of the latter species.

The small cheliped (fig. 17) of the male differs from that of *A. Euphrosyne* by the somewhat shorter fingers and by the flattened upper surface of the *Balaeniceps*-shaped dactylus being broader in proportion to its length, from which character the name of the species has been derived. In the male of *A. Euphrosyne* from Bangkok the chela was 12,5 mm long, the palm 5,25 mm long and 2,8 mm high (J. G. de Man, l. c., 1898); in the male of the new species, however, these numbers are, in the same succession, 14,5 mm, 7,5 mm and 4 mm. While in *A. Euphrosyne* the fingers are nearly one and a half as long as the palm, they show in *A. eurydactylus* nearly the same length as the latter. In *A. Euphrosyne* the flattened upper surface of the dactylus is three times as long as broad, in *A. eurydactylus*, however, it is 6 mm long, but 2,8 mm broad, appearing almost half as broad as long. For the rest this chela resembles that of *A. Euphrosyne* and the height of the palm is the same.



Fig. 17.



Fig. 17a.

The small cheliped of the female (fig. 17a) differs from that of *A. Euphrosyne* by the palm and the fingers being less high in proportion to their length. In the female of *A. Euphrosyne* the small chela was 16,5 mm long, the palm 6 mm long and 3,8 mm high; in the female of *A. eurydactylus* these numbers are in the same succession 14 mm, 6 mm and 3 mm. These numbers also show that the fingers are slightly longer.

The other peraeopods do likewise not seem to differ in both forms. In the male the carpal segments of the 2nd legs are from the 1st or proximal to the last 3,8 mm, 2,05 mm, 0,75 mm, 0,75 mm and 1,2 mm long, the chela 1,9 mm (palm 0,8 mm, fingers 1,1 mm); in the female these numbers are in the same succession 3,6 mm, 2,5 mm, 0,9 mm, 1 mm and 1,4 mm, the chela 2,05 mm (palm 0,9 mm, fingers 1,15 mm).

The merus of the 3rd legs is 5-times, that of the 4th pair 5,5-times as long as broad in the middle.

### **Alpheus crassimanus** Heller

*Alpheus crassimanus* Heller, J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911, p. 417.

4 specimens, among which one adult male, collected by Prof. Sluiter in the Bay of Batavia.

1 male and 1 ova-bearing female, both full-grown, collected by Mr. Rutten at Balikpapan, East-coast of Borneo.

4 specimens, 2 of which are ova-bearing, collected by Mr. van de Sande at the Aru Islands.

The adult male from the Bay of Batavia is 44 mm long from tip of rostrum to end of telson, just as long as the largest female collected by Prof. Kükenthal in the river near Tobelo, Halmahera (J. G. de Man, in: Abhandl. Senckenb. Naturf. Gesellsch. Bd. XXV, 1902, p. 880). The rostrum reaches in this male still a little beyond the 1st joint of antennular peduncle. The antennular peduncle extends beyond that of the upper antennae by the whole length of the 3rd joint of the latter and extends as far forward as the terminal spine of the scaphocerite. The large chela of this male is 25,5 mm long, the palm is 14,5 mm long and 9,5 mm high, these numbers are for the male, long 38 mm, from Balikpapan, in the same succession, 20 mm, 12 mm and 8 mm, for the ova-bearing female, long 38,5 mm, from the Aru-islands 15,5 mm, 10 mm and 7 mm, for the other egg-bearing female, long 28 mm, from the same locality 11 mm, 6,5 mm and 4,75 mm.

General distribution: Djibouti (Cout.); Nicobar Islands (Heller); Indian Archipelago (West-coast of Flores, Timor, Makassar, Palos-bay, North-Ubian, South-coast of Misool, Saleyer, Amboina, Ternate, Halmahera) (de Man).

### **Alpheus macrodactylus** Ortm.

*Alpheus macrodactylus* A. Ortmann, Zoolog. Jahrb. V., Abth. f. Syst. 1890, p. 473, Pl. XXXVI, fig. 10, 10 l.

*Alpheus macrodactylus* J. G. de Man, Mém. Soc. Zoolog. de France, 1898, p. 321, Pl. 4, fig. 4 and Siboga Exped., Monogr. 39a', Family Alpheidae, 1911, p. 330.

