

(Hoffmann, 1874), Marsouins River, Saint Benoît, rivulet near Saint Benoît and Étang du Gol, Réunion (J. Roux, 1934), Black River, W. Mauritius and Creoles River, E. Mauritius (Richters, 1880), Bambous, Mauritius (Ward, 1942), Rodriguez (Miers, 1879, 1880), ? Pondicherry (Nobili, 1903), ? Calcutta (Henderson, 1893), Lolomboli, near Gunungsitoli, Nias (Nobili, 1900), Buabua, Enggano, off W. Sumatra (Nobili, 1900), Semangka Bay, S. Sumatra (Miers, 1880), Java (Heller, 1862, 1865; Koningsberger, 1913), Bali (J. Roux, 1930), Lombok (J. Roux, 1930), Pajeti and Karoni, Sumba (J. Roux, 1928a), Rivers near Berit, near Reo and near Raka-mbaha, Flores (De Man, 1892), Ba and Dona Rivers near Ende, Flores (De Man, 1892), Maumere, Flores (De Man, 1893), Besar Island (= Groot Bastaard), off N.E. Flores (De Man, 1893), Nargi River near Konga, E. Flores (De Man, 1892), Adonara Island, E. of Flores (Von Martens, 1868), Tanamerah, Adonara Island, E. of Flores (De Man, 1892), Koinino River near Kupang, Timor (De Man, 1892), North Celebes (Thallwitz, 1892), Menado, N. Celebes (Schenkel, 1902), Lolak River, E. of Menado, N. Celebes (Schenkel, 1902), Enrekang, S.W. Central Celebes (Schenkel, 1902), River near Parepare, S.W. Celebes (De Man, 1892), Tjenrana River near Pampanua, S.W. Celebes (De Man, 1892), Bonea River, Salajar (De Man, 1892), N. Halmahera (De Man, 1902), Oba, Halmahera (De Man, 1902), Ternate (De Man, 1902), Kajeli, Buru (J. Roux, 1928a), Tuba River and rivulet near Keratu, Ceram (J. Roux, 1923), Amboina (De Man, 1888; Ortman, 1894), between Warkar and Waor, Groot Kai, Kai Islands (J. Roux, 1919), Enralang, Groot Kai, Kai Islands (J. Roux, 1919), Waiho, Wai La and Wai Meniel Rivers, Waigeo (J. Roux, 1923), Sorong, Doom Island, N.W. New Guinea (J. Roux, 1933), Etna Bay, S.W. New Guinea (Holthuis, 1949), between Walckenaer and Tanamerah Bays, N. New Guinea (De Man, 1915), Klipong River, E. of Tanahmerah Bay, N. New Guinea (J. Roux, 1917), Moso River, N. New Guinea, near the frontier with Papua (J. Roux, 1917), Oinaké River, N. New Guinea (De Man, 1915), Rigo, near Port Moresby, Papua (Nobili, 1899), Poulos and Metavoi, New Hanover (J. Roux, 1934a), Beilifu and near Medina, New Ireland (J. Roux, 1934a), Sydney (Heller, 1865), ? Marshall Islands (Ortman, 1891), Samoa (Miers, 1880), Tahiti (Guérin, 1838), Faarapa and Vaituoru Papenoo Rivers, Tahiti (Nobili, 1907), Omoa Valley, Fatuhiva, Marquesas Group (Adams, 1935), Vaitumata Valley, Hivaoa, Marquesas Group (Adams, 1935), Hakahetau Valley, Uapou, Marquesas Group (Adams, 1935).

Macrobrachium aemulum (Nobili)

Palaemon (*Parapalaemon*) *aemulus* Nobili, 1906a, Bull. Mus. Hist. nat. Paris, vol. 12, p. 258.

Palaemon (*Parapalaemon*) *aemulus* Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 362, pl. 1 fig. 5.

Palaemon nobilii Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 295, pl. 17 fig. 6.

Palaemon (*Parapalaemon*) *aemulus* J. Roux, 1926, Nova Caledonia, Zool., vol. 4 pt. 2, p. 221, figs. 47-51.

non *Palaemon* (*Parapalaemon*) *aemulus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 157, pl. 40.

The present species of which no material is at my disposal, is characterized by the slender second legs, which have the carpus distinctly longer than the merus, by the short rostrum, which has the first four or five teeth placed behind the posterior orbital margin and by the large chelae of the males, which have the fingers provided with two or three teeth in the proximal part of the cutting edges.

The species was described first by N o b i l i (1906a, 1907), while R o u x (1926) gave additional details. H e n d e r s o n and M a t t h a i (1910) described a new species of *Palaemon* from South India, which in all respects agrees with N o b i l i's species, which is known from New Caledonia and the Tuamotu Islands. The size of the specimens is the same (those of N o b i l i are: ♂ 64 mm, ♀ 58 mm; those of H e n d e r s o n & M a t t h a i: ♂ 64 mm, ♀ 54.5 mm; according to J. R o u x the species may attain a size of 82 mm). The rostral formula according to J. R o u x is $\frac{4-5}{1-3} \frac{10-13}{2}$, the specimens of H e n d e r s o n & M a t t h a i have the formula $\frac{4-5}{2} \frac{10-12}{2}$, the rostrum in *aemulus* as well as in *nobilii* does not reach beyond the end of the antennular peduncle. The relations between the joints of the second leg agree also in the two forms, only the larger chelipede in H e n d e r s o n & M a t t h a i's male seems to be less developed than in the males of about the same size in J. R o u x's and N o b i l i's material; the relation between the lengths of the joints in H e n d e r s o n & M a t t h a i's male specimen perfectly agrees with that of the male specimen of 65 mm from Plaine des Lacs mentioned by R o u x. The two forms therefore can not be kept separate and are considered here to belong to one species, which of course has to bear the name *Macrobrachium aemulum* (Nobili).

The specimen referred by B o o n e (1935) to the present species certainly is no *Macrobrachium aemulum*, but belongs to *Macrobrachium novae-hollandiae* (De Man).

Distribution: This freshwater species is recorded in literature from: Walajabad, Chingleput District, S.E. India (H e n d e r s o n & M a t t h a i, 1910), numerous localities in New Caledonia (J. R o u x, 1926), Gavatake, Tuamotu Islands (N o b i l i, 1906a, 1907).

Macrobrachium naso (Kemp)

Palaemon naso Kemp, 1918, Rec. Indian Mus., vol. 14, p. 91, pl. 25 figs. 1-5.

The position of this species is still somewhat dubious, as it is based on material in which no ovigerous females were present and in which the males never had the chelae longer than the body, though the appendix masculina was well developed. We therefore still are ignorant if the specimens described by K e m p have attained their final shape or that they are not yet fullgrown. I provisionally follow K e m p in considering the specimens to be adult. No material of the species is at my disposal.

The species is only known from the region of Inlé Lake, Central Burma.

Macrobrachium palaemonoides nov. spec. (fig. 31)

Museum Leiden

Laut Tawar, Lauo Lake, N. Simalur, off Westcoast of Sumatra; fresh water; August, 1913; leg. E. Jacobson; cotypes. — 63 specimens (including 2 ovigerous females) 9-30 mm.

The rostrum (fig. 31a) is elongate and slender, it reaches with up to $\frac{1}{5}$ of its length beyond the scaphocerite. The distal half of the rostrum is curved upwards. The upper margin bears 5 to 7 teeth, the two subapical teeth not included. 1 or 2 of the proximal dorsal teeth are placed on the carapace behind the posterior margin of the orbit, the teeth are regularly divided over the proximal half of the upper margin of the rostrum, while there is a large gap between the last of these proximal teeth and the first subapical tooth; in some specimens the last proximal tooth is situated more anteriorly, sometimes even so far, that it divides the distance between the first subapical tooth and

the penultimate proximal tooth into two equal parts, which are of course much larger than the distances between the proximal teeth mutually. Two small subapical teeth are present on the dorsal margin of the rostrum. The lower margin bears 6 to 9, generally 7 or 8, teeth, which are regularly divided over the distal part of the lower margin. The carapace is smooth and shining. The antennal spine is placed somewhat below the rounded lower orbital angle. The hepatic spine is about as strong as the antennal and is placed much below and behind it. The branchiostegal groove is sharply defined, it commences at the anterior margin of the carapace, then it runs backwards closely below the hepatic spine and continues some distance behind that spine, curving at last ventrally and then it gradually disappears: in this respect *M. palaemonoides* differs from all other species examined by me, as in the latter the branchiostegal groove runs straight towards the hepatic spine and can not be seen continuing behind that spine.

The abdomen is smooth. All segments have the tips of the pleurae rounded. The sixth abdominal segment is elongate, it is twice as long as the fifth.

The telson is as long as or slightly shorter than the sixth abdominal segment. The dorsal surface bears the usual two pairs of spines in the middle and at $\frac{3}{4}$ of its length. The posterior margin of the telson ends in a sharp and elongate median point, which is flanked at each side by two spines, the inner of which is very long and slender, with the tip curved somewhat outwards and far overreaches the median point of the telson. The outer spines are very short. Between the two inner spines two feathered setae are present.

The eyes are normal, the cornea is about as long as and broader than the stalk. An ocellus is present.

The antennulae are normal in shape too. The anterolateral spine of the basal segment reaches to or slightly beyond the anterior margin of the segment. In older specimens it even is overreached by that margin.

The scaphocerite (fig. 31b) is about thrice as long as broad. The outer margin is straight or somewhat concave. The final tooth is rather strong and is distinctly overreached by the lamella, which is somewhat anteriorly produced.

The oral parts are quite typical and show no differences with those of the other species of *Macrobrachium*.

The first pereopods (fig. 31c) reach with part of the fingers only beyond the scaphocerite. The chela is rather robust, being slightly broader than the distal part of the carpus. The fingers are as long as or slightly longer than the palm. The carpus is twice as long as the chela and almost 1.5 times as long as the merus. The ischium measures $\frac{2}{3}$ of the length of the merus. The second legs (fig. 31d) are smooth and slender, being about as thick as the first legs but longer. They reach with the chela and up to $\frac{1}{3}$ of the carpus beyond the scaphocerite. The fingers are distinctly longer than the palm, measuring about $\frac{7}{5}$ of its length; both in lateral and in dorsal view the fingers are somewhat narrowed a little distance above the base, and are broadest at $\frac{3}{4}$ of their length. The cutting edges of both fingers are entire. The carpus is 1.8 times to twice as long as the chela and about 1.5 times as long as the merus; the ischium is as long as or even slightly longer than the merus. No difference in the shape of the second legs of the males and the females or in the right and left legs could be observed. The last three pereopods are very long and slender. The third leg (fig. 31e) reaches only with the tip of the dactylus beyond the scaphocerite. The propodus is twice as long as the dactylus, and distinctly less than twice as long as the carpus. The merus is almost as long as the propodus and

the dactylus combined. The ischium is half as long as the merus. The fourth and fifth leg (figs. 31f, g) are conspicuously longer than the third, they reach with half the propodus or more beyond the scaphocerite. In the fifth leg the propodus is fully thrice as long as the dactylus and fully twice as long as the carpus. The merus is slightly shorter than the propodus, while the ischium is about half as long as the merus. The propodi of the last three legs bear the usual posterior spines, while those of

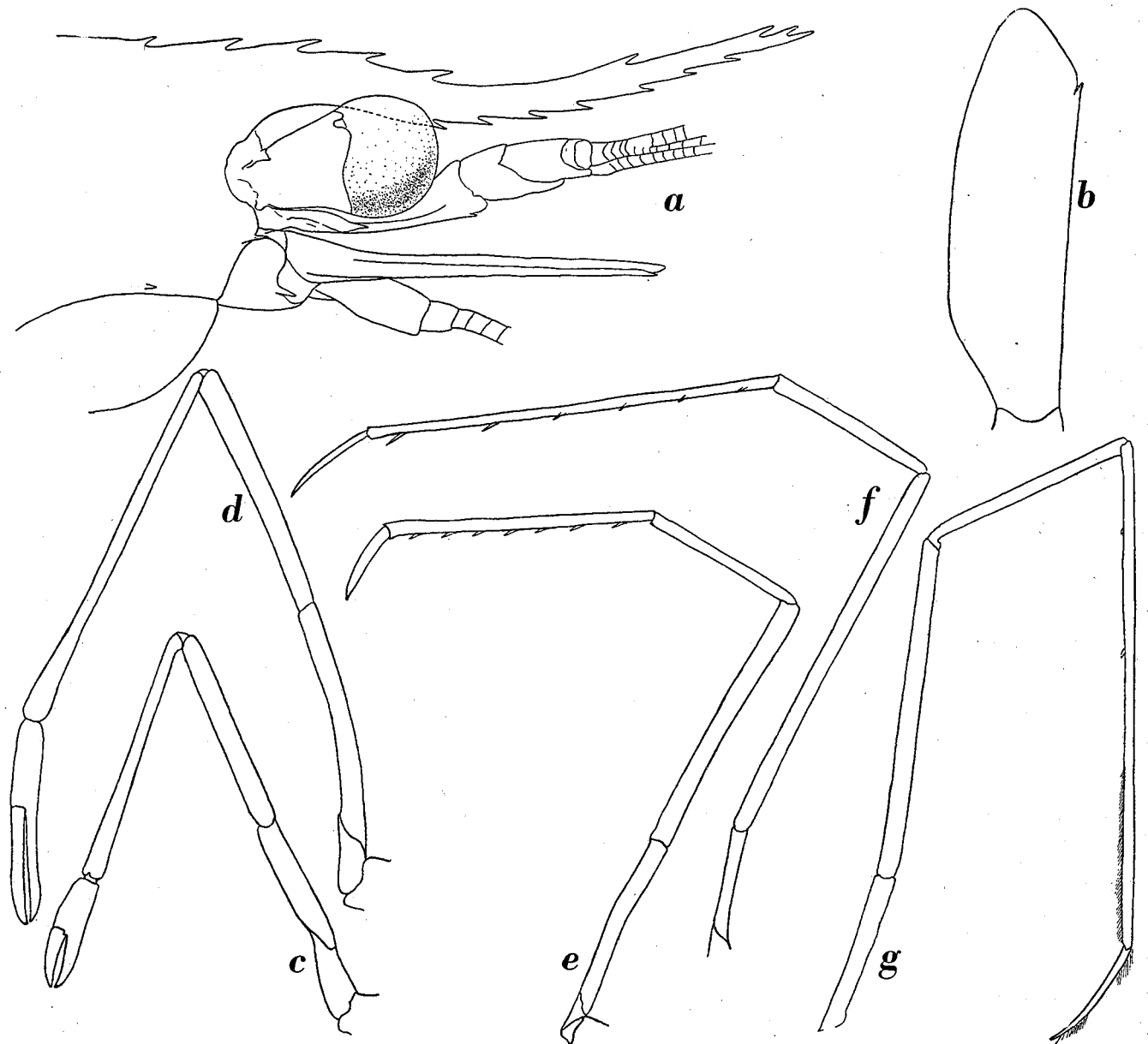


Fig. 31. *Macrobrachium palaemonoides* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, second pereiopod; e, third pereiopod; f, fourth pereiopod; g, fifth pereiopod. a-g, $\times 12$.

the fifth legs have the distal transverse rows of hairs, which also are present in the other species of the present genus.

The pleopods are long, but quite normal in shape. In the males the appendix masculina is well developed, it is longer than the appendix interna of the second pleopod. The endopod of the first pleopod of the males is ovate with the inner margin concave and without a trace of an appendix interna.

The uropods reach distinctly beyond the end of the telson, they are elongate and slender, but of the normal construction.

The eggs are rather numerous and large for the small species, they are 0.50 to 0.65 mm in diameter.

In my opinion the present specimens are full grown, though no certainty can be obtained in this respect, as the presence of ovigerous females in the material, though being an indication in favour of my supposition, is no proof of its correctness, because in several species of *Macrobrachium* not full grown females are observed carrying ova.

The present species in all probability is most closely related to *M. lamarrei* and *M. lanchesteri*, with both species it has the slender shape of the body in common, but it may immediately be separated from them by the shape of the rostrum and the last three legs.

Macrobrachium lanchesteri (De Man)

Palaemon paucidens Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568, pl. 33 fig. 4. (non De Haan, 1841).

Palaemon (Eupalaemon) Lanchesteri De Man, 1911, Notes Leyden Mus., vol. 33, p. 264.

Palaemon lanchesteri Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 257.

Macrobrachium lanchesteri Suvatti, 1937, Check-List aq. Fauna Siam, p. 49.

Palaemon lanchesteri Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 340.

The present species for the first time was described by L a n c h e s t e r under the name *Palaemon paucidens*, which name, however, is preoccupied by the names *Palaemon paucidens* De Haan (1841) and *Palaemon paucidens* Hilgendorf (1893a). Therefore D e M a n (1911) proposed the new name *Palaemon (Eupalaemon) Lanchesteri* for it. I have seen no material of this species, for the description of which I refer to L a n c h e s t e r's (1901) and K e m p's (1918a) papers.

Distribution: *Macrobrachium lanchesteri* is known from fresh water in the Malay Peninsula and Siam. Records in literature are: Singgora, Siamese Malay States (L a n c h e s t e r, 1901), Tale Sap, Siamese Malay States (K e m p, 1918a), Klong Nakorn Noi and Tadi Stream, Ban Ta Yai, Nakorn Sritamarat (S u v a t t i, 1937), Nong Mong, Krabin, Siam (S u v a t t i, 1937), Bangkok, Siam (S u v a t t i, 1937), Nontaburi, Siam (S u v a t t i, 1937). T i w a r i (1949) recorded the species from India (Baroda State and Nagpur).

Macrobrachium superbum (Heller)

Palaemon superbus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 528.

Palaemon superbus Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 118, pl. 10 fig. 10.

Palaemon superbus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 713.

non *Palaemon (Eupalaemon) superbus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.

Palaemon superbus p.p. Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 319, pl. 13 figs. 34, 35 (non 36, 37).

non *Palaemon (Eupalaemon) superbus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 81, pl. 4 fig. 2.

Macrobrachium superbus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

non *Palaemon superbus* Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolga Sta., vol. 9, p. 2.

Palaemon superbus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 269.

non *Palaemon superbus* Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 46, pl. 2 fig. 17.

non *Palaemon superbus* Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 43, fig. 1.

non *Palaemon superbus* Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 55.

non *Palaemon superbus* Birstein, 1941, Life Freshwater U.S.S.R., vol. 1, p. 424.

The synonymy of *Macrobrachium superbum* is very confused. Heller described and figured the species after a specimen from Shanghai. Ortmann (1891) inserted the species in his list, without giving new data. Coutière (1901), who was able to examine Heller's type specimen, identified some specimens from Madagascar with Heller's species. In his paper Coutière gives measurements and figures of both the type specimen and his own material. In my opinion Coutière incorrectly identifies his Madagascar and Zanzibar material with Heller's species. In all Coutière's specimens, according to the description and figures, more than two teeth are present in the proximal part of the cutting edges of the fingers, while in the type of *P. superbus*, which is larger than any of Coutière's specimens, both fingers bear one scarcely visible tooth and Yu (1931) even states of his Chinese material that no teeth are present at all. Furthermore the second legs of *M. superbum* are smooth as is stated by Coutière for the type and by Yu for his Chinese specimens, while Coutière in his other material found "une fine spinulation" on the second legs. Also the difference in length between the carpus and merus of the second leg is much larger in *M. superbum* than in Coutière's Madagascar specimens, while also the fingers of the second leg in *M. superbum* generally are much longer in relation to the palm than those of the specimens of Coutière. In my opinion Coutière's specimens are nothing else but not full grown specimens of *Macrobrachium scabriculum* (Heller) (cf. p. 226).

The specimens described and figured by Parisi (1919) under the name *Palaemon superbus* from S. China, certainly do not belong here, as is already pointed out by Yu (1931, p. 271). In my opinion the specimens are females of *Macrobrachium nipponense* (cf. p. 173).

As is pointed out on p. 196, also the specimens from S.E. Siberia identified by Derjavin (1930), Buldovsky (1933) and Birstein & Vinogradov (1934) with "*Palaemon superbus*", do not belong to the present species, but in all probability are specimens of *Macrobrachium asperulum* (Von Martens).

Distribution: The only genuine specimens of *Macrobrachium superbum* mentioned in literature are the type recorded by Heller (1862a, 1865) from Shanghai, which also was described and figured by Coutière (1901), and the specimens mentioned by Yu (1931), which originated from Ihing and Soochow. The species thus is only known at present from a very restricted area.

Macrobrachium minutum (J. Roux) (fig. 32)

Palaemon minutus J. Roux, 1917, Nova Guinea, vol. 5, p. 599, pl. 27 figs. 1-3.

Museum Amsterdam

Western part of Sentani Lake, N. New Guinea; April 17, 1903; New Guinea Expedition, 1903; cotypes of *Palaemon minutus* J. Roux. — 5 specimens (included 2 ovigerous females) 29-47 mm. Sentani Lake, N. New Guinea; June 28, 1903; New Guinea Expedition, 1903; cotype of *Palaemon minutus* Roux. — 1 specimen 27 mm.

The following details may be added to Roux's description:

The third tooth of the rostrum (fig. 32a) often is placed just over the posterior limit of the orbit. The hepatic spine is placed obliquely behind the antennal, the direction of the hepatic spine lies in the same line as that of the antennal.

In contradistinction to Roux's description I find the surface of the abdomen and telson perfectly smooth. The sixth abdominal segment is about 1.5 times as long as the fifth. The pleurae of the fifth segment are rather acutely pointed.

The telson is somewhat longer than the sixth abdominal segment. The dorsal spines are placed as usual in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in a sharp median point, which is flanked with the common two pairs of spines, the inner of

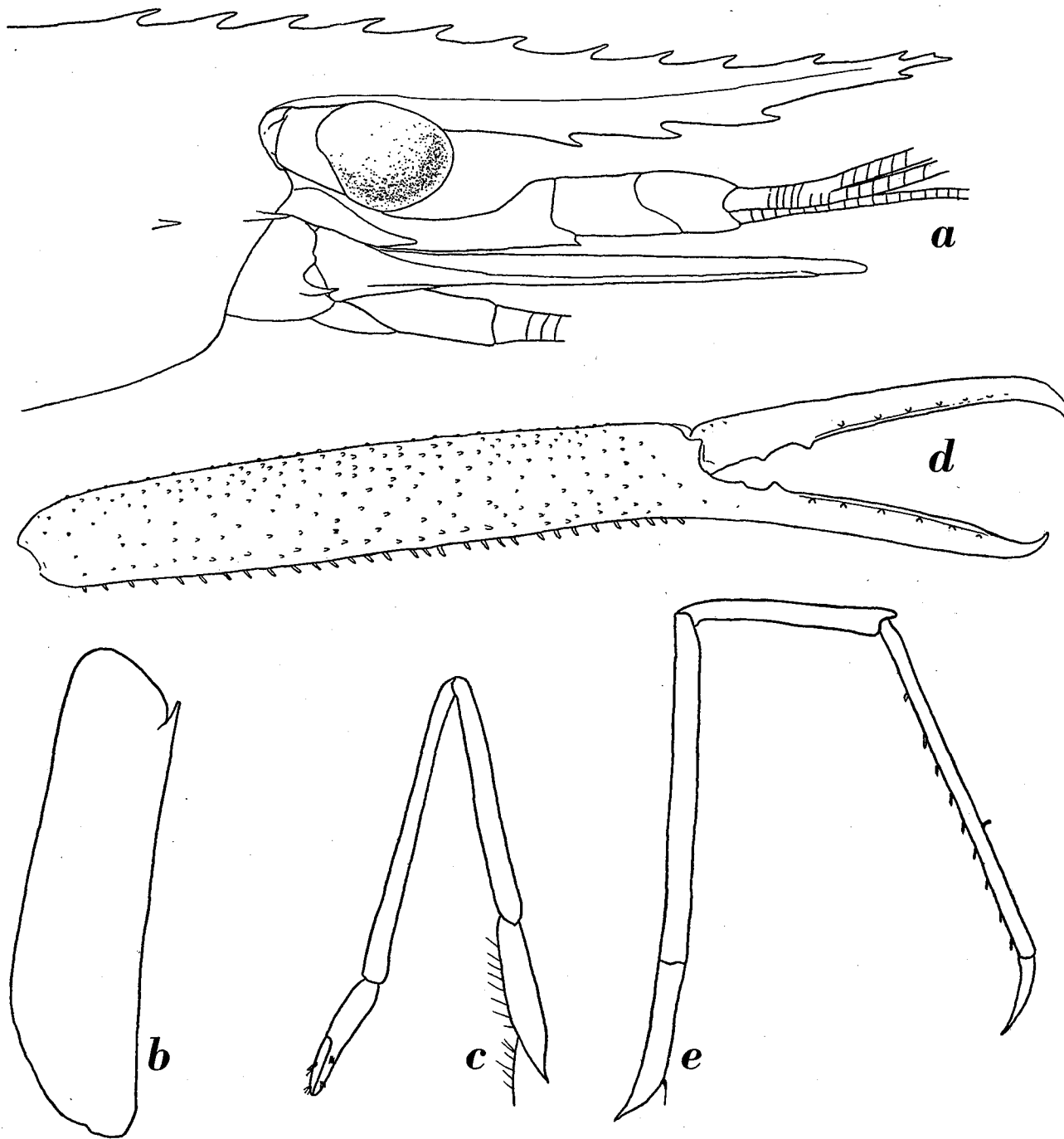


Fig. 32. *Macrobrachium minutum* (J. Roux). a, anterior part of body in lateral view; b, scaphocerite; c, first pereopod; d, chela of second pereopod; e, third pereopod. a-e, $\times 10$.

which is longest and reaches distinctly beyond the apex of the telson, between these two inner spines some 5 feathered setae are present.

The eyes are large, with the cornea slightly shorter and distinctly broader than the stalk. An ocellus is present.

The antennular peduncle is quite typical in shape.

The scaphocerite (fig. 32b) has the outer margin somewhat concave, the final tooth is strong, but it is distinctly overreached by the lamella.

The oral parts are quite typical.

The first pereopods (fig. 32c) reach with the entire chela beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela, the merus is $\frac{4}{5}$ of the length of the carpus. The ischium is about half as long as the carpus. In one of the large chelae of the second leg of the male the fingers are $\frac{2}{3}$ as long as the palm, while in the other they are slightly more than half as long as the palm. In the larger chela at my disposal (fig. 32d) at both sides of the cutting edges of the fixed finger and of the dactylus a row of distinct blunt tubercles is visible. In the leg figured by Roux, which is smaller than the just mentioned pereopod, these tubercles are few in number and not very distinct. The last three legs are slender, they reach with about half the propodus beyond the scaphocerite. In most specimens the last three pereopods are more or less damaged. In none of the specimens the dactylus of the third leg is present. The propodus of the third pereopod (fig. 32e) has the posterior margin provided with about ten rather small spinules. The carpus is distinctly more than half as long as the propodus. The merus is slightly shorter than the propodus, the ischium is about half as long as the merus. The fifth pereopod is much more slender than the third. The dactylus is elongate. The propodus is about five times (not 10 times as stated by Roux) as long as the dactylus, it is very narrow and bears some very small spinules along the posterior margin, which in the distal part bears the usual transverse rows of setae. The carpus is slender too, measuring slightly more than half the length of the merus. The merus is almost as long as the propodus, but is stronger. The ischium is less than half as long as the merus.

The endopod of the first pleopod of the male is typical in shape, it is elongate ovate, with the inner margin concave. The other pleopods too do not differ from the usual type.

The uropods are elongate, their shape is normal.

As already remarked by J. Roux, the present species, by the presence of the very long carpus in the second leg of the adult males belongs to the group of *Macrobrachium idae*. From both *Macrobrachium idae* and *M. idella* it may be distinguished at once by the presence of tubercles along the cutting edge of the fingers of the large chelae of the adult male; moreover the legs are more slender and the carapace and abdomen of the adult specimens show no tubercles.

Distribution. The species is only known from the specimens dealt with here, which all have been collected in Sentani Lake in N. New Guinea, in fresh water.

Macrobrachium idae (Heller) (fig. 33)

- Palaemon Idae* Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 416, pl. 2 figs. 40, 41.
 ? *Palaemon Idae* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 39.
Palaemon Idae Hilgendorf, 1869, Von der Decken's Reise O. Afr., vol. 3 pt. 1, p. 102, pl. 6 fig. 5.
 ? *Palaemon Idae* Von Martens, 1876, Preuss. Exped. Ost Asien, Zool., vol. 1, p. 199.
Palaemon Idae Richters, 1880, Beitr. Meeresf. Maur. Seych., p. 166.
Palaemon idae Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 717.
Palaemon Idae Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 437 footnote.
Palaemon cf. *idae* Ortmann, 1894, Denkschr. med-naturw. Ges. Jena, vol. 8, p. 18.
Palaemon (Eupalaemon) idae De Man, 1897, Zool. Jb. Syst., vol. 9, p. 767.
Palaemon (Eupalaemon) ritsemæ De Man, 1897, Zool. Jb. Syst., vol. 9, p. 774.
Palaemon (Eupalaemon) ritsemæ De Man, 1898, Zool. Jb. Syst., vol. 10, p. 707; pl. 37 fig. 70.
Palaemon (Eupalaemon) idae Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 28.

- Palaemon* (*Eupalaemon*) *Idae subinermis* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 237.
Palaemon (*Eupalaemon*) *Mariae* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Ritsemæ* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Idae* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon (*Eupalaemon*) *Mariae* Coutière, 1900a, Bull. Mus. Hist. nat. Paris, vol. 6, p. 24.
Palaemon (*Eupalaemon*) *Idae* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 480.
Palaemon (*Eupalaemon*) *Idae* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 303, pl. 12
 figs. 29-31.
Palaemon *Idae inermis* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, pp. 304, 306.
Palaemon *Ritsemæ* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 314, pl. 13 figs. 32, 33.
Palaemon (*Eupalaemon*) *robustus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 771,
 pl. 24 fig. 48.
Palaemon (*Eupalaemon*) *idae* Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 379.
 ? *Palaemon* *Idae* Nobili, 1905a, Ann. Mus. nat. Hung., vol. 3, p. 481.
Palaemon (*Eupalaemon*) *idae* Borradaile, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 12, p. 67.
Palaemon (*Eupalaemon*) *ritsemæ* Borradaile, 1907, Trans. Linn. Soc. Lond., Zool., ser. 2 vol. 12,
 p. 67.
 non *Palaemon* *idae* Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 285, pl. 15 fig. 3, pl.
 16 fig. 3.
Palaemon (*Eupalaemon*) *idae* Lenz, 1910, Voeltzkow's Reise O. Afrika, vol. 2, p. 567.
Palaemon (*Eupalaemon*) *ritsemæ* Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 927.
 ? *Palaemon* (*Eupalaemon*) *ritsemæ* J. Roux, 1931, Rev. Suisse Zool., vol. 38, p. 43.
Palaemon (*Eupalaemon*) *idae* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 533.
Palaemon (*Eupalaemon*) *ritsemæ* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 534.
Palaemon (*Eupalaemon*) *cognatus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 223, figs. 6-8. (non
Palaemon cognatus J. Roux, 1927).
Palaemon *idae* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon *idae* Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Palaemon *idae* Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon *idae* Chopra, 1943, Indian Sci. Congr., vol. 30 pt. 2 sect. 6, p. 5.
Palaemon *idae* Nataraj, 1947, Rec. Indian Mus., vol. 45, p. 89, figs., 1, 2.

Museum Leiden

Java; leg. P. Bleeker. — 2 specimens 63 and 76 mm.

Museum Amsterdam

Atjeh (= Achin); leg. capt. Storm; coll. J. G. de Man; cotypes of *Palaemon ritsemæ* De Man. —
 2 specimens (1 ovigerous female) 45 and 51 mm.

Java Sea; leg. capt. Storm; coll. J. G. de Man. — 1 specimen 77 mm.

The specimen of the Amsterdam Museum from the Java Sea formed part of the material described by De Man (1897) as *Palaemon idae*. De Man's description is very extensive, while Coutière (1901) also provided important data concerning the present species. The following details, however, may be useful:

The pleurae of the sixth abdominal segment end in a blunt apex. The sixth segment is slightly longer than the fifth and is about $\frac{2}{3}$ of the length of the telson. The apex of the telson bears numerous setose hairs, its shape and armament is just like those of the allied species.

The scaphocerite (fig. 33a) is only slightly narrower anteriorly than posteriorly. The outer margin is only faintly convex, the final tooth is small and is overreached by the lamella.

The oral parts are typical.

The pleopods are normal in shape.

The specimens reported upon by Von Martens (1868) under the name *Palaemon Idae* at least partially do not belong to that species. Von Marten's material originated from Java, from Singapore and from the Philippines. The description of the specimens, however, is insufficient for recognizing the species, to which they belong. So for instance Von Martens states that in his specimen from Java, an adult male of 115 mm length, the dactylus of the larger leg bears anteriorly of the large proximal tooth 12 smaller teeth, while in the fixed finger the cutting edge distally of the large tooth is entire. This character certainly is never shown by *M. idae*, while in *M. australe*, which has the cutting edges of the fingers of the large legs provided with many denticles, always both cutting edges are denticulate and never only one; it is possible, however, that the denticles of Von Marten's description are nothing else but tubercles, which are placed alongside the cutting edge. Of the specimen from Singapore Von Martens remarks that it closely resembles *Palaemon*

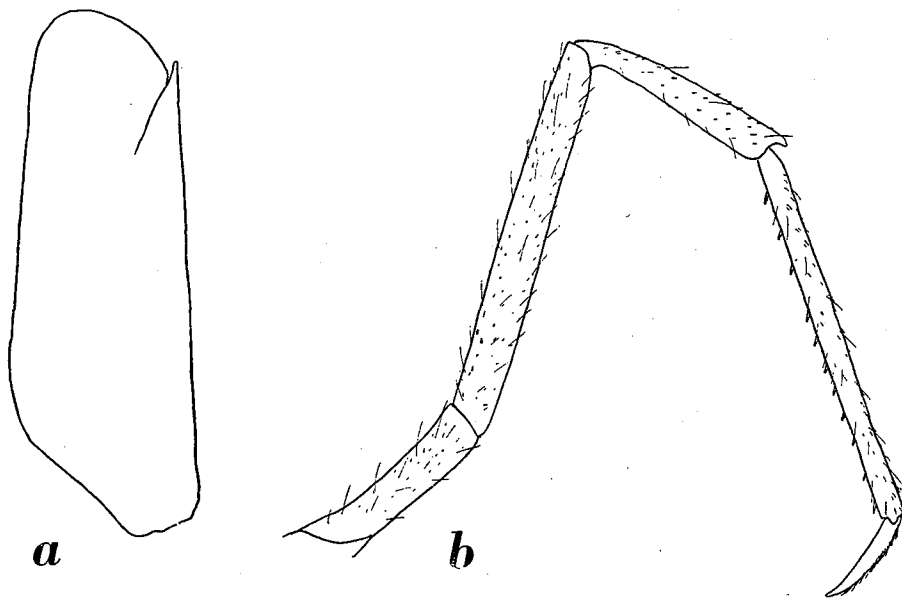


Fig. 33. *Macrobrachium idae* (Heller). a, scaphocerite; b, third leg. a, b, $\times 5$.

equidens Dana; it is of course very well possible that the specimen really belongs to that species, but no certainty can be obtained.

Palaemon ritsemae De Man is based on material of the present species, which contains no adult males, the largest male according to De Man being 45 mm. Some of the females of that lot of specimens were ovigerous, the smallest ovigerous female, however, being 50 mm long. A male and a female specimen of the cotypes of *Palaemon ritsemae* are at my disposal. Comparison of these specimens with specimens of *Macrobrachium idae* at my disposal showed, that the two forms in all respects resemble each other, except for the shape of the second legs. The rostrum of *P. ritsemae* has exactly the same shape as that of *M. idae*, while *P. ritsemae* also has the very slender posterior legs in common with *M. idae* and differs in this respect from allied species as *M. australe* and *M. equidens*. The differences in the relations between the lengths of the joints of the second legs of *Palaemon ritsemae* and *M. idae* are only due to age. Of *M. idae* only large specimens are at my disposal, while in literature too almost exclusively measurements of adult males of *P. idae* are given. Coutière (1901), however, had a rather large material of *P. idae* and *P. ritsemae* at his disposal. His specimens

of *P. idae* generally are larger than those of *P. ritsemae*, at least the second pereopods of the latter species are shorter (48-100 mm in length) than those of the former species (70-195 mm). The measurements given by Cou ti è r e of his material distinctly shows that the two forms are connected by gradual transitions. So in the small specimens of *P. idae* the carpus is only slightly longer than the chela (27 against 25 mm, 28 against 26.5, and 22 against 20 mm), while this also is the case in the larger specimens of *P. ritsemae* (32.5 against 31, 28 against 27.5, 26 against 25 mm). In the larger specimens of *P. idae* the carpus becomes much longer in relation to the chela (71 against 55, and 47 against 39.5 mm), in *P. ritsemae* the carpus becomes slightly shorter than the chela in small specimens (11 against 12, 19 against 21 mm). The relation between the length of the palm and that of the fingers also gradually changes with age, in large *P. idae* the palm is almost or entirely twice as long as the fingers, in smaller specimens it is about 1.5 times as long as the fingers. In large specimens of *P. ritsemae* in Cou ti è r e's material this relation is 1.4, in the smaller 1.2. As in all other characters there is the closest resemblance between the two forms, we confidently may accept their identity. This also is confirmed by the fact that Cou ti è r e's material of *P. ritsemae* as well as that of *P. idae* originated from the same locality, namely the Ivaloina River on Madagascar. In Calm a n's (1913) material the same may be found: his smaller specimens entirely agree with those described by Cou ti è r e as *P. ritsemae*, while the largest male chelipede in his collection (123 mm long) agrees good with that of the large specimens of *P. idae* of Cou ti è r e. Calm a n already pointed to the large resemblance of his specimens with *P. idae*, but he thinks them nevertheless distinct from that species as the carapace has the surface smooth or provided with "very minute and inconspicuous traces of spinules". Now, as is well known and is pointed out by many authors, the spinulation of the carapace in many species is characteristic for the adult males, sometimes large females bear such spinules too, but they always are absent in young specimens. The time at which the spinulation appears in the males generally is very variable. Probably therefore Calm a n's specimens were too young to be provided with such spinules. Calm a n's observations thus confirm my supposition that *P. ritsemae* is nothing else but a juvenile stage of *Macrobrachium idae*. The specimens from S. India mentioned by J. Rou x (1931) under the name *Palaemon (Eupalaemon) ritsemae* probably do not belong to the present species as Rou x describes the ultimate portion of the rostrum to be devoid of teeth, which certainly is not the case with either the adult or young specimens of *M. idae*, also the fact that only 6-8 teeth are present on the upper margin of the rostrum is an indication that these specimens belong to another species, but I cannot conclude from Rou x's description which species that may be.

Palaemon robustus, a form from Halmahera, described by De M a n as a new species also undoubtedly belongs to *Macrobrachium idae*. De M a n himself already pointed out that the species shows such a large resemblance to *P. ritsemae*, that it probably had to be considered an older stage of that species, he therefore gave the new name *robustus* only provisionally. The only differences between *P. ritsemae* and *P. robustus* namely are:

1. *P. robustus* is considerably larger than *P. ritsemae*.
2. The second legs of *P. robustus* are much stronger than those of *P. ritsemae*.
3. The movable fingers of the second legs of *P. robustus* are covered with felt-like hairs, which are absent in *P. ritsemae*.

All these three differences are due to the fact that *P. robustus* is an older stage of *P. ritsemae*. Comparing De M a n's description and measurements of *P. robustus* with those of Cou ti è r e

concerning *P. idae* and *P. ritsemae*, we must come to the conclusion that the three species are identical. The feltlike hairs on the movable finger of the large chela of the adult male and those along the cutting edge of the fixed finger are well shown in older specimens of *Macrobrachium idae*. Also the shape of the rostrum and the elongate last three pereopods as described for *P. robustus* are characteristic for *M. idae*.

The specimens recorded by N o b i l i (1905a) from Stephansort and assigned by him to the present species, according to the rostral formula $\frac{1) 3+1}{3}$ seem to belong to a different species, but too little characters are given by the Italian author to make the identity of his specimen certain.

In 1927 J. R o u x described a new species *Palaemon (Eupalaemon) cognatus* from the Mamberamo river in Dutch North New Guinea, after a young and imperfect male specimen. The identity of this new species or its place among the other species can not be made out from R o u x's description. In 1934 R o u x described and figured adult material of a *Macrobrachium* species from Manus, Admiralty Islands as belonging to *Palaemon cognatus*. From this description and the figures it at once is clear that the specimens belong in reality to *Macrobrachium idae*, with which species they agree perfectly in the shape of the rostrum, in the situation of the hepatic and antennal spines in the shape and relation of the lengths of the various joints of the second legs, in the pubescence of the fingers of those legs in the adult male and in the slender last three pairs of pereopods. I think it very improbable that the type specimen of *P. cognatus* too belongs to *M. idae* as the rostrum is of an entirely different shape. *P. cognatus* must be considered a species incerta.

Distribution: This freshwater species (the only record from salt water is that of D e M a n, 1897, from the Java Sea) is known from the following localities: Zanzibar (H i l g e n d o r f, 1869), ? Dar-es-Salaam (O r t m a n n, 1894), Seychelles (R i c h t e r s, 1880), Côte d'Or, Praslin, Seychelles (B o r r a d a i l e, 1907), Cascade River, Mahé, Seychelles (B o r r a d a i l e, 1907), Madagascar (C o u t i è r e, 1900, 1901), Majunga, N.W. Madagascar (L e n z, 1905), Fiherenga River near Tulear, S. Madagascar (J. R o u x, 1934), Ankarimbela, S. Madagascar (L e n z, 1910), Manambato, N.E. Madagascar (C a l m a n, 1913), Ambilo, E. Madagascar (C a l m a n, 1913), Ivaloina River near Tamatave, E. Madagascar (C o u t i è r e, 1900, 1901), Tamatave (C a l m a n, 1913; J. R o u x, 1934), Ivondro, E. Madagascar (C a l m a n, 1913), Vatomandry, E. Madagascar (J. R o u x, 1934), Mauritius (R i c h t e r s, 1880), Mudumalai, Mysore Plateau, S. India? (J. R o u x, 1931), Pikara River near Teppakadu and Aliyar River near Malayandi Pattanam, S. India? (J. R o u x, 1931), Travancore, S. India (N a t a r a j, 1942, 1947), Singapore? (V o n M a r t e n s, 1868), Laguna de Bay, Luzon, Philippines? (V o n M a r t e n s, 1868, 1876), Albay and Camarines Sur, S. Luzon? (V o n M a r t e n s, 1868), Borneo (H e l l e r, 1862), Atjeh, N. Sumatra (D e M a n, 1897), Sibolga, westcoast of Sumatra (N o b i l i, 1900), Java Sea (D e M a n, 1897), Java? (V o n M a r t e n s, 1868), Kau and Tobelo, Halmahera (D e M a n, 1902), Stephansort, N. Papua? (N o b i l i, 1905a), San Guisepe River near Innawi, Meheo District, Papua (N o b i l i, 1899), Buboi, N.E. Manus, Admiralty Islands (J. R o u x, 1934a).