3 females, one of which is ova-bearing, from Takao, Formosa.

The ova-bearing specimen is 41,5 mm long from apex of rostrum to tip of telson, the second specimen 37 mm, the third 28,5 mm. The adult male from Hué, Annam, of which I have published a detailed description in 1898 and that belongs to my private Collection, is lying before me: the three specimens fully agree with it. The second female bears still the larger cheliped, which, like in the male, is placed at the left side; the chela is 17 mm long, almost half as long as the body, the fingers just as long as the palm and the latter is 6,4 mm broad or high, the height being a little more than one-third the length; another large chela lies loose in the tube, this chela is 14 mm long, the fingers are also just as long as the palm, which is 5,3 mm high. The specimens have all lost the small cheliped, but one is lying loose in the tube; the chela is 11,5 mm long, fingers 7 mm, palm 4,5 mm and the palm is twice as long as high. Different from the male the fingers shut close together and they are much less hairy on their inner margins; the cutting-edge at the inner side bears along the proximal third 7 or 8 very small acute teeth and 4 or 5 slightly larger teeth occur at the proximal third of the dactylus. The outer surface of the palm bears, in the male, on the upper half parallel with but a little distant from the upper border a shallow longitudinal groove or impression contiguous to the oval impressed line, but fading away before reaching the articulation of the fingers; this shallow groove, which was not described by me in 1898, though it is visible in the figure 4 b, does also exist on the palm of the female.

In the largest female the carpal segments of the right second leg are 2,9 mm, 2,2 mm, 0,7 mm, 0,7 mm, and 1 mm long, the chela 2,12 mm (palm 0,92 mm, fingers 1,2 mm).

The anterior pair of dorso-lateral spinules of the telson are, in the three females, implanted a little before the middle, at a somewhat larger distance from the posterior than from the anterior border, while in the male from Hué the anterior pair is situated just in the middle. Besides from Hué, Annam, this species is also known from Sydney.

#### **Alpheus parvirostris Dana**

*Alpheus parvirostris* J. G. de Man, Siboga Exped., Monogr. 39a', Family Alpheidae, 1911 (text), p. 432, 1915 (plates), Pl. XXIII, Fig. 106, 106a.

1 young male and another specimen, collected by Mr. E. Jacobson at Sinabang, island of Simalur, February 1913, between coral.

The young male is nearly 9 mm long from tip of rostrum to tip of telson. As regards the length of the rostrum, of the antennular and antennal peduncles, the stylocerite and the scaphocerite, it fully agrees with my figure 106 (l. c.), but, measured transversely, the black eyes prove to be one and a half



as broad as the distance between them; the strong spine on the basicerite extends along the proximal fifth part of the 2nd joint of the antennular peduncle and is still a trifle longer than the stylocerite. The 2nd joint of the antennular peduncle, 0,4 mm long and 0,24 mm thick, is a trifle longer than the visible part, long 0,36 mm, of the 1st and one and a half as long as the 3rd joint. The large chela is 4,05 mm long, palm 2,9 mm, fingers 1,15 mm and the palm is 1,7 mm high or broad. The small chela is 2,48 mm long, palm 1,2 mm, fingers 1,28 mm, while the palm is 0,7 mm high; like in the adult male, long 13 mm, collected by the „Siboga“ in the Sulu-archipelago, the fingers are very slightly longer than the palm, but, as regards the relative height of the palm, this young male still agrees with the female, the proportion between the length and the height being as 5:3.

The outer branch of the 2nd pleopod is 0,64 mm long, 0,22 mm broad, 3-times as long as broad; endopodite 0,67 mm long, but implanted at a lower level and therefore appearing shorter, also less broad; appendix interna with well developed cincinnuli, measuring hardly more than one-third of the length of the endopodite, appendix masculina almost half as long as this branch, tipped with 5 or 6 setae that measure two-thirds the length of this appendix and, the two appendices being implanted on the middle of the endopodite, project by more than half their length beyond the tip of the latter.

General distribution: From the Red Sea to Japan, Samoa and New Caledonia.

### **Panulirus dasypus** (Latr.)

*Panulirus dasypus* (Latr.), J. G. de Man, Siboga Exp., Monogr. 39a<sup>2</sup>, 1916, p. 48.

1 male of medium size collected by Mr. G. Herman in Sabang-bay.