Macrobrachium idella (Hilgendorf)

Palaemon mossambicus Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34. (non Hilgendorf, 1879).

Palaemon (Eupalaemon) idae idella Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 29, fig. A.

Palaemon (Eupalaemon) multidentis Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.

Palaemon (Eupalaemon) multidentis Coutière, 1900a, Bull. Mus. Hist. nat. Paris, vol. 6, p. 23.

Palaemon multidentis Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 327, pl. 14 fig. 40.

Palaemon (Eupalaemon) multidentis Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 9.

Palaemon idae Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 285, pl. 15 fig. 3, pl. 16 fig. 3.

The present species has been described as *Palaemon multidentis* by Coutière (1901) after a juvenile specimen. Henderson & Matthai (1910) gave an extensive description of adult specimens of this species, which they considered to belong to *Macrobrachium idae*. There is indeed a close resemblance between these two forms and perhaps *M. idella* must be considered only a variety of *M. idae* as is done by Hilgendorf. The main difference between the two species is that the rostrum in *M. idae* bears 9 to 11 dorsal teeth of which almost constantly three are placed behind the posterior limit of the orbit, while in *M. idella* the upper margin of the rostrum is provided with 12 to 17 (seldom 11) teeth of which almost constantly only 2 are placed behind the posterior orbital margin. In most other respects there is a close resemblance between the two forms. In adult males of both, the anterior part of the carapace, the abdominal pleurae, the sixth abdominal segment and the dorsal surface of the caudal fan are beset with numerous small tubercles. The shape of the second pereopods of the adult male of the present species is extensively dealt with by Henderson & Matthai (1910). Comparing the measurements of the second leg of the adult male of this species given by Henderson & Matthai with those of *M. idae* given by other authors, it is distinct that in *M. idella* the carpus of the large second pereopod in relation to the chela generally is shorter, though in large specimens it becomes longer than the chela too; this feature also is shown by Hilgendorf's specimens. The chela in *M. idella* is more slender than in *M. idae*. According to Hilgendorf the eggs of the present species are large, differing in this respect from those of *M. idae*, Henderson & Matthai do not mention anything about the size of the ova of their material.

Hilgendorf's description and figure of *Palaemon idae* var. *idella* in all respects agrees with Henderson & Matthai's *Palaemon idae*. The only difference is the fact that Hilgendorf's specimens are much smaller than those of the British carcinologists, but the latter authors mention that in their material some specimens were present which were much smaller than the others and nevertheless showed adult characters. Comparison of material from both localities is very desirable.

Hilgendorf pointed out that at least part of the specimens reported upon by Pfeffer (1889) as *Palaemon mossambicus* in reality belongs to the present species.

Distribution: The species lives in fresh water and is recorded in literature from: Pond near Matomondo, Unguu, Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Uzaramo, Tanganyika (Hilgendorf, 1898), ? Mbusini, Uzeguhu, Rukagura River, Tanganyika (Pfeffer, 1889), arm of Onilahy River, W. Madagascar (Coutière, 1900, 1901), Mangalore, S. Canara District, S.W. India (Henderson & Matthai, 1910), Calicut and Palghat, Malabar District, S.W. India (Henderson & Matthai, 1910), Kottayam, Travancore, S.W. India (Henderson & Matthai, 1910), Koll Lands and Cochin, Cochin State, S.W. India (Henderson & Matthai, 1910), Pondicherry, S.E. India (Nobili, 1903).

Macrobrachium mammilodactylus (Thallwitz) (fig. 34)

- Palaemon idae mammilodactylus* Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-1891 pt. 3, p. 15.
- Palaemon* (*Eupalaemon*) *Wolterstorffi* Nobili, 1900a, Boll. Mus. Zool. Anat. comp. Torino, vol. 15 n. 379, p. 1.
- Palaemon* (*Eupalaemon*) *wolterstorffi* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 368.
- Palaemon philippinensis* Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D., p. 340, pl. 2 fig. 2.
- Palaemon* (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 590.
- Palaemon* (*Eupalaemon*) *philippinensis* J. Roux, 1921, Nova Guinea, vol. 13, p. 593.
- Palaemon* (*Parapalaemon*) *lorentzi* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 596.
- Palaemon* (*Eupalaemon*) *philippinensis* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 5.
- Palaemon* (*Eupalaemon*) *sundaicus* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 6.
- Palaemon philippinensis* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
- ? *Palaemon talaverae* Blanco, 1939, Philipp. Journ. Sci., vol. 69, p. 168, pl. 2.
- non *Palaemon philippinensis*, Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 10, textfigs. 3, 4, pl. 1 fig. d.

Snellius Expedition

Beo, Talaud Islands; fresh water; June 14-21, 1930. — 1 specimen 108 mm.

Museum Amsterdam

- Rivulet near Ga, Waigeo; January 4, 1910; leg. L. F. de Beaufort. — 1 specimen 72 mm.
- Wai Meniel River, Waigeo; January 5, 1910; leg. L. F. de Beaufort. — 3 specimens 97-137 mm.
- Lorentz River, S. W. New Guinea; May 7 and 14, 1907; New Guinea Expedition, 1907. — 21 specimens (included 2 ovigerous females) 44-83 mm (1 specimen bopyrized).
- Lorentz River, S. W. New Guinea; September 3, 16 and 20, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909. — 8 specimens (included 2 ovigerous females) 56-99 mm (1 specimen bopyrized).
- Creek near Lorentz River, S. W. New Guinea; May 12 and 14, 1907; New Guinea Expedition, 1907. — 26 specimens (included 1 ovigerous female) 50-93 mm.
- Alkmaar, Upper Lorentz River; November 1909; New Guinea Expedition, 1909; cotype of *Palaemon lorentzi* Roux. — 1 specimen 57 mm.
- Verlaten Bocht, Lorentz River, S. W. New Guinea; May 31, 1907; New Guinea Expedition, 1906-1907. — 2 specimens 65 and 70 mm.
- Pandanus Creek, Lorentz River, S. W. New Guinea; May 15 and September 17, 1907; New Guinea Expedition, 1906-1907. — 12 specimens 56-98 mm.
- Bivak Island, Lorentz River, S. W. New Guinea; September 10, 1912; New Guinea Expedition, 1912. — 5 specimens 36-74 mm.
- Regen, Island, Lorentz River, S.W. New Guinea; October 10, 1909; New Guinea Expedition, 1909. — 1 ovigerous female 86 mm.

The present species has been extensively described by Cowles (1914). The following details may be added:

The scaphocerite (fig. 34a) is somewhat less than thrice as long as broad. The external margin is convex or almost straight. The lamella distinctly overreaches the final tooth.

The oral parts are typical in shape.

The first pereopod (fig. 34b) reaches with $\frac{1}{3}$ to $\frac{1}{2}$ of the length of the carpus beyond the scaphocerite. The fingers are as long as the palm (in the specimen from the Talaud Islands only one of the first legs is present, this leg has the fingers $\frac{2}{3}$ as long as the palm). The carpus is somewhat

more than twice as long as the chela, the merus is about $\frac{3}{4}$ of the length of the carpus, the ischium is about half as long as the merus. The second pereiopod is extensively described by Cowles and J. Roux. The third pereiopod (fig. 34c) reaches with a small part of the propodus beyond the scaphocerite. The propodus is about 3.5 times as long as the dactylus, its posterior margin bears a row of about 10 spinules. The carpus is somewhat longer than half the propodus. The merus is of about the same length as the propodus. The ischium is slightly shorter than the carpus. The fifth pereiopod reaches less far forward than the third. The propodus in the fifth leg is four times as long as the dactylus, it is provided at the posterior margin with scattered spinules and distally with transverse rows of hairs. The carpus is more than half as long as the propodus. The merus is distinctly shorter than the propodus. The ischium is about half as long as the merus. In adult males the merus, carpus and propodus of the last three legs are covered with minute spinules, which are packed closest together at the carpus.

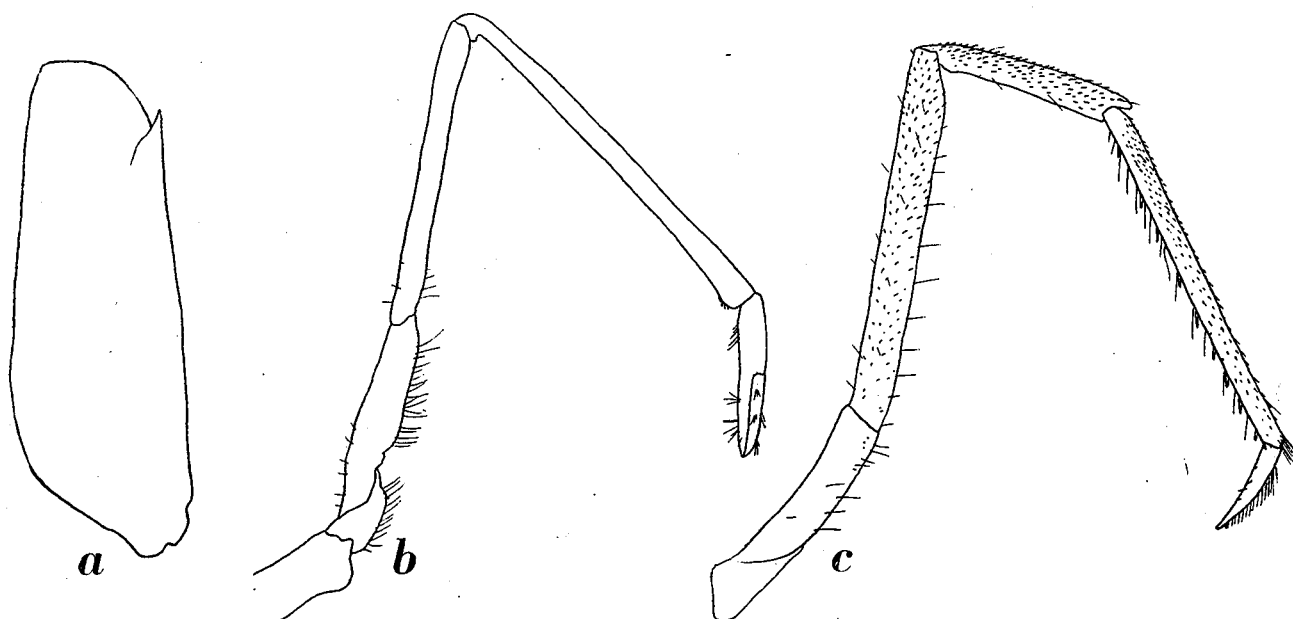


Fig. 34. *Macrobrachium mammilodactylus* (Thallwitz). a, scaphocerite; b, first pereiopod; c, third pereiopod. a-c, $\times 4$.

The pleopods are normal in shape.

The present species was first described by Thallwitz (1892), who considered it a variety of *Macrobrachium idae*. Thallwitz's clear description, in which the most important characters of the species are mentioned, distinctly shows the identity of his species with "*Palaemon philippinensis*" Cowles, which was extensively described and figured by Cowles from the Philippines. Thallwitz's name is older than that of Cowles, so that the present species must be named *Macrobrachium mammilodactylus* (Thallwitz).

Nobili (1900a) described a new species of "*Palaemon*" from Surabaya, E. Java, which he named *P. Wolterstorffi*. His description is rather short and certainly insufficient to identify the species, but in 1908 De Man gave additional details of Nobili's type specimen, which make it possible to identify *P. wolterstorffi* with the present species. In all respects namely there is the closest resemblance between the present specimens and the two descriptions given of *P. wolterstorffi*; the characters concerning the shape of the rostrum and that of the second pereiopods being the most important. It is strange, however, that Nobili's specimen should originate from Java,

as up till now *M. mammillodactylus* has not yet been recorded from the western and southern part of the Malay Archipelago, and certainly not from Java, the carcinological fauna of which island is rather well known. Is it possible, however, that N o b i l i ' s specimen was wrongly labelled.

Palaemon talaverae Blanco (1939) is based on immature specimens (17-35 mm long) of a species of *Macrobrachium*; it in all probability belongs to the present species.

The specimens reported upon by K u b o (1940) under the name *Palaemon philippinensis* from the Riu-kiu Islands certainly do not belong to the present species, since Dr. K u b o states the tubercles along the cutting edges to be absent. It is possible that his material consists of females and "mâles féminisés" of *Macrobrachium formosense* Bate, the more so as in one of the localities from where K u b o obtained his "philippinensis" material also a large male of *M. formosense* (= *Palaemon longipes*) was found.

The specimen from Ga, Waigeo and many specimens from S.W. New Guinea were identified by Dr. J. R o u x (1921, 1923) as *Palaemon sundaicus*. Examination of these specimens, all being females or young males, showed, however, that they in reality are *M. mammillodactylus* (vid. also under *M. equidens*, p. 170).

A damaged specimen of the present species from Alkmaar (S.W. New Guinea), was identified by J. R o u x (1921) with *Palaemon lorentzi* J. Roux (cf. p. 214).

Distribution: The species is only known from fresh water, it is recorded in literature from: Luzon (T h a l l w i t z, 1892), San Juan River, near Manila (C o w l e s, 1915; E s t a m p a d o r, 1937), ? Sampaloc Lake, San Pablo, Laguna Province, Luzon (B l a n c o, 1939), Surabaya, E. Java ? (N o b i l i, 1900a; D e M a n, 1908a), North Celebes (T h a l l w i t z, 1892), Wai-Meniél River, Waigeo (J. R o u x, 1923), Lorentz River, S.W. New Guinea (J. R o u x, 1921), Alkmaar, Upper Lorentz River, Bivak Island in, and creek near Lorentz River, S.W. New Guinea (J. R o u x, 1921).

Macrobrachium rude (Heller)

Palaemon rudis Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.

Palaemon rudis Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 114.

Palaemon (s.s.) *Mossambicus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 839, pl. 4 fig. 17.

? *Palaemon mossambicus* p.p. Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.

Palaemon rudis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 716.

Palaemon mossambicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 741.

Palaemon rudis Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 440 footnote.

Palaemon mossambicus Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 29.

Palaemon (*Eupalaemon*) *rudis* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.

Palaemon (*Eupalaemon*) *rudis* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 288, pl. 12 figs. 23, 24.

Palaemon (*Eupalaemon*) *Alcocki* Nobile, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 9, fig. 5.

Palaemon (*Eupalaemon*) *rudis* Nobile, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 11.

Eupalaemon rudis Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 41.

Palaemon rudis Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 291, pl. 17 fig. 5.

Eupalaemon rudis Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.

Palaemon rudis Kemp, 1915, Mem. Indian Mus., vol. 5, p. 268.

Palaemon mossambicus Colosi, 1918, Monit. zool. Ital., vol. 29, p. 105.

- Palaemon rudis* Balss, 1930, *Ergebn. Biol.*, vol. 6, p. 318.
Palaemon (Eupalaemon) rudis J. Roux, 1934, *Faune Colon. Franç.*, vol. 5, p. 531.
Palaemon rudis Sewell, 1934, *Rec. Indian Mus.*, vol. 36, p. 55.
Palaemon rudis Menon, 1938, *Proc. Indian Acad. Sci.*, vol. 8B, p. 288, figs. 1-20.
Palaemon rudis Chopra, 1939, *Journ. Bombay nat. Hist. Soc.* vol. 41, p. 223, pl. 2 fig. 2.
Palaemon rudis Chopra, 1943, *Indian Sci. Congr.*, vol. 30 pt. 2 sect. 6, p. 4.
Palaemon (Eupalaemon) rudis Vatova, 1943, *Thalassia*, vol. 6 pt. 2, p. 13, pl. 1 fig. 3.

Distribution: This species, which is not represented in the collections studied, is recorded from: Juba, Somaliland (Colosi, 1918; Vatova, 1943), Tanga on Sigli River, Tanganyika (Hilgendorf, 1898), Zanzibar? (Hilgendorf, 1898), Mbusini, Uzeguha, Rukagura River, Tanganyika? (Pfeffer, 1889), Kingani, Bagamoyo District, Tanganyika (Hilgendorf, 1898), Mozambique (Hilgendorf, 1879), Quelimane, Portuguese E. Africa (Hilgendorf, 1879), Durban (Stebbing, 1908, 1910), Madagascar (Coutière, 1900, 1901; J. Roux, 1934), Bemazaka, Ambongo, W. Madagascar (J. Roux, 1934), Ernakulam, Cochin State, S. India (Menon, 1938), Ceylon (Heller, 1862a, 1865), Pondicherry (Nobili, 1903), Madras (Henderson & Matthai, 1910), Cocanada (Henderson & Matthai, 1910), several localities in Chilka Lake (Kemp, 1915), vicinity of Calcutta (Kemp, 1915; Sewell, 1936), Ganges (Nobili, 1903).

Macrobrachium sintangense (De Man)

- Palaemon (Eupalaemon) elegans* De Man, 1892, *Weber's Zool. Ergebn.*, vol. 2, p. 440, pl. 26 fig. 36. (non *Palaemon elegans* Rathke, 1837).
Palaemon elegans Ortmann, 1894, *Denkschr. med.-naturw. Ges. Jena*, vol. 8, p. 18.
Palaemon (Eupalaemon) sintangensis De Man, 1898a, *Notes Leyden Mus.*, vol. 20, p. 138, pl. 6.
Palaemon nipponensis Lanchester, 1901, *Proc. zool. Soc. Lond.*, 1901 pt. 2, p. 566: (non De Haan, 1849).
Palaemon (Eupalaemon) elegans De Man, 1902, *Abh. Senckenb. naturf. Ges.*, vol. 25 p. 764.
Bitbynis (Eupalaemon) elegans Rathbun, 1910, *Bull. Mus. comp. Zoöl. Harvard*, vol. 52, p. 316.
Palaemon elegans Koningsberger, 1913, *Java zoöl. biol.*, p. 401.
Palaemon elegans Kemp, 1918a, *Mem. Asiat. Soc. Bengal*, vol. 6, p. 264.
Palaemon (Eupalaemon) elegans J. Roux, 1932, *Arch. Hydrobiol.*, suppl. vol. 11, p. 569.
Palaemon (Eupalaemon) sundaicus bataviensis J. Roux, 1933, *Rés. sci. Voy. Pr. Belg. Ind. or.*, vol. 3 pt. 14, p. 5.
Palaemon (Eupalaemon) elegans J. Roux, 1933, *Rés. sci. Voy. Pr. Belg. Ind. or.*, vol. 3 pt. 14, p. 5.
Macrobrachium elegans Suvatti, 1937, *Check-List aq. Fauna Siam*, p. 49.

Museum Leiden

- Belawan Deli, Eastcoast of Sumatra; June, 1927; leg. P. Buitendijk. — 2 specimens 46 & 54 mm.
 Weltevreden, near Batavia, W. Java; in a small rivulet; November 15, 1917; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 41-62 mm.
 River near Depok, between Batavia and Buitenzorg; September, 1929; leg. P. Buitendijk. — 5 specimens 28-52 mm.
 Buitenzorg, W. Java; 1888-1889; leg. M. Weber; cotypes of *Palaemon elegans* De Man. — 4 specimens (1 ovigerous female) 46-58 mm.
 Buitenzorg; 1893-1894; leg. W. Kükenthal. — 1 specimen 53 mm.
 Buitenzorg; May, 1909; leg. H. H. van der Weele. — 5 specimens 30-52 mm.
 Buitenzorg; April, 1922, February, 1927, September, 1927, July, 1930, October, 1930; leg. P. Buitendijk. — 20 specimens (3 ovigerous females) 25-53 mm.
 Buitenzorg; in ponds of the Botanical Gardens; July, 1925; leg. P. Buitendijk. — 7 specimens (3 ovigerous females) 28-52 mm.

- West Java; in river; February, 1929; leg. P. Buitendijk. — 1 specimen 40 mm.
 Malang, E. Java; fresh water; leg. P. Buitendijk. — 4 specimens (1 ovigerous female) 42-61 mm.
 Pasuruan, northcoast of E. Java; August, 1926; leg. P. Buitendijk. — 4 specimens 50-60 mm.
 Besuki, northcoast of E. Java; 1865; leg. J. Semmelink. — 1 specimen 47 mm.
 Java; leg. P. Bleeker. — 3 specimens (2 ovigerous females) 39-63 mm.
 Sintang, Central Borneo, basin of Kapuas river; Borneo Expedition, 1894; cotypes of *Palaemon sintangensis* De Man. — 11 specimens (3 ovigerous females) 26-57 mm.

Museum Amsterdam

- Deli, N. E. Sumatra; 1913, Januari, 1915; leg. L. P. de Bussy. — 59 specimens (including ovigerous females) 19-64 mm.
 Sungai Putih, near Serdang, near Medan, N.E. Sumatra; September 10, 1909; leg. van Dedem. — 19 specimens (including ovigerous females) 34-52 mm.
 Gunungsahilan, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 2 specimens 23 and 24 mm.
 Tanahabang, Weltevreden near Batavia; fresh water; March 2, 1908; leg. P. N. van Kampen. — 37 specimens (12 ovigerous females) 23-56 mm.
 Rawa Tjerut, Bekasi near Batavia; July, 1908; leg. E. Jacobson. — 7 specimens (1 ovigerous female) 22-39 mm.
 Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon elegans* De Man. — 10 specimens (3 ovigerous females) 44-55 mm.
 Buitenzorg; July, 1904; leg. K. Kraepelin. — 4 specimens (1 ovigerous female) 13-44 mm. (dry).
 Buitenzorg. — 43 specimens (2 ovigerous females) 29-52 mm.
 Sinagar, near Sukabumi, W. Java; 1888-1889; leg. M. Weber; cotypes *Palaemon elegans* De Man. — 6 specimens 21-58 mm.
 Bandung, W. Java; leg. Huysmans. — 7 specimens (3 ovigerous females) 41-66 mm.
 Panarukan, northcoast of West Java; 1928; leg. J. Verwey. — 1 ovigerous female 49 mm.
 Market at Tulungagung, E. Java; leg. A. Doyer. — 4 specimens (1 ovigerous female) 34-48 mm.
 Sintang, Central Borneo, basin of the Kapuas River; Borneo Expedition, 1894; cotypes of *Palaemon sintangensis* De Man. — 3 specimens 31-38 mm.

Museum Brussels

- Buitenzorg, W. Java; 1929; voyage to the Dutch East Indies of the Prince and Princess Léopold of Belgium; Reg. No. 33 Crust. Mod. II I. G. 9223. — 4 specimens (2 ovigerous females) 38-53 mm.

The present species has been extensively described by De Man under the names *Palaemon* (*Eupalaemon*) *elegans* and *Palaemon* (*Eupalaemon*) *sintangensis*. I may add the following details:

The rostrum generally is straight, the tip sometimes is inconspicuously curved upwards. The rostral formula is $\frac{2-3}{2-5} \frac{9-13}{2-5}$. The teeth are divided regularly over the upper margin of the rostrum.

In young specimens the rostrum is more slender than in the adults. In old specimens the carapace is scabrous by the presence of numerous tubercles; in the young it is smooth. The hepatic spine is almost as strong as the antennal and it is placed behind and slightly below the latter.

The pleura of the fifth segment has a blunt apex. The sixth segment is about 1.5 times as long as the fifth. The telson is somewhat less than twice as long as the sixth abdominal segment, it is of the common shape.

The eyes and the antennulae are normal in shape.

The scaphocerite has the outer margin straight or slightly convex. The final tooth is directed forwards and is much overreached by the rather narrow lamella. The scaphocerite is about 2.5 times as long as broad.

The oral parts are quite typical.

The first pereopod has the carpus twice as long as the chela and the merus $\frac{4}{5}$ of the length of the carpus. The fingers are slightly longer than the palm.

The legs of the second pair are equal in shape in males as well as in females or young specimens. De Man has extensively described the shape of the second pereopods.

In the third leg the propodus is 2.5 times as long as the dactylus. The carpus is somewhat more than half as long as the propodus. The merus is as long as the propodus and is twice as long as the ischium. In the fifth leg the propodus is thrice as long as the dactylus and is almost twice as long as the carpus. All joints are provided with stiff short hairs.

The uropods and the pleopods are normal in shape.

The specimens from Borneo described by De Man (1898a) as new under the name *Palaemon* (*Eupalaemon*) *sintangensis* prove to belong to the same species as the specimens from Buitenzorg described by him (1892) some years earlier under the name *Palaemon* (*Eupalaemon*) *elegans*. Of both species the type material is at my disposal. Comparison of these typical specimens showed the identity of the two forms. In the large male of the type lot of *P. sintangensis* the chela of the second leg is not yet provided with the characteristic tubercles along the cutting edge, but this is only due to the fact that the specimen has not yet attained its full size as is shown by comparison with Javanese specimens. It is very strange that De Man did not compare his *Palaemon sintangensis*, which in most respects like in the shape of the rostrum, the second legs, the larger eggs, etc., shows so much resemblance to *P. elegans*, with the latter species.

The name *Palaemon elegans* of De Man (1892) is stillborn as this name has been used already as early as 1837 by Rathke for a species, already mentioned in the present paper (vid. *Palaemon elegans*, p. 55). De Man's name therefore is not valid and may not be used. The first valid name given to the present species is *Palaemon* (*Eupalaemon*) *sintangensis* De Man (1898a), so that the correct name for it becomes *Macrobrachium sintangense* (De Man, 1898a).

I have little doubt that the specimens from Tale Sap named by Lancheester (1901) *Palaemon nipponensis* in reality belong to the present species as has already been supposed by Kemp (1918a). Lancheester's description of the rostrum and of the large second leg of the male make the identity almost certain. The specimens certainly are no *Macrobrachium nipponense*.

The specimens from Buitenzorg collected by Weber (present in both the Amsterdam and Leiden Museum) are the types of *Palaemon elegans* De Man, those from Sintang (also present in both Musea) are the types of *Palaemon sintangensis* De Man. The specimens from Buitenzorg collected by Kükenthal (Museum Leiden) have been reported upon by De Man (1902).

The specimens of the Brussels Museum were kindly placed at my disposal by Professor Dr. V. van Straelen, the director of that Museum. These specimens were identified by J. Roux (1933) as *Palaemon sundaicus bataviensis* De Man (the name *bataviensis* is used by Roux on p. 5 of his paper, on p. 3, in the list of the species, he uses the name *batavianus* which is the name given originally by De Man). Roux thought his material to consist of juvenile specimens of De Man's form, this, however, is not correct as two of the specimens prove to be ovigerous females (Roux probably overlooked this, because the specimens have lost the larger part of their eggs, though still carrying enough to show their condition). The fact that the rostrum only bears two teeth at the ventral margin, and the large size of the eggs at once shows that the specimens certainly are no *Palaemon sundaicus* (= *Macrobrachium equidens*). Only one of the ovigerous females possesses

one of the second legs; the hairs of the chela are worn off, but the implantations of the hairs distinctly show that they were placed as in *M. sintangense*, namely in the basal part of the fingers only and not as in *M. equidens* over the entire surface of the finger. All these facts distinctly show that the specimens are no *Macrobrachium equidens* but belong to *M. sintangense*, which also is confirmed by that the latter species is very common near Buitenzorg, while the former never has been recorded from there, occurring mainly in brackish waters.

Distribution: The present species is found only in fresh waters, generally at a large distance from the sea, and often at high altitudes. It is recorded in literature from: Lampam, Patalung, Siamese Malay States (Kemp, 1918a), Tale Sap, Patalung, Siamese Malay States (Lanchester, 1901), Ban Kiriwong, Nakorn Sritamarat, Siamese Malay States (Suvatti, 1937), Dha Luang, Gwe Pasak River, Siamese Malay States (Suvatti, 1937), Sintang, Kapuas River, Borneo (De Man, 1898a), Buitenzorg, West Java (De Man, 1892, 1902; Ortmann, 1894; Rathbun, 1910; Kemp, 1918a; J. Roux, 1932, 1933), Sinagar near Sukabumi, West Java (De Man, 1892), Pandjalu Lake, West Java (J. Roux, 1933), various lakes near Klakah, E. Java (J. Roux, 1932). The species now is recorded for the first time from Sumatra.

Macrobrachium lanceifrons (Dana)

var. *lanceifrons* (Dana)

Palaemon lanceifrons Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.

Palaemon lanceifrons Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 589.

Palaemon lanceifrons Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.

Palaemon lanceifrons Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 13.

? *Palaemon lanceifrons* p.p. Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 119.

non *Palaemon lanceifrons* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 716.

Palaemon lanceifrons Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 437 footnote.

Palaemon lanceifrons Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 364, pl. 2 figs. 4, 5.

Palaemon lanceifrons Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

var. *montalbanense* (Cowles)

Palaemon lanceifrons montalbanensis Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 371, pl. 2 fig. 6.

Palaemon lanceifrons montalbanensis Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

The present species, of which no material is at my disposal, is only known from the Philippines. The specimen recorded by Heller (1865) as *Palaemon lanceifrons* from Ceylon, according to Koelbel (1892), who examined Heller's types, probably is a young female of "*Palaemon equidens*". Now it is not certain which species is meant by Koelbel with *Palaemon equidens*, but in all probability this is *Macrobrachium lar*, because Heller (1861) identified specimens of the latter species from Mauritius as *Palaemon equidens* and these specimens are examined by Koelbel (cf. Koelbel, 1892, p. 456 footnote). Heller's specimens from Manila identified as *Palaemon lanceifrons* indeed may belong to that species, but to little data are available to make this certain.

The specimen from Ceylon identified by Ortmann (1891) with *Palaemon lanceifrons* certainly does not belong there; I am not able, however, to find the real identity of the species as several important characters are not mentioned by Ortmann in his description.

Cowles (1914) gives an extensive description and figures of this species and its variety *montalbanense*.

Distribution: The species is only known with certainty from the neighbourhood of Manila, Luzon, from fresh water. The records in literature are: Manila, Luzon, Philippines (Dana, 1852; Heller, 1865; Estampador, 1937), San Juan River near Manila (Cowles, 1914). The variety *montalbanense* is collected at Montalban, near Manila (Cowles, 1914).

Macrobrachium novae-hollandiae (De Man)

Palaemon ornatus Haswell, 1882, Catal. Austr. Crust., p. 196 (non Olivier, 1811).

? *Palaemon* (*Eupalaemon*) *danae* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 363, pl. 16. (non *Palaemon danae* Heller).

Palaemon (*Eupalaemon*) *novae-hollandiae* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 370, pl. 16.

Palaemon novae-hollandiae McNeill, 1926a, Aust. Encycl., vol. 2, p. 325.

Palaemon (*Paralaemon*) *aemulus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 157, pl. 40. (non *Palaemon aemulus* Nobili).

? *Palaemon danae* Rick, 1942, Queensland Nat., vol. 12, p. 12.

Museum Amsterdam

Sydney; leg. A. R. McCulloch; coll. J. G. de Man (received January 25, 1908); type of *Palaemon novae-hollandiae* De Man. — 1 specimen 118 mm.

The present specimen, the type of the species, has been extensively described and figured by De Man (1908a). I only will add the following additional details:

The scaphocerite is rather slender, it is almost thrice as long as broad, the outer margin is straight. The final tooth is distinctly overreached by the lamella.

The oral parts are typical, as far as I could ascertain without damaging the specimen.

The pleopods are normal in shape.

As pointed out by De Man (1908a), the specimens mentioned by Haswell under the name *Palaemon ornatus*, do not belong to that species (= *Macrobrachium lar*), but are in reality *M. novae-hollandiae*.

In De Man's opinion the present species possibly is identical with *Palaemon danae* Heller. This, however, can not be correct: Koelbel (in De Man, 1892, p. 438), namely, in his notes on the type specimens of *Palaemon danae*, states that there are five teeth in the proximal part of the cutting edge of the dactylus of the second pereopod of the juvenile type specimen. In *M. novae-hollandiae* there are constantly only two teeth present there. As I have already pointed out before (p. 133) *Palaemon danae* must be considered to be based on juvenile specimens of *Macrobrachium australe* (= *Palaemon dispar*). As the present species, as far as I can find, has not been described as new before 1908, the name *novae-hollandiae* proposed by De Man, in case that the species might prove to be distinct from *Palaemon danae*, must be used.

The specimen of which Boone (1935) gives a good description and figure under the name *Palaemon aemulus*, impossibly can belong to that species, as is distinctly shown by the shape of the rostrum and the second leg. Boone's specimen, which concluding from the enormous development of the second legs must be an adult male, and not a female as stated by her, differs from *M. aemulum* by possessing only two upper teeth of the rostrum behind the posterior limit of the orbit, while in *M. aemulum* there are 4 or 5 teeth there, furthermore the rostrum in Boone's specimen is much longer and higher than that of *M. aemulum*, while the lower margin bears 5 teeth (in *M. aemulum*

only 2 or 3 teeth are present). Also the second leg differs strongly from that of *M. aemulum*, by having the fingers distinctly shorter than half the palm and by having the carpus and chela much more elongate. Boone's specimen in all respects agrees with *Macrobrachium novae-hollandiae*, so that I do not hesitate to identify the specimen with that species. In her description Boone states the specimen to have 8 dorsal teeth on the rostrum, in her figure, however, 10 teeth are visible, which is the number present also in De Man's type specimen of the present species.

Distribution: The species is recorded in literature from: Australia (Haswell, 1882), Sydney, New S. Wales (De Man, 1908a), Queensland (De Man, 1908a), New Caledonia (Boone, 1935). Rick (1942) reports *Palaemon danae* from Queensland: as I could not consult his paper I do not know anything about the identity of his specimens.

Macrobrachium venustum (Parisi)

Palaemon (*Eupalaemon*) *vernustus* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 82, pl. 4 fig. 1, pl. 6 figs. 5, 13 (*venustus* on pp. 92 and 93).

Macrobrachium venustus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

This species is only known from the specimen recorded by Parisi from Hainan, S. China. I have seen no material of it.

The specific name *vernustus* used by Parisi on p. 82 of his article obviously is a typographical error, as the name *venustus* is used thrice in the explanation of the plates of his paper.

Macrobrachium formosense Bate

Palaemon longipes De Haan, 1849, Fauna Japonica, Crust., p. 171 (non Olivier, 1811).

Macrobrachium formosense Bate, 1868a, Proc. zool. Soc. Lond., 1868, p. 364, pl. 31 fig. 1.

Macrobrachium formosense Semper, 1868, Proc. zool. Soc. Lond., 1868, p. 586.

Palaemon longipes De Man, 1879, Notes Leyden Mus., vol. 1, p. 177.

Palaemon formosensis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 713.

Palaemon longipes Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 715.

Palaemon (*Eupalaemon*) *longipes* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 770.

Palaemon (*Eupalaemon*) *longipes* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 707, pl. 37 fig. 69.

Bithynis longipes Rathbun, 1902b, Proc. U.S. Nat. Mus., vol. 26, p. 53.

? *Palaemon* (*Eupalaemon*) *longipes* Borradaile, 1907, Trans. Linn. Soc. Lond., ser. 2 vol. 12, p. 67.

Palaemon (*Eupalaemon*) *longipes* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 367.

Palaemon longipes Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 59.

Palaemon (*Eupalaemon*) *longipes* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 79, pl. 6 fig. 4.

Bithynis longipes Urita, 1921, Dobuts. Zasshi, vol. 33, pp. 214-220.

Macrobrachium longipes Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 61, pl. 7 fig. 3.

Macrobrachium longipes Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346.

? *Palaemon philippinensis* Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 10, textfigs. 3, 4, pl. 1 fig. d.

Palaemon longipes Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 11, textfig. 5, pl. 1 fig. d.

Museum Leiden

Japan; cotypes of *Palaemon longipes* De Haan. — 5 specimens 86-89 mm.

Museum Amsterdam

Takao, Formosa. — 6 specimens (1 ovigerous female) 67-106 mm.
Locality unknown. — 4 specimens 60-96 mm.

The present species has been extensively described and figured by De Man (1897). To this description I only will add the following remarks:

The hepatic spine is placed obliquely below the antennal and does not lie in one line with it.

The pleura of the fifth abdominal segment has the apex bluntly pointed.

The antennule is of the normal shape.

The scaphocerite is about 2.5 times as long as broad, the lamella has the apex rounded. The outer margin is straight or slightly convex.

The oral parts are quite normal. The third maxillipede reaches only to the end of the second segment of the antennular peduncle.

The first leg reaches with the chela beyond the scaphocerite. The second legs are much less developed in the female than in the male, in the female they reach with the larger part of the carpus beyond the scaphocerite. The right and left leg are equal in shape. All the joints of these legs are provided with spinules, but these are much smaller than those of the male. The fingers measure about $\frac{2}{3}$ of the length of the palm; in the proximal half of its cutting edge the dactylus bears two teeth, while the fixed finger is provided with one tooth on the cutting edge. No hairs are present on the chela. The carpus is as long as the palm. The merus measures $\frac{5}{7}$ of the length of the carpus. The ischium is almost as long as the merus. The last three pereopods are equal in shape. The third leg reaches the end of the scaphocerite, the other legs do not reach so far. The propodus is 2.5 times as long as the dactylus. The carpus is somewhat more than half as long as the propodus, the merus is twice as long as the carpus, the posterior margin of the propodus bears the usual row of spines. No tubercles as in the male are present on the joints of the last three legs, though sometimes small spinules may be detected. The fifth leg is somewhat more slender than the third.

The pleopods of the male have the usual shape.

The eggs are numerous and small, they measure 0.4 to 0.5 mm.

Macrobrachium formosense Bate, undoubtedly belongs to the same species as *Palaemon longipes* De Haan, which is already supposed by Balss (1914). Bate's description and figures in every detail agree with the present species, but for the absence of lower teeth on the rostrum, but this perhaps is only an abnormality or due to wrong observation. In Bate's figure only 8 dorsal teeth are shown on the rostrum, but this obviously is an error, because in the description 11 teeth are mentioned.

It is very improbable that the specimens brought by Borradaile (1907) with some doubt to *Palaemon longipes*, really belong here, as Borradaile's specimens were collected at the Seychelles and *M. formosense* never has been found outside Japanese waters. Borradaile gives too few characters, however, to make the real identity of his specimens certain.

Kubo (1940) mentioned under the name *Palaemon philippinensis* Cowles some specimens from the Riukiu Islands. The fact that the males do not possess tubercles along the cutting edges makes the identification very doubtful. Kubo thinks his specimens specifically distinct from *Macrobrachium formosense* because of the shorter chelipeds of the second pair, which have the fingers not gaping. The character of the long second legs, which have the fingers gaping, however, only may

be observed in fully developed males of *Macrobrachium formosense*, and the two specimens brought by Kubo to the latter species (under the name *Palaemon longipes*) indeed are large males. In my opinion it is very probable that Kubo's specimens, identified by him with *Palaemon philippinensis* Cowles, in reality are females, "mâles féminisés" and juveniles of *Macrobrachium formosense*, the more as the shape of the rostrum figured by Kubo for his specimens agrees perfectly with that of *M. formosense* and is different from that of *M. mammillodactylus* (= *Palaemon philippinensis*). The fact that one of Kubo's males of *Palaemon longipes* and part of his *Palaemon philippinensis* material originates from the same locality (Sirakawa, Miyako, Riukiu Islands) supports this supposition.

The name *Palaemon longipes* De Haan (1849) for the present species may not be used as it is invalidated by *Palaemon longipes* Olivier (1811); the latter name being a synonym of *Stenopus hispidus* (Olivier). The name *Macrobrachium formosense* Bate (1868) must be used for the present species as it is the first valid name given to it.

Distribution: This species occurs in freshwater, it is only known with certainty from the Japanese Islands and Formosa. The records in literature are: ? Côte d'Or, Praslin, Seychelles (Borradaile, 1907), Japan (De Haan, 1849; De Man, 1879, 1897, 1908), Kamakura, Sagami-bay (Kubo, 1940), Fukuura and Ito, Sagami-bay (Balss, 1914), Amami, Oshima, Sagami-bay (Parisi, 1919), Asaki River near Okayama, S. Hondo (Balss, 1914), Kagoshima, Kyushyu (Urita, 1921), Kawatana¹) (Rathbun, 1902b), Nagasaki, Kyushyu (Rathbun, 1902b; Parisi, 1919), Okinawa, Riukiu Islands (Parisi, 1919), Kuzi-gawa, Genka-gawa, Izumi, Okinawa (Kubo, 1940), Sirakawa, Miyako, Riukiu Islands (Kubo, 1940), Ogasawara, Bonin Islands (Balss, 1914), Formosa (Maki & Tsuchiya, 1923), Tamsui, N. Formosa (Bate, 1868a; Balss, 1914), S. Formosa (Balss, 1914).

Macrobrachium hainanense (Parisi) (fig. 35)

Palaemon (*Parapalaemon*) *hainanense* Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 87, pl. 3 fig. 1, pl. 6 figs. 1, 7.

Macrobrachium hainanense Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

Palaemon similis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 281, fig. 2.

Palaemon Hainane Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 285.

Museum Leiden

Pools near the Laboratorium voor het Onderzoek der Zee (Laboratory for Marine Investigations), Batavia; January 24, 1906; leg. P. N. van Kampen. — 3 specimens (1 ovigerous female) 58-91 mm.

Java; leg. P. Bleeker. — 8 specimens (2 ovigerous females) 47-67 mm.

Museum Amsterdam

Tanahabang, Weltevreden, near Batavia; fresh water; March 2, 1908; leg. P. N. van Kampen. — 13 specimens (4 ovigerous females) 27-66 mm.

The rostrum (fig. 35a) is straight, sometimes it has the tip curved inconspicuously upwards; it reaches slightly beyond the antennular peduncle, but distinctly fails to reach the end of the scaphocerite. The upper margin is convex and bears from 11 to 15 teeth (generally 12, in one specimen only

1) The exact position of this locality is unknown to me.

9 teeth are present), which are divided regularly over the rostrum, though the first tooth generally is distinctly more remote from the second than the third is. The first three teeth are placed on the carapace behind the posterior limit of the orbit, the fourth is placed just over or even slightly behind the posterior margin of the orbit. The lower margin of the rostrum too is convex, it is armed with three teeth. The carapace in the adult males is entirely roughened by numerous small spinules, which are most distinct in the anterolateral portion of the carapace. The hepatic spine is somewhat less strong than the antennal and is placed below and behind it.