This specimen is 162 mm long from the frontal border of the carapace to the end of the telson (carapace 52 mm, abdomen 110 mm) and agrees with the much younger female from Makassar, described l. c. and which is again lying before me, in all respects. According to Prof. A. Gruvel, in: *Annales de l'Institut Océanogr.* T. III, Fasc. IV, Paris 1911, p. 34 are the „Cornes frontales, épines latérales et épines céphalothoraciques comme chez *Burgeri*“ and the male from Sabang-bay, indeed, fully agrees with de Haan's figure of *Panul. Burgeri* on Tab. 43 and 44 of the „Fauna Japonica“ as regards the number, the size and the arrangement of the carapacial spines, while one observes likewise at their base a fringe of short setae, the largest spines excepted. In this connection I wish, however, to observe that H. Milne-Edwards (*Hist. Nat. Crustacés*, II, 1837, p. 300) describes the carapace as „n'ayant guère d'épines que sur la région stomacale“ and that in Gruvel's photograph (Pl. II, fig. 5) the carapacial spines

are rather inconspicuous, especially in front of the cervical groove. As Gruvel has already rightly pointed out, the two species may, however, be easily distinguished, besides by the coloration, at first sight by the different crenulation of the abdominal somites, on which some of the transverse grooves are more or less, though slightly, interrupted in the middle line, which never takes place in *Panul. Burgeri*. So in the male from Sabang-bay the transverse groove on the 2nd and 3rd somite appears interrupted in the middle, though for a very short distance, and on the 5th the groove appears also almost interrupted; the crenulation is much less developed on the dorsal than on the lateral parts of the terga and sometimes the crenulation fades away and fully disappears, like here and there on the 3rd and 5th somite, but in *Panul. Burgeri* this is never observed. In the male from Sabang-bay the 3rd legs reach as far forward as the antennal peduncle and their propodi project by one-fifth their length beyond those of the 2nd pair.

***Scyllarus tuberculatus* (Bate)**

Fig. 18—18c.

*Arctus tuberculatus* C. Spence Bate, Report on the Challenger Macrura, 1888, p. 70, Pl. X, fig. 1, 2.

*Arctus tuberculatus* W. F. Lanchester, in: Proc. Zool. Soc. London 1901, p. 557.

*Scyllarus tuberculatus* J. Pearson, Report Pearl Oyster

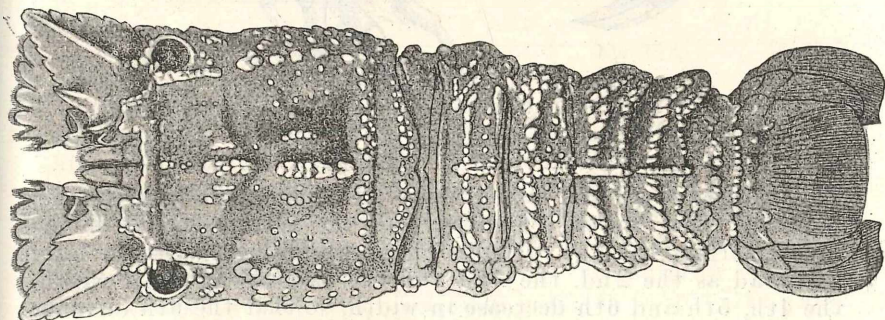


Fig. 18.

Fisheries, Suppl. Report XXIV, On the Macrura, 1905, p. 90.

1 female without eggs from Banka collected 1912 by Mr. H. van der Horst.

This specimen (fig. 18, 18a) is 70 mm long from the anterior border of the carapace to the end of the telson and thus considerably larger than the Challenger types, for which the length of 50 mm has been indicated; the carapace is 22,5 mm long, the abdomen 47,5 mm and the



distance between the antero-lateral angles of the carapace 24,5 mm. This distance is larger than the length of the carapace in the middle line, in Bate's figure 2 these measurements are in the same succession 52 mm and 45 mm. Therefore when Bate describes the carapace as „quadrate, scarcely longer than broad“, he evidently measured the width of the carapace in the middle. Though in my opinion the female from Banka belongs to this species, it presents some differences from Bate's description and figures. The chief difference is presented by the outer antennae. According to Bate's figure 2 the terminal joint was fringed in the Challenger types with 7 prominent cusps, 5 on the anterior and 2 on the inner margin; the 5 anterior are subequal, the outer one not broader than the rest and of the 2 inner cusps the posterior is