The abdomen has the pleurae of the first three segments broadly rounded, in the fourth and fifth segments the pleurae are narrower, but the tips are rounded. In the adult males the pleurae are provided with numerous small spinules, which are strongest near the lateral margins, also the sixth segment bears some spinules in the lateral part. The sixth segment measures about $1\frac{1}{3}$ of the length of the fifth.

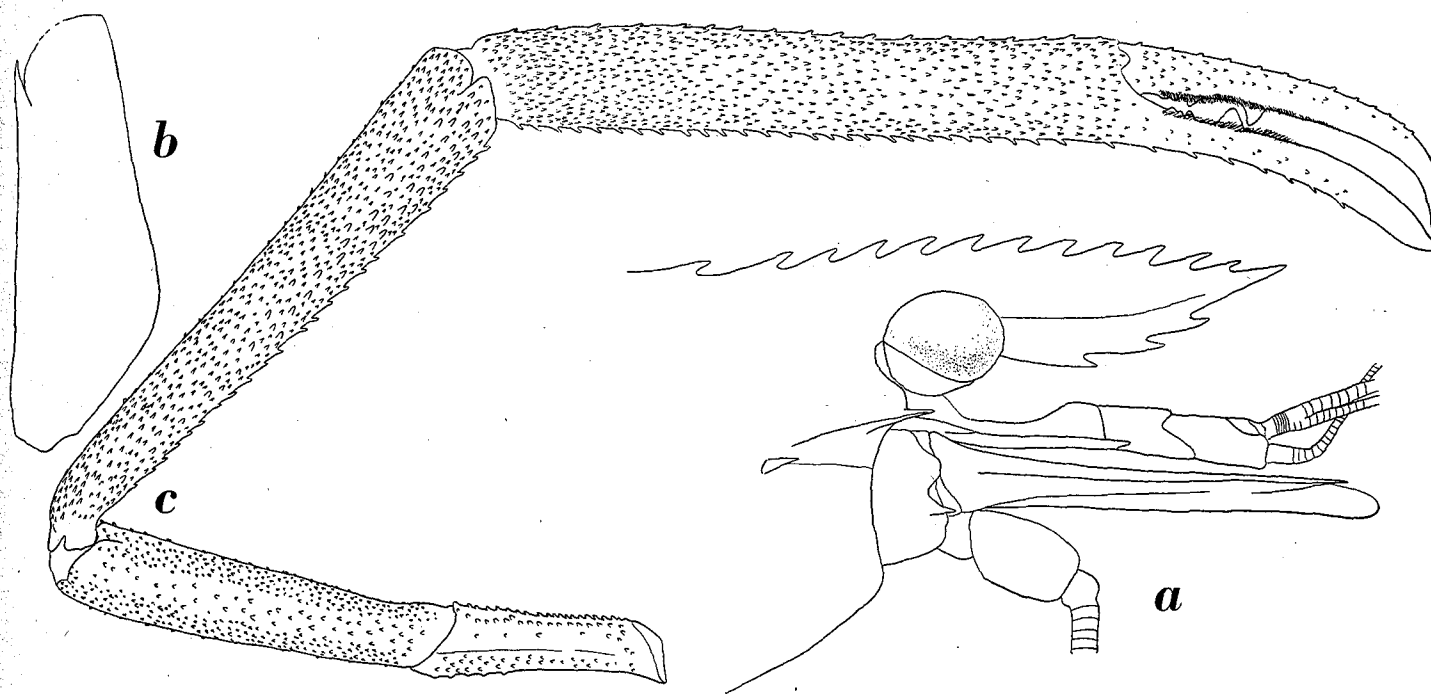


Fig. 35. *Macrobrachium hainanense* (Parisi). a, anterior part of body in lateral view; b, scaphocerite; c, second leg of adult male. a, b, $\times 3$; c, $\times 2$.

The telson is 1.5 times as long as the sixth segment of the abdomen. In the adult male it is covered with numerous small spinules, the two pairs of dorsal spines are placed as usual at about the middle and at about $\frac{3}{4}$ of the length of the telson. The tip of the telson is pointed and flanked by the usual two pairs of spines, the inner of which reaches distinctly beyond the tip of the telson; numerous setae are present between the inner spines.

The eyes are normal in shape, the cornea is distinctly broader than the eyestalk.

The antennula has the usual shape.

The scaphocerite (fig. 35b) has the outer margin straight or slightly convex, the final tooth is strong and is distinctly overreached by the lamella, which is somewhat angular at its anterointernal angle. The scaphocerite is almost 2.5 times as long as broad.

The oral parts are typical. The third maxillipede reaches slightly beyond the end of the second segment of the antennular peduncle.

The first pereiopod reaches with about $\frac{1}{3}$ to $\frac{1}{2}$ of the length of the carpus beyond the scaphocerite, in small specimens it reaches less far. The fingers are as long as the palm. The carpus is twice as long as the chela and is $1\frac{1}{3}$ as long as the merus. The second pereiopods of the adult male (fig. 35c) are very strong, they are distinctly longer than the entire body. They are about equal in shape. The fingers are slender, with the apex curved. The dactylus bears two, the fixed finger one strong tooth in the proximal part of the cutting edge; between the tooth of the fixed finger and the base of the cutting edge some 2 or 3 small denticles may be seen. Along both sides of the cutting edges of the dactylus and the fixed finger a row of velvety hairs is present; this row is most distinct in the proximal part; the rest of the fingers is naked, though small horny spines are present on the dactylus as well as on the fixed finger. The palm is cylindrical or slightly compressed, of equal height throughout its length; it is covered with numerous small horny spinules, which are most dense at the outer surface. At the inner surface there are also larger horny spinules, of the same type as the spinules on the fingers. The palm is about 5 times as long as wide and about 1.5 times as long as the fingers. The carpus is about as long as the palm, it narrows posteriorly and is covered with spinules in the same way as the palm. The merus measures about $\frac{2}{3}$ of the length of the carpus. The ischium is $\frac{3}{5}$ of the length of the merus. In the females and in the young males the leg is shorter than the body. It resembles that of the adult male in most respects, except for the relation between the various joints. In small specimens the fingers in relation to the palm are longer than in the large specimens, furthermore the carpus, in relation to the palm, is slightly shorter, also the ischium in the young specimens is longer in relation to the merus. The following measurements (in mm.) are taken from my material:

| material | sex | total length of the body | length of the joints of the 2nd leg | | | | |
|---------------------|-------|-----------------------------|-------------------------------------|------|--------|-------|---------|
| | | | fingers | palm | carpus | merus | ischium |
| Batavia | ♂ | 86 | 24 | 37 | 38 | 24 | 14 |
| | ov. ♀ | 86 | 12.2 | 21 | 21.8 | 14.5 | 8 |
| | | | 13.7 | 23 | 24 | 15.5 | 8 |
| Java Weltevreden | ♂ | 59 | 7.1 | 9.2 | 10 | 8.2 | 6.3 |
| | ♂ | 67 | 10 | 14 | 14 | 10.5 | 8 |
| | | | 16 | 26.5 | 27 | 16 | 10 |
| | ♂ | 66 | 10.5 | 16 | 17 | 12 | 8 |
| | | | 12.8 | 19 | 19 | 13.5 | 8 |
| | ov. ♀ | 43 | 5 | 6 | 6.3 | 5.2 | 4 |
| | ? | ? | 6.2 | 8 | 8.5 | 7 | 5 |
| ♂ | 41 | 5 | 6 | 7 | 5 | 4 | |

The third pereiopod in the adult males reaches slightly beyond the scaphocerite, in females and younger males it reaches somewhat less far forwards. The dactylus is rather short, the propodus is slightly more than 2.5 times as long as the dactylus, it bears the usual posterior spines. The carpus is distinctly more than half as long as the propodus. The merus is longer than the entire propodus. The ischium is about half as long as the merus. The fifth leg reaches about to the end of the antennular peduncle. The propodus is 2.5 times to thrice as long as the dactylus, the carpus is more than half as long as the propodus, the merus is about as long as the propodus. The last three pairs of legs bear long scattered and stiff hairs, while moreover in those of the adult male all the joints are covered with numerous spinules, which are placed close together.

The pleopods and uropods are normal in shape. In the adult male the uropods are thickly covered with spinules.

The eggs are numerous and small, they are 0.4 to 0.6 mm in diameter. The smallest ovigerous female is 35 mm, the largest 86 mm long.

Palaemon similis of Yu (1931) can not be regarded to be specifically distinct from *Macrobrachium hainanense* as it agrees in all respects with that species. According to Yu the difference between *P. similis* and *P. Hainane* (sic!) is that in the former species the carpus of the second leg is as long as or longer than the palm, while in the latter it is slightly shorter than the palm; the relation between palm and carpus in *P. hainanense* is, according to Parisi, 1.03, in *P. similis* it varies between 1.00 and 0.95. In my opinion this difference is too small to be of specific value, the more as it is very variable in most species of the present genus. Furthermore Yu states the fingers of *P. hainanense* to be longer in relation to the palm than those of *P. similis*; the relation palm / fingers in *P. hainanense* is 1.6, in *P. similis* it varies between 1.7 and 2.0. This too is insufficient for the distinction of two species, as also the relation between the lengths of the palm and the fingers always is very variable. As last difference Yu mentions that in *P. hainanense* the telson hardly reaches the end of the uropods, while in *P. similis* it fails with $\frac{1}{4}$ of its length to reach the end of the uropods. This character of course is of no value as the situation of the end of the telson and that of the uropods is entirely dependant on the curvature of the abdomen. As these three characters are too variable (as is also shown by my material) and their differences too small, and as in all others respects there is a close resemblance between *P. similis* and *P. hainanense*, I see no reason and no possibility to treat the two forms as distinct species.

Macrobrachium hainanense is so very closely related to *Macrobrachium formosense*, that it perhaps only must be considered a subspecies of that species. The differences between the two forms are:

1. In *M. formosense* the rostrum bears 10 or 11 dorsal teeth (seldom 12), while in *M. hainanense* the number of dorsal teeth varies between 12 and 14 (seldom being 11).

2. In *M. formosense* the second pereopod of the adult male is much more slender than in *M. hainanense*. In the former species the carpus in the adult male is at least 9 times as long as broad, while in the latter it is less than 7 times as long as broad. The same relation also is found between the length and the breadth of the palm in both species. In *M. formosense* furthermore the fingers of the adult male often are less than half as long as the palm, while in *M. hainanense* they are at least half as long as the palm, being generally longer.

Whether these differences really are constant, only may be proved by larger material than that which I have at my disposal. It is very well possible that larger males of *M. hainanense* have the second legs more elongate.

The native name of this species near Batavia is "udang pelutuk"; the word "udang" means "prawn", the meaning of the word "pelutuk" is unknown to me.

Distribution: The species up till now only has been recorded from S. China: Amoy (Yu, 1931), Keng-kong River, Hainan (Parisi, 1919). The present records from Java largely extend our knowledge of the range of distribution of the species. Little is known about the environment in which the species lives, the indication Keng-kong River points to fresh water, which is confirmed by the specimens from Weltevreden (Museum Amsterdam), the pools near the Laboratory for Marine Investigations at Batavia were formed by floodings of the river, the prawns collected in it may therefore originate from localities more inland.

Macrobrachium equidens (Dana) (fig. 36)

- Palaemon equidens* Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon equidens Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 591.
Palaemon equidens Weitenweber, 1854, Lotos Praha, vol. 4, p. 62.
Palaemon equidens Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 39 fig. 2.
non *Palaemon equidens* Heller, 1862, S.B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 418, pl. 2 fig. 44.
Palaemon equidens (*aequidens*) Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 40.
Palaemon equidens De Man, 1888a, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 283.
Palaemon equidens Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 718.
Palaemon (*Eupalaemon*) *sundaicus*? De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 437, pl. 2
fig. 35.
non *Palaemon* (*Eupalaemon*) *equidens* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 453, pl. 2
fig. 36.
Palaemon (*Eupalaemon*) *sundaicus* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 779.
Palaemon (*Eupalaemon*) *sundaicus* var. De Man, 1897, Zool. Jb. Syst., vol. 9, p. 783.
Palaemon sunndaicus bataviana De Man, 1897, Zool. Jb. Syst., vol. 9, p. 784.
Palaemon (*Eupalaemon*) *sundaicus* Weber, 1897, Zool. Jb. Syst., vol. 10, p. 165.
Palaemon (*Eupalaemon*) *sundaicus* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 708, pl. 37
figs. 70 m, n, 71.
Palaemon (*Eupalaemon*) *sundaicus* var. De Man, 1898, Zool. Jb. Syst., vol. 10, pl. 37 figs. 70 o, p. 72
Palaemon (*Eupalaemon*) *sundaicus* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 30.
Palaemon (*Eupalaemon*) *sundaicus brachydactyla* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40,
40, p. 238.
Palaemon sunndaicus De Mani Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 239.
Palaemon (*Eupalaemon*) *acanthosoma* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 242.
Palaemon (*Eupalaemon*) *sundaicus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
Palaemon Sunndaicus Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 332, pl. 14 figs. 44-46
non *Palaemon equidens* Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 565, pl. 34 fig. 4.
Palaemon sunndaicus Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568.
Palaemon (*Eupalaemon*) *sundaicus baramensis* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25,
p. 769.
Palaemon (*Eupalaemon*) *sundaicus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452,
452, p. 8.
Palaemon (*Eupalaemon*) *nasutus* Nobili, 1903a, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 455,
455, p. 9, textfig.
Palaemon (*Eupalaemon*) *sundaicus* var. Nobili, 1903a, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 455,
18 n. 455, p. 11.
Palaemon sunndaicus Lanchester, 1906, Fasc. Malay. Zool., vol. 3, p. 132.
Palaemon (*Eupalaemon*) *acanthosoma* De Man, 1908a, Ann. Mag. nat. Hist., ser. 8 vol. 1, p. 369.
Palaemon sulcatus Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 289, pl. 16 fig. 4.
Bithynis (*Eupalaemon*) *sundaicus* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316.
Eupalaemon sunndaicus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 384.
Palaemon sunndaicus Cowles, 1914, Philipp. Journ. Sci., sect. D vol. 9, p. 355, pl. 2 fig. 3.
Palaemon (*Eupalaemon*) sp. De Man, 1915, Zool. Jb. Syst., vol. 38, p. 425, pl. 29 fig. 8.
Palaemon (*Eupalaemon*) *acanthosoma* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 427, pl. 29
figs. 10, 11.
Palaemon sunndaicus Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 73.
Palaemon delagoae Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 74, pl. 16.
Palaemon (*Eupalaemon*) *sundaicus* J. Roux, 1917, Nova Guinea, vol. 5, p. 597.
Palaemon (*Eupalaemon*) *acanthosoma* J. Roux, 1917, Nova Guinea, vol. 5, p. 597.
Palaemon sunndaicus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 261.
Palaemon (*Eupalaemon*) *sundaicus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 334.

- Palaemon (Eupalaemon) acanthosoma* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 334.
Palaemon (Eupalaemon) sundaicus p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 590.
 ? *Macrobrachium sundaicus* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 57, pl. 2
 fig. 2.
 ? *Macrobrachium equidens* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 62, pl. 6
 fig. 1.
Palaemon (Eupalaemon) sundaicus p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 6.
Urocaridella borradailei Stebbing, 1923, Rep. Fish. mar. biol. Surv. S. Afr., vol. 3 pt. 3, p. 8, pl. 14.
Eupalaemon sundaicus Barnard, 1926, Trans. Roy. Soc. S. Afr., vol. 13, p. 121.
Palaemon sundaicus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 276.
Palaemon nasutus Nouvel, 1932, Bull. Mus. Hist. nat. Paris, ser. 2 vol. 4, p. 409.
Palaemon (Eupalaemon) sundaicus J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 569.
 non *Palaemon (Eupalaemon) sundaicus bataviensis* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or.,
 vol. 3 pt. 14, p. 5.
Palaemon (Eupalaemon) acanthosoma J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 218.
Palaemon delagoae Rathbun, 1935, Bull. Mus. comp. Zoöl. Harvard, vol. 79, p. 28, figs. 1, 2.
Palaemon sundaicus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon sulcatus Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
Macrobrachium sundaicus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.
 ? *Palaemon sundaicus* Kubo, 1940, Journ. Imp. Fish. Soc. Tokyo, vol. 34, p. 20, fig. 11.
 ? *Palaemon sundaicus* Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 313, fig. 7.
Palaemon sulcatus Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon sundaica Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 390.

Siboga Expedition

- Station 4, Anchorage off Djangkar, Java, 7° 42' S, 114° 12'.6 E; shore exploration; March 9, 1899.
 — 4 specimens (1 ovigerous female) 51-66 mm.
 Station 131, Anchorage off Beo, Talaud Islands; reef exploration; depth 13 m; bottom mud and sand;
 July 24 and 25, 1899. — 1 specimen 75 mm.
 Station 181 or 231, Amboina anchorage; reef exploration; September 5-11 or November 14-18, 1899.
 — 1 ovigerous female 72 mm.

Museum Leiden

- Santa Lucia Bay, Natal; October 26, 1938; leg. L. D. Brongersma. — 1 ovigerous female 68 mm.
 Port Dickson, Malay Peninsula; in sea; March, 1946; leg. L. D. Brongersma. — 1 specimen 71 mm.
 We Island, off northpoint of Sumatra; May, 1922, February, May and July, 1927; leg. P. Buitendijk.
 — 6 specimens (3 ovigerous females) 46-70 mm.
 Sinabang, Simalur, off westcoast of Sumatra; January and February, 1913; leg. E. Jacobson. —
 8 specimens 43-73 mm.
 Sibigo, Simalur, off westcoast of Sumatra; August, 1913; leg. E. Jacobson. — 1 specimen 43 mm.
 Harbour of Belawan Deli, eastcoast of Sumatra; brackish water; December, 1924; leg. P. Buitendijk.
 — 9 specimens (1 ovigerous female) 38-70 mm.
 Belawan Deli; September, 1930; leg. P. Buitendijk. — 2 specimens 38 and 92 mm.
 Tandjong Priok, near Batavia, W. Java; 1906, 1907, November, 1926, May and August, 1927; leg.
 P. Buitendijk. — 14 specimens (3 ovigerous females) 50-97 mm.
 Mouth of river, West of Tandjong Priok; July, 1911; leg. P. Buitendijk. — 2 specimens (1 ovigerous
 female) 62 and 71 mm.
 Fishmarket, Batavia; March, 1917; leg. P. Buitendijk. — 1 specimen 50 mm.
 River near Batavia; 1896; leg. A. G. Vorderman. — 1 ovigerous female 67 mm.
 River near Batavia; 1896; leg. A. G. Vorderman; cotypes of *Palaemon sundaicus* var. *bataviana* De
 Man. — 3 ovigerous females 72-91 mm.
 Singkil Island, probably near Batavia; 1876; don. F. A. Jentink. — 3 specimens 58-88 mm.

- Bay of Batavia; January, 1908, 1909, December, 1924 and November, 1926; leg. P. Buitendijk. — 8 specimens (3 ovigerous females) 60-88 mm.
- Indramaju, northcoast of W. Java; September, 1924; leg. P. Buitendijk. — 14 specimens (7 ovigerous females) 45-64 mm.
- Cheribon, northcoast of W. Java; August, 1929; leg. P. Buitendijk. — 6 ovigerous females 52-70 mm.
- Tjilatjap, southcoast of Central Java; August, 1905; leg. P. Buitendijk. — 3 specimens 33-39 mm.
- Tegal, northcoast of Central Java; November, 1927; leg. P. Buitendijk. — 3 specimens 64-79 mm.
- Off Semarang, northcoast of Central Java; March, 1912; leg. P. Buitendijk. — 1 specimen 54 mm.
- Surabaya, northcoast of E. Java; April, 1926, February, 1927, July and October, 1930; leg. P. Buitendijk. — 10 specimens (8 ovigerous females) 54-93 mm.
- Pasuruan, northcoast of E. Java; September, 1921; leg. P. Buitendijk. — 1 ovigerous female 66 mm.
- Probolinggo, northcoast of E. Java; August 1, 1926; leg. P. Buitendijk. — 1 specimen 77 mm.
- Fishmarket of Panarukan, northcoast of E. Java; February, 1924; leg. P. Buitendijk. — 2 specimens (1 ovigerous female) 78 and 86 mm.
- Panarukan; August, 1927; leg. P. Buitendijk. — 1 ovigerous female 84 mm.
- Southcoast of Madura; January, 1917; leg. P. Buitendijk. — 4 specimens 61-66 mm.
- Madura; July, 1928; leg. P. Buitendijk. — 1 ovigerous female 96 mm.
- Java Sea; 1906, December, 1907, October, 1911; leg. P. Buitendijk. — 11 specimens (5 ovigerous females) 53-84 mm.
- Borneo; 1846; leg. C. A. L. M. Schwaner. — 2 specimens 78 and 79 mm.
- Makassar, S. W. Celebes; leg. D. M. Piller. — 5 specimens 72-82 mm.
- Roads of Makassar; January, 1888; leg. J. Semmelink. — 9 specimens (6 ovigerous females) 57-71 mm.
- Amboina; leg. D. J. Hoedt. — 2 specimens 86 and 88 mm.
- Andai, N. New Guinea; 1870; leg. C. B. H. von Rosenberg. — 4 specimens 55-70 mm.
- Hollandia, North New Guinea; freshwater near the bivouac; New Guinea Expedition, 1910-1911. — 2 specimens 77-87 mm.
- Hollandia, N. New Guinea; May 15, 1911; New Guinea Expedition, 1910-1911. — 1 specimen 61 mm.
- Locality unknown. — 5 specimens (2 ovigerous females) 56-89 mm.

Museum Amsterdam

- Durban; 1894; leg. M. Weber. — 1 specimen 88 mm.
- Umgeni River near Durban; 1894; leg. M. Weber. — 1 specimen 46 mm.
- Atjeh, N. Sumatra; leg. Capt. Storm; coll. J. G. De Man. — 4 specimens 44-66 mm.
- Nias, off westcoast of Sumatra; leg. J. P. Kleiweg de Zwaan. — 49 specimens (8 ovigerous females) 42-96 mm.
- River near Batavia; 1896; leg. A. G. Vorderman; cotype of *Palaemon sundaicus* var. *batavianus* De Man. — 1 ovigerous female 85 mm.
- Sunter River near Batavia. — 1 specimen 61 mm.
- Java Sea; leg. Capt. Storm; coll. J. G. de Man. — 1 specimen 80 mm.
- Ampenan, Lombok, Lesser Sunda Islands; May, June, 1909; leg. G. F. Tydeman. — 4 specimens 59-86 mm.
- Raka-mbaha (= Mbawa), Flores; in river close near the sea; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 37 and 64 mm.
- Balikpapan, E. Borneo; leg. W. J. Tissot van Patot. — 4 specimens (3 ovigerous females) 45-76 mm.
- Balikpapan, E. Borneo; leg. L. G. M. Rutten. — 3 specimens 48-64 mm.
- River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber. — 2 specimens 35 and 36 mm.
- River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber. — 1 specimen 36 mm.
- Waterfall Bantimurong near Maros, S. W. Celebes; 1888-1889; leg. M. Weber. — 1 specimen 63 mm.
- Balangnipa, S. W. Celebes; 1888-1889; leg. M. Weber. — 11 specimens (1 ovigerous female) 26-65 mm.

- Ondolean, E. Celebes; December 18, 1904. — 4 specimens 54-88 mm.
 Ternate; pool in dry bed of a rivulet; February 1, 1903; leg. L. F. de Beaufort. — 2 specimens 69 and 98 mm.
 Batjan; 1884; leg. S. C. J. W. van Musschenbroek. — 2 specimens 46 and 71 mm.
 Merdika, Amboina; December 6 and 7, 1909; leg. L. F. de Beaufort. — 4 specimens 34-55 mm (1 bopyrized).
 Lorentz (= Noord) River, S. W. New Guinea; May 4, 1907 and September 3, 1909; leg. H. A. Lorentz; New Guinea Expeditions, 1907 and 1909. — 5 specimens (1 ovigerous female) 63-80 mm.
 Varen River, tributary of Lorentz River, S. W. Guinea; May 3, 1907; leg. H. A. Lorentz; New Guinea Expedition, 1907. — 9 specimens (5 ovigerous females) 43-94 mm.
 Merauke, S. W. New Guinea; leg. J. W. R. Koch; New Guinea Expedition, 1905. — 59 specimens (including ovigerous females) 24-76 mm.
 Mouth of Merauke River, S. W. New Guinea; leg. J. W. R. Koch; New Guinea Expedition, 1905. — 15 specimens (3 ovigerous females) 43-77 mm.

I am not certain whether the specimens from Bantimurong, Parepare and Palopo really belong to the present species. The hepatic spine namely is placed distinctly below the antennal. The specimens are too young, however, to make certain identification possible, I therefore follow De Man in bringing these specimens to the present species.

Cowles (1915) gives an extensive description of the present species, which fits for most of my specimens. I only will add the following details: The hepatic and antennal spines lie in one line; the hepatic spine lies close behind and below the antennal. The antennal spine generally continues posteriorly in a rather strong carina, which almost reaches the hepatic spine.

The abdomen is normal in shape. The fifth segment has the pleura ending in a rounded to rather acute apex, the sixth segment is slightly longer to 1.3 times as long as the fifth. The telson is provided with the usual dorsal and posterior spines.

The scaphocerite (fig. 36a) is 3.5 to 4 times as long as broad. The outer margin is somewhat concave. The final tooth is strong, but is distinctly overreached by the lamella.

The oral parts are quite typical.

The first pereiopod reaches with about $\frac{1}{3}$ of the carpus beyond the scaphocerite in adult males, in young specimens only with the chela. The fingers are as long as the palm. The carpus is twice as long as the chela. The merus measures $\frac{3}{4}$ of the length of the carpus. The second pereiopods are extensively described by Cowles. In some of my old specimens the palm is fully twice as long as the fingers. The last three pereiopods (fig. 36b) reach with the dactylus beyond the scaphocerite, in young specimens the third pereiopod fails to reach the end of the scaphocerite. In Cowles's remark: "In older individuals as much as one-fifth or one-third of the dactyli may extend beyond [the scaphocerite].", probably the word "dactyli" is used instead of propodi, as in my old specimens the dactylus and a part of the propodus reach beyond the scaphocerite.

The pleopods and uropods are normal in shape.

The present species is best known under the name *Palaemon sundaicus*, but as already pointed out before (p. 131), the specimens described by Heller (1862) as *Palaemon sundaicus* are identical with *Palaemon dispar* and *Macrobrachium australe*. The name *sundaicus* therefore may not be used for the present species. In my opinion there is little doubt that the specimen described by Dana (1852) as *Palaemon equidens* from Singapore is identical with *Palaemon sundaicus* auctt. (non Heller). The rostrum of Dana's specimen shows the characteristic upwards curved

shape and the rostral formula is the same as that of *P. sundaicus* auctt. Furthermore the hepatic spine lies in one line with the antennal. In literature only two species of *Macrobrachium* have been reported from Singapore, namely *M. rosenbergii* and "*Palaemon sundaicus*", the latter being very common there. All these facts I think evidence enough to identify *Palaemon equidens* of D a n a with *Palaemon sundaicus* auctt., notwithstanding the structure of the carpus and chela of the second pereiopod of D a n a's specimen not being known. As D a n a's name is the oldest valid name available

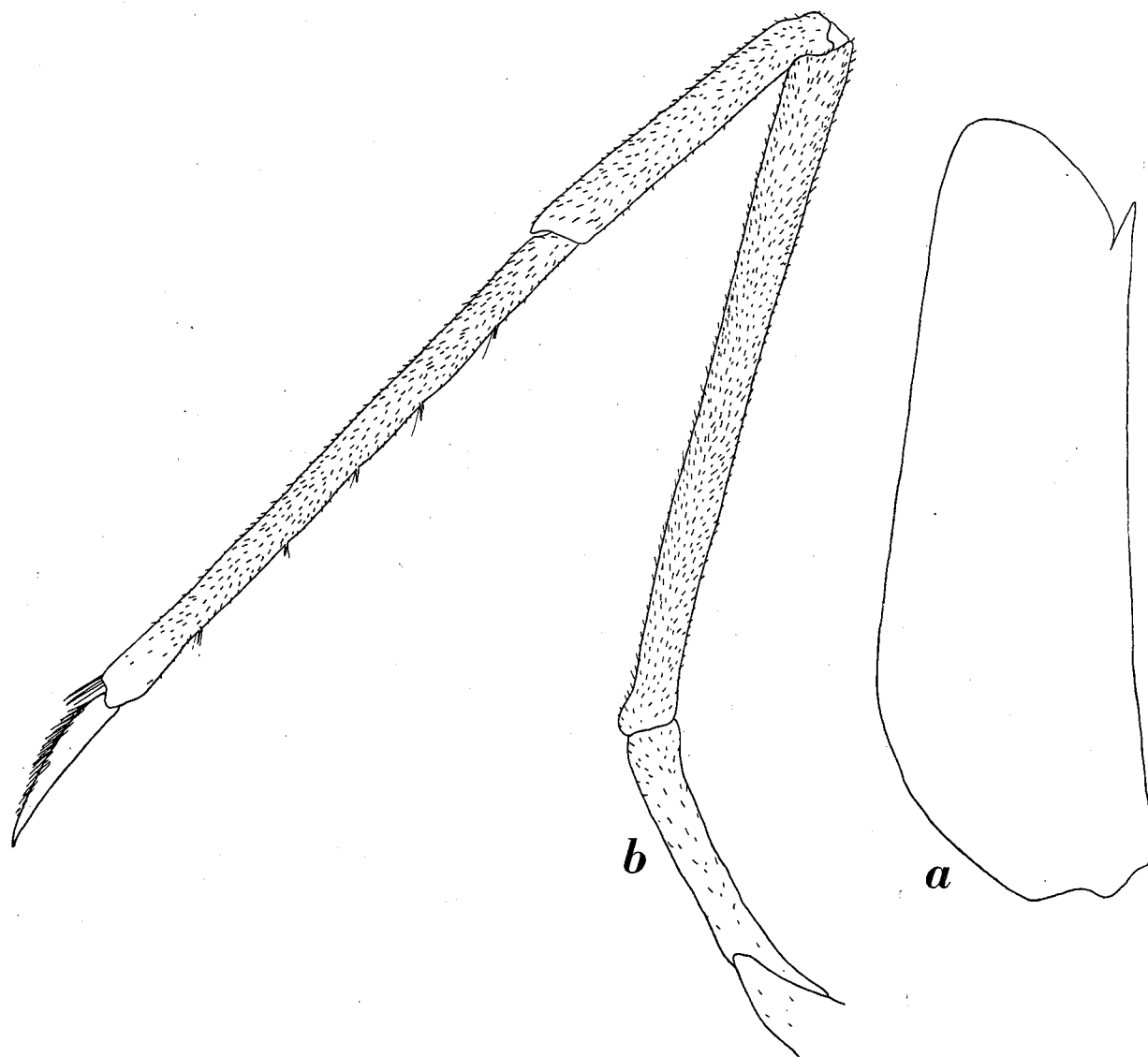


Fig. 36. *Macrobrachium equidens* (Dana). a, scaphocerite; b, third pereiopod of adult male. a, b, $\times 7$.

for the present species, this species has to be named *Macrobrachium equidens* (Dana). The specimens referred by D e M a n (1888) to *Palaemon equidens* in all probability indeed belong here, those, however, which he in 1892 identifies with *P. equidens* are different and afterwards are placed by him in a new species *Palaemon neglectus* (vid. p. 191). In his 1892 paper D e M a n identifies specimens of the present species with *Palaemon sundaicus*, and he is the first to do so. In this respect he is followed by numerous later authors. At the same time, however, D e M a n (1897, p. 781) is the first to cast doubt on the correctness of this identification and already supposed the identity of *Palaemon sundaicus* with *P. dispar*: "Da nun beim Männchen der vorliegenden Art

[*Macrobrachium equidens*] die Finger dieselbe Bezahnung und Verhältnisse zeigen wie beim Weibchen (De Man, l.c. p. 438), so könnte es fraglich scheinen, ob die Heller'sche Art nicht mit *Pal. dispar* v. Mart. identisch wäre; in diesem Fall müsste die jetzt beschriebene einen neuen Namen empfangen, und es ist daher besser, ihr den Namen *sundaicus* zu lassen." Also Kemp (1918) pointed to the possible identity of *P. sundaicus* and *P. dispar*.

In literature many varieties of "*Palaemon sundaicus*" have been described, viz.: the varieties *bataviana* De Man (1897), *brachydactyla* Nobili (1899), *De Mani* Nobili (1899), and *baramensis* De Man (1902).

var. *bataviana* De Man. This variety is based on adult females of the present species originating from Batavia. The typematerial is at my disposal. The differences with the main form as stated by De Man are:

- a. The rostrum is slightly longer.
- b. The carpus of the second leg is $1\frac{1}{3}$ as long as the merus, not 1.5 times.
- c. The palm of the second leg is slightly shorter than the merus (in the typical form it is as long as the merus).
- d. The fingers of the larger second leg are provided with closely packed woolly hairs, while in the main form the fingers are smooth or bear only some scattered hairs.
- e. The legs are slightly less slender than in the typical specimens.

In my material of the present species the rostrum is very variable in length, as is also found by Cowles in his specimens: it sometimes fails to reach the end of the scaphocerite, sometimes it just attains the end of that scale or distinctly overreaches it. Also the relation between the lengths of the carpus and of the merus and that between the palm and the fingers of the second legs is so variable that the above differences between the two forms fall within the range of variability of these characters in the present species, so that no varietal or subspecific value may be attached to it (cf. also Cowles's table of the lengths of the various joints in his material). The woolly hairs on the fingers are present in all full grown specimens of the present species, and the fact that they are not present in the "typical" specimens from the Java Sea examined by De Man is only due to the fact that these specimens (part of which could be examined by me) had not yet reached their final size. Also the slenderness of the legs is slightly variable in the present species, moreover the difference between the Batavia specimens and those from the Java Sea is very small in this respect. Summarizing we may conclude that the variety *bataviana* has no right of existence, as part of the so called differences fall within the range of variability of the species, and have no connection whatever with one another, while the other differences only are due to age. This also is confirmed by the fact that of the five specimens from the same locality four were brought by De Man to the variety *bataviana*, while the other was considered by him to be typical.

var. *brachydactyla* Nobili. The differences between this form and the typical "*Palaemon sundaicus* auctt." are, according to Nobili, the following:

- a. The fingers of the second legs are very much shorter than the palm, the relation being $\frac{1}{2.2} - \frac{1}{2.3}$.
- b. Hairs are present on the fingers of the second legs.
- c. The merus shows more resemblance to that of the typical "*Palaemon sundaicus* auctt." than to the var. *bataviana*.

The first difference is largely due to age, in old specimens the fingers are much shorter in relation to the palm, than in young specimens. N o b i l i's specimen (a male) is old, this not only is obvious from the measurements given by N o b i l i, but also by the fact that the fingers are covered with woolly hairs. The variability of the relation between the lengths of the merus and carpus of the second legs has already been pointed out above. Thus also the variety *brachydactyla* can not be maintained as its differences are due to age or fall within the range of variability of the species.

var. *De Mani Nobili*. This variety is based by N o b i l i upon the specimens mentioned by D e M a n (1897) as *Palaemon (Eupalaemon) sundaicus* var. from Atjeh. Part of these specimens is present in the collection of the Amsterdam Museum and could be examined by me. The differences with the "typical form" as mentioned by D e M a n and N o b i l i are:

- a. The specimens are smaller (ovigerous females of 45-52 mm), than in the typical form (70-82 mm).
- b. Only 2 (seldom 3) teeth of the rostrum are placed behind the orbit (in the typical form always 3).
- c. The carpus of the second leg is less slender, because it is more thickened anteriorly.
- d. The palm is somewhat longer than the merus.

The length of ovigerous females is due to a considerable variation and often small females are found, which according to the various characters can not be considered adult, but nevertheless bear ova. The number of teeth of the upper margin of the rostrum, which are placed behind the orbit varies between 2 and 3, it is impossible, however, to divide the material in two groups according to this character as transitions occur (the third tooth may be placed slightly before, just over, or slightly behind the posterior margin of the orbit), which also is indicated by the fact that even in some of D e M a n's specimens three teeth are placed behind the orbit. The third difference too is of no varietal value as it falls within the range of variability of the species, which is confirmed by the fact that in D e M a n's specimen 3 of the variety the carpus shows the slender shape of the typical form. The variability of the relation between the length of the merus and the palm of the second legs has already been pointed at under var. *bataviana*. Like the two other varieties in my opinion var. *De Mani* can not be maintained.

var. *baramensis* De Man. D e M a n himself thought it doubtful that the erection of a new variety for his specimens from the Baram River (Sarawak) was justified. He gives the following differences with the typical form:

1. The rostrum is only slightly curved upwards at the apex.
2. The hepatic spine lies slightly lower than in the typical form.
3. The carpus of the second leg is almost twice as long as the merus.

The shape of the rostrum is variable in the present species, the tip sometimes is very strongly curved upwards, sometimes the upward curvature is much less distinct. The second point is of much more importance. In all my material of the present species the hepatic spine lies in one line with the antennal, generally being placed close behind it, in some cases, however, the hepatic spine is placed somewhat below the antennal but then always the two spines lie in one line and the posterior ridge of the antennal spine extends itself in the direction of the hepatic spine and reaches close to the latter. This perhaps also may be the case with D e M a n's specimens. The variability of the relation between the several joints of the second leg in the present species has already been pointed out before (p. 167). The fact that the material of D e M a n in all other respects, even in the bluish mottled colour of the fingers of the second leg (which is an important and constant character), agrees with *M. equidens*, makes it extremely probable that also the erection of the var. *baramensis* is not justified. Examination of the typematerial of this form is needed, however, to obtain final certainty.

Nobili (1899) described a species of the present genus from Papua under the name *Palaemon (Eupalaemon) acanthosoma*, he regarded this form with some doubt as a new species, as it was only represented in his material by a male, which missed the second pereopods. De Man (1915) gave additional details and figures of Nobili's type. Nobili's description namely is very short and is not accompanied by figures. From De Man's extensive description and good figures of Nobili's type and of the specimen, which he identifies with Nobili's species, the identity of *Palaemon acanthosoma* with the present species can be made fully certain. Moreover I could examine De Man's specimens, which entirely confirmed the above supposition. J. Roux (1917) pointed to the identity of *Palaemon acanthosoma* and *P. sundaicus* var. *brachydactyla*.

Palaemon nasutus Nobili (1903a) from Singapore according to Nobili's description should only differ from *P. sundaicus* auctt. in the longer rostrum, in all other respects there is the closest affinity between the two forms. As already pointed out above the length of the rostrum of the present species is very variable and the character of a long rostrum can not be considered to be of specific or even varietal value as it is connected by all transitions with that of a short rostrum, as is distinctly shown by my material. *Palaemon nasutus* Nobili therefore must be considered a synonym of *Macrobrachium equidens*.

In their 1910 paper Henderson & Matthai considered *Palaemon sundaicus* Heller to be identical with *Palaemon idae* of the same author and used the latter name for a species, which however in reality is neither *Palaemon sundaicus* nor *P. idae*, but is *Macrobrachium idella* (Hilg.). Nevertheless the present species is represented in their material, but was considered by them to be a new species, which they gave the name *Palaemon sulcatus*; from the good description and figures the identity of *Palaemon sulcatus* Henderson & Matthai¹⁾ with *Macrobrachium equidens* (Dana) is clearly shown. J. Roux (1917) already pointed to the close resemblance between *Palaemon sulcatus* H. & M. and *Palaemon acanthosoma* Nobili.

The specimens brought by Maki & Tsuchiya (1923) and Kubo (1940, 1941) to this species probably do not belong here. They may be young specimens of *Macrobrachium nipponense*, but the identity of the specimens can not be made out with certainty from the descriptions and figures given.

The specimen described and figured by De Man (1915) as *Palaemon* sp. from Hollandia, N. New Guinea could be examined by me and proved to be a specimen of the present species, which has the rostrum very long, resembling thereby *Palaemon nasutus* Nobili.

In 1915 Stebbing described a new species of the present genus from river estuaries at Delagoa Bay (Portuguese E. Africa). This species as may be concluded from Stebbing's rather short description and figures hardly can be anything else as *Macrobrachium equidens*, as is shown by the shape of the rostrum, and the position of the antennal and hepatic spines (in his fig. n.s., representing the entire animal, the hepatic spine is figured below the antennal, this obviously is incorrect as in figure car., showing the anterior part of the carapace in detail, the hepatic spine is situated in one line with the antennal, a situation so characteristic for *Macrobrachium equidens*), also the shape and the pubescence of the chelae are typical for *M. equidens*. I do not hesitate therefore to consider Stebbing's species to be identical with that latter species, the more as Barnard (1926)

1) The name *Palaemon sulcatus* is already used by Olivier (1811) for a species of Penaeidae (= *Penaeus kerathurus* (Fossek.) = *P. caramote* (Risso) = *P. trisulcatus* Leach).

reports "*Eupalaemon sundaicus*" from Delagoa Bay, and as I have examined several specimens of *M. equidens* from the Natal coast. The specimen from Kenya identified by Rathbun (1935) with Stebbing's *Palaemon delagoae* is, as far as may be concluded from Rathbun's remarks and figures, indeed identical with that and therefore also with the present species.

In a paper on Crustacea of Natal Stebbing (1923) described a new prawn from the Umhlotuzi River, which he named *Urocaridella borradailei*. His specimen, however, is no Pontoniid at all and also does not belong to *Urocaridella* (this genus, as is already pointed out on p. 30, is identical with *Leander* Desmarest and belongs to the Palaemoninae). *Urocaridella borradailei* belongs to the genus *Macrobrachium* as is immediately shown by the situation of the hepatic spine, by the fact that the mandible is provided with a threejointed palp, and by that the dactylus of the last three pereopods is simple. Comparison of Stebbing's description and figures with the present species makes it clear that *Urocaridella borradailei* is nothing else than *Macrobrachium equidens* as is shown by the shape of the rostrum and the situation of the hepatic spine. Unfortunately the shape of the second pereopods is unknown since they are missing in Stebbing's typespecimen. Barnard (1947) already pointed out that Stebbing's *Urocaridella borradailei* belongs to the present species.

In the collection of the Amsterdam Museum, material is preserved, which is identified by J. Roux and published by him in Nova Guinea and in Capita Zoologica. The material identified by Roux (1921, 1923) as *Palaemon sundaicus* proved to consist of specimens belonging to various species, namely to *Macrobrachium australe*, *M. mammillodactylus* and to *M. equidens*. His 1921 material originating from the Lorentz River (S.W. New Guinea) and consisting of females and young males, for the larger part belongs to *M. mammillodactylus*, large males of which species are reported by Roux from that region. Only some of the specimens really are *M. equidens*, all others belong to *M. mammillodactylus*. Of the specimens mentioned by Roux (1923) as *Palaemon (Eupalaemon) sundaicus*, only that from Amboina really is *M. equidens*, those from Ceram and most specimens from Waigeo belong to *M. australe*, while the female from the rivulet near Ga, Waigeo proved to belong to *M. mammillodactylus*. This confusion again proves the extreme difficulty to separate the females and young males of *M. australe*, *M. equidens* and *M. mammillodactylus*. *M. equidens* and *M. australe* may be best distinguished by the fact that in *M. equidens* the hepatic and antennal spine lie in one line, while in *M. australe* they are placed distinctly below each other and do not lie in one line, furthermore the scaphocerite in *M. equidens* is much more slender than that in *M. australe*. *M. equidens* and *M. mammillodactylus* show the following differences in their females and young males:

1. The rostrum of *M. mammillodactylus* generally bears more (11-13) dorsal teeth than that of *M. equidens* (generally 10 or 11), the teeth in the former species are more erect. The lower margin of the rostrum in *M. mammillodactylus* generally bears 3 or 4 teeth, that of *M. equidens* generally 5. The rostrum of *M. mammillodactylus* is higher and narrows more rapidly towards the apex.
2. The fingers of the second legs in *M. mammillodactylus* often are more slender than those of *M. equidens*.
3. The best character to separate the females and young specimens of the two species is the shape of the scaphocerite. In *M. equidens* the outer margin of the scaphocerite is straight or more or less concave, while in *M. mammillodactylus* it is somewhat convex.

These characters are often rather vague, but when used together they are sufficient to find the identity of the specimens.

The specimens from a river near Batavia collected by A. G. V o r d e r m a n (Museum Leiden and Amsterdam) have already been mentioned by D e M a n (1897), 4 of these specimens are cotypes of D e M a n's *Palaemon sundaicus* var. *bataviana*. The specimens from Hollandia, N. New Guinea (Museum Leiden) have been described by D e M a n (1915) as *Palaemon acanthosoma* and *Palaemon* sp. The specimens from Durban and neighbourhood (Museum Amsterdam) have been dealt with by M. W e b e r (1897) as *Palaemon sundaicus*, those from Atjeh in the same Museum, by D e M a n (1897) as *Palaemon (Eupalaemon) sundaicus* var., the latter are made by N o b i l i (1899) the types of a new variety *Palaemon (Eupalaemon) sundaicus* var. *De Mani*. The specimens from the Java Sea (Museum Amsterdam) are mentioned by D e M a n (1897) as *Palaemon sundaicus*, those from Flores and Celebes, collected by M. W e b e r are described by D e M a n (1892) as *P. sundaicus*. Other specimens from the Amsterdam Museum have been mentioned by J. R o u x (1917), namely those from Ternate, Merauke and Tawarin as *Palaemon (Eupalaemon) sundaicus* and one from Ternate as *Palaemon (Eupalaemon) acanthosoma*, the specimens from the Lorentz and Varen Rivers are mentioned by J. R o u x (1921) as *P. sundaicus*, those from Amboina by the same author (1923) under the same name.

Distribution: This very common species, which seems to be a typical inhabitant of brackish water, but also is found in salt and fresh water, is recorded in literature from: Ngatana, Tana River, Kenya (R a t h b u n, 1935), Zanzibar (C o u t i è r e, 1901), Uzaramo Province and Kongorambotto, E. Africa (H i l g e n d o r f, 1898), Delagoa Bay, Portuguese E. Africa (S t e b b i n g, 1915; B a r n a r d, 1926), Umhlotuzi River, Natal (S t e b b i n g, 1923), Umgeni River, near Durban (M. W e b e r, 1897), Durban (M. W e b e r, 1897), Umlaas River, Natal (S t e b b i n g, 1915), Bay of Antongil, Madagascar (C o u t i è r e, 1900, 1901), Travancore (N a t a r a j, 1942), Cochin, S.W. India (H e n d e r s o n & M a t t h a i, 1910), Pondicherry (N o b i l i, 1903), Mergui Archipelago (D e M a n, 1888a), Singapore (D a n a, 1852; N o b i l i, 1903a), Patani River, Siamese Malay States (K e m p, 1918a), Kuala Mabek, Jalor, Siamese Malay States (L a n c h e s t e r, 1906), Tale Sap near Singora, Siamese Malay States (K e m p, 1918a), Patalung River, Siamese Malay States (S u v a t t i, 1937), Menam Chao Phya, Paknam near Bangkok, Siam (S u v a t t i, 1937), Bang-pla-soi, coast S.E. of Bangkok (S u v a t t i, 1937), Tachalom and Menam at Pakret, Siam (S u v a t t i, 1937), Chang Island, off Krat, Siam (S u v a t t i, 1937), Klong Raibon, Krat, Siam (S u v a t t i, 1937), Cochinchina (N o u v e l, 1932), Amoy, China (Y u, 1931), ? Miyako and Iriomote, Riukiu Islands (K u b o, 1941), ? Formosa (M a k i & T s u c h i y a, 1923), ? Kotôhi and Tainan, Formosa (K u b o, 1940), Obando River near Manila, Luzon, Philippines (C o w l e s, 1915), Manila (C o w l e s, 1915), San Francisco River near Manila, Luzon (C o w l e s, 1915), Laguna de Bay, Luzon (E s t a m p a d o r, 1937), Baram River, Sarawak (D e M a n, 1902), Atjeh, N. Sumatra (D e M a n, 1897), near Padang, W. coast of Sumatra (J. R o u x, 1932), Musi River near Muaraklingi, S. Sumatra (J. R o u x, 1932), Java Sea (D e M a n, 1897), River near Batavia (D e M a n, 1897), Ampenan, Lombok (J. R o u x, 1917), Rakambaha (= Mbawa), W. Flores (D e M a n, 1892), ? Palopo, Central Celebes (D e M a n, 1892), ? Parepare, ? Bantimurong and ? Balangnipa, S.W. Celebes (D e M a n, 1892), Makassar, S.W. Celebes (R a t h b u n, 1910), Ternate (J. R o u x, 1917), Amboina (N o b i l i, 1899; J. R o u x, 1917, 1923), Elat and Warkar, Groot Kai, Kai Islands (J. R o u x, 1919), Wokam and Waskai, Wokam Island, Aru Islands (J. R o u x, 1919), Hollandia, N. New Guinea (D e M a n, 1915), Tawarin River, Walckenaer Bay, N. New Guinea (J. R o u x, 1917), Lorentz River and Varen River,

S.W. New Guinea (J. Roux, 1921), Merauke, S.W. New Guinea (J. Roux, 1917), Katau, Papua (Nobili, 1899), Omboi Islands, New Britain (J. Roux, 1934a).

Macrobrachium nipponense (De Haan)

- Palaemon nipponensis* De Haan, 1849, Fauna Japon., Crust., p. 171.
Palaemon asper Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 41.
Palaemon Nipponensis Herklots, 1861, Tijdschr. Ent., vol. 4, p. 145.
Palaemon sinensis Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 528.
Palaemon sinensis Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 119, pl. 10 fig. 11.
Palaemon asper Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 119.
Palaemon Sinensis Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 42.
Palaemon nipponensis De Man, 1879, Notes Leyden Mus., vol. 1, p. 175.
Palaemon Sinensis Fauvel, 1880, Mém. Soc. Sci. nat. math. Cherbourg, vol. 23, p. 196.
Palaemon sinensis Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.
Palaemon nipponensis Ortman, 1891, Zool. Jb. Syst., vol. 5, p. 713, pl. 47 fig. 4.
Palaemon nipponensis Thallwitz, 1891a, Zool. Anz., vol. 14, p. 419.
Palaemon nipponensis De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 441.
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Palaemon nipponensis Koelbel, 1897, Wiss. Ergebn. Reise Szechenyi, vol. 2, p. 567.
Palaemon nipponensis Koelbel, 1897a, Szechenyi's Kelet. Utaz., vol. 2, p. 709.
Palaemon nipponensis Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 566.
Palaemon nipponensis Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon nipponensis Doflein, 1902, Abh. Bayer. Akad. Wiss., vol. 21, p. 640.
Bithynis nipponensis Rathbun, 1902b, Proc. U.S. Nat. Mus., vol. 26, p. 53.
Palaemon nipponensis Ichô, 1912, Oyashiwo, n. 7, p. 1.
Palaemon nipponensis Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 59.
Palaemon nipponensis Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 258.
Palaemon (Eupalaemon) nipponensis Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 80, pl. 6 fig. 2.
Palaemon (Eupalaemon) superbus Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 81, pl. 4 fig. 2.
Macrobrachium nipponensis Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 60, pl. 5 fig. 4.
Macrobrachium nipponensis Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.
Macrobrachium nipponensis Sowerby, 1925, Nat. Note-Book in China, pp. 133, 138.
Palaemon nipponensis Urita, 1926, Dobuts. Zass., vol. 38, p. 427.
Macrobrachium nipponensis Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Palaemon nipponensis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 271.
Palaemon sinensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon nipponensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
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Macrobrachium nipponense Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 1A, 2A, 2B, 3A, 3B.
Palaemon nipponensis Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 6, textfigs. 1, 2, pl. 1 fig. f.
Palaemon nipponensis Kubo, 1949, Bull. Japan. Soc. sci. Fish., vol. 15, p. 125, figs. 1-3.

Museum Leiden

Japan; cotypes of *Palaemon nipponensis* De Haan. — 12 specimens (4 ovigerous females) 61-99 mm. Takao, S. Formosa; received May 9, 1908; leg. H. Sauter. — 3 specimens 44-61 mm. Locality unknown. — 1 specimen 92 mm (dry).

This species has been often described and figured in literature (Ortmann, 1891; Parisi, 1919; Yu, 1931; Kubo, 1940). I only wish therefore to make the following remarks:

The scaphocerite is slender, it is almost thrice as long as broad. The outer margin is straight or slightly concave, the apex is rounded.

The antennule and the oral parts are typical, just like the pleopods.

The eggs are 0.4 to 0.6 mm in diameter.

The identity of *Palaemon asper* Stimps. and *P. sinensis* Heller with the present species has already been pointed out by older authors (De Man, Ortmann).

The specimens from Tale Sap (Siamese Malay States) identified by Lancheester as *Palaemon nipponensis* do not belong to the present species, but to *Macrobrachium sintangense* (vid. supra, p. 153), as is shown by the rostral formula $\left(\frac{6-11}{3-6}\right)$ and the shape of the large second leg of the male specimens.

Parisi in his 1919 paper described and figured *Palaemon (Eupalaemon) superbus* from Southern China. These specimens certainly do not belong to *Macrobrachium superbum*, as is already remarked by Yu (1931). In my opinion they must be referred to the present species, with which they agree in all respects. The fact that Parisi's specimens from Southern China all are females, and that his Japanese specimens correctly referred by him to *P. nipponensis* all are males, probably is the cause that he overlooked their conspecificity.

The specimens from Japan in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden are the cotypes of the present species; the material is in rather good condition. The dry specimen from an unknown locality also may have belonged to the type lot as many of the original labels of the old collection of dry Crustacea have been lost.

Distribution: *Macrobrachium nipponense* is very commonly met with in fresh waters of China and Japan (Ortmann, 1891, thinks it probable that his specimens were captured in brackish water). Records in literature are: China: Shanhaikwan and Chinwangtao, Hopeh Province, N. China (Yu, 1931), Peiping, Peiping Province (Doflein, 1902; Gee, 1925; Kellogg, 1928), Peh Tai Ho, Hopeh Province (Gee, 1925; Kellogg, 1928; Yu, 1931), Tsinan and Chefoo, Shantung Province (Yu, 1931), Chengtu, Szechwan Province (Yu, 1931), Shasi, upper Yangtsekiang, Hupeh Province (Doflein, 1902), Hankow, Hupeh Province (Yu, 1931), Yangchow, Chinkiang and Soochow, Kiangsu Province (Yu, 1931), Tai Hu Lake near Shanghai, Kiangsu Province (Kemp, 1918a), Shanghai, Kiangsu Province (Heller, 1862a, 1865; Von Martens, 1868; Doflein, 1902; Balss, 1914; Sowerby, 1925; Kellogg, 1928; Yu, 1931), Tsungming, Kiangsu Province (Yu, 1931), Hangchow, Chekiang Province (Koelbel, 1897), Kashing, Chekiang Province (Yu, 1931), Ningpo, Chekiang Province (Fauvel, 1880), Wenchow, Chekiang Province (Gee, 1925; Kellogg, 1928), Kiukiang and Nanchang, Kiangsi Province (Yu, 1931), Pei-chii¹⁾ (Yu, 1931), Foochow, Fukien Province (Kellogg, 1928), Min River, Fukien Province (Gee, 1925; Kellogg, 1928), Amoy, Fukien Province (Yu, 1931), Canton, Kwantung Province (Stimpson, 1860), West Lake (Yu, 1931), S. China (Parisi, 1919), Annam (Thallwitz, 1891a).

Japan: Japan (De Haan, 1849; Herklots, 1861; De Man, 1879; Kingsley, 1882; Thompson, 1901; Fish. Soc. Japan, 1935), Kasumiga-ura, N. of Tokyo (Kitahara, 1895;

1) The exact position of this locality is not known to me

Ich ô, 1912; Kemp, 1918; Kubo, 1949), Tokyo Bay (Ortmann, 1891; Balss, 1914), Yokohama (Von Martens, 1868; Parisi, 1919), Turumi-gawa, Kanagawa Prefecture (Kubo, 1940), Fukuura, Sagami Bay (Balss, 1914), Hamanako, Sizuoka Prefecture, and Miya, Aiti Prefecture (Kubo, 1940), Wakanoura, Kii Province (Rathbun, 1902b), Yodo River near Osaka (Kemp, 1918), Asaki River near Okayama, Hondo (Balss, 1914), Yukuhasi, Fukuoka Prefecture, Kyushu (Kubo, 1940), Chikugo River near Kurume (Rathbun, 1902b), Kurume, Kyushu (Rathbun, 1902b).

Formosa: Formosa (Maki & Tsuchiya, 1923), Keelung River near Tamsui, N. Formosa (Balss, 1914).

Macrobrachium mirabile (Kemp)

Palaemon mirabilis Kemp, 1917, Rec. Indian Mus., vol. 13, p. 227, pl. 10.

Palaemon mirabilis Kemp, 1917a, Rec. Indian Mus., vol. 13, p. 234.

Palaemon mirabilis Sewell, 1934, Rec. Indian Mus., vol. 36, pp. 54, 55.

Macrobrachium mirabilis Suvatti, 1937, Check-List aq. Fauna Siam, p. 49.

Siboga Expedition

Station 82, Batupangal, Lower Mahakam River, E. Borneo; June 15 and 16, 1899. — 11 specimens 28-46 mm.

Museum Amsterdam

Sibpur near Calcutta, Hooghly River; January, 1917; leg. S. Kemp; coll. J. G. de Man; paratypes of *Palaemon mirabilis* Kemp. — 6 specimens 24-52 mm.

My specimens entirely agree with Kemp's extensive description and fine figures of the characteristic species.

The pleopods of the males present the normal shape.

The specimens from Sibpur formed part of the material on which Kemp's original description is based.

Distribution: *Macrobrachium mirabile* lives in brackish waters. It is recorded in literature from several localities in the Hooghly district, Ganges delta; off Cowcolly Lighthouse, mouth of Damodar River, Trebeni, Hooghly Nulla and Sibpur (Kemp, 1917), from various localities in the Ganges delta: Sandheads, Port Canning, Shela in Khulna District, and Barisal (Kemp, 1917), Pazudaun and Dala Creeks, Rangoon, Burma (Kemp, 1917), Moulmein River, Burma, (Kemp, 1917), Chay Phya River, Menam at Pakret and Menam at Paknam, Siam (Suvatti, 1937). The present record of the species from E. Borneo forms a considerable extension of the known range of distribution of the species.

Macrobrachium australiense nom. nov.

Palaemon n.sp.? De Man, 1887a, Zool. Jb. Syst., vol. 2, p. 711, fig. 4.

Palaemon sp.? Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 708.

Palaemon australis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 709. (non Guérin, 1838).

Palaemon australis Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 17.

Palaemon australis McNeill, 1926a, Aust. Encycl., vol. 2, p. 325, fig.

Palaemon australis Hale, 1927, Crust. S. Aust., vol. 1, p. 60, fig. 56.

Palaemon australis Hale, 1927a, Trans. Roy. Soc. S. Aust., vol. 51, p. 309.

Palaemon (*Parapalaemon*) *australis* McNeill, 1929, Rec. Aust. Mus., vol. 17, p. 144, pl. 35.

Palaemon australis J. Roux, 1933a, Rev. Suisse Zool., vol. 40, p. 344.

Museum Leiden

- Sydney; leg. R. Schütte. — 1 specimen 115 mm.
 Rockhampton, Queensland; Mus. Godeffroy. — 1 specimen 42 mm.
 Peak Downs, Queensland; Mus. Godeffroy. — 2 specimens 40 and 42 mm.
 Locality unknown; Mus. Godeffroy. — 2 specimens 46 and 48 mm.

Museum Amsterdam

- Pallal, Horton river, near Bingara, New S. Wales; 1910; don. A. R. McCulloch; coll. J. G. de Man. —
 5 specimens 24-81 mm.

The present species has been extensively described by McNeill (1929), who also provided good figures.

The scaphocerite is more than 2.5 times as long as wide. The outer margin is about straight, sometimes being slightly concave or slightly convex.

The oral parts are normal in shape.

The fingers of the first leg are about as long as the palm, the carpus is twice as long as the chela. The merus measures $\frac{4}{5}$ of the length of the carpus. The third leg just reaches beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus and twice as long as the carpus. The merus is slightly longer than the propodus. The fifth leg just fails to reach the end of the scaphocerite. The relation between the joints is the same as that of the third leg, though the joints themselves are more slender. The legs are provided with some short scattered hairs, while the usual spines are present on the posterior margin of the propodus; no other spines are observed on these legs.

The pleopods and uropods are normal in shape.

This species was first mentioned in literature by De Man (1887a), who had a specimen with a damaged rostrum at his disposal. De Man, though describing and figuring his specimen, did not give it a specific name because his material was too small. The first to give the species a name was Ortmann (1891), who, having examined several young specimens, described them as *Palaemon* sp.?, but gave in the text the name *Palaemon australis* for the case his material should belong to a new species. This name is used by all subsequent authors. *Palaemon australis* Ortmann (1891), however, is not valid as it is preoccupied by the name *Palaemon australis* Guérin (1838), which belongs to the species inserted in the present paper under the name *Macrobrachium australe* (Guérin) (= *Palaemon dispar* Von Mart.). Ortmann's species therefore needs another name, for which I should like to propose *Macrobrachium australiense* nom. nov., as the species seems to be confined to the Australian continent.

The specimen from Sydney (Museum Leiden) was provided with the label "*Palaemon ruber* Hess var. *digitis inermatis*. type." This certainly is not correct as the type of Hess's *Palaemon ruber* is a *Macrobrachium lar*, which originated from the Fiji Islands. It also is not the specimen from Sydney described by De Man (1887) as *Palaemon* n. sp.?, and which according to De Man was inserted in the collection of the Göttingen Museum under the name *Palaemon ruber* Hess; the rostrum in my specimen namely is normal in shape.

The specimens from Rockhampton and Peak Downs were obtained by the Leiden Museum from the Museum Godeffroy, from which Museum the Strassbourg Museum also purchased specimens from the same localities, which became the types of the present species. In all probability the specimens of the Strassbourg and Leiden Museums have formed part of the same lot.

The specimens of the Amsterdam Museum were presented in 1910 by Mr. A. R. McCulloch to Dr. J. G. de Man. In his 1929 paper McNeill published the letter of De Man to McCulloch concerning these animals.

Distribution: The species is only known from freshwater of the Australian continent. Records in literature are: Katherine River, Northern Territory (J. Roux, 1933a), Peak Downs, Rockhampton and Gayndah, E. Queensland (Ortmann, 1891), Burnett, S.E. Queensland (Ortmann, 1894), Pallal, Horton River, northern New S. Wales (McNeill, 1929), Sydney? (De Man, 1887a), S. Australia (Hale, 1927), Kangaroo Island, S. Australia (Hale, 1927a).

Macrobrachium hildebrandti (Hilgendorf)

Bithynis? hildebrandti Hilgendorf, 1893, S. B. Ges. naturf. Fr. Berlin, 1893, p. 244.

Palaemon hildebrandti Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 928, pl. 92.

This species has not been seen by me. It is extensively described and figured by Calman (1913).

Distribution: *Macrobrachium hildebrandti* is only known from Madagascar. It lives in fresh water. The records in literature are: Madagascar (Calman, 1913), Central Madagascar (Hilgendorf, 1893), Ambatonharanana, East Imerina and Betsileo, Central Madagascar (Calman, 1913).

Macrobrachium insulare (Parisi)

Palaemon (Parapalaemon) insularis Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 85, textfig. 7, pl. 3 figs. 2, 3, pl. 6 fig. 12.

Macrobrachium insulare is only known from the type specimens reported by Parisi (1919) to originate from Formosa.

Macrobrachium lar (Fabricius) (fig. 37)

Palaemon Lar Weber, 1795, Nomencl. Entom., p. 94 (nom. nud.).

? *Palaemon longimanus* Weber, 1795, Nomencl. Entom., p. 94 (nom. nud.).

Palaemon Lar Fabricius, 1798, Suppl. Ent. Syst., p. 402.

? *Palaemon longimanus* Fabricius, 1798, Suppl. Ent. Syst., p. 402.

Palaemon lar Bosc, 1801, Hist. nat. Crust., vol. 2, p. 104.

? *Palaemon longimanus* Bosc, 1801, Hist. nat. Crust., vol. 2, p. 104.

Palaemon lar Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 258.

? *Palaemon longimanus* Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 258.

Pa'laemon Lar Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 659.

Palaemon ornatus Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 660.

? *Palaemon longimanus* Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 661.

Palaemon ornatus Latreille, 1818, Tabl. enc. méth., vol. 24, p. 5, pl. 318 fig. 1.

Palaemon ornatus H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 396.

? *Palaemon longimanus* H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 396.

Palémon Lar H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 397.

Palaemon ornatus Guérin, 1838, Voy. Coquille Zool., vol. 2 pt. 2 n. 1, p. 36.

? *Palaemon ornatus* Cantor, 1842, Ann. Mag. nat. Hist., vol. 9, p. 491.

Palaemon ornatus White, 1847, List Crust. Brit. Mus., p. 78.

Palaemon tridens (Leach MSS) White, 1847, List Crust. Brit. Mus., p. 78.

? *Palaemon longimanus* White, 1847, List Crust. Brit. Mus., p. 78.

Palaemon ornatus De Haan, 1849, Siebold's Fauna Japonica, Crust., pl. P.

- Palaemon ornatus* Bleeker, 1856, Reis Minahassa Moluksche Arch., vol. 1, p. 273; vol. 2, p. 64 (as *Palaemon ornatus*).
- Palaemon vagus* Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 417, pl. 2 figs. 42, 43.
- Palaemon equidens* Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 418, pl. 2 fig. 44 (non Dana, 1852).
- Palaemon spectabilis* Heller, 1862 a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.
- Palaemon vagus* Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 113.
- Palaemon spectabilis* Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 113, pl. 10 fig. 8.
- Palaemon ornatus* Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 119.
- Palaemon ruber* Hess, 1865, Arch. Naturgesch., vol., 31 pt. 1, p. 165, pl. 7 fig. 20.
- Palaemon ornatus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 36.
- Palaemon ornatus* Semper, 1868, Proc. zool. Soc. Lond., 1868, p. 586.
- Palaemon mayottensis* Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 32, pl. 9 figs. 61, 62.
- Palaemon reunionnensis* Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 33, pl. 9 figs. 66, 67.
- Palaemon longimanus* Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 34, pl. 9 figs. 68, 69.
- Palaemon madagascariensis* Hoffmann, 1874, Rech. Faune Madagascar, vol. 5 pt. 2, p. 35, pl. 7 fig. 58.
- Palaemon ornatus* Von Martens, 1876, Preuss. Exped. Ost-Asien, Zool., vol. 1, p. 315.
- Palaemon ornatus* Miers, 1876, Catal. Crust. New Zeal., p. 87.
- Palaemon ornatus* De Man, 1879, Notes Leyden Mus., vol. 1, p. 168.
- Palaemon mayottensis* De Man, 1879, Notes Leyden Mus., vol. 1, p. 173.
- Palaemon Reunionnensis* De Man, 1879, Notes Leyden Mus., vol. 1, p. 174.
- Palaemon ornatus* Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 493.
- Palaemon* Lenz & Richters, 1881, Abh. Senckenb. naturf. Ges., vol. 12, p. 427.
- non *Palaemon ornatus* Haswell, 1882, Catal. Aust. Crust., p. 196.
- Palaemon longimanus* Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 108.
- Palaemon ornatus* Filhol, 1885, Bibl. Éc. haute Étud., vol. 30 pt. 2, p. 52.
- Palaemon ornatus* Filhol, 1886, Miss. Ile Campbell, Zool., vol. 2 pt. 2, p. 434.
- Palaemon ruber* De Man, 1887 a, Zool. Jb. Syst., vol. 2, p. 710.
- Bithynis lar* Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 789, pl. 129 fig. 1.
- Palaemon ornatus vagus* De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 554.
- Palaemon ornatus* Osorio, 1888, Journ. Sci. math. phys. nat. Lisboa, vol. 12, p. 240.
- Palaemon ornatus* Hickson, 1889, Natural. N. Celebes, pp. 105, 362.
- Palaemon lepidodactylus* p.p. Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
- Palaemon ruber* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 705, pl. 47 fig. 3.
- Palaemon lar* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 724.
- Palaemon (Eupalaemon) lar* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 445.
- Palaemon spectabilis* Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 446 footnote.
- Palaemon equidens* Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 456 footnote.
- Palaemon (Eupalaemon) lar* De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.
- Palaemon lar* Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 123.
- Palaemon lar* Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 17.
- Palaemon ornatus* Casto de Elera, 1895, Catal. Faun. Filip., vol. 2, p. 568.
- Palaemon lar* Borradaile, 1898, Proc. zool. Soc. Lond., 1898, p. 1008.
- Palaemon (Eupalaemon) lar* Hilgendorf, 1898, Deutsch O. Afr., vol. 4 pt. 7, p. 31.
- Palaemon lar* Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 409.
- Palaemon (Eupalaemon) lar* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 240.
- Palaemon (Eupalaemon) vagus* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 240.
- Palaemon (Eupalaemon) lar* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
- Palaemon (Eupalaemon) lar* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 482.

- Palaemon lar* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 292, pl. 12 figs. 25-28.
- Palaemon lar* Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 436.
- Palaemon lar* Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
- Palaemon (Eupalaemon) lar* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 774.
- Palaemon lar* Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 505.
- Palaemon lar* Seurat, 1903, Bull. Mus. Hist. nat. Paris, vol. 9, p. 223.
- Palaemon lar* Seurat, 1903 a, Bull. Mus. Hist. nat. Paris, vol. 9, p. 381.
- Palaemon lar* Seurat, 1903 b, Bull. Soc. ent. France, 1903, p. 246.
- Bithynis ornatus* Thomson, 1903, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 8, p. 451.
- Palaemon (Eupalaemon) lar* De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 291, pl. 18 fig. 1.
- Palaemon (Eupalaemon) lar* Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 380.
- Palaemon (Eupalaemon) reunionnensis* De Man, 1905, Notes Leyden Mus., vol. 26, p. 204, pl. 15 figs. 1-4.
- Palaemon lar* De Man, 1905, Notes Leyden Mus., vol. 26, p. 205, pl. 15 fig. 5.
- Palaemon (Eupalaemon) lar* var.? De Man, 1905 a, Proc. zool. Soc. Lond., 1905 pt. 2, p. 544, pl. 18.
- Palaemon lar* Nobili, 1905 a, Ann. Mus. nat. Hungar., vol. 3, p. 481.
- Leander dionyx* Nobili, 1905 a, Ann. Mus. nat. Hungar., vol. 3, p. 482, pl. 12 fig. 2.
- Palaemon (Eupalaemon) lar* Borradaile, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 12, p. 67.
- Palaemon ornatus* Coulon, 1907, Bull. Soc. Étud. Sci. nat. Elbeuf, vol. 26, p. 191.
- Palaemon (Eupalaemon) lar* Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 361.
- Palaemon lar* var. Calman, 1909, Proc. zool. Soc. Lond., 1909, p. 706.
- Palaemon (Eupalaemon) lar* Lenz, 1910, Voeltzkow's Reise O. Afr., vol. 2, p. 567.
- Bithynis (Eupalaemon) lar* Rathbun, 1910, Bull. Mus. comp. Zoöl. Harvard, vol. 52, p. 316.
- Palaemon lar* Koningsberger, 1913, Java zoöl. biol., p. 401.
- Palaemon ornatus* Baker, 1914, Trans. Roy. Soc. S. Aust., vol. 38, p. 447.
- Palaemon lar* Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 380, pl. 2 fig. 7.
- Palaemon lar* Pesta, 1914, Denkschr. Akad. Wiss. Wien, vol. 89, p. 675.
- Palaemon (Eupalaemon) lar* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 415.
- Palaemon (Macrobrachium) latimanus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.
- Palaemon (Eupalaemon) lar* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 330.
- Macrobrachium lar* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 56, pl. 5 fig. 1.
- Palaemon (Eupalaemon) lar* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 9.
- Palaemon lar* Balss, 1925, Wiss. Ergebn. Valdivia Exped., vol. 20, p. 293.
- Leander dionyx* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 294.
- Palaemon (Eupalaemon) lar* J. Roux, 1926, Nova Caledonia, Zool., vol. 4, p. 221.
- Palaemon (Eupalaemon) lar* J. Roux, 1927, Nova Guinea, vol. 15, p. 322.
- Palaemon (Eupalaemon) lar* J. Roux, 1928a, Treubia, vol. 10, pp. 213, 219.
- Palaemon (Eupalaemon) lar* J. Roux, 1929, S.B. Ges. naturf. Fr. Berlin, 1929, p. 236.
- Palaemon lar* Roxas, 1930, Puerto Galera mar. biol. Lab., p. 17.
- Palaemon (Eupalaemon) lar* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 565.
- Palaemon (Eupalaemon) lar* J. Roux, 1933, Rés. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 6.
- Palaemon (Eupalaemon) lar* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 531.
- Palaemon (Eupalaemon) lar* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, pp. 217, 218, 219.
- Palaemon lar* Adamson, 1935, Occ. Pap. Bishop Mus. Honolulu, vol. 11 pt. 10, p. 17.
- Palaemon (Eupalaemon) lar* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 150, pl. 38.
- Palaemon lar* Gordon, 1935a, Ann. Mag. nat. Hist., ser. 10 vol. 16, p. 629.
- Macrobrachium lar* Ohshima, 1935, Botany Zool. Tokyo, vol. 3 pt. 3, p. 974.
- Palaemon lar* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
- Palaemon lar* Miyake, 1938, Annot. zool. Japon., vol. 17, p. 110.
- Palaemon lar* Adamson, 1939, Bull. Bishop Mus. Honolulu, vol. 159, p. 36.
- Palaemon lar* Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 23, textfig. 14, pl. 2 figs. a-c.

- Macrobrachium lar* Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 12.
Palaemon lar Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 312, fig. 6.
Palaemon longimanus Ward, 1942, Mauritius Inst. Bull., vol. 2, p. 58.
Palaemon lar Gibson-Hill, 1947, Bull. Raffles Mus., vol. 18, p. 44.
Macrobrachium lar Holthuis, 1949, Nova Guinea, n. ser. vol. 5, p. 291.

Siboga Expedition

- Station 47, Bay of Bima, Sumbawa; reef; depth 55 m; bottom mud, with patches of fine coral sand; April 8-12, 1899. — 2 specimens 15 and 18 mm.
 River near Station 121, Menado, N. Celebes; July 14-16, 1899. — 4 specimens (2 of which ovigerous females) 69-80 mm.
 Station 131, Beo, Talaud Islands; July 24 and 25, 1899. — 7 specimens 60-91 mm (1 female bopyrized).
 River near Station 180, northcoast of Kelang Island, W. of Ceram; September 4, 1899. — 1 specimen 102 mm.
 River near Station 234, Nalahia Bay, Nusa Laut Island, S. of Ceram; November 19 and 20, 1899. — 18 specimens 57-125 mm.

Snellius Expedition

- Mamudju, off the mouth of the Mamudju River; surface; August 4, 1929. — 1 specimen 17 mm.
 Haruku; fresh water; May 3-7, 1930. — 10 specimens 90-140 mm.
 Amboina; in rivulet; September 13, 1930. — 16 specimens 90-130 mm.
 Morotai; October 2, 1930. — 19 specimens 47-156 mm.

Museum Leiden

- Mayotta, near Madagascar; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon mayotensis* Hoffmann. — 9 specimens 71-124 mm.
 Réunion; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon longimanus* Hoffmann. — 8 specimens 60-129 mm.
 Réunion; 1865; leg. F. P. L. Pollen & D. C. van Dam; cotypes of *Palaemon reunionnensis* Hoffmann. — 11 specimens 115-131 mm.
 We Island, northpoint of Sumatra; fresh water; 1906, 1907, January, 1913, November, 1919, September, 1922, November, 1923, February, 1924, March, July, and November, 1925, May, July, August, October and November, 1926, June, 1927, March, and October, 1930; leg. P. Buitendijk. — 108 specimens (including ovigerous females) 29-132 mm.
 Padang, westcoast of Sumatra, and Timor. — 2 specimens 110 and 115 mm. (dry).
 West Sumba, Lesser Sunda Islands; 1891; leg. H. ten Kate. — 3 specimens 62-102 mm.
 Flores; leg. E. W. A. Ludeking. — 1 specimen 122 mm.
 Besar Island (= Groot Bastaard), off N. E. Flores; 1891; leg. H. ten Kate. — 9 specimens (including 5 ovigerous females) 55-123 mm.
 Wero River, near Atapupu, N. Dutch Timor, and Nefko Lake, near Kupang, S. Dutch Timor; 1891; leg. H. ten Kate. — 14 specimens (including 6 ovigerous females) 52-134 mm.
 Atapupu, Timor; 1888-1889; leg. M. Weber. — 2 specimens 69 & 72 mm.
 Timor; 1893; leg. H. ten Kate. — 1 specimen 83 mm.
 River near Talae, Roti, S. of Timor; 1888-1889; leg. M. Weber. — 2 specimens (1 ovigerous female) 68 and 73 mm.
 Roti, island S. of Timor; 1891; leg. H. ten Kate. — 7 specimens 46-68 mm.
 Gorontalo Bay, E. Celebes. — 1 specimen 108 mm.
 Celebes; April 14, 1878; leg. J. G. F. Riedel. — 1 specimen 99 mm.
 Celebes; April 18, 1878; leg. C.B.H. von Rosenberg. — 2 specimens 50 and 87 mm.
 Celebes; leg. E. A. Forsten. — 2 specimens 90 and 118 mm.

- Tahuna, Sangihe Island, N. of Celebes; May and June, 1903; leg. E. E. W. Schröder. — 3 specimens (1 ovigerous female) 46-94 mm.
- Sangihe Island; 1903; leg. E. E. W. Schröder. — 3 specimens 11-43 mm.
- Tobelo, Halmahera, N. Moluccas; May, 1912; leg. A. Hueting. — 48 specimens (including 18 ovigerous females) 54-106 mm.
- Halmahera; 1862; leg. H. A. Bernstein. — 8 specimens (1 ovigerous female) 58-93 mm.
- Morotai, near Halmahera; 1862; leg. H. A. Bernstein. — 7 specimens 86-101 mm.
- Ternate, Moluccas; leg. H. A. Bernstein. — 2 specimens 76 and 97 mm.
- Gebe Island, E. of S. Halmahera; 1864; leg. H. A. Bernstein. — 1 ovigerous female 77 mm.
- Sanana, Sula Islands; 1877; leg. J. E. Teysmann. — 9 specimens 53-99 mm.
- Ceram or Lesser Sunda Islands; 1915; leg. J. M. Kampmeiert. — 1 ovigerous female 92 mm.
- Seri, Amboina; found in large quantities out of the water on wet rocks in a rapidly flowing brook, near where it empties into the sea; June 25, 1922; leg. F. Kopstein. — 56 specimens 14-19 mm.
- Amboina; in rapidly flowing mountain rivulets and waterfalls; October, 1922; leg. F. Kopstein. — 2 specimens 47 and 50 mm.
- Amboina; 1877; leg. J. E. Teysmann. — 4 specimens (1 ovigerous female) 63-90 mm.
- Groot Banda; fresh water; 1881; leg. J. Semmelink. — 1 specimen 84 mm.
- Banda Sea; 1881; leg. J. Semmelink. — 38 specimens 21-98 mm.
- Moluccas; 1844; leg. E. A. Forsten. — 2 specimens 131 and 161 mm.
- Moluccas; 1895; leg. W. A. Moreaux. — 3 specimens 89-104 mm.
- Andai, N. W. New Guinea; 1870; leg. C. B. H. von Rosenberg. — 1 specimen 82 mm.
- Lower Sermowai River, N. New Guinea; in small rivulet, altitude about 70 m; April 9, 1911; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 150 mm.
- Korime River, near Nimburan, N. New Guinea; fresh water; September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 109 mm.
- Tarfia, N. New Guinea; in fresh water; September, 1910; or, Armo River near Jakari; August 28, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 87 mm.
- Jaona, N. New Guinea; September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 7 specimens 57-109 mm.
- Mbai River near Hollandia, N. New Guinea; fresh water; April and September, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 13 specimens (1 ovigerous female) 75-114 mm.
- Tributary of the Mbai river near its mouth; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 5 specimens (2 ovigerous females) 83-106 mm.
- Hollandia, N. New Guinea; April 10 and May 15 and 19, 1911; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 10 specimens 95-137 mm (1 bopyrized).
- Mouth of river emptying into Kajo Bay (= Hollandia Bay), N. New Guinea; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 10 specimens (2 ovigerous females) 85-117 mm.
- Fate River near Hollandia, N. New Guinea; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 78 mm.
- Zoutbron, 3° 1' 13" S, 140° 57' 30" E, N. New Guinea; New Guinea Expedition 1910-1911; leg. K. Gjellerup. — 1 specimen 98 mm.
- Tjano River near Njao, N. New Guinea; June 15, 1910; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 3 specimens (1 ovigerous female) 109-181 mm.
- Indian Archipelago. — 3 specimens 98-123 mm.
- Sydney?; leg. R. Schütte. — 1 specimen 102 mm.
- New Caledonia. — 2 specimens 129 and 131 mm. (dry).
- Pacific Ocean; Mus. Godeffroy. — 3 specimens 61-116 mm.
- Locality unknown; 1844; leg. E. A. Forsten. — 1 specimen 165 mm.

Museum Amsterdam

- Sabang Bay, We Island, off northpoint of Sumatra; leg. G. Herman. — 10 specimens (7 ovigerous females) 76-117 mm.

- Sinabang, Simalur, off westcoast of Sumatra; January and February, 1913; leg. E. Jacobson. — 38 specimens (10 ovigerous females) 47-91 mm.
- Lugu, Sinabang Bay, Simalur; February, 1913; leg. E. Jacobson. — 7 specimens (1 ovigerous female) 58-151 mm.
- Tudju River, Simalur; April, 1913; leg. E. Jacobson. — 4 specimens 74-128 mm.
- Lasikin, Simalur; April, 1913; leg. E. Jacobson. — 9 specimens (5 ovigerous females) 63-94 mm.
- ? Simalur; 1913; leg. E. Jacobson. — 1 specimen 125 mm.
- Babi Island, 2° 7' N, 96° 40' E, off westcoast of Sumatra; fresh water; April, 1913; leg. E. Jacobson. — 12 specimens (4 ovigerous females) 96-131 mm.
- Gunungsitoli, Nias, off westcoast of Sumatra; 1910; leg. J. P. Kleiweg de Zwaan. — 6 specimens (1 ovigerous female) 35-72 mm.
- Lolowau, Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 8 specimens (2 ovigerous females) 74-143 mm.
- West Nias; leg. J. P. Kleiweg de Zwaan. — 17 specimens (6 ovigerous females) 39-89 mm.
- Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 68 specimens (1 ovigerous female) 33-128 mm.
- Serdang, eastcoast of Sumatra; leg. van Dedem. — 2 specimens (1 ovigerous female) 81 and 93 mm.
- Nusa Kambangan, island off the southcoast of Java; in rivulet, fresh water; March, 1911; leg. E. Jacobson. — 21 specimens (2 ovigerous females) 33-108 mm.
- Tjilatjap, southcoast of Java; leg. G. J. Terwiel. — 1 specimen 132 mm.
- Guwa Ninggrong Cave in Gunung Sewu, Mula Subdistrict, near Jogjakarta, S. Java; in rivulet, fresh water; March, 1911; leg. E. Jacobson. — 7 specimens (5 ovigerous females) 69-146 mm.
- Buleleng, Bali; January 25, 1907. — 1 specimen 86 mm.
- West Sumba; October 18, 1932. — 1 specimen 71 mm.
- Lahalura Island off S. E. Sumba; May 2, 1909. — 1 specimen 75 mm.
- River near Reo, N. W. Flores; 1888-1889; leg. M. Weber. — 3 specimens 31-48 mm.
- Alowai River, south of the village Papang, Riung district, northcoast of Flores; 40 m above sealevel; September 28, 1908; leg. G. A. J. van der Sande. — 5 specimens 89-138 mm.
- Raka-mbaha (= Mbawa), S. Flores; in river close near the sea; 1888-1889; leg. M. Weber. — 3 specimens 54-71 mm.
- Raka-mbaha, S. Flores; upstreams of waterfalls; 1888-1889; leg. M. Weber. — 8 specimens (1 ovigerous female) 26-75 mm.
- Wukur River near Sikka, S. Flores; 1888-1889; leg. M. Weber. — 1 specimen 40 mm.
- Lela River near Sikka; 1888-1889; leg. M. Weber. — 5 specimens (3 ovigerous females) 54-67 mm.
- Konga River, E. Flores; December 9, 1908 and October 30, 1909; leg. G. A. J. van der Sande. — 6 specimens (3 ovigerous females) 57-125 mm.
- Rivulet near Lamuda, E. Flores; May 3, 1908; leg. G. A. J. van der Sande. — 10 specimens (1 ovigerous female) 23-72 mm.
- Near Riangkami, Ilimandiri mountain, E. Flores; leg. G. A. J. van der Sande. — 2 specimens 50 and 77 mm.
- Wure, westcoast of Adonara, island E. of Flores; November 12, 1908; leg. G. A. J. van der Sande. — 3 specimens 40-92 mm.
- Tanahmerah, westcoast of Adonara; 1888-1889; leg. A. Wichmann. — 2 specimens 64 and 82 mm.
- River near Atapupu, N. Dutch Timor; February 26, 1899; leg. A. Wichmann. — 11 specimens (3 ovigerous females) 34-102 mm.
- Putain, Semanatang district, Central Timor; region of the sources of the Temutu River; about 600 m above sealevel. — 5 specimens 76-132 mm.
- Koinino River near Kupang, S. Timor; March, 1889; leg. A. Wichmann. — 7 specimens 51-124 mm.
- Koinino River near Kupang; August 21, 1909; leg. H. A. Lorentz. — 9 specimens 50-113 mm (1 specimen bopyrized).
- River near Kupang; May 14, 1908; leg. G. A. J. van der Sande. — 1 specimen 120 mm.
- River near Talae, Roti, S. of Timor; 1889; leg. A. Wichmann. — 6 specimens (2 ovigerous females) 61-94 mm.
- Jer Lawi River, Babar, N.E. of Timor; 7 km from the mouth. — 6 specimens 74-95 mm.