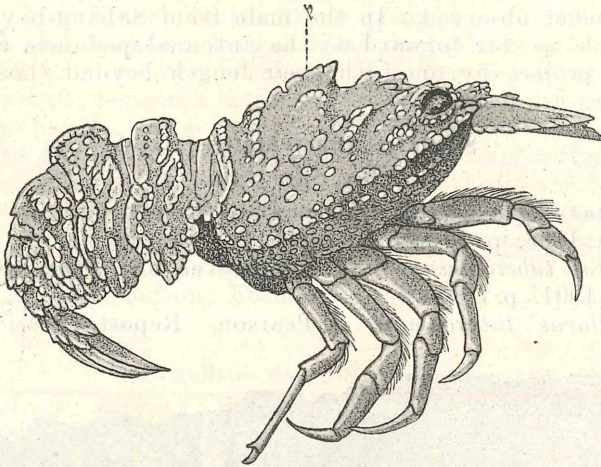


Fig. 18a.

the smallest of all and rather acute. In the female from Banka, however, there are only 6 cusps, 5 on the anterior and 1 on the inner margin; the 1st or outer cusp appears one and a half as broad as the 2nd, the 2nd and the 3rd are of equal width, the 4th, 5th and 6th decrease in width, so that the 6th or inner cusp is the smallest of all and placed more forward than the 7th in Bate's figure; the 1st or outer cusps is broadly rounded, the three following are also obtuse, the 5th and the 6th subacute, the incisions, finally, between the cusps are less deep than in fig. 2 and become gradually deeper from the outer to the inner one. The inner margin of the antepenultimate or outer squame (fig. 18c) is armed with 6 teeth of which the posterior one is a little larger than the following that are equal; the outer margin has 6 or 7 teeth, but the teeth both of the outer and the inner margin are less acute than in Bate's figure 2. In this figure the

strong ridge on the upper surface of this joint runs parallel with the outer margin, but in the female from Banka the ridge diverges distinctly from this margin.

In Bate's figure 1 the tubercles of the median crest appear acute, in the female from Banka obtuse; the anteriorly directed tubercles on the branchial region are also less acute than in the Challenger specimens and likewise the tubercles of the longitudinal crest at the inner side of the eyes, those of the post-cardiac region and of the posterior margin of the carapace are rounded or obtuse.

Like in the specimens from Kelantan, described by Mr. W. F. Lanchester (l. c.), the tubercle on the 3rd abdominal tergum is not so clearly separated from its base as it is in Bate's figure 1 and the tubercle on the 2nd is anteriorly rounded and obtuse.

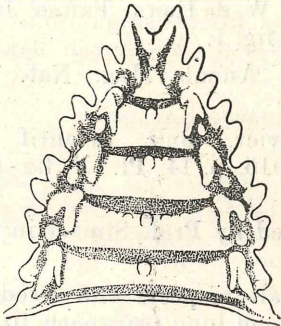


Fig. 18b.

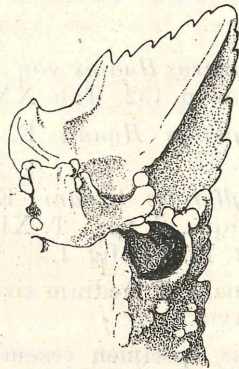


Fig. 18c.

The 1st somite of the abdomen is smooth and covered by the carapace, excepting the slightly elevated posterior margin. Different from the Challenger specimens the terga and pleura of the following somites are more strongly tuberculated, the tubercles flattened, obtuse or subacute, the teeth, finally, on the posterior margin of the somites are contiguous, obtuse and less prominent than in Bate's figure 2. The anterior extremity of the 1st thoracic sternum (fig. 18b) bears a deep triangular notch which is one and a half as broad as deep; the four following thoracic sterna bear each a small, rounded tubercle in the middle line, anteriorly.

Dactylus of the 1st pair of peraeopods a little longer than the propodus, the latter with a small notch or incision on the distal margin of the outer surface. According to Bate's figure 1  $\sigma^{\circ}$  ♀ the immobile finger of the subchelate leg of the 5th pair should be almost as long as the dactylus, in the present female it is hardly half as long as the latter. The pleopoda agree with Bate's description of those of the female.