- River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber. — 2 specimens 76 and 123 mm.
- River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber. — 7 specimens 41-98 mm.
- Kadjang, S. E. part of the S. W. peninsula of Celebes; in a brooklet; 1888-1889; leg. M. Weber. — 14 specimens 33-54 mm.
- Bangkalan and Bonea Rivers, Salajar, off S. W. Celebes; 1888-1889; leg. M. Weber. — 3 specimens (2 ovigerous females) 72-93 mm.
- River near Tobelo, Halmahera; leg. W. Kükenthal; coll. J. G. de Man. — 2 specimens 92 and 119 mm.
- Patani, Halmahera; leg. W. Kükenthal; coll. J. G. de Man. — 1 specimen 120 mm.
- Ternate; pool in the dry bed of a rivulet; February 1, 1903; leg. L. F. de Beaufort. — 3 specimens (1 ovigerous female) 63-91 mm.
- River south of Labuha, Batjan, Moluccas; January, 1927; leg. H. T. de Booy. — 1 specimen 73 mm.
- Batjan; 1884; leg. S. C. J. W. van Musschenbroek. — 5 specimens 65-140 mm.
- Leksula, southcoast of Buru; March 2, 1921; Buru Expedition 1921; leg. L. J. Toxopeus. — 13 specimens 46-113 mm.
- Makatita, S. E. Buru; in fast flowing water, in rather deep places; September 25, 1921; Buru Expedition 1921; leg. L. J. Toxopeus. — 1 specimen 120 mm.
- Upper Tuba River, W. Ceram; February 27, 1910; leg. L. F. de Beaufort. — 14 specimens (1 ovigerous female) 41-114 mm.
- Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 3 specimens 64-102 mm.
- Rivulet near Kairatu, W. Ceram; February 28, 1910; leg. L. F. de Beaufort. — 4 specimens 67-84 mm (1 specimen bopyrized).
- Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 1 specimen 118 mm.
- Amboina; pond near the house of the governor; 1929; leg. W. G. N. van der Sleen. — 12 specimens (3 ovigerous females) 36-145 mm.
- Amboina; 1910; leg. L. F. de Beaufort. — 1 specimen 120 mm.
- Amboina; November, 1921-March, 1922;? leg. L. J. Toxopeus. — 2 specimens 63 and 66 mm (both bopyrized).
- Waiho River, Waigeo; freshwater; upstreams of rapids; December 20, 1909; leg. L. F. de Beaufort. — 13 specimens (1 ovigerous female) 53-142 mm.
- Mumes River, Waigeo; December 29 and 30, 1909; leg. L. F. de Beaufort. — 12 specimens 50-149 mm.
- Rabiai River, Waigeo; December 31, 1909; leg. L. F. de Beaufort. — 3 specimens (1 ovigerous female) 80-112 mm.
- Wai La River, Waigeo; January 18, 1910; leg. L. F. de Beaufort. — 2 specimens 91 and 125 mm.
- Mamapiri Rivulet, westcoast of Geelvink Bay, N. New Guinea, 2° 24' S, 134° 15' E; July 20-30, 1903; New Guinea Expedition, 1903. — 17 specimens 51-97 mm.
- Jende, Ron Island, W. Geelvink Bay, 2° 21' S, 134° 31' E; rivulet behind the house of the missionary; March 3, 1903; New Guinea Expedition, 1903. — 3 specimens 69-96 mm.
- Abu, southcoast of Geelvink Bay, 3° 12' S, 134° 50' E; August 15, 1903; New Guinea Expedition, 1903. — 1 specimen 123 mm.
- Tawarin River, emptying in Walckenaer Bay, N. New Guinea, 1° 22' S, 139° 47'.5 E; June 20, 1903; New Guinea Expedition, 1903. — 15 specimens (1 ovigerous female) 74-128 mm.
- Klipong, rivulet at eastcoast of Tanahmerah Bay, N. New Guinea, 2° 46' S, 140° 21'.6 E; July 9, 1903; New Guinea Expedition, 1903. — 5 specimens (1 ovigerous female) 76-134 mm.
- Waitjiri River, N. New Guinea, 2° 26'.5 S, 140° 34'.5 E; May 23, 1903; New Guinea Expedition, 1903. — 13 specimens (3 ovigerous females) 31-74 mm.
- Mbai River near Hollandia, N. New Guinea, 2° 32' S, 140° 42'.5 E; fresh water; New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 1 specimen 116 mm.
- Rivulet flowing in Kajo Bay (= Hollandia Bay); New Guinea Expedition, 1910-1911; leg. K. Gjellerup. — 2 specimens 87 and 104 mm.
- Moso River, tributary of Tami River, N. New Guinea, 2° 30' S, 140° 56'.5 E; May 9-12, 1903; New Guinea Expedition, 1903. — 5 specimens 80-112 mm.

Etna Bay, S. W. New Guinea, 3° 53'-4° S, 134° 28'-134° 52' E; 1905; New Guinea Expedition, 1905.
2 specimens 130 and 165 mm.
Indonesia; coll. J. G. de Man. — 2 specimens 105 and 127 mm.
North-East New Guinea. — 3 specimens 142-180 mm.
Locality unknown. — 6 specimens 96-141 mm.

This most common of the indo-westpacific species of the genus *Macrobrachium* has been extensively described by many authors as *De Man* (1892, 1902) and *Cowles* (1914). The following notes may be added:

The scaphocerite is about 2.5 times as long as broad. The outer margin is somewhat convex and ends in a final tooth, which is distinctly overreached by the lamella, which has the antero-internal angle rounded.

The oral parts are normal.

The first leg is slender and reaches with the chela and a small part of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and about $\frac{9}{7}$ as long as the merus. The shape of the second legs has extensively been dealt with by other authors. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is thrice as long as the dactylus and almost twice as long as the carpus. The merus is distinctly longer than the propodus. The fifth leg fails to reach the end of the scaphocerite. The propodus is more than thrice as long as the dactylus and fully twice as long as the carpus, while it is as long as the merus. All three legs in the adult males are covered with numerous spinules.

The pleopods and uropods are normal in shape.

The large variability of the present species and the large differences between specimens of different sex and age is the cause that numerous (about 10) species were described as new after specimens of this species. The identity of *Palaemon vagus*, *P. spectabilis*, *P. ruber*, *P. mayottensis*, *P. longimanus* Hoffm. (non Fabr.), and *P. madagascariensis* with *Palaemon lar* is generally accepted by most authors. Also *P. reunionnensis* Hoffm. is considered by several authors (e.g. *Miers*, 1880, *Ortmann*, 1891) to be a synonym of *P. lar*. *De Man*, however, in his 1905 paper still considers *P. reunionnensis* a local variety of *P. lar*, which should differ from the typical form by having:

1. the second legs equal.
2. the second legs more elongate.
3. three teeth of the upper margin of the rostrum behind the orbit.

I cannot agree with *De Man*, since in my material of *M. lar* these three characters vary so much and quite independant of each other, that even no varietal value can be attached to them. *P. reunionnensis* certainly cannot be considered a local variety as these characters occur in material from almost all localities. *De Man* in a footnote in his 1905 paper already states that he had examined a specimen from Halmahera with three teeth of the rostrum behind the orbit. I myself could examine the typematerial of *Palaemon reunionnensis*, which is present in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden, and found the specimens to be indeed *Macrobrachium lar*, though they have the rostrum rather long, being generally longer than the rostrum of *Palaemon longimanus* Hoffm. from the same locality, but all transitions to shorter rostra occur, while in the material from the Malay Archipelago such long rostra also were observed.

De Man (1915) considers his specimens from Halmahera to belong to a variety different

from the typical form, by having more slender legs. This difference in my opinion is too small and too variable in the present species to be of varietal value. De Man fortunately does not give this "variety" a new name.

Also specimens from Christmas Island were considered by De Man (1905a) to form a variety different from the main species. I have not seen his material, but the following differences are given by De Man.

1. Christmas Island males have the second legs shorter than those of a specimen of the same size from Celebes.
2. The rostrum in the specimens from Christmas Island is shorter.

In my opinion these differences are too small even for the separation of a variety, as the rapidity of the development of the second legs in the male of most species of *Macrobrachium* is far from constant, in this regard we may point to the occurrence of the "mâles féminisés". Furthermore De Man states that he has examined specimens from Flores, which had the same shape as those from Christmas Island. That the length of the rostrum of the present species is very variable is distinctly shown in literature and by my material. None of De Man's varieties of "*Palaemon lar*" in my opinion has any right of recognition.

The description given by Fabricius of *Palaemon lar* runs as follows: "P. [alaemon] chelis porrectis aequalibus muricatis, rostro recto antennarum squamis aequante.

Habitat in India Dom. Daldorff.

Statura praecedentis [*Macrobrachium rosenbergii*] at paullo minor. Thorax laevis antice utrinque dentibus duobus acutis. Rostrum compressum, rectum, serratum. Pedes muricati." This description very well fits for the present species, but it is so short that it equally well fits for others. Olivier (1811) gave a more extensive description of *P. lar* but this description too is insufficient for the certain recognition of the species. H. Milne Edwards (1837, p. 397) remarks that *P. lar* in all probability only is a variety of *P. ornatus*, which has the rostrum shorter than in the typical form. Bate (1888) is one of the first to synonymize *P. lar* and *P. ornatus*, using thereby the former name. No reasons are given by Bate for this identification. The majority of the authors after 1888 follow Bate in using Fabricius's name and for this reason I think it best to retain the name *lar* for the present species. The real identity of *Palaemon lar* never will be known with certainty, as the type specimens of all *Palaemon* species described by Fabricius are no longer extant, as the late Dr. K. Stephensen of the Zoological Museum at Copenhagen kindly informed me. As Fabricius's description gives no features which are in contrast with features of the present species, and as the latter very commonly occurs in the East Indies, there is in my opinion no objection whatever for the use of Fabricius's name.

Palaemon longimanus Fabr., which according to Fabricius should differ from *P. lar* by having the chelae smooth and unequal is identified by H. Milne Edwards (1837) with *P. ornatus*, while also Bate pointed to the possibility of the identity of *P. lar* and *P. longimanus*. No certainty, however, can be obtained in this respect. Kingsley (1882) identified both *P. lar* and *P. longimanus* with *P. ornatus*, he used the specific name *longimanus* for the species.

In the collection of the Leiden Museum two specimens were found bearing the label "*Palaemon ruber* Hess, type. Sydney. R. Schütte", these specimens were preserved in separate jars. They were presented to the Leiden Museum by the Göttingen Museum. Neither of the specimens, however, in reality is the type of *Palaemon ruber* Hess. One of them is *Macrobrachium australiense* nom. nov. (vid.

there, p. 175), the other indeed belongs to the present species, but it is not the type of *P. ruber*, because it possesses two normal second legs, and moreover does not originate from the Fiji Islands.

The specimens recorded by Pfeffer (1889) as *Palaemon lepidodactylus* from Zanzibar, according to Hilgendorf (1898), who examined them, in reality belong to *Macrobrachium lar*.

The specimen from Waitjiri River, N. New Guinea (Museum Amsterdam) was identified by J. Roux (1917) as a juvenile specimen of *Palaemon latimanus*; examination of this specimen, however, showed that it is a juvenile *Macrobrachium lar*. In the collection of the Zoological Museum at Amsterdam numerous other specimens of *Macrobrachium lar* from the N. New Guinea Expedition 1903 were found; these specimens were identified by J. Roux as *Palaemon lar*, but are not inserted in his (1917) paper on the Decapod Crustacea of this Expedition.

In 1905 Nobili described a new species of "*Leander*" from Stephansort, North-East New Guinea. This species is remarkable by the possession of a biunguiculate dactylus at the last three pereopods and therefore was named by Nobili *Leander dionyx*. After Nobili's record the species was no more found. Kemp (1925) pointed out that the species does not belong to *Leander*, but he gave no suggestions as to the correct place of the species. In the Palaemonoid material examined by me a large number of specimens from Amboina (Museum Leiden), one from Mamudju (Snellius Expedition) and two from Sta. 47 of the Siboga Expedition proved to be perfectly identical with *Leander dionyx*. The rostrum (fig. 37a) of these specimens is rather high and compressed, it reaches beyond the antennular peduncle, but fails to reach the end of the scaphocerite. Its upper margin bears 8 to 10, its lower margin 2 to 3 teeth. In larger specimens these teeth are rather low, in smaller specimens they are more erect, especially those of the upper border. The first tooth of the upper margin is situated anterior of or slightly behind the posterior limit of the orbit. The distal teeth of the upper margin are placed closer together than the proximals. The carapace is smooth and bears an antennal spine and a spine on the anterior margin of the carapace; furthermore there is a blunt tubercle on the carapace above the orbit, this tubercle is best visible when the specimen is seen in dorsal view.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are more acute. The sixth segment is more than twice as long as the fifth.

The telson is slender and is slightly shorter than the sixth abdominal segment. The dorsal surface bears two pairs of spines, which are situated in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in a median point which is flanked at each side by two spines, the inner of which is longest and overreaches the apex of the telson. Two feathered setae are present between the inner spines.

The eyes are well developed. The cornea is about as broad as and slightly shorter than the stalk. An ocellus is present, though it is not very distinct.

The first segment of the antennular peduncle is broad and bears a slender stylocerite, which fails to reach the middle of the segment. The anterolateral spine is well developed. The second segment is slightly shorter and broader than the third; together these two segments are about $\frac{2}{3}$ of the length of the basal joint. The upper antennular flagellum has the two rami fused for two joints; the shorter ramus has the free part consisting of 6 or 7 joints, being about three times as long as the fused part.

The scaphocerite reaches beyond the tip of the rostrum, it is rather narrow, its greatest breadth lies some distance above the base. The anterior margin is more or less truncate. The outer margin of the scaphocerite is straight and ends in a strong final tooth, which almost reaches the end of the

lamella. The antennal peduncle bears a small spinule, which only is visible as a triangular point, at the anterior margin of the second segment. The last segment of the peduncle is rather broad and almost reaches the middle of the scaphocerite.

The mandible (fig. 37b) bears a very small rudimentary palp, which consists only of one bud-like joint. The maxillipedes all are provided with epi- and exopods, they show the normal shape of the oral parts of *Macrobrachium* species. The third maxillipede fails to reach the end of the basal segment of the antennular peduncle. The ultimate segment is about as long as the penultimate.

Rudiments of exopods are present at the bases of the first four pereiopods. The first pereiopod (fig. 37c) reaches about to the end of the antennular peduncle. The fingers are slender and slightly

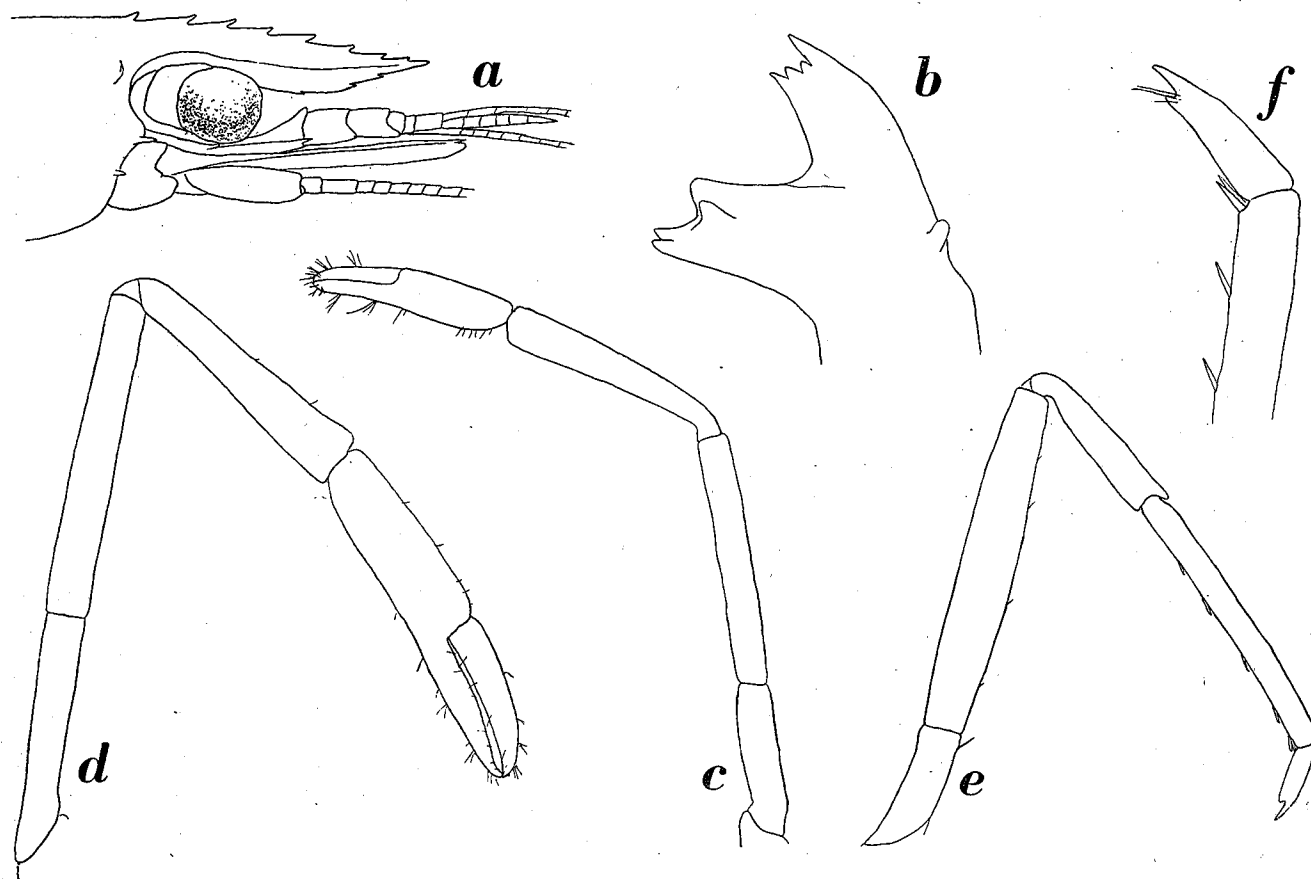


Fig. 37. *Macrobrachium lar* (Fabricius) "dionyx" stage. a, anterior part of body in lateral view; b, mandible; c, first pereiopod; d, second pereiopod; e, third pereiopod; f, dactylus of third pereiopod. a, $\times 15$; b, $\times 75$; c-e, $\times 30$; f, $\times 60$.

shorter than the palm. The carpus is longer than the chela and of about the same length as the merus. The ischium is slightly more than half as long as the merus. The second pereiopods (fig. 37d) are equal, they are stronger than the first pair. The fingers are slightly shorter than the palm, bear no teeth on the cutting edges and have the tips crossing. The carpus is longer than the palm, but shorter than the entire chela. The merus is longer than the carpus. The ischium is distinctly longer than half the merus. There are no spines or tubercles on any of the joints. The last three pairs of legs are equal in shape. The third leg (fig. 37e) reaches about to the end of the scaphocerite, the fifth does not reach further than the end of the first segment of the antennular peduncle. The dactylus (fig. 37f) is slender, it measures about $\frac{1}{3}$ to $\frac{1}{4}$ of the length of the propodus. The lower margin bears an accessory tooth in the distal half; this tooth is rounded. Some tufts of setae are present near the base of this accessory tooth. The propodus is slender and bears a row of spines along its posterior margin.

The carpus is half as long as the propodus. The merus is rather broad and is longer than the propodus, the ischium is short. The fifth pereopod is somewhat more slender than the two preceding legs.

The first pleopod possesses a small endopod and a normally shaped exopod. In the other pleopods both endo- and exopod are well developed. The endopods of these last four pairs of pleopods each bear an appendix interna, no appendix masculina is present in any of my specimens.

The uropods are long and slender. The endopod reaches slightly beyond the end of the telson. The exopod is longer than the endopod. The outer margin of the exopod is straight and ends in a tooth, which at its inner side bears a movable spine.

These specimens now prove to be nothing else but the very young postlarval stages of *Macrobrachium lar*. In the large material at my disposal specimens of almost all sizes are present, so that one can follow the entire development of the species from specimens of 14-19 mm (dionyx stage) to the adult. In this series the supraorbital tubercle, which probably is the last remainder of the supraorbital spine of the larva, gradually disappears, the hepatic spine, which in the dionyx stage is placed on the anterior margin of the carapace gradually retreats posteriorly and finally attains its normal position below and behind the antennal spine, the mandibular palp becomes large and three-jointed, the accessory claw of the last pereopods becomes smaller to disappear at last (sometimes vestiges of this claw are still visible in large specimens), etc. This development resembles in every respect that of *M. australe* and perhaps is present too in *M. latimanus*, the young specimens of which species at my disposal also have the hepatic spine placed close near the anterior margin of the carapace.

All the specimens of the dionyx stage in my material were found in or very close near the sea, which makes it very probable that the eggs are hatched in salt or brackish water, which is observed in many other species of *Macrobrachium* (cf. Kemp, 1915, p. 266). The occurrence of young specimens in the sea in all probability accounts for the large range of distribution of this species.

One of the specimens from the Siboga Station 131 was provided with a Bopyrid belonging to the species *Palaegyge bonnierii* Weber, and has already been mentioned by Nierstrass & Brender à Brandis (1923) in their paper on the Siboga Epicaridea.

The specimens from Mayotta and Réunion (Museum Leiden) are the types of *Palaemon mayottensis* Hoffmann, *P. longimanus* Hoffm. and *P. reunionnensis* Hoffm., they have been described in Hoffmann's (1874) paper and are discussed by De Man in his 1879 and 1905 articles. The specimens collected by Ten Kate at W. Sumba, Besar Island, Timor and Roti (Museum Leiden) are reported upon by De Man (1893), those from Flores (leg. Ludeking), Gorontalo, Halmahera (leg. Bernstein), Morotai (leg. Bernstein), Ternate, Gebe, Sanana (= Xulla Bessy), Amboina (leg. Teysmann), Moluccas (leg. Forsten) and Andai, all from the collection of the Leiden Museum are mentioned by De Man in his 1879 paper, those from N. Dutch New Guinea, collected by the New Guinea Expedition, 1910-1911, were reported upon by the same author (De Man, 1915). The specimens from the Pacific Ocean (Museum Leiden) in all probability formed part of the same set of material from which also the material of the Strassbourg Museum, described by Ortman (1891) was obtained. The specimens collected by M. Weber and A. Wichmann in Flores, Adonara, Roti, Timor, Celebes, and Salajar have been dealt with by De Man in his 1892 paper. Those from Tobelo and Patani, Halmahera (Museum Amsterdam) by the same author (De Man, 1902). The specimens from Makatita (Buru), W. Ceram, Amboina (leg. De Beaufort) and Waigeo from the Amsterdam Museum have been inserted in J. Roux's (1923) paper.

Distribution. The species is a real freshwater form, though the postlarval stages have been found in sea and brackish estuaries. It is widely distributed throughout the indo-westpacific region from E. Africa to the Riukiu Islands and the Marquesas. The records in literature are: Zanzibar (Pfeffer, 1889; Hilgendorf, 1898; Lenz, 1905), Pemba, N. Mozambique (Lenz, 1910), Indian Ocean (H. Milne Edwards, 1837), East Indies (Fabricius, 1798; Bosc, 1801; Latreille, 1802; Olivier, 1811), Mahé Seychelles (Coutière, 1901; Borradaile, 1907; Balss, 1925), Praslin and Silhouette Islands, Seychelles (Borradaile, 1907), Mohilla, Comores (Lenz, 1910), Mayotta, Comores (Hoffmann, 1874; De Man, 1879), Madagascar (Coutière, 1900, 1901), Nosi Bé, N.W. Madagascar (Lenz & Richters, 1881; Lenz, 1905), Nosi Fali, N.W. Madagascar (Hoffmann, 1874), Majunga, N.W. Madagascar (J. Roux, 1934), Betampona forest near Tamatave, E. Madagascar (J. Roux, 1934), Réunion (Hoffmann, 1874; De Man, 1879, 1905), Saint Benoît and Marsouins River near Saint Benoît, Réunion (J. Roux, 1934), Mauritius (White, 1847; Heller, 1862; Miers, 1876; Ortman, 1891; Sharp, 1893; Thompson, 1901), Tamarind Falls, Mauritius (Ward, 1942), Rodriguez (Miers, 1879), Pondicherry? (White, 1847), Ganges River, India (Filhol, 1886), Nicobar Islands (Koelbel in De Man, 1892), Chusan, China? (Cantor, 1842), Okinawa and Miyako, Riukiu Islands (Kubo, 1940, 1941), Isigaki and Iriomote, Riukiu Islands (Kubo, 1940, 1941), Yaéyama Group (Ohshima, 1935), Formosa (Maki & Tsuchiya, 1923), Rota Island, Marianas (Miyake, 1938), Guam, Marianas (Cowles, 1914), Palau Islands (Kubo, 1940), Philippines (Von Martens, 1868; Semper, 1868), Manila, Luzon (Casto de Elera, 1895), San Juan del Monte near Manila (Cowles, 1914; Estampador, 1937), Mariveles, Bataan Province, Luzon (Estampador, 1937), Puerto Galera, Mindoro (Cowles, 1914; Roxas, 1930; Estampador, 1937), Pasananca and Zamboanga, Mindanao, Philippines (Bate, 1888), Christmas Island, Indian Ocean (De Man, 1905a; Calman, 1909; Gibson-Hill, 1947), Sidney's Dale and Dolly Beach, Christmas Island (Gordon, 1935), Sumatra (Gordon, 1935), Lolomboli, Nias (Nobili, 1900), Soreino River, Mentawai (Nobili, 1900), Kifajuk and Buabua, Enggano (Nobili, 1900), near Padang, W. coast of Sumatra (J. Roux, 1932), Java (Koningsberger, 1913), Bali (Miers, 1880), Buleleng, Bali (Rathbun, 1910), Gitgit, Bali (J. Roux, 1929), West Sumba (De Man, 1893), Laora and Mao Marru, Sumba (J. Roux, 1928a), Flores (De Man, 1879), Rana Mese, W. Flores (J. Roux, 1928), Reo, W. Flores (De Man, 1892), Raka-mbaha (= Mbawa), S. Flores (De Man, 1892), Lela River near Sikka, S. Flores (De Man, 1892), Besar Island (= Groot Bastaard), off N.E. Flores (De Man, 1893), Adonara Island, E. of Flores (Von Martens, 1868), Tanahmerah, Adonara (De Man, 1892), Roti, near Timor (De Man, 1893), Talae, Roti (De Man, 1892), Timor (Osorio, 1888; De Man, 1893), Koinino River near Kupang, Timor (De Man, 1892), Kupang (Nobili, 1900), Atapupu, Timor (De Man, 1893), Baram River, N.W. Borneo (De Man, 1902), Minahasa, N. Celebes (De Man, 1902), Talise Island, N.E. Celebes (Hickson, 1889), Sawangan, Tondano River, N. Celebes (Von Martens, 1868), Menado (Schenkel, 1902), Kema, N. Celebes (Schenkel, 1902), Lolak River, N. Celebes (Schenkel, 1902), Gorontalo, N. Celebes (De Man, 1879), Matinan Mountain, N. Celebes (Schenkel, 1902), Randangan River (= Uangkahulu River), N. Celebes (Schenkel, 1902), between Borau and Manangalu, Luwu District, Central Celebes (Schenkel, 1902), Palopo, Luwu District (De Man, 1892), Enrekang, S.W. Celebes (Schenkel, 1902), Parepare, S.W. Celebes (De Man, 1892), Makassar, S.W. Celebes (Miers, 1880), Kadjang, S.W. Celebes (De Man,

1892), Bonea and Bangkalan Rivers, Salajar, off S.W. Celebes (De Man, 1892), Moluccas (De Man, 1879), Morotai, N. Moluccas (De Man, 1879), Halmahera (De Man, 1879, 1902), North Halmahera (De Man, 1902), Saluta and Tobelo, N. Halmahera (De Man, 1902), Oba, Central Halmahera (De Man, 1902), Gimia and Patani, S.E. Halmahera (De Man, 1902), Ternate (De Man, 1879, 1902), Batjan (De Man, 1902), Gebe (De Man, 1879), Sanana (= Xulla Bessy), Sula Islands (De Man, 1879), Makatita, Buru (J. Roux, 1928a), Riuapa River, Ceram (J. Roux, 1923), Tuba River, Ceram (J. Roux, 1923, 1928a), Kairatu, Ceram (J. Roux, 1923), Amboina (H. Milne Edwards, 1837; Bleeker, 1856; Heller, 1862; Von Martens, 1868, 1876; De Man, 1879, 1888; Ortmann, 1894; Nobili, 1899; J. Roux, 1923, 1928a), Banda (Bate, 1888), Erlalaan, Elat, Ohoinangan, Warkar and Waor, Groot Kai, Kai Islands (J. Roux, 1919), Udjir, Aru Islands (J. Roux, 1919), Ngaiguli, Trangan, Aru Islands (J. Roux, 1919), Waigeo, off N.W. New Guinea (H. Milne Edwards, 1837; Guérin, 1838; Bleeker, 1856), Mumes, Rabiai, Waiho and Wai Sa Rivers, Waigeo (J. Roux, 1923), Sorong, Doom Island, N.W. New Guinea (J. Roux, 1933), Andai, N.W. New Guinea (De Man, 1879; Nobili, 1899), Etna Bay, S.W. New Guinea (Holthuis, 1949), Pioneer Bivouac, Mamberamo River, N. New Guinea (J. Roux, 1927), Korime and Sermowai Rivers, N. New Guinea (De Man, 1915), between Walckenaer and Tanahmerah Bays, N. New Guinea (De Man, 1915), Jaona, N. New Guinea (De Man, 1915), Waitjiri River, N. New Guinea (J. Roux, 1917), Mbai River near Hollandia (De Man, 1915), Hollandia, N. Dutch New Guinea (De Man, 1915; J. Roux, 1927), Fate and Tjano Rivers, and Zoutbron, N.E. Dutch New Guinea (De Man, 1915), Stephansort, N.E. New Guinea (Nobili, 1905a), Moroka and Innawi, near Port Moresby, Papua (Nobili, 1899), Papua, between Cape Possession and East Cape, 9°-11° S, 146°-151° E (Ortmann, 1894), Manus, Admiralty Islands (J. Roux, 1934a), Likding and Poulos, New Hannover (J. Roux, 1934a), Bimoun, Medina, Laman, and Tabar Island, New Ireland (J. Roux, 1934a), Cape Gazelle, New Britain (Borradaile, 1899), Jacquinet Bay, New Britain (J. Roux, 1934a), Australia (Olivier, 1811; Semper, 1868; Miers, 1876), ? Running Waters and Hermannsburg, S. Northern Territory (Baker, 1914), Pacific Ocean (Ortmann, 1891), Auckland, New Zealand (Heller, 1865; Miers, 1876; Filhol, 1886; Thomson, 1903), various localities in New Caledonia (J. Roux, 1926), New Hebrides (Miers, 1876), Fiji (Hess, 1865; Semper, 1868; Miers, 1876; De Man, 1887a), Kandavu and Ovalau, Fiji (Bate, 1888), Tamavua River, Fiji (Borradaile, 1898), Samoa (Miers, 1879; Sharp, 1893; Lenz, 1901; Thompson, 1901; Pesta, 1914), Tahiti (Heller, 1862a, 1865; Seurat, 1903; De Man, 1904), Papeuriri, Tahiti (Bate, 1888), Vaituru, Papenoo and Faa River, Tahiti (Nobili, 1907), Papeete and Venus Point Reef, Tahiti (Boone, 1935), Mangareva, Gambier Islands, Tuamotu Group (Seurat, 1903), Marquesas (Adams, 1939), several localities in Hivaoa, Tahuata, Fatuhiva, Nukuhiva, Uapou, Uahuka and Eiao Islands, Marquesas (Adams, 1935), ? Kapapa Islet, Oahu, Hawaiian Islands (Armstrong, 1941).

The records of the present species from Australia must be considered with some reserve, since in modern literature *Macrobrachium lar* has not been reported from that continent. The records in older literature may refer to *M. australiense* or to *M. novae-hollandiae* (so for instance Haswell's record of "*Palaemon ornatus*" from Australia, is based on specimens of *M. novae-hollandiae*). Olivier's specimen of *Palaemon ornatus* is a genuine specimen of the present species, but may have been wrongly labelled. Baker's (1914) record from Central Australia is based on larvae and there-

fore not certain. Also the record of the present species from Auckland, New Zealand (Heller, 1862, 1865) in all probability is incorrect as is already pointed out by Thomson (1903). Cantor's (1842) record of "*Palaemon ornatus*" from Chusan, China must be considered with much reserve; since no specimen of *M. lar* has ever been recorded from that region, from which many new species have been described after 1842; Cantor gives too little details to make certain identification possible.

Dr. Armstrong informs me that the specimen reported by him (Armstrong, 1941, p. 12) from the Hawaiian Archipelago, in all probability is incorrectly labelled, as Kapapa Islet, on which the specimen was said to be collected, contains no streams nor rivers capable of supporting so large a shrimp. He thinks it probable that the specimen in reality comes from Samoa. Up till now only *M. grandimanus* has been recorded from the Hawaiian Islands.

Macrobrachium javanicum (Heller) (fig. 38)

- Palaemon javanicus* Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 421, pl. 2 fig. 48.
Palaemon javanicus Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 116.
 ? *Palaemon Javanicus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.
Palaemon Javanicus De Man, 1879, Notes Leyden Mus., vol. 1, p. 180.
Palaemon acutirostris De Man, 1888a, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 280, pl. 18 fig. 7.
 (non Dana, 1852).
Palaemon acutirostris Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 707 (non p. 728).
Palaemon javanicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.
Palaemon (Eupalaemon) equidens De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 453, pl. 26 fig. 37. (non Dana, 1852).
Palaemon (Parapalaemon) javanicus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 457, pl. 26 fig. 38.
Palaemon (Parapalaemon) javanicus Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 483.
Palaemon equidens Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt 2, p. 565, pl. 34 fig. 4.
Palaemon (Eupalaemon) neglectus De Man, 1905, Notes Leyden Mus., vol. 26, p. 201, pl. 15 fig. 6.
Palaemon neglectus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 265.
Palaemon (Parapalaemon) javanicus J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 565, 571.
Macrobrachium neglectus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.

Museum Leiden

- Bay of Batavia, W. Java; July, 1938; leg. F. P. Koumans. — 1 specimen 58 mm.
 Besuki, E. Java; leg. J. Semmelink. — 1 specimen 84 mm.
 Java; leg. P. Bleeker. — 4 specimens (3 ovigerous females) 63-75 mm.

Museum Amsterdam

- King Island, Mergui Archipelago; coll. J. G. de Man; cotype of *Palaemon neglectus* De Man. --
 1 specimen 67 mm.
 Batak Landen near Deli, N. E. Sumatra; in rivers and brooks; December 1, 1890; leg. Moesch;
 cotypes of *Palaemon neglectus* De Man. — 3 specimens 61-85 mm.
 Sungai Pati Bubur near Airbangis, Padangsche Benedenlanden (Padang Lowlands), W. Sumatra;
 November, 1913; leg. E. Jacobson. — 1 specimen 94 mm.
 River near Kajutanam, W. Sumatra; 1888-1889; leg. M. Weber. — 3 specimens 92-98 mm.
 Sunter River near Batavia. — 2 specimens 82 and 83 mm.
 River near Palopo, Central Celebes; fresh water; 1888-1889; leg. M. Weber. — 1 specimen 73 mm.
 Locality unknown. — 16 specimens (7 ovigerous females) 54-105 mm.

The species has been extensively described by De Man (1888a, 1892, 1905) and Kemp (1918a). I only should like to add the following details:

The hepatic spine is placed closely below and distinctly behind the antennal, the two spines, however, are not placed in one line.

The abdomen is normal in shape, it has the apex of the pleurae of the fifth segment rounded. The sixth segment is 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. It bears the usual two pairs of dorsal spines, which are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in a sharp median point, which is flanked by the usual two pairs of spines, the inner of which distinctly overreaches the apex.

The scaphocerite is 2.5 times to thrice as long as broad. Its outer margin is generally straight, sometimes it is more or less concave or even slightly convex, it ends in a strong final tooth, which fails to reach the end of the lamella. The lamella has its antero-internal angle somewhat produced.

The oral parts are quite normal.

The first pereopod reaches with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are as long as or a trifle shorter than the palm. The carpus is twice as long as the chela and is about $\frac{4}{3}$ as long as the merus. In the adult males the ischium bears numerous spinules, which though less distinctly, also may be seen in the merus. The fingers of the second legs

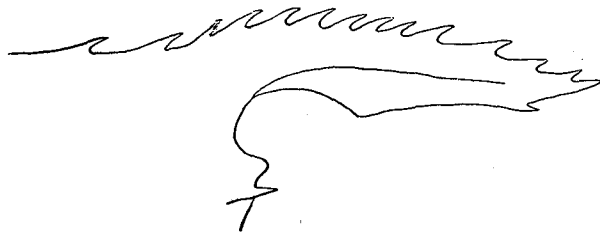


Fig. 38. *Macrobrachium javanicum* (Heller). Abnormal rostrum. $\times 5$.

of the adult male have no tubercles along the distal part of the cutting edge as in *M. horstii*, though sometimes a row of spinules, as are present on the rest of the surface of the fingers, may be placed more or less close near the edge. The third leg fails to reach the end of the scaphocerite or just attains it. The propodus is 2.5 times as long as the dactylus and twice as long as the carpus. The merus is distinctly longer than the propodus, and about twice as long as the ischium. The fifth leg, though being more slender than the third, reaches slightly less far forwards. The propodus is as long as the merus, slightly less than twice as long as the carpus and thrice as long as the dactylus.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, they are 0.4 to 0.6 mm in diameter.

One of the specimens collected by Bleeker is identified here with some doubt with the present species. It is an ovigerous female, which has the rostrum (fig. 38) directed straightly forward; the upper margin of the rostrum is convex, bearing 13 teeth, which are small and placed close together. It is possible, however, that this shape of the rostrum is abnormal, as the lower surface of that organ shows signs of damage. The second pereopod of this specimen is like that of the other specimens of the present species.

The synonymy of the present species is rather intricate. Up till now "*Palaemon*" *javanicus* and "*Palaemon*" *neglectus* have been considered distinct species. The latter species has been identified by De Man (1888a) with Dana's *Palaemon acutirostris*, later by the same author (De Man, 1892) with *Palaemon equidens* Dana, to be at last described by him (De Man, 1905) as a new species.

I cannot agree with De Man in considering the forms indicated by him with the names *Palaemon javanicus* and *Palaemon neglectus* to be separate species. De Man himself already pointed to the close resemblance between them. The differences enumerated by De Man are:

1. In *P. neglectus* the carpus of the second legs is shorter than the merus, while in *P. javanicus* the carpus is the longer of the two.
2. The fingers of the second legs of the adult male of *P. neglectus* are differently dentate from those of *P. javanicus*, and they moreover are relatively shorter.
3. The palm of the large chela of adult males of *P. javanicus* is more compressed than in *P. neglectus*.

1. The first character is very variable, though in most of my material the carpus is equal to or somewhat longer (seldom somewhat shorter) than the merus, while in the type specimens of *P. neglectus* it is equal to or somewhat shorter than the merus (cf. the table below). Kemp (1918a)

| material | sex | total length of body | length (in mm) of the second leg and its joints | | | | | |
|----------------------|-------|-------------------------|---|--------|------|--------|-------|---------|
| | | | leg | finger | palm | carpus | merus | ischium |
| Besuki | ♂ | 84 | 66 | 10.5 | 18.0 | 15.5 | 14.0 | 10.0 |
| | | | 52 | 8.5 | 11.8 | 12.0 | 11.8 | 8.0 |
| Java, Bleeker | ♂ | 75 | 61 | 9.0 | 18.0 | 13.0 | 13.0 | 8.0 |
| | | | 47 | 7.0 | 11.0 | 11.0 | 11.0 | 7.0 |
| Kajutanam | ov. ♀ | 65 | 35 | 5.0 | 7.0 | 8.0 | 8.0 | 6.0 |
| | ov. ♀ | 58 | 46 | 8.0 | 11.5 | 11.0 | 7.5 | 7.0 |
| | ♂ | 98 | 70 | 10.0 | 18.5 | 15.0 | 14.5 | 10.0 |
| | | | 73 | 10.5 | 20.0 | 16.5 | 16.0 | 11.0 |
| Palopo | ♂ | 92 | 60 | 9.0 | 15.0 | 13.0 | 13.4 | 9.3 |
| | | | ♂ | 96 | 71 | 11.0 | 21.0 | 15.0 |
| | ♂ | 73 | 57 | 9.0 | 14.0 | 13.0 | 12.5 | 9.0 |
| | | | 80 | 12.0 | 24.0 | 17.5 | 17.5 | 9.5 |
| Sunter River | ♂ | 82 | 79 | 11.5 | 21.0 | 17.5 | 17.0 | 8.0 |
| | | ♂ | 83 | 104 | 15.0 | 30.0 | 24.0 | 23.0 |
| Sungai Pati Bubur | ♂ | 94 | 84 | 14.0 | 22.0 | 19.0 | 19.0 | 10.0 |
| | | | 108 | 17.0 | 29.0 | 25.0 | 24.0 | 14.0 |
| Mergui Batak | ♂ | 67 | 42 | 7.0 | 9.0 | 7.5 | 8.0 | 5.5 |
| | | | ♂ | 84 | 81 | 14.0 | 22.0 | 18.0 |
| ♂ | 60 | 95 | 16.5 | 26.0 | 21.0 | 21.5 | 12.0 | |
| | | 35 | 6.0 | 8.0 | 8.0 | 8.0 | 6.0 | |
| | | | 36 | 6.0 | 8.0 | 7.0 | 7.5 | 5.0 |

in his material referred to *P. neglectus* found in the males the carpus as long as or somewhat shorter, in the females slightly longer than the merus. The character is very variable and in my opinion cannot be used for separating species.

2. As is shown by the table of measurements given by Kemp for his *Palaemon neglectus* specimens and by that given by me for my material, no constant differences can be observed in the relation between the length of the palm and the fingers of the second legs of the two forms. Furthermore it must be pointed at that in all probability in none of the known specimens of *P. neglectus*

the male has attained its full size, as in all specimens the large chela is shorter than the entire body. The only difference in the dentition of the fingers of both species as figured by De Man is that in *P. javanicus* the teeth are larger and placed slightly more anteriorly, but no difference could be found in this respect between the *P. neglectus* specimens and smaller specimens of *P. javanicus*.

3. The character of the more or less compressed shape of the palm too depends on the age of the specimens. In my material no difference in this respect can be observed between the *neglectus* and *javanicus* specimens.

Summarizing these results I come to the conclusion that I at present can find no reason whatever to treat *P. neglectus* and *P. javanicus* as two distinct species, more material, however, must decide in this question.

I am much in doubt about the correctness of the identification by Von Martens (1868) of his specimens from Central Borneo. In those specimens, measuring 74 mm, the rostral formula is stated to be $\frac{10-11}{4-6}$. Now in *M. javanicum* the rostrum bears generally three, seldom 4 lower teeth. I think it most probable that Von Martens's specimens belong to *Macrobrachium trompii*, a species, which shows the same rostral formula as Von Martens's animals and also in the other characters agrees with that material, it moreover is known from the region from where Von Martens reports his *Palaemon javanicus*. Von Martens's description is too short, however, to make certain identification possible.

The specimens of the Leiden Museum from Besuki and Java (leg. Bleeker) have already been mentioned by De Man (1879), those from Sumatra and Celebes collected by M. Weber (Museum Amsterdam) by the same author (De Man, 1892). The specimen from the Mergui Archipelago has been identified by De Man (1888a) as *Palaemon acutirostris* and later (De Man, 1905) has served that author for the description of his new species *P. neglectus*, just like the specimens from the Bataklanden, which De Man previously (1892) had described under the name *Palaemon equidens* Dana.

Distribution: This freshwater species has been recorded in literature from the following localities: King & Elphinstone Islands, Mergui Archipelago (De Man, 1888a, 1905), Penang (Kemp, 1918a), Kelantan, Malay Peninsula (Lanchester, 1901), Koh Chang, Siam (Suvatti, 1937), Bataklanden near Deli, N.E. Sumatra (De Man, 1892, 1905), Sibolga, N.W. Sumatra (Nobili, 1900; J. Roux, 1932), Kajutanam, W. Sumatra (De Man, 1892), Java (Heller, 1862, 1865; De Man, 1879), Besuki, E. Java (De Man, 1879), ? Danau Srian, Upper Kapuas River, Central Borneo (Von Martens, 1868), Palopo, Central Celebes (De Man, 1892).

Macrobrachium asperulum (Von Martens) (fig. 39)

Palaemon asperulus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 43, pl. 1 fig. 5.

Palaemon asperulus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 708.

Palaemon (*Parapalaemon*?) *asperulus* De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 293, pl. 18 figs. 2-8.

Palaemon asperulus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 259, fig. 8.

Macrobrachium asperulus Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 59, pl. 7 fig. 2.

Macrobrachium asperulus Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

Macrobrachium asperulus Sowerby, 1925, Nat. Note-Book in China, p. 133.

- Macrobrachium asperulus* Kellogg, 1928, Lingnan Sci. Journ., vol. 5, p. 352.
Palaemon superbus Derjavin, 1930, Hydrobiol. Zeitschr. biol. Wolgasta., vol. 9, p. 2.
Palaemon asperulus Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 286, fig. 3.
Palaemon asperulus brevirostris Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 287, fig. 4.
Palaemon asperatus Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon asperatus brevirostris Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.
Palaemon superbus Buldovsky, 1933, Bull. Far East. Br. Acad. Sci. U.S.S.R., 1933, p. 46, pl. 2
 fig. 17.
Palaemon superbus Birstein & Vinogradov, 1934, Zool. Journ. Moscow, vol. 13, p. 43, fig.
Palaemon superbus Birstein, 1939, Zool. Journ. Moscow, vol. 18, p. 55.
Palaemon superbus Birstein, 1941, Life Freshwater U.S.S.R., vol. 1, p. 424.

Museum Amsterdam

Marsh near Tientsin, N. China; May, 1909; leg. Miss A. Hüllmann. — 1 specimen 36 mm.

The present specimen is referred with some doubt to *Macrobrachium asperulum*, to which species it at least is very closely related. Most of the descriptions of *Macrobrachium asperulum* in literature are so incomplete, that I can get no full certainty about the identity of my specimen, the more as this specimen seems to be not yet fullgrown. I therefore give here a complete description of the animal:

The rostrum (fig. 39a) is elongate and straight, it reaches to the end of the scaphocerite. The upper margin is slightly convex above the eyes and bears 13 teeth, the first two of which are placed on the carapace behind the orbit. The first tooth, which is placed at $\frac{1}{3}$ of the length of the carapace, is somewhat more distant from the second than the third is; above the eyes the teeth are placed slightly closer together. The lower margin of the rostrum bears three teeth. The carapace is smooth. The hepatic spine is almost as strong as the antennal and both spines lie in one line, the hepatic being placed behind and slightly below the antennal.

The abdomen is normal in shape. The pleura of the fifth segment is rounded. The sixth segment is almost twice as long as the fifth.

The telson is of the normal shape, it is elongate, being 1.5 times as long as the sixth abdominal segment. It bears two pairs of dorsal spines, which are placed respectively at the middle and at three quarters of the length of the telson. The posterior margin of the telson ends in an acute median point, which is flanked by two pairs of spines, a long inner pair, which overreaches the apex of the telson distinctly, and a short outer pair. Numerous feathered setae are present at the posterior margin of the telson.

The eyes are well developed and pigmented.

The antennulae are normal in shape.

The scaphocerite (fig. 39b) is somewhat more than 2.5 times as long as broad and is of about the same breadth throughout its entire length. The outer margin is straight and ends in a strong final tooth, which is outreached by the lamella, which is somewhat produced at its antero-internal angle.

The oral parts are typical.

The first pereopods (fig. 39c) extend with the fingers only beyond the scaphocerite. The fingers are as long as the palm. The carpus is 1.5 times as long as the chela and about $\frac{5}{4}$ of the length of the merus. Only one of the second legs (fig. 39e) is present in my specimen, which is a female. It reaches with the chela beyond the scaphocerite. The fingers measure about $\frac{5}{8}$ of the length of

the palm. The dactylus bears two very small teeth in the proximal part of its cutting edge, while I could not detect any tooth on the fixed finger. Tufts of hairs are scattered over the fingers. The palm is cylindrical and is provided with some widely scattered hairs. The carpus is about 1.5 times as long as the palm. The merus is somewhat shorter than the carpus, while the ischium is about as long as the palm. The surface of the limbs is somewhat rugose. The last three legs are slender, the third (fig. 39d) distinctly fails to reach the end of the scaphocerite. The dactylus is long and slender, the propodus is twice as long as the dactylus, which is about as long as the carpus. The merus is somewhat longer than the propodus. The ischium is half as long as the merus. The fifth leg reaches somewhat beyond the third and just attains the apex of the scaphocerite. The propodus is slightly more than twice as long as the dactylus. The carpus is half as long as the propodus, while the merus

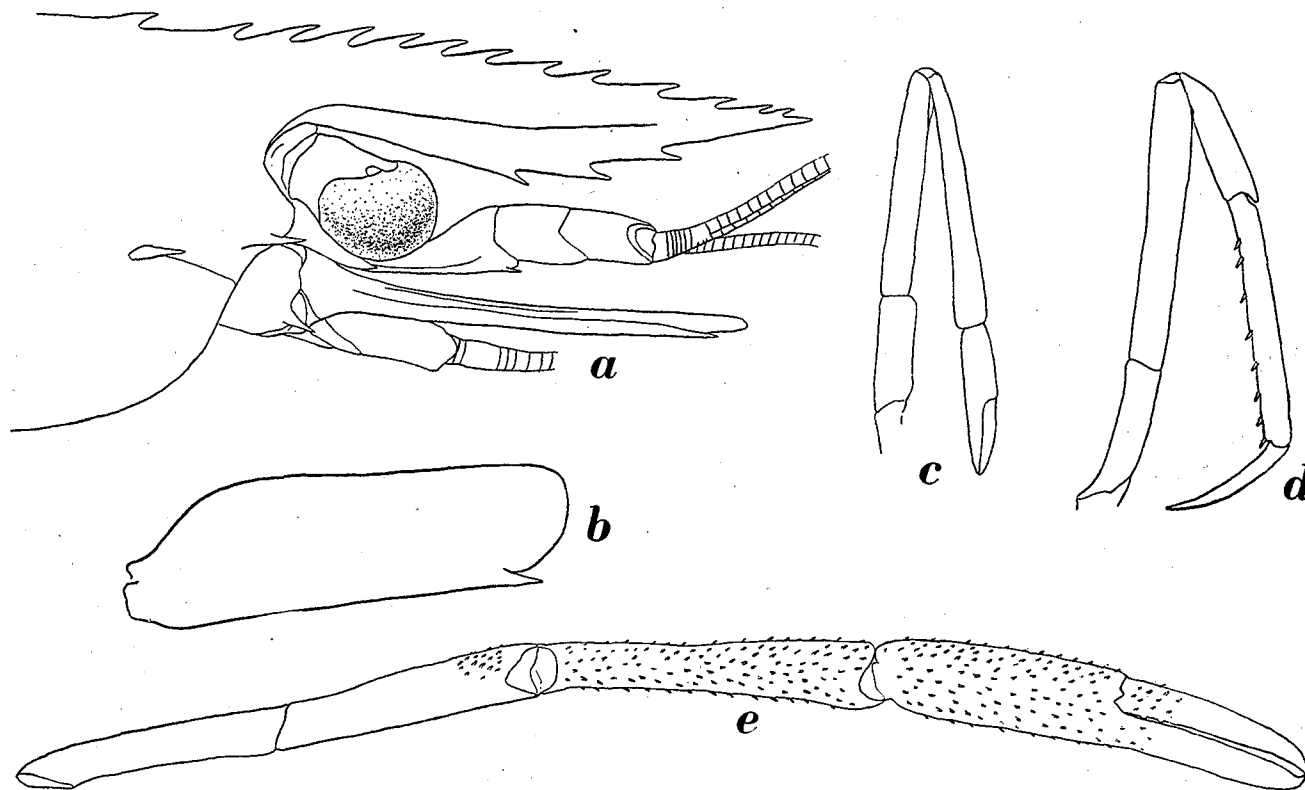


Fig. 39. *Macrobrachium* ? *asperulum* (Von Martens). a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, third pereiopod; e, second pereiopod. a-c, e, $\times 10$; d, $\times 14$.

is as long as the latter joint. Except for the normal spinulation of the propodus no spinules are present on the various joints of the last three legs.

The uropods and pleopods are normal in shape.

In the shape of the rostrum, in the situation of the antennal and hepatic spines, and in the general shape of the second legs the present specimen resembles *M. asperulum*, with which species I have provisionally identified it. The fact that the fingers are relatively longer than for instance in Kemp's (1918) specimen may be due to the fact that my specimen is juvenile. The most striking feature in my specimen, in my opinion, is the very long and slender dactylus of the last three legs, which in the third leg is half as long as the propodus and in the fifth leg only relatively slightly shorter. Unfortunately in none of the descriptions of *M. asperulum* the length of the dactyli of the

last three legs is mentioned or figured, except in that of De Man (1904). The identity of De Man's (1904) specimen with the present species, however, is severely doubted by Kemp (1918), while Yu (1931) places that specimen in a separate variety, var. *brevirostris* of *M. asperulum*. De Man's specimen shows a short and broad dactylus of the third leg, which is about $\frac{1}{3}$ as long as the propodus. According to Kemp (1918) the typical *M. asperulum* has the last three legs more slender than the form described by Dr. De Man, but he unfortunately does not give the relation between the length of the dactylus and the propodus in his material, nor a figure of one the last three legs. A decision in this question only can be reached after examination of more material of both forms, in adult and juvenile specimens. Then also the correct status of the var. *brevirostris* Yu can be decided; the characters on account of which Yu separates this variety from the typical form namely are rather vague and not very convincing, taking the variability of several of these characters in other *Macrobrachium* species into consideration.

The specimens recorded by Derjavin (1930), Buldovsky (1933) and by Birstein and Vinogradov (1934) from Lake Khanka in E. Siberia under the name *Palaemon superbus*, certainly do not belong to that species as is shown by the rostral formula of their specimens ($\frac{12-13}{3}$) and by the fact that the fingers of the second chela are distinctly shorter than the palm (cf. the description of *Palaemon superbus* given by Yu, 1931). It is far more probable that the specimens from Siberia belong to *M. asperulum*, or at least to the same species as my specimen from Tientsin, which in all respects agrees with Birstein & Vinogradov's figures. In the text the Russian authors state one tooth of the rostrum to be placed behind the orbit, while in their figure they show three teeth to be present there.

Distribution: The species lives in fresh water, often far from sea. It is recorded from: Khanka Lake, S.E. Siberia (Derjavin, 1930; Buldovsky, 1933; Birstein & Vinogradov, 1934; Birstein, 1941), Shanghai (Von Martens, 1868), Tai Hu Lake, near Shanghai (Kemp, 1918a; Kellogg, 1938), Soochow, Yangchow, Ihing and Chinkiang, Kiangsu Province (Yu, 1931), Kiukiang, Kiangsi Province (Yu, 1931), Ichang, Hupeh Province (Yu, 1931), Southern Hupeh Province (De Man, 1904), Changsha, Hunan Province (Yu, 1931), Fukien Province and southwards (Sowery, 1925), Foochow and Yenping, Fukien Province (Gee, 1925; Kellogg, 1928), Formosa (Maki & Tsuchiya, 1923).

Macrobrachium altifrons (Henderson)

Palaemon altifrons Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 444, pl. 40 figs. 4-6.

Macrobrachium altifrons, of which no material is at my disposal, has not been recorded after 1893. It is known from North India only, Henderson reported it from the following localities: Lahore, Jumna River and Delhi.

Macrobrachium kiukianense (Yu)

Palaemon kiukianensis Yu, 1931, Bull. Soc. zool. France, vol. 56, p. 279, fig. 1.

Palaemon kiukiangensis Ping, 1932, Peking nat. Hist. Bull., vol. 7, p. 169.

This species is only known from the specimen recorded by Yu from Kiukiang, Kiangsi Province, China.

Macrobrachium niloticum (P. Roux)

- Palaemon Niloticus* P. Roux, 1833, Ann. Sci. nat., vol. 28, p. 73, pl. 7 fig. 2.
Palaemon niloticus Heller, 1862, S. B. Akad. Wiss. Wien, vol. 45 pt. 1, p. 422.
Palaemon niloticus Klunzinger, 1866, Zeitschr. wiss. Zool., vol. 16, p. 358, pl. 20.
Palaemon Niloticus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 66.
Palaemon niloticus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 704.
Palaemon niloticus Hilgendorf, 1898, Deutsch Ost-Afr., vol. 4 pt. 7, p. 33.
Palaemon niloticus Sollaud & Tilho, 1911, C. R. Acad. Sci. Paris, vol. 152, p. 1868.
Palaemon (Eupalaemon) niloticus J. Roux, 1927a, Denkschr. Akad. Wiss. Wien, vol. 101, p. 71.
Palaemon niloticus Gordon, 1933, Journ. Linn. Soc. Lond. Zool., vol. 38, p. 359, figs. 5-7.

There is no material of *Macrobrachium niloticum* at my disposal. The species is recorded in literature from: Nile (P. Roux, 1833), Nile near Qena, Upper Egypt (Klunzinger, 1866; Roux, 1927), Kurusku, Upper Egypt (Gordon, 1933), Blue Nile (Gordon, 1933), White Nile (Heller, 1862; Gordon, 1933), Tonga, White Nile (J. Roux, 1927a), Bahr el Jebel (Gordon, 1933), Lake Rudolf (Gordon, 1935), Lake Chad (Sollaud & Tilho, 1911).

Macrobrachium moorei (Calman)

- Palaemon moorei* Calman, 1899, Proc. zool. Soc. Lond., 1899, p. 709, pl. 40 figs. 20-24.
Palaemon moorei Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Palaemon Moorei Moore, 1903, Tanganyika Problem, p. 291, pl. 4 figs. 20-24.
Palaemon moorei Calman, 1906, Proc. zool. Soc. Lond., 1906, p. 188, pl. 11 fig. 1.
Palaemon moorei Cunnington, 1920, Proc. zool. Soc. Lond., 1920, p. 555.

This species, which is closely related to the preceding, is extensively described by Calman (1899, 1906). I have seen no material of it. It is recorded in literature from: Tanganyika Lake, E. Africa (Calman, 1899; Thompson, 1901; Moore, 1903; Cunnington, 1920), Niamkolo, Kalambo, Kirando, and Mrumbi, Tanganyika Lake (Calman, 1906).

Macrobrachium dayanum (Henderson)

- Palaemon Dayanus* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 443, pl. 40 figs. 7-13.
Palaemon dayanus Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
Palaemon dayanus Chopra & Tiwari, 1949, Rec. Indian Mus., vol. 45, p. 215, fig. 1.

The species is known only from India. Henderson recorded it from: Lahore, Loodhiana, Hardwar, Roorki, Jumna River and Delhi, N.W. India, from Jubbulpur, Central India, from Orissa, Beerbhoom and Calcutta, N.E. India, and probably from the Dibru River in Assam. Chopra & Tiwari's specimens originate from Harishanker, Patna State, from the Varuna River at Benares, and from Sonarpur near Calcutta. Nataraj's material came from Travancore.

Macrobrachium callirhoë (De Man)

- Palaemon (Macrobrachium) callirhoë* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 152, pl. 8.

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- Nangaraun, Mandai River, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon callirhoë* De Man. — 3 specimens 31-37 mm.

Ketungau River, Central Borneo; 1894; Dutch Borneo Expedition; cotype of *Palaemon callirhoë* De Man. — 1 specimen 32 mm.

The scaphocerite is rather slender, being somewhat more than 2.5 times as long as broad. The outer margin is somewhat convex. The final tooth is strong and almost reaches to the end of the lamella, which has the antero-internal angle broadly rounded.

The oral parts and the pleopods are quite normal.

For the other characteristics I refer to the very extensive description made by De Man after the present material.

Distribution: The species is only known from the two above localities in the Kapuas basin (Central Borneo).

Macrobrachium petiti (J. Roux)

Palaemon (*Macrobrachium*) *Petiti* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 537, figs. 1-3.

Macrobrachium petiti has not been recorded since the publication of the original description. It is not represented in the collections studied by me. Roux's specimens originated from Vatomandry, E. Madagascar.

Macrobrachium sophronicum nom. nov. (fig. 40)

? *Palaemon gracilirostris* Miers, 1875, Ann. Mag. nat. Hist., ser. 4 vol. 16, p. 343.

? *Palaemon gracilirostris* Ortman, 1891, Zool. Jb. Syst., vol. 5, p. 712.

Palaemon (*Parapalaemon*) *modestus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 469, pl. 27 fig. 43. (non *Palaemon modestus* (Heller, 1862)).

Palaemon (*Parapalaemon*) *modestus brevimanus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 228, figs. 9, 10.

Palaemon modestus Kubo, 1941, Trans. biogeogr. Soc. Japan, vol. 3, p. 310, textfig. 4, pl. 20 fig. 2.

Museum Leiden

Batjan; 1884 leg. S. C. J. W. van Mussenbroek. — 1 ovigerous female 72 mm.

Air Lorike, Hitu peninsula, Amboina; March 17, 1923; leg. F. Kopstein. — 1 ovigerous female 44 mm.

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Wukur River, near Sikka, S.E. Flores; fresh water; 1888-1889; leg. M. Weber; cotypes of *Palaemon modestus* De Man. — 3 specimens (1 ovigerous female) 46-60 mm.

Locality unknown. — 2 specimens 46 & 86 mm.

To De Man's (1892) good description of the present species, which is based on the three above specimens from Flores, I only have to add the following remarks:

The rostral formula in my specimens is $\frac{5) 9}{2}$.

The scaphocerite (fig. 40a) is about 2.5 times as long as broad, the outer margin is straight. The final tooth is strong and almost reaches the end of the lamella, which is slightly produced antero-internally.

The oral parts are quite normal.

The third pereopods (fig. 40c) reach with half the propodus beyond the scaphocerite. The

propodus is slightly more than thrice as long as the dactylus and is somewhat more than 1.5 times as long as the carpus. The merus is distinctly longer than the propodus. The fifth leg fails to reach the end of the scaphocerite, the relations between the various joints are like those in the third leg. The last three legs are robust, the posterior being more slender than the anterior. All joints are covered with minute scale-like tubercles.

The pleopods and uropods are normal in shape.

The eggs are rather numerous and measure 0.6 to 0.8 mm in diameter.

The present species, in the shape of the rostrum, the very long first legs and the shape and

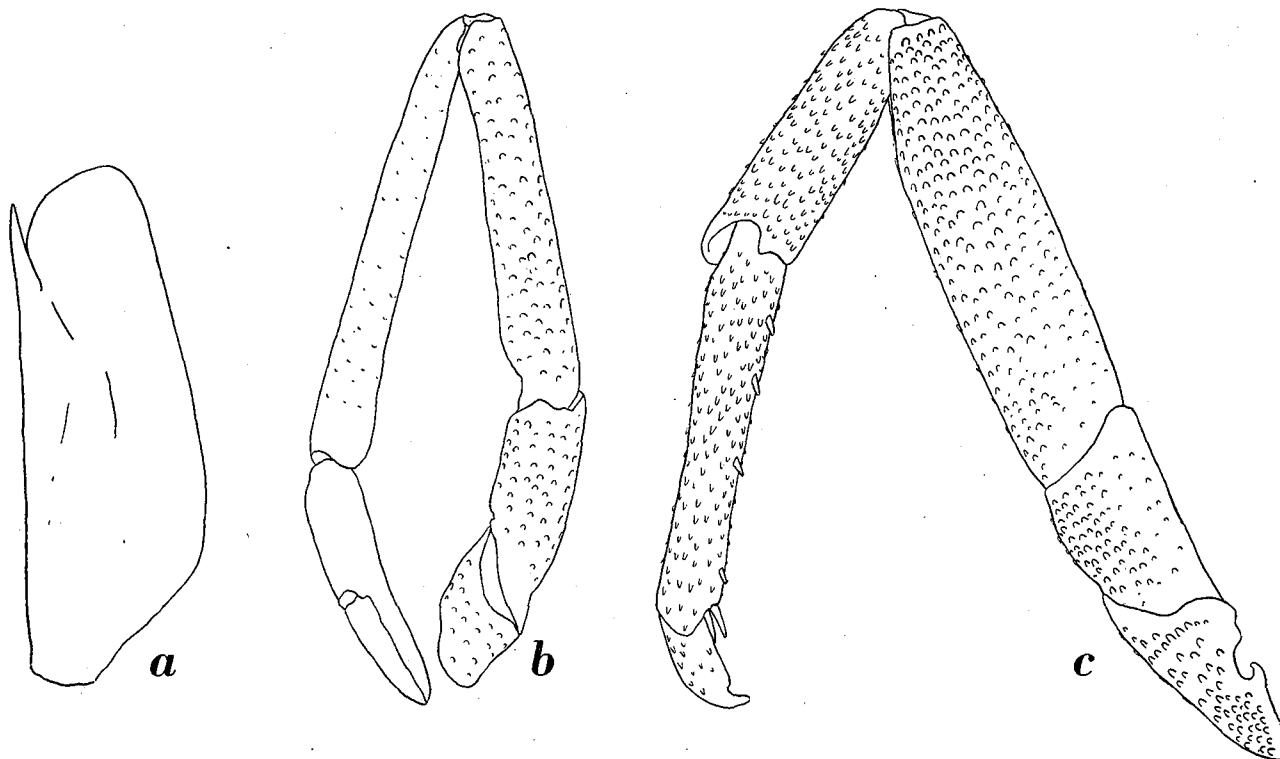


Fig. 40. *Macrobrachium sophronicum* nom. nov. a, scaphocerite; b, first pereopod; c, third pereopod. a-c, $\times 14$.

spinulation of the last three legs, resembles most *Macrobrachium placidulum*, but may at once be distinguished from that species by the shape of the second legs, which are symmetrical and have the fingers closing throughout their length, while they are provided moreover with 1 or 2 large teeth on the cutting edges only; furthermore the teeth of the rostrum in the present species extend distinctly beyond the middle of the carapace while in *M. placidulum* they at most reach to the middle of the carapace. The first pereopods of the present species, though like in *M. placidulum* reaching with the entire carpus beyond the scaphocerite, are not so slender in shape.

De Man (1892) described this species under the name *Palaemon modestus*. Now the name *Palaemon modestus* De Man (1892) is preoccupied by the name *Palaemon modestus* (Heller, 1862), and therefore has to be dropped. A new name is thus needed for the present species; I propose here the name *Macrobrachium sophronicum* nom. nov.

J. Roux (1934a) described a new subspecies of the present species from New Ireland; the differences, which he found between his specimen and those of De Man are:

1. The relation between the length of the carpus and propodus in the second leg of the typical form is 0.6, in Roux's specimen 0.77.

2. The palm of the second leg of the typical form is as long as the carpus, while in the New Ireland specimen it is slightly shorter.

Taking the large variability of the relation between the lengths of the various joints of the second leg in all *Macrobrachium* species in account, these differences are far too small and based on too little material to be considered of even subspecific value. The name *brevimanus* may not be used for the specific or subspecific name of the present species as it is already used by *Fabricsius* (1798) for the species incerta *Palaemon brevimanus* Fabr.

Palaemon gracilirostris Miers (1875) from Samoa in all probability is very closely related if not identical with the present species, since *Miers* describes the rostrum to be very narrow, with 10 dorsal teeth, which continue beyond the middle of the carapace. *Miers's* description is too short, however, to give any certainty in this question.

The specimens from Flores in the collection of the Zoological Museum at Amsterdam are the cotypes of the present species, the other material is reported upon here for the first time.

Distribution: *Macrobrachium sopheronicum* is found in fresh water in the eastern part of the Malay Archipelago, the Riukiu Islands, and New Ireland. The records in literature are: Wukur River, near Sikka, S.E. Flores (*De Man*, 1892), Iriomote, Riukiu Islands (*Kubo*, 1941), Bimun, New Ireland (*J. Roux*, 1934a), ? Upolu, Samoa Islands (*Miers*, 1875). The species is recorded here for the first time from the Moluccas (Batjan and Amboina).

Macrobrachium japonicum (De Haan) (fig. 41)

Palaemon japonicus De Haan, 1849, Fauna Japonica, Crust., p. 172.

Palaemon boninensis Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 41.

Palaemon japonicus De Man, 1879, Notes Leyden Mus., vol. 1, p. 175.

Palaemon boninensis Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 706.

Palaemon japonicus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 726.

Palaemon (Parapalaemon) japonicus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 40.

non *Palaemon japonicus* Rathbun, 1902, Proc. U.S. Nat. Mus., vol. 26, p. 50.

Palaemon (Parapalaemon) japonicus Parisi, 1919, Atti Soc. Ital. Sci. nat., vol. 58, p. 83, pl. 6 figs. 3, 11.

non *Palaemon japonicus* Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 53, pl. 2 fig. 4.

Macrobrachium japonicum Maki & Tsuchiya, 1923, Rep. Dept. Agric. Formosa, vol. 3, p. 63, pl. 5 fig. 2.

non *Palaemon (Leander) japonicus* Gee, 1925, Lingnaam agric. Rev., vol. 3, p. 158.

non *Palaemon japonicus* Urita, 1926, Dobuts. Zassh., vol. 33, pp. 214-220.

non *Palaemon (Leander) japonicus* Kellogg, 1928, Lingnan Sci. Journ. vol. 5, p. 352.

Macrobrachium japonicum Kubo, 1937, Bull. Japan. Soc. sci. Fish., vol. 5, p. 346, figs. 2C, 3C.

Palaemon japonicus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 13, textfigs. 6, 7, pl. 2 fig. d.

Palaemon boninensis Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 15, figs. 8, 9.

Museum Leiden

Japan; cotypes of *Palaemon japonicus* De Haan. — 7 specimens 43-84 mm.

Locality unknown. — 6 specimens 67-80 mm (dry).

Description: The rostrum (fig. 41) reaches about to the end of the antennular peduncle, it is straight, only the extreme tip is slightly curved upwards, the upper margin is somewhat convex over

the eyes, it bears 10 to 13 (generally 12) teeth, 4 or 5 of which are placed on the carapace behind the orbit. The distance between the first tooth and the posterior margin of the orbit is $\frac{2}{5}$ of the total length of the carapace (rostrum excluded). The lower margin of the rostrum is provided with 2 or 3 rather large teeth. The carapace is entirely smooth, even in adult males. The hepatic spine is almost as strong as the antennal, it is placed distinctly behind and below the latter and is not situated in one line with it.

The abdomen is smooth and normal in shape. The pleurae of the fifth segment are rounded at the top. The sixth segment is slightly more than 1.5 times as long as the fifth segment.

The telson is almost 1.5 times as long as the sixth segment. The two pairs of spines on the dorsal surface are placed in the middle and on $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in an acute median point, which in old specimens is truncated. Of the two pairs of posterior spines the inner are longest and distinctly overreach the apex of the telson. Numerous posterior setae are present.

The eyes are well developed and normal in shape.

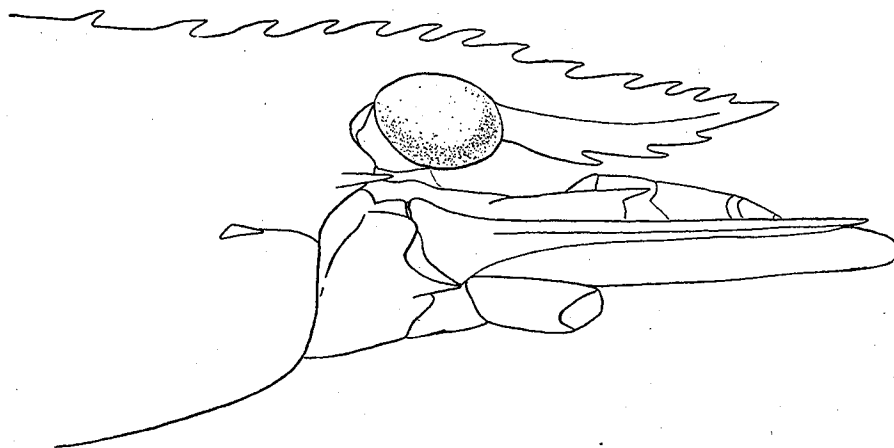


Fig. 41. *Macrobrachium japonicum* (De Haan). Anterior part of body in lateral view. $\times 5$.

The antennulae too are normal.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight. The final tooth has its tip slightly curved inwards. This tooth is far overreached by the lamella, which has its antero-internal angle distinctly produced.

The oral parts are typical.

The first leg reaches only with a small part of the carpus beyond the scaphocerite. The chela is robust, the fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus is slightly shorter, but more robust than the carpus. The ischium is as broad and about half as long as the merus. Both ischium and merus are covered with squamiform spinules, while the other joints are smooth. The second legs are strong, they are equal in shape both in the male and the female. In the adult males they are longer than the entire body. The fingers are slightly less than $\frac{2}{3}$ to quite $\frac{1}{2}$ as long as the palm, they are rather slender. The dactylus bears two teeth on the cutting edge, the anterior of which is situated in or even before the middle of the finger, two smaller teeth are present between the proximal large tooth and the articulation of the finger with the propodus. The fixed finger too is provided with two large teeth, the distal of which is situated between the two large teeth of the dactylus; like in the dactylus here too two small teeth are present between the

proximal large tooth and the base of the finger. The distal part of the cutting edge of both fingers is entire; there are no tubercles present along the cutting edges as in *M. horstii* and *M. jaroense*, only a few hairs may be observed there. The palm is elongate and slightly compressed, it is of the same breadth throughout its length. Both palm and fingers are entirely covered by broad squamiform anteriorly directed tubercles. The carpus measures $\frac{2}{3}$ of the length of the palm, it is slightly constricted posteriorly and is of about the same breadth as the chela anteriorly. The merus is as long as the carpus, it too narrows posteriorly and is about 1.5 times as long as the ischium. Ischium, merus and carpus are covered with similar spinules as are present on the chela. In younger specimens the legs are much shorter. The fingers are longer in relation to the palm, being $\frac{2}{3}$ as long as the palm in specimens of 63 mm. In these specimens the carpus, which is as long as the merus measures $\frac{3}{4}$ of the length of the palm, while the ischium is almost as long as the merus. The last three legs are relatively stout, the third reaches with part of or with the entire dactylus beyond the scaphocerite. The propodus is 2.5 times to thrice as long as the dactylus. The carpus is somewhat more than half as long as the propodus, which is distinctly shorter than the merus. The ischium is about half as long as the propodus. The fifth leg distinctly fails to reach the end of the scaphocerite; the relations between the lengths of the various joints are about as in the third leg. All joints of the last three legs in the adult male are thickly covered with squamiform spinules.

The pleopods and uropods are normal in shape. Ovigerous females are not present in the material at hand.

The spirit specimens of the collection of the Leiden Museum are the type specimens of *De Haan*. In all probability the dry specimens too belong to the type lot, though no label was found indicating this; however, of many of those type specimens of *De Haan*, which are preserved dry, the labels have been lost.

The species mentioned by *Rathbun* (1902), *Maki & Tsuchiya* (1923), *Urita* (1926) and *Kellogg* (1928) under the name *Palaemon japonicus* do not belong to the present species, but are the *Leander japonicus* *Ortmann*, which in the present paper (p. 49) is given a new name *Palaemon orientis* nom. nov.

Palaemon boninensis was described by *Stimpson* (1860) from the Bonin Islands. The species has been redescribed by *Kubo* (1940) likewise after material from the Bonin Islands. When comparing the descriptions of *Stimpson* and *Kubo* and the figures by the latter author with my material and the descriptions and figures available of *Macrobrachium japonicum*, I cannot find any good difference and therefore consider the two forms to be identical. In his key *Kubo* states *Palaemon boninensis* to differ from *Macrobrachium japonicum* by having the second leg more cylindrical and provided with less hairs; in his description he points to the relatively larger appendix masculina of his male of *P. boninensis*. Now these characters vary strongly with age in the male specimens. As *Kubo* possessed only a young male of *Palaemon boninensis* (besides an ovigerous female and some juveniles), it becomes clear that what *Kubo* thinks to be specific differences are nothing but the differences between young and adult specimens of one species. Unless other differences between specimens from the Bonin Islands and Japan come to light, *Palaemon boninensis* must be considered a synonym of *Macrobrachium japonicum*.

Distribution: In literature nothing is mentioned about the habitat which the species inhabits. It is recorded from: Japan (*De Haan*, 1849; *De Man*, 1879, 1892), Itiki, Kagoshima Prefecture, Kyushyu (*Kubo*, 1940), Henoki, Nakizin, Kinmura, Genka-gawa, Kuzi-gawa, Idumi, Yohuke-gawa,

Hentona, and Sasiki-mura, Okinawa, Riukiu Islands (K u b o, 1940), Simozi and Hora-gawa, Miyako, Riukiu Islands (K u b o, 1940), Kagi, W. Formosa (P a r i s i, 1919), Tansui, S.W. Formosa (M a k i & T s u c h i y a, 1923), Bonin Islands (S t i m p s o n, 1860), Byôbu-dani, Ômura, Titi-zima, Bonin Islands (K u b o, 1940).

Macrobrachium horstii (De Man) (fig. 42)

Palaemon (*Parapalaemon*) *Horstii* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 460, pl. 27 fig. 39.

Palaemon horstii Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 509.

Palaemon (*Parapalaemon*) *horsti* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 357.

Palaemon (*Parapalaemon*) *horsti brevidigitus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 358.

Museum Amsterdam

River near Palopo, Luwu District, Celebes; fresh water; 1888-1889; leg. M. Weber; cotypes of *Palaemon Horstii* De Man. — 3 specimens 61-68 mm.

The present species has already extensively been described by D e M a n (1892) and J. R o u x (1930).

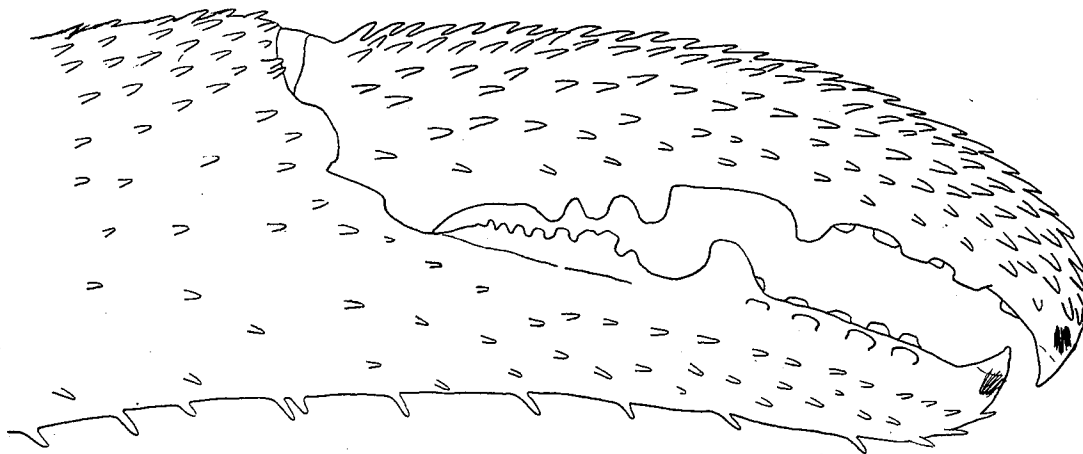


Fig. 42. *Macrobrachium horstii* (De Man). Fingers of second leg of adult male. $\times 10$.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or slightly convex. The final tooth has the apex curved slightly inwards, it is far overreached by the lamella, which is produced at the antero-internal angle.

The oral parts are quite normal.

The first leg has the fingers as long as the palm, the merus slightly shorter than the carpus and the ischium about half as long as the merus. D e M a n in his description does not mention the curious armament of the fingers of the second leg of the adult male (fig. 42). Both dactylus and fixed finger bear slightly proximally of the middle of their length a large tooth on the cutting edge, the tooth of the dactylus is placed somewhat before that of the fixed finger. Between the large tooth of the dactylus and the articulation with the propodus 2 to 3 smaller teeth are present, there is a wide gap between the last of these smaller teeth and the large tooth. The fixed finger bears a ridge in the region where in the dactylus the smaller teeth are situated, this ridge consists of 5 to 8 indistinctly separated, often crenulated, teeth. Distally of the large teeth the cutting edge of both fingers shows as a sharp ridge, or is entirely wanting. At each side of the edge up to 8 rounded tubercles are

present; these tubercles are arranged in a row parallel to the edge. In younger specimens and in the females they are missing. These tubercles are entirely different from the spinules, which are placed on the palm and fingers. This dentition and tuberculation has been described by J. R o u x (1930) for his *Palaemon horstii* var. *brevidigitus*, while a similar tuberculation is found in the closely related *Macrobrachium jaroense* (Cowles). The third leg reaches with part of or with the entire dactylus beyond the scaphocerite. The propodus is slightly more than twice to almost thrice as long as the dactylus and is decidedly less than twice as long as the carpus. The merus is distinctly longer than the propodus and twice as long as the ischium. The fifth pereopod reaches about to the middle of the scaphocerite, the relation between the joints is just like in the third leg.

The pleopods and uropods are normal in shape. No ovigerous females are present in the material examined.

J. R o u x (1930) separates a male specimen from Bali as a variety *brevidigitus* from the main form from Lombok and Celebes on account of the shorter fingers and the shorter carpus. For comparison I give here the measurements of the second legs of the type specimens (all being males), as well as the measurements given by S c h e n k e l (1902) and J. R o u x (1930) for their males.

| author | locality | body length. (mm) | leg 1) | length of joints of second leg (mm) | | | | |
|----------------|----------------------|----------------------|-----------|-------------------------------------|-------|--------|------|--------|
| | | | | ischium | merus | carpus | palm | finger |
| DE MAN, 1892 | Palopo, Celebes | 68 | r | 6.5 | 13.0 | 14.5 | 14.5 | 10.0 |
| | | | l? | 7.0 | 13.5 | 14.0 | 15.0 | 10.0 |
| | | 66 | ? | — | 15.0 | 18.0 | 22.0 | 12.0 |
| | | | ? | — | 15.0 | 18.0 | 22.0 | 11.0 |
| SCHENKEL, 1902 | Enrekang, Celebes | 61 | ? | 6.0 | 8.8 | 9.0 | 9.3 | 6.8 |
| | | 57.5 | r | 7.8 | 14.5 | 16.0 | 16.3 | 12.8 |
| J. ROUX, 1930 | Bali | 63.5 | l | 8.0 | 10.5 | 11.0 | 11.0 | 8.5 |
| | | 58.0 | r | 8.5 | 16.5 | 18.0 | 23.0 | 12.0 |
| | | | l | 7.5 | 15.0 | 16.5 | 18.0 | 10.0 |

1) r = right, l = left

As may be seen from the above data the relation between the lengths of the palm and the fingers varies between 0.50 and 0.73 in the type specimens, in S c h e n k e l's specimens the relation is 0.77 and 0.78. In the type of the var. *brevidigitus* 0.52 and 0.56. The relation between the lengths of carpus and palm in the types of the species is 1 to 1.22, in S c h e n k e l's specimens it is 1 and 1.02, in J. R o u x's specimens (types of the variety) 1.09 and 1.27. There is thus no reason whatever to consider the specimens from Bali to be a separate variety. One generally is not justified in the present genus to base new forms solely on the differences in the relation between the lengths of various limbs, unless these differences are considerable. The measuring of a limb always is rather subjective as none of the limbs has a distinct beginning or end, thus large differences may be found when two different persons measure one and the same limb. The measurements given in literature therefore always must be considered with much reserve.