Excepting the lower surface of the abdomen the whole animal is covered, between the tubercles, with an ash-coloured tomentum, while the tubercles are of a more or less pale reddish colour.

The described differences are, as I suppose, owing to the larger size of this female, though the difference presented by the outer antennae appears, indeed, quite remarkable.

*Scyllarus tuberculatus* Bate was hitherto known from the Sea between New Guinea and Australia, from Kelantan on the east-coast of the Malaysian Peninsula, from Singapore, Ceylon and Japan.

### **Scyllarides Haanii** (von Siebold)

{Fig. 19.

*Scyllarus Haanii* von Siebold, W. de Haan, Fauna Japonica, Crustacea p. 152, Tab. XXXVIII, fig. 1.

*Scyllarus Haanii* E. J. Miers, Annals Mag. Nat. History 1880, p. 37.

*Scyllarides Haani* E. L. Bouvier, Bull. Scientif. France et Belgique, 7. Sér., T. XLVIII, 1915, p. 14, Pl. IV, fig. 1, Pl. V, fig. 1 et Pl. VI, fig. 1.

1 male of medium size collected by Prof. Sluiter in the Bay of Batavia.

This specimen resembles in all respects the cited figures of de Haan and Bouvier and is 24 cm long (carapace 10 cm, abdomen 14 cm), while according to Prof. Bouvier this species



Fig. 19.

attains a length of 50 cm. As regards the characters of the sternum of the 2nd abdominal somite in the male, this species forms a transition between *Scyll. latus* (Latr.) and *Scyll. squamosus* (H. M.-Edw.): while namely in the latter the free border of the sternum does not present the deep and triangular notch, that occurs in *Scyll. latus*, one observes (fig. 19) in the male of *Scyll. Haanii* in the middle line a triangular notch, which, however, is small and hardly deeper than the other incisions between the teeth of the border.

*Scyllarides Haanii* is at present known from Japan, Amboina, the Aru islands and Mauritius.



**Parribacus ursus major** (Herbst)

*Parribacus ursus major* (Herbst), J. G. de Man, Siboga Exped., Monogr. 39a<sup>2</sup>, Part III, Eryonidae etc., p. 93.

1 adult male collected by Mr. Herman in Sabang-bay.

This specimen is 22 cm long from the anterior extremity of the outer antennae to the end of the telson, distance between the antero-lateral angles of the carapace 92 mm. The terminal segment of the external antennae is armed with 8 teeth, the smallest of which is placed on the inner border, one observes moreover on the outer border contiguous to the last tooth 3 much smaller teeth, diminishing gradually in size. The antepenultimate joint is armed with 11 teeth, namely with 8 on the outer border, that increase in size from the 1st or posterior to the 8th at the tip; the latter is immediately followed on the inner border by two teeth, the last, finally, occurs at the postero-internal angle of the joint.

The acute spine on the outer border of the coxa of the 5th legs is well-developed, directed laterally outward and slightly forward.

**Enoplometopus occidentalis** (Randall)

Fig. 20.

Confer: E. I. Bouvier, in: Bulletin Scientif. France et Belgique, 7. Série, T. XLVIII, fasc. 3, 1915, p. 5, fig. 1 of the text and Pl. VII, fig. 1.

One of the 13 young specimens from Amboina, described by me in 1888 under the name of *Enoplom. pictus*, is preserved in my private collection. It is a young female long 42 mm, that shows all the characters mentioned by Professor Bouvier (l. c.) for distinguishing *Enoplom. occidentalis* from *Enoplom. pictus*. The openings of the sexual ducts are already quite distinct; the pleopods of the 1st pair are delicate uniramous appendages, of which the distal joint is constricted into a number of smaller segments like in *Homarus*. The endopodite of the four following pleopods presents an obtuse prominence on the inner border not far from the base, but there is no appendix interna.