Distribution: *Macrobrachium horstii* at present only is known from freshwater in the eastern part of the Malay Archipelago. The records in literature are Bali, Lesser Sunda Islands (J. R o u x, 1930), Lombok, Lesser Sunda Islands (J. R o u x, 1930), Palopo, Luwu, Central Celebes (D e M a n, 1892), Enrekang, Central Celebes (S c h e n k e l, 1902).

Macrobrachium jaroense (Cowles)

Palaemon jaroensis Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 385, pl. 3 fig. 8.

Palaemon jaroensis Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

This species is closely related to *M. horstii* but may be distinguished from it by the shape of the second legs of the adult male.

Distribution: *Macrobrachium jaroense* is only known from the Hibucawan River near Jaro, Leyte, Philippines (Cowles, 1914; Estampador, 1937).

Macrobrachium cavernicola (Kemp)

Palaemon cavernicola Kemp, 1924, Rec. Indian Mus., vol. 26, p. 42, pl. 3 figs. 1-4.

Palaemon cavernicola Kemp & Chopra, 1924, Rec. Indian Mus., vol. 26, pp. 12, 19, 20.

Palaemon cavernicola Spandl, 1926, Tierw. unterird. Gewässer, pp. 89, 140, figs. 59, 104, 106.

Palaemon cavernicola Chappuis, 1927, Tierw. unterird. Gewässer, p. 87, fig. 49.

Palaemon cavernicola Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 102.

Macrobrachium cavernicola is the only member of the present genus with the cornea of the eyes reduced. It moreover is the only species of *Macrobrachium* which is known to bear a two-jointed mandibular palp. It is a typical cave-animal and is known from fresh water in the Siju Cave, Garo Hills, Assam (Kemp, 1924).

Macrobrachium latimanus (Von Martens) (fig. 43)

Palaemon latimanus Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 44.

Palaemon latimanus De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 557.

Palaemon latimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 737, pl. 47 fig. 11.

Palaemon euryrhynchus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 738, pl. 47 fig. 12.

Palaemon (Macrobrachium) latimanus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 477, pl. 28 fig. 45.

Palaemon (Macrobrachium) latimanus Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 485, figs. 3, 4.

Palaemon (Macrobrachium) singalangensis Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 487.

Palaemon (Macrobrachium) latimanus De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 780.

Palaemon latimanus Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 512.

Palaemon (Macrobrachium) latimanus De Man, 1904, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 296, pl. 18 figs. 9-12.

non *Palaemon (Macrobrachium) latimanus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.

Palaemon (Macrobrachium) latimanus J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 340.

Palaemon (Macrobrachium) latimanus J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 15.

Palaemon (Macrobrachium) latimanus Sandler, 1923, Abh. Senckenb. naturf. Ges., vol. 38, p. 46.

Palaemon (Macrobrachium) latimanus J. Roux, 1928a, Treubia, vol. 10, pp. 213, 220.

Palaemon (Macrobrachium) latimanus J. Roux, 1929, S. B. Ges. naturf. Fr. Berlin, 1929, p. 236.

Palaemon (Macrobrachium) latimanus J. Roux, 1934a, Rev. Suisse Zool., vol. 41, pp. 218, 219.

Palaemon latimanus Adamson, 1935, Occ. Pap. Bishop Mus. Honolulu, vol. 11 pt. 10, p. 17.

Palaemon latimanus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.

Palaemon latimanus Adamson, 1939, Bull. Bishop Mus. Honolulu, vol. 159, p. 36.

Palaemon latimanus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 24, textf. 15, pl. 1 fig. a.

Siboga Expedition

Station 50, Bay of Badjo, westcoast of Flores; dredge and trawl; depth up to 40 m; bottom mud, sand and shells; April 16-18, 1899. — 1 juvenile 12 mm.

Museum Leiden

- Anai Canyon, W. Sumatra; altitude 500 m; 1926; leg. E. Jacobson. — 6 specimens 40-110 mm.
 Celebes; leg. E. A. Forsten. — 2 specimens 92 and 100 mm (dry).
 Amboina; in rapidly running mountain rivulets and waterfalls; October, 1922; leg. F. Kopstein. —
 3 specimens 47-58 mm.
 River near Atapupu, Timor; 1888-1889; leg. M. Weber. — 1 specimen 42 mm.
 Fiji Islands; Museum Godeffroy. — 1 specimen 101 mm.
 Locality unknown. — 2 specimens 74 and 77 mm (dry).

Museum Amsterdam

- Lolowau, Nias; 1910; leg. J. P. Kleiweg de Zwaan. — 18 specimens (including 6 ovigerous females)
 36-74 mm.
 River near Bomba, S. Flores; 1888-1889; leg. M. Weber. — 1 specimen 44 mm.
 River near Raka-mbaha (= Mbawa), S. Flores; downstreams of a waterfall; 1888-1889; leg. M.
 Weber. — 2 specimens (1 ovigerous female) 56 and 63 mm.
 Wukur River near Sikka, S.E. Flores; fresh water; 1888-1889; leg. M. Weber. — 8 specimens
 (1 ovigerous female) 16-46 mm.
 River near Talae, Roti; 1888-1889; leg. A. Wichmann. — 1 specimen 51 mm.
 Bele, East Amanubang District, Central Timor; rivulet of the Noiltuke basin, about 700 m above
 sealevel. — 1 specimen 105 mm.
 Noilbesi River, near path from Noiltoko (via F. Semaan) to Bonleo, Central Timor; about 900 m
 above sealevel; leg. de Marez Oyens. — 6 specimens 60-105 mm.
 Noilaplaal (= Noilbesi) River near Aplaal bivouac, Miomaffo District, Central Timor; 500 m above
 sealevel; leg. de Marez Oyens. — 3 specimens (1 ovigerous female) 68-100 mm.
 River near Atapupu, N. Timor; 1888-1889; leg. A. Wichmann. — 6 specimens (2 ovigerous females)
 45-60 mm.
 Poso Lake, Celebes; leg. E. E. Abendanon. — 2 specimens 114 and 122 mm.
 Northern Halmahera; 250 m above sealevel; leg. W. Kükenthal; coll. J. G. de Man. — 1 specimen
 74 mm.
 Wakatin, Buru; Station 5 of the Buru Expedition 1921/1922; 544 m above sealevel; February,
 1921-March, 1922; leg. L. J. Toxopeus. — 4 specimens 100-125 mm.
 Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 165 specimens (45 ovigerous
 females) 28-113 mm (2 specimens bopyrized).
 Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 33 specimens (15
 ovigerous females) 32-92 mm.
 Riuapa River, W. Ceram; leg. L. F. de Beaufort. — 1 specimen 26 mm.
 Rivulet near Honitetu, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 9 specimens (8
 ovigerous females) 50-102 mm.
 Eme River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 14 specimens (3 ovigerous females)
 31-53 mm.
 Tributary of the Upper Eme River near Honitetu, W. Ceram; February 19, 1910; leg. L. F. de
 Beaufort. — 2 specimens (1 ovigerous female) 47 and 49 mm.

The present species has already been described extensively by De Man (1902) and J. Roux (1923), so that I only will add some additional details.

The carapace is entirely smooth, even in adult males. The hepatic spine lies behind and below the antennal, it is distinctly smaller than the antennal spine.

The abdomen is quite normal in shape. The pleura of the fifth segment has the apex rounded. The sixth segment is only slightly longer than the fifth. The telson is about 1.5 times as long as the sixth abdominal segment. It is of the usual shape.

The eyes and antennules are normal.

The scaphocerite has the outer margin straight or somewhat concave. The final tooth is far overreached by the lamella. It is slightly more than twice as long as broad.

The oral parts are typical.

The last three pereiopods are rather short and plump. The third leg reaches only with the tip of the dactylus beyond the scaphocerite. The propodus is about 2.5 times as long as the dactylus. The carpus is distinctly more than half as long as the propodus. The merus is longer than the propodus. In the fifth pereiopod the merus is relatively shorter, but the other relations are as in the third leg. Ischium, merus, carpus and propodus in the last three legs of the adult males are provided with longitudinal rows of spinules, which are most distinct on the propodus and least distinct on the ischium, where they are confined to the posterior part. In young specimens these spines are missing.

The pleopods and uropods are quite typical.

In younger specimens the rostrum is relatively longer than in the old.

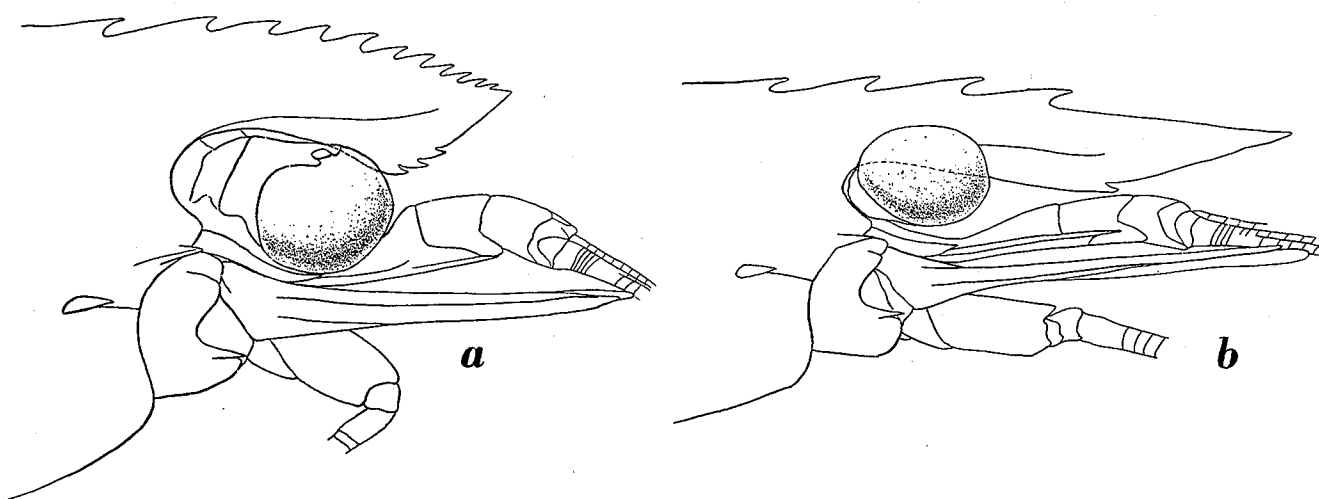


Fig. 43. *Macrobrachium latimanus* (Von Martens). a, anterior part of body (f. *latimanus* s.s.); b, anterior part of body (f. *singalangense*). a, b, $\times 9$.

In the material at hand specimens are present from the Anai Canyon in W. Sumatra. This locality is situated close near Singalang from where Nobile (1899) reported the type specimens of his species *Palaemon singalangensis*. My specimens entirely agree with Nobile's description, the shape of the rostrum being most remarkable. After comparison of this material with the material of the typical *Macrobrachium latimanus*, however, I can not consider this form to be a separate species. Nobile mentioned the following differences between his *P. singalangensis* and *P. latimanus*:

1. The rostrum in *P. singalangensis* is longer than the antennular peduncle.
2. The distal part of the upper margin of the rostrum in *P. singalangensis* has no teeth, while in the proximal part only 4 to 6 teeth are present (figs. 43a, b).
3. The difference between the left and right second leg is larger in *P. singalangensis* than in *P. latimanus*.
4. *P. singalangensis* is more slender and larger.

Point 1, 3, and 4 are of no value at all, in the material of the typical *Macrobrachium latimanus* at my disposal the rostrum sometimes overreaches the antennular peduncle too, the difference in

the shape of the left and right second leg in some adult males of the typical *M. latimanus* often is much more pronounced than that in my adult male of *P. singalangensis*, while I also could not observe any difference in slenderness and size between the two forms. Only thus point 2 remains. In all my material from the Anai Canyon the rostrum bears 3-5 upper teeth (fig. 43b), while the ultimate part of the rostrum is entire, just like in N o b i l i's material. This feature therefore seems to be constant in material from that region. As, however, some of my specimens from other localities show a similar low number of dorsal rostral teeth and sometimes have the extreme distal part entire too (these two shapes of the rostrum may occur in material from one locality), and as I can find no other differences, I can not consider the two forms to be separate species; perhaps the West Sumatran specimens may be considered a local form, though forms with an almost similar rostrum occur among material from Timor, while specimens from Nias, an island off the westcoast of Sumatra, have the rostrum of the typical shape.

The specimen from the Fiji Islands obtained by the Leiden Museum from the Museum Godeffroy probably has belonged to the same lot as the type specimens of *Palaemon euryrhynchus* Ortman.

The material from Sikka, Flores, includes some very young specimens. Like in *M. australe* and *M. lar*, the specimens show a supraorbital knob (only visible in the smallest specimen), the palp of the mandible is reduced, the hepatic spine is situated close near the anterior margin of the carapace (in a specimen of 35 mm the hepatic spine reaches just with the tip to the anterior margin of the carapace), the dactyli are biunguiculate (in the just mentioned specimen of 35 mm this biunguiculation is still visible). The rostrum in the very young specimens has the dorsal teeth of equal size; here the posterior teeth are not larger and not placed farther apart than the anteriors, as this is the case in the adult specimens. Comparison of these very young specimens from Sikka, which are connected by a gradual series of transitions with the adults, with a single very young specimen from the Siboga Expedition Sta. 50, convinced me that the latter also belongs to the present species. Like in *M. australe* and *M. lar*, the very young specimens may be found in sea, which probably explains the large range of distribution of these species, which all three extend as far eastward as the Marquesas Islands in Polynesia.

The specimens reported by J. R o u x (1917) from the Waitjiri River, N. Dutch New Guinea under the name *Palaemon (Macrobrachium) latimanus*, certainly does not belong here. In my opinion the specimen, which is present in the collection of the Amsterdam Museum, is a juvenile of *Macrobrachium lar*, as is distinctly shown by the shape of the rostrum, which is much shallower than that of specimens of *M. latimanus* of the same size and which has the teeth larger; furthermore the carpus of the second leg is too long in relation to the merus and the armament of the cutting edge too is different. Comparison of this specimen with material of both *M. latimanus* and *M. lar*, leaves no doubt as to its identity with the latter species.

The specimens collected by W e b e r and W i c h m a n n in Flores, Roti and Timor, have been dealt with by D e M a n (1892). Those from Ceram and Buru by J. R o u x, 1923 and 1928a respectively.

Distribution: The species lives in pure fresh water, often at considerable altitudes, but the very young specimens may be found in sea. It ranges from the Malay Archipelago (W. Sumatra) to the Riukiu Islands and eastern Polynesia (Marquesas). The records in literature are: Genka, Hanegi-mura, Okinawa Island, Riukiu Islands (K u b o, 1940), Soreino River, Sipora, Mentawai

Islands, off W. Sumatra (Nobili, 1900), Airmantjur near Singalang, W. Sumatra (Nobili, 1900), Loquilocun, Central Samar, Philippines (Von Martens, 1868), Minahasa, N. Celebes (De Man, 1902), Tomohon, Bone River, and Buol, N. Celebes (Schenkel, 1902), Mapane River, Central Celebes (Schenkel, 1902), N. Halmahera, Moluccas (De Man, 1902), Soakonora, N. Halmahera (De Man, 1902), Wakatin, Buru (J. Roux, 1928a), Tuba, Riuapa and Eme Rivers, W. Ceram (J. Roux, 1923), Honitetu, W. Ceram (J. Roux, 1923), Amboina (De Man, 1888), Ohoinangan, Groot Kai (J. Roux, 1919), Gitgit, Bali (J. Roux, 1929), Kanangar and Mao Marru, Sumba (J. Roux, 1928a), Rana Mese, W. Flores (J. Roux, 1929), Bomba, S. Flores (De Man, 1892), Raka-mbaha (= Mbawa), S. Flores (De Man, 1892), Wukur River near Sikka, S.E. Flores (De Man, 1892), Talae, Roti (De Man, 1892), Atapupu, Timor (De Man, 1892), Dinawa, Owen Stanley Range, Papua (De Man, 1904), Manus, Admiralty Islands (J. Roux, 1934a), Bimoun, New Ireland (J. Roux, 1934a), Tana, New Hebrides (Sandler, 1923), Fiji (Ortmann, 1891), Tahiti (Ortmann, 1891), Marquesas (Adams, 1939), Hivaoa, Tahuata, Fatuhiva, Uapou and Mohotani Islands, Marquesas Group (Adams, 1935).

Macrobrachium hendersoni (De Man)

Palaemon (*Parapalaemon*?) *Hendersoni* De Man, 1906, Ann. Mag. nat. Hist., ser. 7 vol. 17, p. 405.

Palaemon (*Parapalaemon*?) *hendersoni* De Man, 1907, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 9, p. 446, pl. 33 figs. 66-68.

Bithynis (*Parapalaemon*) *hendersoni* Rathbun, 1910, Bull. Mus. comp. Zool. Harvard, vol. 52, p. 316, pl. 5 fig. 3.

Palaemon hendersoni Kemp, 1913, Rec. Indian Mus., vol. 8, p. 303, pl. 19 figs. 19-23.

Palaemon hendersoni Kemp, 1918, Rec. Indian Mus., vol. 14, p. 95.

Palaemon hendersoni Kemp, 1924, Rec. Indian Mus., vol. 26, p. 41, pl. 3 fig. 5.

Palaemon hendersoni Kemp & Chopra, 1924, Rec. Indian Mus., vol. 26, pp. 12, 19.

Palaemon hendersoni Spandl, 1926, Tierw. unterird. Gewässer, pp. 89, 140, fig. 105.

Palaemon hendersoni Chappuis, 1927, Tierw. unterird. Gewässer, p. 88.

Palaemon hendersoni Wolf, 1934, Anim. Cavern. Catal., vol. 3, p. 102.

Palaemon yunnanensis Yu, 1936, Bull. Fan Mem. Inst. Zool., vol. 6, p. 308, figs. 3, 4.

Museum Amsterdam

Balassan River, India; leg. M. Weber. — 9 specimens 35-56 mm.

Near Kurseong, Darjeeling, N. India; December, 1898; leg. M. Weber. — 7 specimens 29-55 mm.

The present species has been extensively described by De Man (1907) and Kemp (1913), these authors also gave good figures. I will therefore give only some additional details.

In my specimens the number of dorsal teeth of the rostrum varies between 7 and 9 (in 4 specimens being 7, in 7 specimens 8 and in 4 specimens 9). This formula thus is just intermediate between those of Kemp's and De Man's specimens from Assam and Darjeeling (formula $\frac{5-7}{2}$), and those specimens mentioned by Kemp from the Inlé Lake (Burma) (formula $\frac{9-11}{3}$). Rathbun's (1910) specimens had the formula $\frac{7-10}{2-3}$. In all other respects my specimens resemble those described and figured by Kemp (1913).

The oral parts as well as the pleopods and uropods are typical in shape.

Ovigerous females are not present in my material and as far as I know they have not yet been recorded in literature.

Y u (1936) described a new *Palaemon* from Yunnan Province, S. China, which he named *Palaemon yunnanensis*. His description and good figure show that this species is identical with *Macrobrachium hendersoni*. The Yunnan specimens have the rostrum very short and provided with 7-9 dorsal and 2 ventral teeth. The fingers of the large chela of the male bear the typical longitudinal hairy grooves.

Distribution: The species is an exclusive freshwater form and lives at high altitudes far inland (300-1300 m), it is found up till now only in the eastern Himalayas from Darjeeling to Yunnan and N. Burma. The records in literature are: Kurseong, Darjeeling District (K e m p, 1913), Darjeeling (D e M a n, 1906, 1907; K e m p, 1918), Siyu Cave, Garo Hills, Assam (K e m p, 1924), Garo Hills (K e m p, 1918, 1924), Sirpo and Egar Streams near Renging and Rotung, Abor, N. Assam (K e m p, 1913), Gokteik Gorge, S. Shan States, Burma (R a t h b u n, 1910), He-Ho Stream, Yawngwhe State, Burma (K e m p, 1918), Swa Reserve Forest, Burma (K e m p, 1918), Mann-Tchi-Pan, Yunnan (Y u, 1936).

Macrobrachium clymene (De Man)

Palaemon (*Macrobrachium*) *clymene* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 794, pl. 25 fig. 50.

Museum Leiden

Baram River, Sarawak; 1893-1894; leg. W. Kükenthal; cotypes of *Palaemon clymene* De Man. — 4 specimens (1 ovigerous female) 33-53 mm.

The present specimen formed part of D e M a n's type material and has been extensively described and figured by him. I only will add the following remarks.

The fifth abdominal segment has the apex rounded.

The scaphocerite reaches slightly beyond the antennular peduncle and is a little more than twice as long as broad. The outer margin is somewhat convex and ends in a strong final tooth, which is somewhat overreached by the lamella, which has the antero-internal angle slightly produced.

The oral parts and the pleopods are normal.

Distribution: The species only is known from K ü k e n t h a l's specimens from the Baram River, Sarawak.

Macrobrachium patsa (Coutière)

Palaemon (*Parapalaemon*) *Patsa* Coutière, 1899, Bull. Mus. Hist. nat. Paris, vol. 5, p. 382.

Palaemon (*Parapalaemon*) *Patsa* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.

Palaemon (*Parapalaemon*) *Patsa* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 284, pl. 11 figs. 20-22.

Macrobrachium patsa Rathbun, 1935, Bull. Mus. comp. Zoöl. Harvard, vol. 79, p. 27.

Distribution: The species is recorded from E. Africa and Madagascar. The records are: Tsavo, Kenya, E. Africa (R a t h b u n, 1935), Onilahy River, S.W. Madagascar (C o u t i è r e, 1899, 1900, 1901), Antongil Bay, N.E. Madagascar (C o u t i è r e, 1899, 1900, 1901), Mare near Andampy, Manahara River, E. Madagascar (C o u t i è r e, 1899, 1900, 1901).

Macrobrachium yui nom. nov.

Palaemon brevicarpus var. *heterochirus* Yu, 1936, Bull. Fan Mem. Inst. Zool., vol. 6, p. 305, figs. 1, 2.

In 1936 Yu described a new species of *Macrobrachium* from Yunnan. He thought his specimens to belong to *Palaemon brevicarpus* De Haan, though being varietally distinct from De Haan's species, and therefore named them *Palaemon brevicarpus* De Haan var. *heterochirus*. Now *Palaemon brevicarpus* De Haan is identical with *Macrobrachium carcinus* (L.) (= *Palaemon jamaicensis* auctt.) and is totally different from Yu's Yunnan specimens. I can not identify Yu's form with any of the described species of *Macrobrachium* and in my opinion it certainly belongs to a new species. The name *heterochirus* may not be used for the species as it has already been used before for a species of this genus (*Palaemon heterochirus* Wiegmann, 1836). Therefore I propose the new name *Macrobrachium yui* nom. nov. for it, in honour of the Chinese author, who has done so much to enlarge our knowledge of the Chinese Caridea.

Distribution. The type specimens of this species have been collected in a mountain stream at Ning-Erh, Yunnan, S. China.

Macrobrachium trompii (De Man)

?*Palaemon Javanicus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.

Palaemon (*Parapalaemon*) *Trompii* De Man, 1898a, Notes Leyden Mus., vol. 20, p. 144, pl. 7.

Palaemon (*Parapalaemon*) *thienemanni* J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, p. 570, figs. a, b.

Palaemon (*Parapalaemon*) *trompi armatus* J. Roux, 1936, Bull. Raffles Mus., vol. 12, p. 30.

Museum Leiden

Mandai River near Nangaraun, Kapuas Basin, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon Trompii* De Man. — 2 ovigerous females 47 and 50 mm.

Ketungau River, Kapuas Basin, Central Borneo; 1894; leg. M. Moret; cotypes of *Palaemon Trompii* De Man. — 2 specimens (1 ovigerous female) 46 and 66 mm.

Sintang, Kapuas River, Central Borneo; 1894; Dutch Borneo Expedition; cotypes of *Palaemon Trompii* De Man. — 2 specimens 28 and 30 mm.

Museum Amsterdam

Taluk, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 5 specimens 41-72 mm.

Muaraklingi, Upper Musi River, S. Sumatra; May 10, 1929; leg. A. Thienemann; Deutsche Limnologische Sunda-Expedition; cotypes of *Palaemon thienemanni* Roux. — 10 specimens 22-39 mm.

Mandai River near Nangaraun, Kapuas Basin, Central Borneo; 1894; Dutch Borneo Expedition; cotype of *Palaemon Trompii* De Man. — 1 ovigerous female 46 mm.

The ovigerous female from Ketungau and those from Nangaraun have the chelae of the second legs provided with closely packed short velvety setae in the distal part of the palm and the whole surface of the fingers, while small spinules may be seen in the proximal part of the palm. De Man's statement that in this species there are no spinules on the second legs and that only scattered hairs are present, thus is erroneous. The males in the collections at hand certainly have not yet attained their final size and it may be expected therefore that in the full grown males such a spinulation and pubescence also will be found. This is the more probable as the specimens described

by R o u x from the Malay Peninsula as *Palaemon trompi armatus* have the second leg spinulate and its chelae pubescent in the males as well as in the females. R o u x (1936) separated his specimens as a distinct variety on account of this spinulation and pubescence from the Bornean main species. As, however, as pointed out above, in the Bornean specimens these velvety hairs and spinules are present, there is no reason whatever to treat the Malay specimens as a separate variety, the more as no other differences exist.

J. R o u x (1932) described a new species *Palaemon thienemanni* from S. Sumatra. The type material of this species, part of which is present in the Amsterdam Museum, entirely consists of juvenile specimens, the largest of which is 40 mm long. J. R o u x himself already pointed to the close resemblance of his species to *P. trompii*, but he thought it different in the shape of the second legs; in *P. thienemanni* namely the carpus should be shorter than the merus, while in *P. trompi* the merus should be slightly shorter than the carpus (R o u x, 1937, p. 571, of course makes an error when he states: "bei *Pal. trompi*, im Gegenteil ist der Merus ein wenig länger.") Among the 10 specimens of the type lot of *P. thienemanni* at my disposal only one second leg is present. In this leg, however, the carpus in reality is slightly longer than the merus, just like in *M. trompi*, the measurements of the leg being: ischium 2.6 mm, merus 2.9 mm, carpus 3.2 mm, palm 2.5 mm, fingers 2.3 mm. We thus must come to the conclusion, that either R o u x's measurements are wrong, or that the relation between the lengths of the carpus and merus is variable in the species. The differences between these lengths are extremely small indeed in young specimens as may be seen from the following table:

| author | material | length merus (mm) | length carpus (mm) |
|---------------|------------|-------------------|--------------------|
| DE MAN, 1898a | ♂ of 30 mm | 3.5 | 4.0 |
| | ♀ of 47 mm | 5.5 | 6.3 |
| J. ROUX, 1932 | | 5.0 | 4.5 |
| | | 6.0 | 5.5 |
| | | 4.8 | 4.5 |
| | | 5.0 | 4.5 |

The identity of J. R o u x's species with *Macrobrachium trompii* therefore becomes very probable. As the material from Taluk, Central Sumatra (Mus. Amsterdam), which undoubtedly belongs to *M. trompii*, shows that the latter species indeed occurs in Sumatra, we safely may accept the identity of *P. thienemanni* with *M. trompii*.

My specimens from Taluk, Sumatra entirely agree with the typical specimens. The largest specimen, a male of 72 mm has the chelae more robust than those of a male of 69 mm, which closely resembles the largest specimen of the type collection (a male of 66 mm from Ketungau). The Sumatran specimen of 72 mm probably is not yet full grown as no pubescence is observed on the chelae of the second legs, though spinules are distributed over all the joints of these legs. The palm, which is as long as or slightly longer than the fingers, is somewhat swollen. In the proximal third of their cutting edge the fingers bear 4 or 5 small equally sized teeth. The carpus is conical and only slightly longer than the merus. There are long hairs scattered over all joints of the second legs, just as in the typical male specimens. No females are present in the Taluk material.

V o n M a r t e n s (1868) described a specimen from Danau Sriang, in the basin of the

Kapuas River, Central Borneo, under the name *Palaemon Javanicus* Heller. As already pointed out under the latter species (p. 193), it is more probable, concluding from V o n M a r t e n s's description that his specimens belong to *M. trompii* than to *M. javanicum*.

Distribution. The present species is recorded in literature from fresh water in the Malay Peninsula, Sumatra and Borneo. The records are: Gunong Pulai, Johore, Malay Peninsula (J. R o u x, 1936), Muaraklingi, Musi River, S. Sumatra (J. R o u x, 1932), Danau Sriang, Kapuas Basin, Central Borneo ? (V o n M a r t e n s, 1868), Mandai and Ketungau Rivers and Sintang, Kapuas Basin, Central Borneo (D e M a n, 1898a).

Macrobrachium lorentzi (J. Roux) (fig. 44)

Palaemon (*Parapalaemon*) *lorentzi* p.p. J. Roux, 1921, Nova Guinea, vol. 13, p. 596, pl. 16 figs. 1-3.

Museum Amsterdam

Went Mountains, near the source of the Van der Sande River, S. W. New Guinea; October 11, 1909; leg. H. A. Lorentz; New Guinea Expedition, 1909; cotypes of *Palaemon lorentzi* J. Roux. — 1 specimen 30 mm.

Kloof bivouac, Upper Lorentz River, S. W. New Guinea; November 27 and December 2 and 3, 1912; leg. G. Versteeg; New Guinea Expedition, 1912; cotypes of *Palaemon lorentzi* J. Roux. — 4 specimens 67-78 mm.

Alkmaar Camp, Upper Lorentz River; from Exploration detachment; New Guinea Expedition, 1909; cotypes of *Palaemon lorentzi* J. Roux. — 2 specimens 72 and 86 mm.

Sabang, on tributary of the Lorentz River; July 17, 1907; leg. H. A. Lorentz; New Guinea Expedition, 1907; cotype of *Palaemon lorentzi* J. Roux. — 1 specimen 76 mm.

The following details may be added to J. R o u x's description, which is made after the above material.

Of the upper rostral teeth 4 or 3 are placed behind the orbit. The distance between the first dorsal tooth and the posterior margin of the orbit is about $\frac{1}{4}$ of the length of the carapace (rostrum excluded). There always is a rather large interval between the apex of the rostrum and the distal lower tooth. The anterolateral part of the carapace in the adult male is scabrous. The hepatic spine is placed behind and below the antennal and does not lie in one line with it.

The abdomen and telson are smooth. The pleura of the fifth segment ends in a small blunt tooth. The sixth segment is only a little longer than the fifth. The telson is of the common shape, the anterior dorsal pair of spinules lies slightly behind the middle of the telson, the other pair midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a sharp triangular point, which is distinctly overreached by the inner pair of posterior spinules.

The eyes and antennules are normal in shape.

The scaphocerite is somewhat less than 2.5 times as long as broad. It is not much narrower anteriorly than posteriorly. The outer margin mostly is straight or slightly concave. The lamella has the antero-internal angle slightly produced. The final tooth fails to reach the end of the lamella.

The oral parts are normal in shape.

The first legs have the carpus distinctly less than twice as long as the chela. In R o u x's figure of the second leg, the relation between the lengths of the various joints is not correct, therefore a new figure (fig. 44) of this leg is given here. The last three pairs of pereopods are rather robust.

The third reaches to or slightly beyond the scaphocerite. The dactylus bears a row of hairs along the anterior margin. The propodus is about 2.5 times as long as the dactylus. The carpus is more than half as long as the propodus. The merus is slightly shorter than the propodus and carpus combined. The fifth pereopod fails to reach the end of the scaphocerite, it is somewhat more slender than the third leg. The propodus is about thrice as long as the dactylus, twice as long as the carpus and as long as the merus. The posterior margin of the propodus in all three legs bears the usual spinules, while in the fifth leg the transverse rows of setae are present in the distal part.

The pleopods and uropods are quite normal in shape.

The present species shows most resemblance to *M. pilimanus*, but may at once be distinguished from that species by the pubescence of the chelae and by the longer and more slender carpus of the second legs.

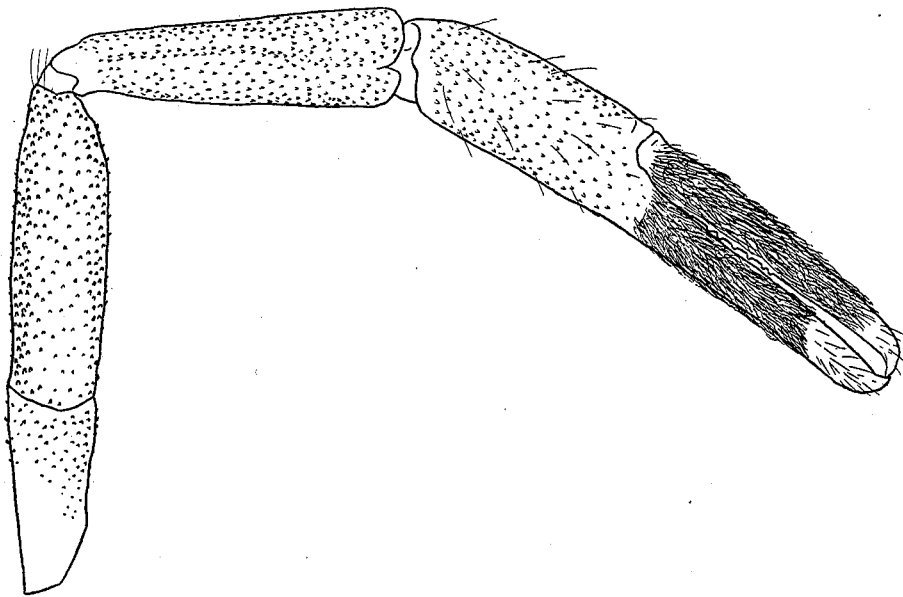


Fig. 44. *Macrobrachium lorentzi* (J. Roux). Second leg of adult male. $\times 3.5$.

The collection examined also contained a specimen from Alkmaar, Upper Lorentz River (November, 1909; leg. H. A. Lorentz), which is the specimen indicated by Roux in his description as juv. This specimen is damaged: the anterior part of the rostrum is broken and it lacks both second legs. Its length (measured from the tip of the telson to the tip of the scaphocerites) is 57 mm. In the jar containing this specimen a label was found bearing the following inscription in J. Roux's handwriting "Pal. (Parap.) ? *lorentzi* Roux, beschädigt". This specimen certainly is no *Macrobrachium lorentzi* as is shown by its very slender legs, by the shape of the scaphocerites and that of the remaining part of the rostrum. Comparison of this specimen with material of *M. mammilodactylus* convinced me that it must belong to the latter species.

Distribution. The species lives in freshwater far inland. It only is known from the above localities in the Lorentz River basin, S.W. New Guinea.

Macrobrachium pilimanus (De Man)

Palaemon pilimanus De Man, 1879, Notes Leyden Mus., vol. 1, p. 181.

?*Palaemon* Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.

- Palaemon pilimanus* De Man, 1887, Midden Sumatra Exped., vol. 4 pt. 1 n. 4, p. 4, pl. 2 fig. 2.
Palaemon pilimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 735, pl. 47 fig. 9.
Palaemon (Macrobrachium) pilimanus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 471, pls. 27, 28 figs. 44 a-h.
Palaemon (Macrobrachium) pilimanus leptodactylus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 476, pl. 28 figs. 44 i-l.
Palaemon (Macrobrachium) pilimanus De Man, 1898a, Notes Leyden Mus., vol. 20, p. 158.
Palaemon (Macrobrachium) pilimanus Borradaile, 1900, Proc. zool. Soc. Lond., 1900, p. 93.
Palaemon (Macrobrachium) pilimanus Hanitsch, 1900, Journ. Roy. Asiat. Soc. Straits Br., vol. 34, p. 85.
Palaemon (Macrobrachium) pilimanus Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 485.
Palaemon pilimanus Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 567.
Palaemon (Macrobrachium) pilimanus Nobili, 1901c, Boll. Mus. Zool. Anat. comp. Torino, vol. 16 n. 397, p. 2.
Bitbynis (Macrobrachium) pilimanus Rathbun, 1910, Bul. Mus. comp. Zoöl. Harvard, vol. 52, p. 317.
Palaemon pilimanus Koningsberger, 1913, Java zoöl. biol., p. 401.
Palaemon pilimanus Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 267.
Palaemon (Macrobrachium) pilimanus Calman, 1925, Journ. fed. Malay States Mus., vol. 8 pt 3, p. 167.
Palaemon (Macrobrachium) pygmaeus J. Roux, 1928a, Treubia, vol. 10, p. 222, figs. 1-4.
Palaemon (Macrobrachium) pilimanus J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 566, 572.
Palaemon (Macrobrachium) pilimanus malayanus J. Roux, 1935, Bull. Raffles Mus., vol. 9, p. 32.
Macrobrachium pilimanus Suvatti, 1937, Check List aq. Fauna Siam, p. 49.
Macrobrachium pilimanus Chace, 1938, Proc. New England zool. Cl., vol. 17, p. 20.

Museum Leiden

- Manindjau Lake, W. Sumatra; 1888-1889; leg. M. Weber. — 6 specimens (1 ovigerous female) 35-40 mm.
 Singkarak Lake, W. Sumatra; 1888-1889; leg. M. Weber. — 7 specimens (1 ovigerous female) 34-41 mm.
 Bua Cave, near Sidjungdjung, W. Sumatra; in tepid water of the cave; March, 1914; leg. E. Jacobson. — 1 specimen 23 mm. (rather poor condition).
 Andola, Padangsche Bovenlanden (Padang Highlands), W. Sumatra; May, 1914; leg. E. Jacobson. — 1 specimen 50 mm.
 Alahanpandjang, West Sumatra; in river; 1877; leg. J. F. Snelleman; Central Sumatra Expedition; cotypes of *Palaemon pilimanus* De Man. — 58 specimens (24 ovigerous females) 23-46 mm.
 Silago, Central Sumatra; 1877; leg. J. F. Snelleman; Central Sumatra Expedition. — 1 specimen 44 mm.
 Muaralabuh, W. Sumatra; 1877; leg. J. F. Snelleman; Central Sumatra Expedition; cotypes of *Palaemon pilimanus* De Man. — 5 specimens 36-47 mm.
 Buitenzorg, W. Java; February, 1927; leg. P. Buitendijk. — 2 specimens 27 and 29 mm.
 Buitenzorg, W. Java; 1888-1889; leg. M. Weber. — 2 specimens 43 and 45 mm.
 Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon pilimanus leptodactylus* De Man. — 2 specimens 51 and 53 mm.
 Buitenzorg; May, 1909; leg. H. H. van der Weele. — 45 specimens (14 ovigerous females) 22-49 mm.
 Tjibodas, Gede mountain, W. Java; July, 1909; leg. H. H. van der Weele. — 5 specimens 11-30 mm.
 Tjibodas; December 15, 1920; leg. H. Boschma. — 1 specimen 33 mm.
 Sukabumi, W. Java; 1908-1909; leg. W. Oppenoorth. — 8 specimens (2 ovigerous females) 33-57 mm.
 Panumbangan, W. Java; in stalactitic caves; November, 1915; leg. S. Leefmans. — 1 ovigerous female 36 mm.
 Tjibabalukan River, near desa Marokko, S. coast of W. Java; May 25 and 26, 1939; leg. C. P. J. de Haas. — 11 specimens 17-26 mm.

- Tretes near Malang, E. Java; in rivulet on slope of Ardjuno Mountain; altitude 900 m; June, 1924, March and May, 1925; leg. P. Buitendijk. — 63 specimens (1 ovigerous female) 20-47 mm.
- Malang, E. Java; freshwater lake; March 10, 1918 and August, 1922; leg. P. Buitendijk. — 18 specimens 15-31 mm.
- Sanggau, Kapuas River, S. W. Borneo; 1893-1894; Dutch Borneo Expedition. — 5 specimens (1 ovigerous female) 24-29 mm.
- Sintang, Kapuas River, S. W. Borneo; 1894; Dutch Borneo Expedition. — 4 specimens (1 ovigerous female) 32-49 mm.
- Ketungau River, tributary of the Kapuas, S. W. Borneo; August 15, 1894; Dutch Borneo Expedition. — 3 specimens (1 ovigerous female) 29-36 mm.
- Near the source of the Kajan River, tributary of the Kapuas, S. W. Borneo; 1900; leg. A. W. Nieuwenhuis. — 22 specimens (2 ovigerous females) 30-53 mm.
- Upper Sibau River, tributary of the Kapuas River, S. W. Borneo; 1893-1894; Dutch Borneo Expedition. — 1 specimen 57 mm.

Museum Amsterdam

- Medan, eastcoast of Sumatra; September 10, 1920; leg. J. B. Corporaal. — 2 specimens (1 ovigerous female) 31 and 37 mm (1 specimen bopyrized).
- Bataklanden, N. Sumatra; coll. J. G. de Man. — 2 specimens 34 and 37 mm.
- Rivulet near Petok, W. Sumatra; June 28, 1929; leg. L. F. de Beaufort. — 10 specimens (1 ovigerous female) 21-37 mm.
- Manindjau Lake W. Sumatra; 1888-1889; leg. M. Weber. — 71 specimens (2 ovigerous females) 14-48 mm.
- River near Manindjau, where it enters the lake; 1888-1889; leg. M. Weber. — 31 specimens (1 ovigerous female) 16-44 mm.
- Fort de Kock, W. Sumatra; altitude 920 m; from well, between Potamogeton; 1926; leg. E. Jacobson. — 3 specimens 27-44 mm.
- Kotabaru near Padangpandjang, W. Sumatra; altitude 1200 m; in marsh; February, 1925; leg. E. Jacobson. — 20 specimens (2 ovigerous females) 18-47 mm.
- Anai Canyon, W. Sumatra; altitude 500 m; 1926; leg. E. Jacobson. — 14 specimens 15-48 mm.
- Airteganang, between Fort de Kock and Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 1 specimen 31 mm.
- Canyon near Airmantjur, S. of Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 2 specimens 48 and 49 mm.
- Kajutanam, S. of Padangpandjang, W. Sumatra; 1888-1889; leg. M. Weber. — 7 specimens (1 ovigerous female) 19-42 mm.
- Singkarak Lake, W. Sumatra; 1888-1889; leg. M. Weber. — numerous specimens (including ovigerous females) 13-42 mm.
- Sidjungjung, W. Sumatra; leg. J. P. Kleiweg de Zwaan. — 1 specimen 39 mm.
- Solok, S. of Singkarak Lake, W. Sumatra; leg. J. P. Kleiweg de Zwaan. — 10 specimens 22-31 mm.
- Danau-di-baruh, lake S. of Singkarak Lake; 1888-1889; leg. M. Weber. — 5 specimens 30-44 mm.
- Danau-di-atas, lake S. of Danau-di-baruh; 1888-1889; leg. M. Weber. — 35 specimens (1 ovigerous female) 20-38 mm.
- Tambangawah near Benkulen, S. W. Sumatra; 1925; leg. N. Seckerling. — 1 specimen 42 mm.
- Taluk, Central Sumatra; leg. J. P. Kleiweg de Zwaan. — 2 specimens (1 ovigerous female) 37 and 51 mm.
- Buitenzorg, W. Java; 1888-1889; leg. M. Weber. — 16 specimens (2 ovigerous females) 21-58 mm.
- Buitenzorg; 1888-1889; leg. M. Weber; cotypes of *Palaemon pilimanus leptodactylus*. — 9 specimens (1 ovigerous female) 14-55 mm.
- Tjibodas, Gede Mountain, W. Java; 1888-1889; leg. M. Weber. — 12 specimens (1 ovigerous female) 24-55 mm.