According to Miss Rathbun (The Brachyura and Macrura of the Hawaiian Islands, 1906, p. 900) the carapace should bear in Randall's type specimen 6 median spines, the posterior one behind the cervical suture, while the anterior one should be broken off and probably the smallest of all. In the young female from Amboina there are only 5 median spines, which in a lateral view slightly decrease in size from the anterior one to the posterior one, that is placed immediately behind the cervical suture; I observe, however, just in front of the anterior spine a small low tubercle that is tipped with 2 or 3 long setae, reaching nearly to the middle of the rostrum. Lateral row composed of 5 spines, the 1st or posterior one immediately behind the antepenultimate

spine of the median row, the 3rd immediately behind the 5th or anterior of the latter, the 4th at the level of the orbital margin and a little farther distant from the 3rd as the 2nd from the 3rd or the 1st, the 5th or anterior on the rostrum opposite the middle of the eyes, the 4th also a little farther distant from the 3rd than from the 5th; the 4th and the 5th are placed nearer to the midline of the carapace than the 3 posterior pairs that slightly converge backward. At the outer side of the 4th lateral a somewhat larger supraocular spine occurs. Of the lateral margins of the rostrum the left is armed with 3, the right with 4 spines. From the 1st or posterior spine of the middle row a smooth ridge proceeds to the posterior margin of the carapace. Immediately behind the 1st, the 2nd and the 3rd pair of legs the sternum (fig. 20) bears a vertical plate that ends

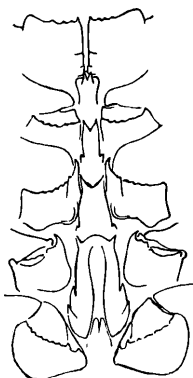


Fig. 20.

in two acute spines, while one observes at the base of the lateral margins of the 2nd and 3rd plates a smaller acute tooth; between the legs of the 4th and the 5th pair is placed a rectangular piece, about twice as long as broad, a little less broad anteriorly than posteriorly and the upper lateral margins of which are armed each with 3 spines, 2 posteriorly behind one another, the 3rd much smaller at the antero-lateral angle; this piece is deeply hollowed out, the opening being longitudinal, somewhat broader anteriorly than in the middle and posteriorly where one observes two obtuse contiguous teeth or prominences.

In the anterior legs the fingers are slightly longer than the palm, dactylus with 3 spines, only on the distal fourth. Upper and lower surface of palm and fingers without tubercles.

I would finally remark that Bouvier erroneously considers the figure in Kingsley's paper (Bullet. Essex Institute, XIV, 1884, p. 131, Pl. II, fig. 1) as that of Randall's type: Kingsley indeed emphasizes that he did not succeed, when at work at the collections of the Philadelphia Academy, in finding again the type.

### Explanation of the Plates.

Fig. 1—1b. *Penaeopsis monoceros* (Fabr.). 1 Petasma of the largest male from West-Nias, viewed from behind,  $\times 5$ ; 1a thelycum of the largest female from the same locality,  $\times 5$ ; 1b petasma of a male, long 85 mm, from Sinabang, viewed from behind,  $\times 5$ .

Fig. 2, 2a. *Penaeopsis affinis* (H. M.-Edw.). Thelycum of the two adult females from Deli, Sumatra,  $\times 4$ .

Fig. 3—3f. *Penaeopsis brevicornis* (H. M.-Edw.). 3 carapace of the largest female from Bagan Api Api,  $\times 1\frac{1}{2}$ ; 3a caudal fan of this female,  $\times 3\frac{1}{3}$ ; 3b petasma of the male, long 78 mm, from the same locality, viewed from behind,  $\times 6$ ; 3c thelycum of the female, long 74 mm, 3d that of the largest female,  $\times 4$ ; 3e petasma of the young male from the Bay of Batavia, viewed from behind,  $\times 6$ ; 3f third pereopod of the largest female,  $\times 2$ .

Fig. 4—4d. *Penaeopsis Lysianassa* (de Man). 4 Petasma of the male from Bagan Api Api, viewed from behind,  $\times 6$ ; 4a thelycum of the female, long 30 mm, from Samarang,  $\times 10$ ; 4b thelycum of an adult female, long 60 mm, from the Mergui Archipelago (cotype out of my private collection)  $\times 6$ ; 4c distal part of telson of the young female from Samarang,  $\times 25$ ; 4d the same of the female from Mergui,  $\times 14$ .

Fig. 5—5c. *Penaeopsis assimilis* de Man. 5 Petasma of an adult male, viewed from behind,  $\times 17$ ; 5a extremity of the left branch of the petasma of another specimen,  $\times 50$ ; 5b thelycum of adult female,  $\times 17$ , a leg of 3rd, b that of 5th pair; 5c telson of adult male,  $\times 17$ , the pubescence has not been figured.

Fig. 6, 6a. *Penaeopsis* sp.  $\alpha$ . 6 Petasma viewed from behind,  $\times 17$ ; 6a left branch, viewed from before,  $\times 50$ .

Fig. 7—7a. *Penaeopsis Borradailei* de Man. 7 fourth abdominal somite of the male from the Little Sunda-Islands,  $\times 17$ ; 7a petasma of this specimen, viewed at somewhat obliquely from behind, so that the left branch becomes visible,  $\times 17$ .

Fig. 8. *Parapenaeopsis sculptilis* (Heller). Carapace of the adult female from Deli,  $\times 1\frac{1}{2}$ .

Fig. 9—9e. *Parapenaeopsis gracillima* Nobili. 9 carapace etc. of a male, long 70 mm, from Bagan Api Api,  $\times 2\frac{2}{3}$ ; 9a rostrum of this specimen,  $\times 6$ ; 9b carapace of an adult female, long 100 mm,  $\times 2\frac{2}{3}$ ; 9c carapace of the hermaphrodite specimen,  $\times 2\frac{2}{3}$ ; 9d petasma of the male, long 70 mm, viewed from behind,  $\times 6$ ; 9e first leg of an adult female,  $\times 4$ .

Fig. 10. *Heteropenaeus longimanus* de Man. Thelycum of the female from Ternate,  $\times 6$ .

Fig. 11—11f. *Processa Jacobsoni* de Man. 11 anterior part of carapace, the eyes etc,  $\times 22$ ; 11a lateral view of the same,  $\times 33$ ; 11b posterior angle



of 5th abdominal pleuron,  $\times 33$ ; 11c telson,  $\times 22$ ; 11d right, 11e left leg of 1st pair,  $\times 17$ ; 11f ischium of 2nd leg,  $\times 33$ .

Fig. 12—12e. *Synalpheus Sluiteri* de Man. 12 anterior part of carapace with the antennal and antennular peduncles,  $\times 20$ ; 12a telson,  $\times 20$ ; 12b right, 12c left basicerite,  $\times 66$ ; 12d large cheliped,  $\times 10$ ; 12e dactylus of 3rd leg,  $\times 50$ .

Fig. 13. *Synalpheus Theophane* de Man var. Carpus and chela of large cheliped,  $\times 10$ .

Fig. 14. *Alpheus splendidus* Cout. Anterior part of carapace and peduncles of the type specimen, collected at Djibouti, from the Paris Museum,  $\times 6$ .

Fig. 15—15e. *Alpheus gracilipes* Stimpson. 15, 15a anterior part of carapace etc. of the two largest females from Sinabang,  $\times 10$ ; 15b, 15c large cheliped of the female, figured in fig. 15, viewed from the outer respectively the inner surface,  $\times 8$ ; 15d, 15e small cheliped of this female, viewed likewise from both surfaces,  $\times 8$ .

Fig. 16, 16a. *Alpheus brevisrostris* (Oliv.) var. *angustodigitus* de Man. 16 carapace etc. of the female from Java,  $\times 4$ ; 16a small cheliped of this specimen,  $\times 4$ .

Fig. 17, 17a. *Alpheus eurydactylus* de Man. 17 dactylus of the small chela of the male,  $\times 6$ ; 17a small chela of the female,  $\times 6$ .

Fig. 18—18c. *Scyllarus tuberculatus* (Bate). 18, 18a the female from Banka viewed from above and laterally,  $\times 2$ ; 18b sternum,  $\times 2\frac{2}{3}$ ; 18c outer antenna,  $\times 3\frac{1}{3}$ .

Fig. 19. *Scyllarides Haanii* (von Siebold). Denticulate margin of the sternum of the male from the Bay of Batavia,  $\times 1\frac{1}{3}$ .

Fig. 20. *Enoplometopus occidentalis* (Randall). Sternum of a young female from Amboina, one of the 13 specimens described by me in 1888 (Archiv für Naturg., Jahrg. 53, p. 486), under the name of *En. pictus*,  $\times 7$ .



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