- Tjinjiruan Quinine Gardens, Puntjak-Gede District, W. Java; altitude about 1600 m; leg. Kerkhoven. — 121 specimens 19-42 mm.
- Sinagar near Sukabumi, W. Java; 1888-1889; leg. M. Weber. — 4 specimens.
- Pasirdatar near Tjisaät, vicinity of Sukabumi, W. Java; December, 1907; altitude 2700 m. — 11 specimens 37-53 mm.
- Mountain rivulet of the Patuha Mountain, S. W. Java; cold water; May 26, 1929; leg. L. F. de Beaufort. — 23 specimens 12-49 mm.
- Rivulet along the slope of the Patuha Mountain, S. W. Java; altitude 2000 m; April 20, 1930; leg. W. S. S. van Benthem Jutting. — 1 specimen 44 mm.
- Situ Bagendit Lake, W. Java; 1888-1889; leg. M. Weber. — 5 specimens 46-54 mm.
- Ungaran Mountain, Central Java; December, 1909; leg. E. Jacobson. — 14 specimens (1 ovigerous female) 18-47 mm.
- Near Salatiga, Central Java; April 9, 1910; leg. L. F. de Beaufort. — 1 specimen 35 mm.
- Rivulet in Guwa Gremeng Cave, Sewu Mountains, near the southcoast of Central Java; February, 1911; leg. E. Jacobson. — 7 specimens 28-49 mm.
- Sekartjo River near Lawang, E. Java; November, 1909; leg. L. F. de Beaufort. — 2 specimens (1 ovigerous female) 41 and 59 mm.
- Pond near Mendit, near Malang, E. Java; December, 1907. — 20 specimens 18-39 mm.
- Small lake near Blimbing, near Malang, E. Java; November 26, 1909; leg. L. F. de Beaufort. — 47 specimens 13-32 mm.
- Djember, E. Java; May 10, 1909; leg. H. A. Lorentz. — 2 specimens 41 and 47 mm.
- Kastoba crater lake, Bawean Island, Java Sea; 250 m altitude; November 25-27, 1937; leg. J. H. Coert. — 47 specimens 11-28 mm.
- Indonesia. — 1 specimen 28 mm.
- Locality unknown. — 5 specimens 44-53 mm.

Description. The rostrum is straight, with the upper margin somewhat convex; it is, when compared with the rostra of *M. hirtimanus*, *M. placidulum* etc., rather high. It reaches somewhat beyond the base of the last segment of the antennular peduncle, sometimes reaching to the end of this peduncle. The upper margin bears 9 to 15, generally 10 or 11 teeth, which are of about equal size and are regularly arranged over the upper margin of the rostrum. 4 or 5 teeth of the rostrum (seldom 3) are placed behind the posterior limit of the orbit. The lower margin of the rostrum bears 1-3, generally 2 teeth. The carapace is smooth, in very old males, however, minute prickles are present in the anterolateral part. The hepatic spine is somewhat smaller than the antennal and is placed on a much lower level.

The abdomen is smooth. The pleurae of the fifth segment have the top rounded. The sixth segment is somewhat less than 1.5 times as long as the fifth.

The telson has the usual shape. It dorsally bears 2 distinct pairs of spines, one in the middle and one at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson is rounded and ends in a sharp small median point. The inner pair of posterior spines distinctly overreaches the apex of the telson.

The eyes are well developed. The antennulae are of the usual shape.

The scaphocerite is twice to 2.5 times as long as broad. The outer margin is straight, the final tooth is strong, with the tip curved slightly inwards (seldom the tip is straight or directed slightly outwards). The lamella somewhat overreaches the final tooth and its anterior margin is rounded.

The oral parts are normal in shape.

The first pereopods reach with $\frac{1}{4}$ to $\frac{1}{2}$ of their carpus (in very old specimens with almost

the entire carpus) beyond the scaphocerite. The fingers are about as long as the palm. The carpus is 1.5 times, or slightly more, as long as the chela and is $\frac{3}{4}$ to $\frac{4}{3}$ of the length of the merus. The ischium is about $\frac{2}{3}$ of the length of the merus. The second pereopods in the adult male generally are unequal in size, though they are equal in shape. The larger leg reaches with almost the entire carpus beyond the scaphocerite (in very old males even with part of the merus). The fingers are $\frac{3}{4}$ to $\frac{4}{4}$ of the length of the palm. They close throughout their length. The cutting edges are provided with numerous (about 10) small teeth of equal size, which are regularly distributed over the whole length of the cutting edges. In younger specimens these teeth are not present in the ultimate part of the cutting edges. The palm is more or less compressed, it is about twice as long as high. No spines are present on the chela, though sometimes minute spinules may be observed there. Numerous tufts of long soft hairs are present on the entire surface of the fingers, such long and soft hairs also are present on the outer surface of the palm; in the distal part of the palm, near the bases of the fingers these hairs are about as long as those of the fingers, but proximally the hairs of the palm become shorter and even are absent in the extreme proximal portion. The inner surface of the palm generally is naked, only in very old males it is pubescent too. The carpus is short triangular, generally it is somewhat less than half as long as the palm, sometimes it is up to $\frac{4}{5}$ of the length of the palm. It rapidly narrows posteriorly and bears on its upper surface numerous very small and sharp spinules, and some scattered rather stiff setae. The merus is 1.5 times to twice as long as the carpus, it is distinctly thickened in the middle. The ischium is as long as the carpus. Like the carpus, the ischium and merus are provided with minute spinules and scattered stiff hairs. The smaller leg reaches with the chela and a small part of the carpus (in large males with the entire carpus) beyond the scaphocerite. The fingers are slightly longer, to 1.5 times as long as the palm, their cutting edge bears in the proximal third of its length 5 to 9 small teeth of equal size, tufts of setae again are present on the entire surface of the fingers. The pubescence of the fixed finger continues a small distance on the palm, but the larger part of the palm is naked, bearing only some scattered rather stiff hairs (in very old specimens a larger part of the palm, up to more than $\frac{1}{2}$ of its inner and outer surface is pubescent). The carpus is about $\frac{1}{2}$ to $\frac{2}{3}$ as long as the palm; the general shape of the carpus, merus and ischium is like in the larger leg. In very young specimens the second legs already differ in size, they are more slender than those of the old males, no spinules are present, but the pubescence soon is visible. The third leg reaches with part of or with the entire dactylus beyond the scaphocerite, while the fifth leg fails to reach the end of that scale. The dactylus is simple or with a faint indication of a lobiform process behind the apex. The propodus is 2.5 times as long as the dactylus. The carpus is half as long as the merus and slightly more than half as long as the propodus. The ischium is a little more than half as long as the merus. The fifth pereopod is somewhat more slender than the third. The last three pairs of pereopods bear no spinules except those on the posterior margin of the propodus.

The pleopods and the uropods are of the usual shape.

The eggs are few and large, they measure 1.2 to 1.8 mm.

Very strange in the present species is the large variability of the shape of the second legs. Generally the carpus is very short, being almost cupshaped and very much shorter than (up to half as long as) the merus. Sometimes, however, it is more elongate, being $\frac{2}{3}$, $\frac{4}{5}$ or even almost as long as the merus. Also the fingers vary much in length. This variability is not linked to geographical

or to ecological factors, as it is observed in Malacca, Sumatra, Java, as well as in Borneo and specimens with long and short carpus and with long and short fingers occur side by side in material collected at one locality, moreover gradual transitions are observed. I therefore see no reason whatever to maintain the varieties *leptodactylus* De Man and *malayanus* J. Roux, which are based on Javanese and Malaccan material respectively in which the carpus is more elongate.

J. Roux's (1928a) new species *Palaemon pygmaeus* from Bawean is based on not full grown specimens of the present species. I have at my disposal a large number of prawns from the type locality of *P. pygmaeus*, which undoubtedly belong to the same species as J. Roux's specimens, as is shown by comparing them with J. Roux's description and figures. Like J. Roux's specimens, my material also does not attain a size larger than 19 mm. I can not find any difference between my specimens and young specimens of *M. pilimanus* from Java, the shape of the rostrum and its formula is quite the same, the second legs show all characters of those of *M. pilimanus* (the haired fingers, the dentition of the cutting edges, which, just like in the young specimens of *M. pilimanus*, is only visible in the proximal part, and in the relation between the lengths of the joints). Also in other less important points there is a close resemblance. J. Roux thought his specimen full grown, as among his material an ovigerous female of 16 mm length was present. In my Bawean material no ovigerous females occur. As I have already pointed out (p. 104) and as is also observed by various older authors, it is a well known fact that sometimes not full grown specimens of a *Macrobrachium* species are sexually mature. This also is the case with *M. pilimanus*, of which species in the material from the Singkarak Lake I found an ovigerous female, which actually like J. Roux's specimen measured 16 mm, this however is an exception, since ovigerous females generally are much larger (about 40 mm). In the light of this evidence it is impossible, in my opinion, to treat *Palaemon pygmaeus* J. Roux as a distinct species.

The specimens from Java mentioned by Miers (1880) without giving them a specific name, probably belong here, but too few characters are given by the British author to make this supposition certain.

The material of both Musea collected by M. Weber and that from the Bataklanden (Mus. Amsterdam) has already been dealt with by De Man (1892), that from the Central Sumatra Expedition is the type material and has been treated by De Man (1879 and 1887). The specimens from the Borneo Expedition have been dealt with by De Man (1898).

Distribution: This typical freshwater species is found at altitudes between 250-2500 m, it is known from the Malay Peninsula, and from the larger Sunda Islands: Sumatra, Java and Borneo. The records in literature are: Lasah, Plus Valley, E. Perak, Malay Peninsula (J. Roux, 1934), Blimbing River, Trengganu, Malay Peninsula (Lanchester, 1901), Aring River, Kelantan, Malay Peninsula (Lanchester, 1901), Tadi River and Ban Ta Yai, Nakorn Sritamarat, Siamese Malay States (Suvatti, 1937), Bataklanden, N. Sumatra (De Man, 1892), Manindjau Lake, W. Sumatra (De Man, 1892), Airteganang, between Fort de Kock and Padangpandjang, W. Sumatra (De Man, 1892), Airmantjur, S. of Padangpandjang, W. Sumatra (De Man, 1892), Kajutanam, S. of Padangpandjang (De Man, 1892), Singkarak Lake, W. Sumatra (De Man, 1892; J. Roux, 1932), Subang Pass (J. Roux, 1932), Danau-di-baruh Lake, W. Sumatra (De Man, 1892), Danau-di-atas Lake, W. Sumatra (De Man, 1892; J. Roux, 1932), Alahanpandjang, W. Sumatra (De Man, 1879, 1887), Silago, Central Sumatra (De Man, 1887), Muara-

labuh, W. Sumatra (De Man, 1879, 1887), Indrapura River, W. Sumatra (Ortmann, 1891), Kerintji Lake (Calman, 1925), Musi near Muaraklingi, Central Sumatra (J. Roux, 1932), Djermi River, near Tjurup, W. Sumatra (J. Roux, 1932), Ranau Lake, S.W. Sumatra (J. Roux, 1932), Java (Miers, 1880; Koningsberger, 1913), Buitenzorg, W. Java (De Man, 1892; Nobili, 1900; Rathbun, 1910; J. Roux, 1932), Tjibodas, Gede Mountain, W. Java (De Man, 1892; J. Roux, 1932), Tjinjiruan Quinine Gardens (not Tijnpruan), Puntjak-Gede, W. Java (Kemp, 1918a), Sinagar near Sukabumi, W. Java (De Man, 1892), Situ Bagendit near Garut, W. Java (De Man, 1892), Garut (Kemp, 1918a), Sarangan, Lawu Mountain, E. Java (J. Roux, 1932), Pasir Lake and Wurung Lake near Sarangan, E. Java (J. Roux, 1932), Ngebel Lake, Manjutan Mountain, E. Java (J. Roux, 1932), Lamongan Lake near Klakah, E. Java (J. Roux, 1932), Kastoba Lake, Bawean Island, Java Sea (J. Roux, 1928a), Bundutuan, Tenompok, and Renau, Mount Kinabalu Region, British North Borneo (Chace, 1938), Inuman River between Kalawat and Bungol, British North Borneo (Borradaile, 1900; Hanitsch, 1900), Matang and Sarawak, Sarawak (Nobili, 1901c), Sanggau and Sintang, Kapuas River, S.W. Borneo (De Man, 1898), Ketungau River and Upper Sibau River, tributaries of Kapuas River, S.W. Borneo (De Man, 1898), Nangaraun at Mandai River, tributary of Kapuas, S.W. Borneo (De Man, 1898).

Macrobrachium sulcicarpale nov. spec. (fig. 45)

Palaemon (*Parapalaemon*) *scabriculus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 41.

Museum Amsterdam

Bangkalan River, Salajar, S.E. of Celebes; 1888-1889; leg. M. Weber. — 1 specimen 47 mm.

De Man brought the present specimen and a damaged specimen from Tempe Lake, Celebes, to *Palaemon scabriculus*. The specimen from Tempe Lake is so damaged, that identification is not possible, but it certainly is no *M. scabriculum*. The other specimen in my opinion belongs to a new species and will be described here:

The rostrum (fig. 45a) is straight, reaching slightly beyond the antennular peduncle. The dorsal margin bears 15 equally spaced teeth, the first 6 of which are situated behind the orbital margin. The first tooth is placed slightly before the middle of the carapace. The lower margin bears two teeth in the middle, the distance between the distal tooth and the apex of the rostrum being about twice as long as the distance between the two teeth themselves. The carapace of my only (male) specimen is scabrous in the anterior part. The hepatic spine is placed much behind and below the antennal; the two spines are not situated in one line.

The abdomen is smooth and normally shaped. The fifth segment has the pleurae ending in a rather acute point. The sixth segment is 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth segment of the abdomen. Dorsally it bears the usual two pairs of spinules, which are situated in the middle and at $\frac{3}{4}$ of the length of the telson. My specimen is abnormal in possessing an additional spine in the right half of the telson, midway between the right posterior dorsal spine and the posterior margin of the telson. This posterior margin ends in an acute median point, which is flanked by the usual long inner and short outer posterior spines. Numerous setae are present.

The eyes have the cornea well developed. The antennulae have the usual shape.

The scaphocerite (fig. 45b) is about 2.5 times as long as broad. The outer margin is somewhat concave. The final tooth is rather strong, but is distinctly overreached by the lamella. The lamella has the antero-internal angle somewhat produced.

The oral parts are typical.

The first pereiopod reaches with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela and $\frac{5}{4}$ as long as the merus. The ischium is about half as long as the merus. The second pereiopods are unequal in size. The right leg is the larger and reaches with the chela and a small part of the propodus beyond the scaphocerite. The fingers are about 1.5 times as long as the palm. In the

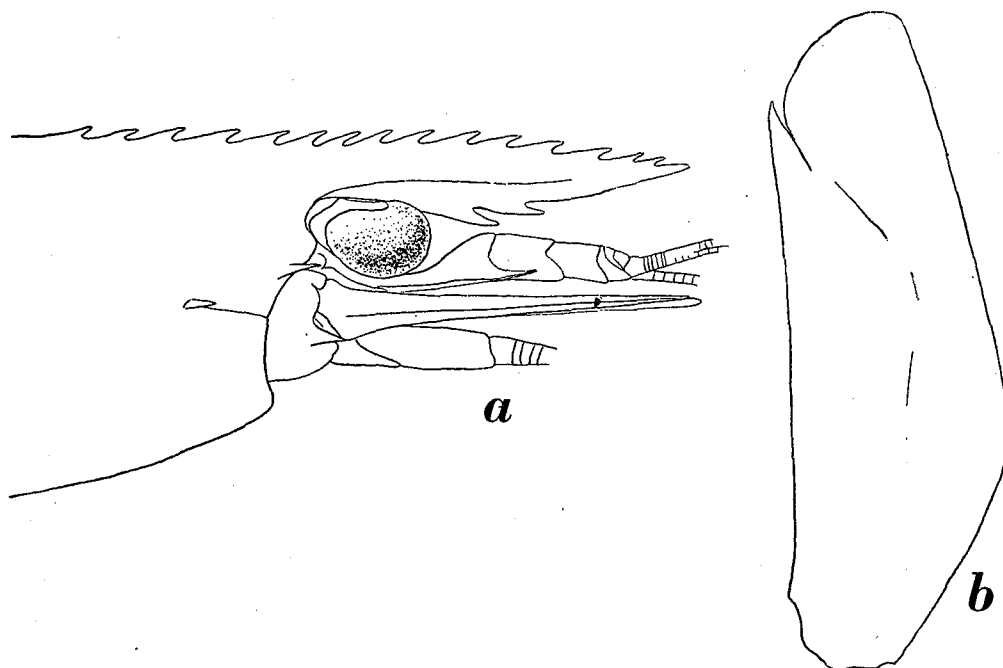


Fig. 45. *Macrobrachium sulcicarpale* nov. spec. a, anterior part of body in lateral view; b, scaphocerite. a, $\times 5$; b, $\times 9$.

proximal part of the cutting edge there is a rather large tooth. Between this tooth and the base of the edge some 4 or 5 smaller teeth are present, while 7 or 8 teeth are placed distally of them. The extreme distal part of the edge is entire, but this in all probability is due to the fact that the specimen is not yet entirely fullgrown. The palm is cylindrical and covered with numerous very small spinules. Velvety hairs are present at the palm and the base of the fingers. In the basal part of the palm the velvety hairs are absent. The carpus is somewhat longer than the palm and it gradually narrows proximally, it bears small spinules and long stiff hairs, no velvety pubescence can be observed. A very deep longitudinal groove is present on the upper as well as on the outer surface of the carpus (a feature not observed in *M. scabriculum* and *M. petersii*). The merus is only a trifle shorter than the carpus, it too is provided with spinules and some long hairs, just like the ischium, which is somewhat more than half as long as the merus. The smaller leg reaches only with a part of the palm beyond the scaphocerite. The fingers are 1.5 times as long as the palm and bear 3 to 5 teeth in the proximal part of their cutting edge. Long hairs are present on the palm and fingers, but no velvety pubescence is visible. The carpus is distinctly longer than the palm; it too is provided with two longitudinal grooves,

which, however, are not so distinct as in the large leg. The merus is about as long as the carpus and 1.5 times as long as the ischium. All three segments are covered with long hairs and small spinules. The third pereopod just reaches beyond the apex of the scaphocerite. The propodus is almost thrice as long as the dactylus and somewhat less than twice as long as the carpus; it moreover is slightly shorter than the merus. The fifth leg by far fails to reach the end of the scaphocerite. The propodus is fully thrice as long as the dactylus and twice as long as the carpus. The merus is as long as the propodus. Except for the spinules at the posterior margin of the propodus, no spinules are present on the last three legs.

The pleopods and uropods are normal in shape.

The species shows much affinity to *M. scabriculum*, but may be distinguished at once by the shape of the rostrum and that of the second legs, especially the deeply grooved carpus is characteristic.

It is to be regretted that no more material of this species could be examined; then perhaps more characters should be found to separate this species from the allied forms.

Macrobrachium petersii (Hilgendorf) (fig. 46)

Palaemon (*s.s.*) *Petersii* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 841, pl. 4 fig. 19.

Palaemon petersii Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.

Palaemon (*Parapalaemon*) *petersii* Weber, 1892, Zool. Jb. Syst., vol. 10, p. 166.

Palaemon (*Parapalaemon*) *petersii* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 33.

Parapalaemon petersii Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.

Museum Amsterdam

Umhloti River, near Durban, Natal; 1894; leg. M. Weber. — 31 specimens (4 ovigerous females)
43-84 mm.

Umgeni River, near Durban, Natal; 1894; leg. M. Weber. — 7 specimens (2 ovigerous females)
34-58 mm.

Illovo River, Natal; 1894; leg. M. Weber. — 27 specimens (4 ovigerous females) 34-69 mm.

Description. The rostrum (fig. 46) is straight, it reaches about to the end of the scaphocerite and distinctly overreaches the antennular peduncle. The upper margin is evenly convex and bears 11 to 13 teeth, 3 or 4 of which are placed behind the posterior limit of the orbit. The distance between the first dorsal tooth and the orbital margin is $\frac{1}{3}$ or less than $\frac{1}{3}$ of the total length of the carapace (rostrum excluded). The teeth are regularly divided over the dorsal margin of the rostrum, though the first tooth is slightly more remote from the second than the third is. The lower margin bears 3 (seldom 4) equally spaced teeth in the distal half. The carapace in the adult males is distinctly scabrous in the anterior half. In the females and young males it is smooth. The hepatic spine is distinctly smaller than the antennal and is placed below and behind it; the two spines do not lie in one line.

The abdomen is smooth and normal in shape. The fifth segment has the pleurae ending in a bluntly angular point. The sixth segment is 1.5 times as long as the fifth.

The telson is normal in shape, it is somewhat less than 1.5 times as long as the sixth abdominal segment. The two dorsal pairs of spines are distinct and are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin ends in an acute median point, which mostly is broken in adult specimens, while the usual 2 pairs of posterior spines flank the apex, the inner spines far overreaching it. Numerous setae are present between the inner spines.

The eyes and antennules are normal.

The scaphocerite is almost thrice as long as broad. The outer margin is somewhat concave. The final tooth is rather small and is far overreached by the lamella, which has a rather blunt antero-internal angle.

The oral parts are quite typical.

The first pereiopods are slender and reach with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is twice as long as the chela. The merus measures $\frac{3}{4}$ of the length of the carpus. The ischium is slightly more than half as long as the merus. The second pereiopods are very unequal in the adult male. The larger leg reaches with the carpus and even a small part of the merus beyond the scaphocerite. The fingers are elongate, in old specimens they are about as long as or even somewhat longer than the palm, in young specimens they are shorter. In young specimens the fingers are straight and close over their entire length, in large

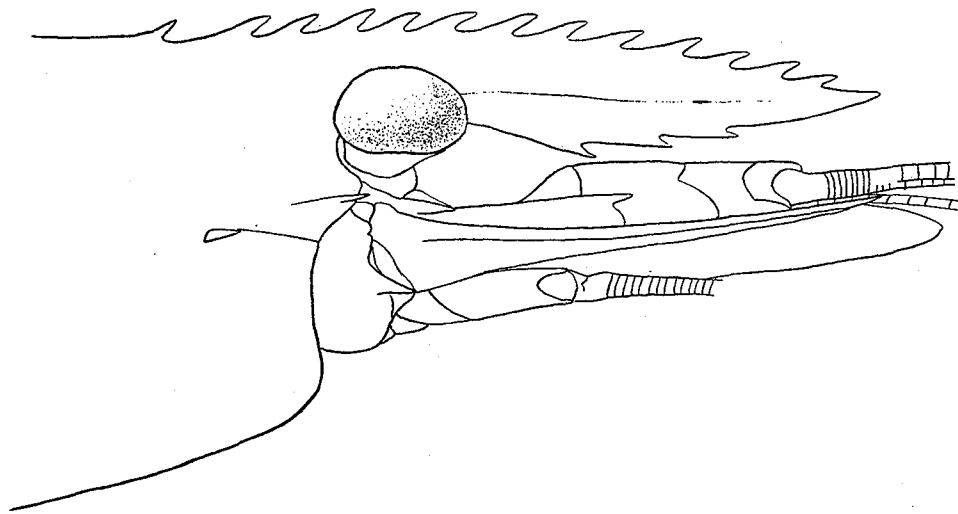


Fig. 46. *Macrobrachium petersii* (Hilgendorf). Anterior part of body in lateral view. $\times 5$.

males the fixed finger is straight, while the dactylus is strongly curved, the fingers thus are gaping. The cutting edge of the fingers are provided with one large proximal tooth, behind which about 4 or 5 smaller teeth are present, while distally of this larger tooth the edge is provided with about 10-16 smaller teeth, which are regularly divided over that part of the edge. The palm is elongate and only slightly compressed. Small spinules are present on the palm, but lack on the fingers. The palm is covered with a thick layer of velvety hairs; this coat of hairs ends a small distance before the articulation with the dactylus, both fingers are naked. The carpus is about $\frac{3}{4}$ to $\frac{1}{1}$ as long as the palm and is provided with spinules and a thick coat of velvety hairs too. The merus is as long as or slightly shorter than the carpus and like that joint bears a thick coat of hairs. The ischium is less than half as long as the merus and also bears velvety hairs and spinules. The smaller leg reaches with a part of the carpus only beyond the scaphocerite. The fingers are about as long as or somewhat shorter than the palm, they are straight and close over their entire length, some 2 to 5 teeth are present in the proximal part of the cutting edge, which for the rest is entire. The palm is cylindrical and bears some very minute spinules. Scattered stiff hairs are present on the palm and fingers, but no velvety hairs are observed. The carpus is 1.5 times as long as the palm and about as long as the merus. The ischium is half as

contradistinction to the chela, the ischium, merus and carpus are provided with hairs, just like in the larger leg. In young males the chelae are not so strongly the differences between the right and left legs are not so pronounced. In the difference between the legs becomes visible, first in the size, after- in a male specimen of 43 mm the second legs are subequal, the right being the left (it reaches with part of the palm beyond the scaphocerite, while the at scale with a small part of the carpus). The fingers are as long as the entire length, in the proximal part of the cutting edge an indication of is distinctly longer than the palm. The merus is as long as the carpus, somewhat more than half as long as the merus. No velvety hairs are present. ovigerous females, which are much smaller than the largest males (49 to 52 mm) the second legs are equal in shape. These legs reach with the chela beyond the scaphocerite. Their shape is like that of the second legs of the young males, described above. In a large ovigerous female from the Umgeni River (58 mm long) the entire cutting edge of the fingers of the second legs is provided with teeth, the fingers are shorter than the palm. The third pereopod reaches about to the end of the scaphocerite. The dactylus is slightly less than half as long as the propodus, while the carpus is slightly more than half as long as the latter joint. The merus is distinctly longer than the propodus, the ischium is slightly more than half as long as the merus. The fifth leg distinctly fails to reach (or sometimes just reaches to) the tip of the scaphocerite. The propodus is thrice as long as the dactylus and about twice as long as the carpus. The merus is about as long as the propodus.

The pleopods and uropods are normal in shape.

The eggs are numerous and are 0.4 to 0.6 mm in diameter.

The present species, as already pointed out by other authors, is closely related to *M. scabriculum* (= *P. dolichodactylus*). It may be distinguished immediately from that species, however, by the shape and pubescence of the second legs of the adult males. These legs are much more unequal in the present species than in *M. scabriculum*; in large males of the former species the chelae are strongly gaping by having the dactylus curved, in those of the latter the fingers generally are meeting over the entire length when closed. In *M. petersii* the fingers of the second leg of the adult male are entirely naked, the velvety pubescence not fully extending to the end of the palm, while in *M. scabriculum* the chelae are velvety pubescent up to the basal part of the fingers. In the latter species velvety hairs are absent from carpus, merus and ischium of both the larger and smaller leg, in *M. petersii* this pubescence is present on those joints of both legs. In my material of *M. petersii* furthermore the final tooth of the scaphocerite is much smaller and does not reach as far forward as in my material of *M. scabriculum*.

The present material of the Amsterdam Museum has already been mentioned by Weber (1897).

Distribution: *Macrobrachium petersii* is known only from the S.E. coast of Africa, where it is found in fresh water. The records in literature are: Tete, Mozambique (Hilgendorf, 1879, 1898), Umhloti, Umgeni and Illovo Rivers, Natal (Weber, 1897).

Macrobrachium scabriculum (Heller)

Palaemon scabriculus Heller, 1862a, Verh. zool.-bot. Ges. Wien, vol. 12, p. 527.

Palaemon scabriculus Heller, 1865, Reise Novara Zool., vol. 2 pt. 3, p. 117, pl. 10 fig. 9.

- Palaemon* (s.s.) *dolichodactylus* Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 840, pl. 4 fig. 18.
- Palaemon scabriculus* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 710.
- Palaemon dolichodactylus* Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 732.
- non *Palaemon* (*Parapalaemon*) *scabriculus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 462, pl. 27 fig. 41.
- Palaemon scabriculus* Koelbel, 1892, in De Man, Weber's Zool. Ergebn., vol. 2, p. 462 footnote.
- Palaemon scabriculus* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 442.
- Palaemon* (*Parapalaemon*) *scabriculus* De Man, 1897, Zool. Jb. Syst., vol. 9, p. 786.
- Palaemon* (*Parapalaemon*) *scabriculus* De Man, 1898, Zool. Jb. Syst., vol. 10, p. 708, pl. 37 fig. 73.
- Palaemon* (*Parapalaemon*) *dolichodactylus* Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 31.
- Palaemon* (*Eupalaemon*) *superbus* p.p. Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1266.
- Palaemon* (*Parapalaemon*) *dolichodactylus* Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
- Palaemon* (*Parapalaemon*) *scabriculus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 483.
- Palaemon dolichodactylus* Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 283, pl. 11 figs. 18, 19.
- Palaemon superbus* p.p. Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 319, pl. 13 figs. 36, 37 (non figs. 34, 35).
- Palaemon* (*Parapalaemon*) *dolichodactylus* Coutière, 1902, Bull. Mus. Hist. nat. Paris, vol. 8, p. 516.
- Palaemon* (*Parapalaemon*) *scabriculus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 12.
- Palaemon* (*Parapalaemon*) *dolichodactylus* Nobili, 1903, Boll. Mus. Zool. Anat. comp. Torino, vol. 18 n. 452, p. 13.
- Palaemon scabriculus* Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 296, pls. 17, 18 fig. 7.
- Palaemon dolichodactylus* Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 300, pl. 18 fig. 8.
- Palaemon dubius* Henderson & Matthai, 1910, Rec. Indian Mus., vol. 5, p. 300, pl. 18 fig. 9.
- Parapalaemon dolichodactylus* Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 385.
- Palaemon* (*Parapalaemon*) *dolichodactylus* Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 926.
- Palaemon scabriculus* Kemp, 1915, Mem. Indian Mus., vol. 5, p. 272.
- Palaemon dolichodactylus* Colosi, 1918, Monit. zool. Ital., vol. 29, p. 105.
- non *Palaemon* (*Parapalaemon*) *scabriculus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 361.
- Palaemon* (*Macrobrachium*) *dolichodactylus* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 534.
- Palaemon scabriculus* Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
- Palaemon dolichodactylus* Panikkar, 1937, Journ. Bombay nat. Hist. Soc., vol. 39, p. 346.
- Palaemon dolichodactylus* Nataraj, 1942, Curr. Sci., vol. 11, p. 468.
- Palaemon* (*Parapalaemon*) *dolichodactylus* Vatova, 1943, Thalassia, vol. 6 pt. 2, p. 12, pl. 1 fig. 4.

Museum Leiden

Sungai Pati Bubur, near Airbangis, Padangsche Benedenlanden (Padang Lowlands), W. Sumatra; fresh water; November, 1913; leg. E. Jacobson. — 7 specimens (included 1 ovigerous female) 26-43 mm.

Macrobrachium scabriculum is an extremely variable form, especially with regard to the shape of the second pereopods of the male. Henderson & Matthai (1910) already pointed out that it is very probable that the three forms, which they distinguished as *Palaemon scabriculus*, *P. dolichodactylus* and *P. dubius*, belong to one species as transitions between the extremes occur and moreover as the three forms often are found together. Taking the large variability of the shape of the chelae of allied species (e.g. *M. latidactylus* and *M. pilimanus*) into account, I entirely agree with their supposition and see no reason to keep the forms separated. The chelae of all three forms have the same construction, but differ only in the relation between the lengths of the various joints and that between length and breadth of those joints. In *M. pilimanus* we also find a large variability in

the relation between the length of the fingers and the palm of the second leg in the male and also the relation between the length and breadth of the carpus in that species is more variable than in most forms.

Henderson & Matthai rather extensively deal with the present species of which they moreover give good figures. I should like to add the following details:

The first tooth of the rostrum is placed so, that the distance between that tooth and the posterior margin of the orbit is $\frac{1}{3}$ to $\frac{2}{5}$ of the length of the entire carapace (rostrum excluded). The hepatic spine is placed behind and below the antennal and is directed parallel to it, but the two spines do not lie in one line.

The abdomen is normal in shape. The pleura of the fifth abdominal segment is rounded at the tip. The telson is normal.

The eyes and antennulae have the usual shape.

The scaphocerite reaches slightly beyond the rostrum, it narrows slightly anteriorly. The outer margin is concave. The final tooth is long and slender, it reaches to or somewhat beyond the end of the lamella.

The oral parts are typical.

The first pereopods reach with the chela and a very small portion of the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is twice as long as the chela and $\frac{7}{5}$ as long as the merus. The second pereopods have been extensively described by Henderson & Matthai. My specimens agree good with the description given by these authors. The relation between the fingers and the palm is variable in my material; the chela mostly resembles the form named *scabriculus* by Henderson & Matthai, though the palm is somewhat more slender and the felt-like hairs cover a larger part of the fingers than shown in pl. 18 fig. 7d of these authors. In two of the larger chelipedes of the males in my material a trace of a blue coloration of the fingers is visible, the fingertips being white; in one of the chelae moreover a white band is visible in the distal part of the blue colour. The merus and carpus, though bearing some long setae lack the felty hairs of the palm. The third pereopod just reaches the end of the scaphocerite (in young specimens it reaches with the dactylus beyond that scale). The propodus is thrice as long as the dactylus. The carpus is half as long as the propodus. The merus is slightly longer than the propodus. The fifth leg distinctly fails to reach the end of the scaphocerite. It is somewhat more slender than the third, though the relation between the lengths of the various joints is about the same.

The pleopods and uropods are of the normal shape.

The eggs of the female are 0.40 to 0.53 mm in diameter.

The specimens described by De Man (1892) as *Palaemon (Parapalaemon) scabriculus* could be examined by me. The larger specimen, namely that from Lake Tempe in Celebes, lacks both second legs and can not be identified with certainty, as is already remarked by De Man himself; it certainly, however, does not belong to the present species. The smaller specimen, which originates from Salajar, too belongs to another species. It is new in my opinion and has been described here as *Macrobrachium sulcicarpale* nov. spec. (vid. p. 220).

Coutière (1901) mentions *Palaemon superbus* from Madagascar. As already pointed out (p. 140) Coutière's identification is incorrect, because *M. superbum*, a species inhabiting China, is characterized by its slender and smooth second legs, the chelae of which bear no or at most 2 very small teeth on the cutting edges. The specimens from Madagascar referred by Coutière to

Heller's species undoubtedly belong to *M. scabriculum*. Coutière himself already pointed to the close relation between the two species, but thought them nevertheless distinct, because:

1. The carapace in *M. scabriculum* (named *Palaemon dolichodactylus* by him) is scabrous, while it is smooth in his "*superbus*" specimens.
2. The second legs in *M. scabriculum* are strongly unequal.
3. The second legs in *M. scabriculum* are much longer than the body.

All these characters, as is sufficiently shown by other species, are only due to age. The fact that Coutière's "*superbus*" specimens from Madagascar are young specimens of *M. scabriculum* is shown by their lengths (21.5 to 57.5 mm); the specimens identified by Coutière as *Palaemon dolichodactylus* measured 72 and 80 mm. In one of the detached chelae identified by Coutière as *P. superbus* the velvety hairs on the palm and the base of the fingers are already visible.

J. Roux (1930) described two ovigerous females from Lombok under the name *Palaemon* (*Parapalaemon*) *scabriculum*. These specimens in all probability have to be referred to *Macrobrachium latidactylus*, with females of which species they agree in every respect, and which species moreover is rather common at Lombok as is shown by the present material.

Distribution: The species up till now is only known with certainty from the region around the Indian Ocean. It lives in fresh water. The records in literature are: Juba, S. Italian Somaliland (Colosi, 1918; Vatova, 1943), "Région des grands lacs" (Coutière, 1902), Zanzibar (Hilgendorf, 1898; Coutière, 1901), Uzaramo, Tanganyika (Hilgendorf, 1898), Tete, Mozambique (Hilgendorf, 1879, 1898), Rio Kwakwa near Quelimane, Mozambique (Hilgendorf, 1898), Madagascar (Coutière, 1900, 1901), Kapiloza River and Bemazaka, Ambongo, N.W. Madagascar (J. Roux, 1934), Onilahy River, S.W. Madagascar (Coutière, 1900, 1901; Calman, 1913; J. Roux, 1934), Ivoloïna near Tamatave, E. Madagascar (J. Roux, 1934), Fiheranena, Mantimaso River and Haut Kamoro, Madagascar¹⁾ (J. Roux, 1934), Kotri, near mouth of Indus River (Henderson, 1893), Nilambur Forest, Malabar District, S.W. India (Henderson & Matthai, 1910), Calicut and Palghat, S.W. India (Henderson & Matthai, 1910), Travancore (Nataraj, 1942), Ceylon (Heller, 1862a, 1865), Trichonopoly and Tanjore, S. India (Henderson & Matthai, 1910), Pondicherry (Nobili, 1903), Saidapet, Walajabad, Red Hills and Madras, S.E. India (Henderson & Matthai, 1910), Rambha, Chilka Lake (Kemp, 1915), Atjeh (= Atchin), N. Sumatra (De Man, 1897), Buabua, Enggano, off the westcoast of Sumatra (Nobili, 1900). Coutière's (1901) remark that the species according to Hilgendorf should occur in Natal, is erroneous, as in none of Hilgendorf's papers such a statement is made; Stebbing (1910) includes the species in his list of South African Crustacea on account of the above remark of Coutière.

Macrobrachium jacobsoni nov. spec. (fig. 47)

Museum Amsterdam

Lugu, Sinabang Bay, Simalur, off the westcoast of Sumatra; February, 1913; leg. E. Jacobson. — 7 specimens (3 ovigerous females) 38-77 mm.

Sinabang, Simalur; January, 1913; leg. E. Jacobson. — 1 specimen 43 mm.

Description. The rostrum (fig. 47a) is straight or directed somewhat downwards. The tip is slightly curved upwards. It reaches to or almost to the end of the scaphocerite. The upper margin

1) The exact position of these three localities is unknown to me; with Fiheranena perhaps Fiherenga, S.W. Madagascar is meant.

is straight or slightly convex above the eyes and bears 12 to 15 equidistant teeth, 5 or 6 of which are situated behind the posterior orbital margin. The first of these teeth is placed in the middle of the carapace. The lower margin of the rostrum bears 3 or 4 teeth; the distance between the last tooth and the apex of the rostrum generally is larger than that between the teeth themselves. The carapace of the adult male is scabrous in the anterolateral region. The antennal spine is strong and ends posteriorly in a carina. The hepatic spine is much smaller than the antennal and is placed behind and below it, close near the end of the antennal carina.

The abdomen is smooth and normal in shape, the apex of the pleura of the fifth segment is rounded. The sixth segment is about 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment, it is provided with the usual two dorsal pairs of spinules, which are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin of the telson ends in an acute median point, which bears at each side the usual short and long spines. The long inner spines overreach the tip of the telson and some feathered setae are present between them.

The eyes and antennulae are of the common shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or somewhat convex, the final tooth is strong, directed slightly inwards and fails to reach the end of the lamella, which in its antero-internal angle is only slightly produced.

The oral parts are typical in shape.

The first pereopod (fig. 47b) reaches with $\frac{1}{4}$ of the carpus beyond the scaphocerite (in young specimens it does not reach so far). The fingers are about as long as the palm. The carpus is twice (in young specimens less than twice) as long as the chela. The merus is $\frac{3}{4}$ as long as the carpus. The ischium is somewhat more than half as long as the merus. In the adult male the second legs are distinctly unequal in size, they are, however, of about the same shape. The larger leg (sometimes the right, sometimes the left) (fig. 47d) reaches with the chela (often also with part of the carpus) beyond the scaphocerite. The fingers are as long as or slightly longer than the palm and close over their entire length. In the proximal part of the cutting edge of the fixed finger a rather large tooth is present, proximally of which there are about 4 small teeth, while distally about 12 larger teeth are placed on the cutting edge. The cutting edge of the dactylus bears about 20 teeth of about equal size, no differentiation in one larger and many smaller teeth, as in the fixed finger, is visible, though generally the proximal teeth are smaller than the distals. The fingers are almost entirely naked and smooth, only close near the base some very small spinules may be observed and some few scattered short hairs are present. The palm is somewhat compressed and slightly swollen in the middle, it bears numerous small spinules over its entire surface, while moreover scattered long hairs are present. The outer surface of the palm bears a coat of velvety hairs, which is especially dense in the ventral region. This pubescence is absent in the distal part of the palm and on its inner surface. The carpus is short and conical, it is narrower than the palm and measures somewhat more than half the length of the palm, it bears numerous small spinules and scattered long hairs, no velvety pubescence is visible. The merus is slightly less than 1.5 times as long as the carpus, the ischium is half as long as the merus. Both merus and ischium show the same spinulation and hairs as the carpus. The smaller leg (fig. 47e) reaches only with part of the propodus beyond the scaphocerite. The fingers are distinctly longer than the palm, they close over their entire length and possess about 4 small teeth in the proximal part. Scattered long hairs are present on both palm and fingers, but no velvety pubescence is observed.

The carpus is about as long as the palm. The merus is slightly longer than the carpus; all joints bear long hairs and small spinules, which especially on the palm are very inconspicuous. In younger males the large leg resembles the smaller in the relations between the various joints. Ovigerous females have the second legs (fig. 47c) equal in shape and size; these legs strongly resemble the smaller leg of the male, only less hairs are present. The third pereiopod (fig. 47f) reaches with the entire dactylus or only part of it beyond the scaphocerite. The propodus is thrice as long as the dactylus. The carpus is somewhat more than half as long as the propodus, while the merus is distinctly longer than that

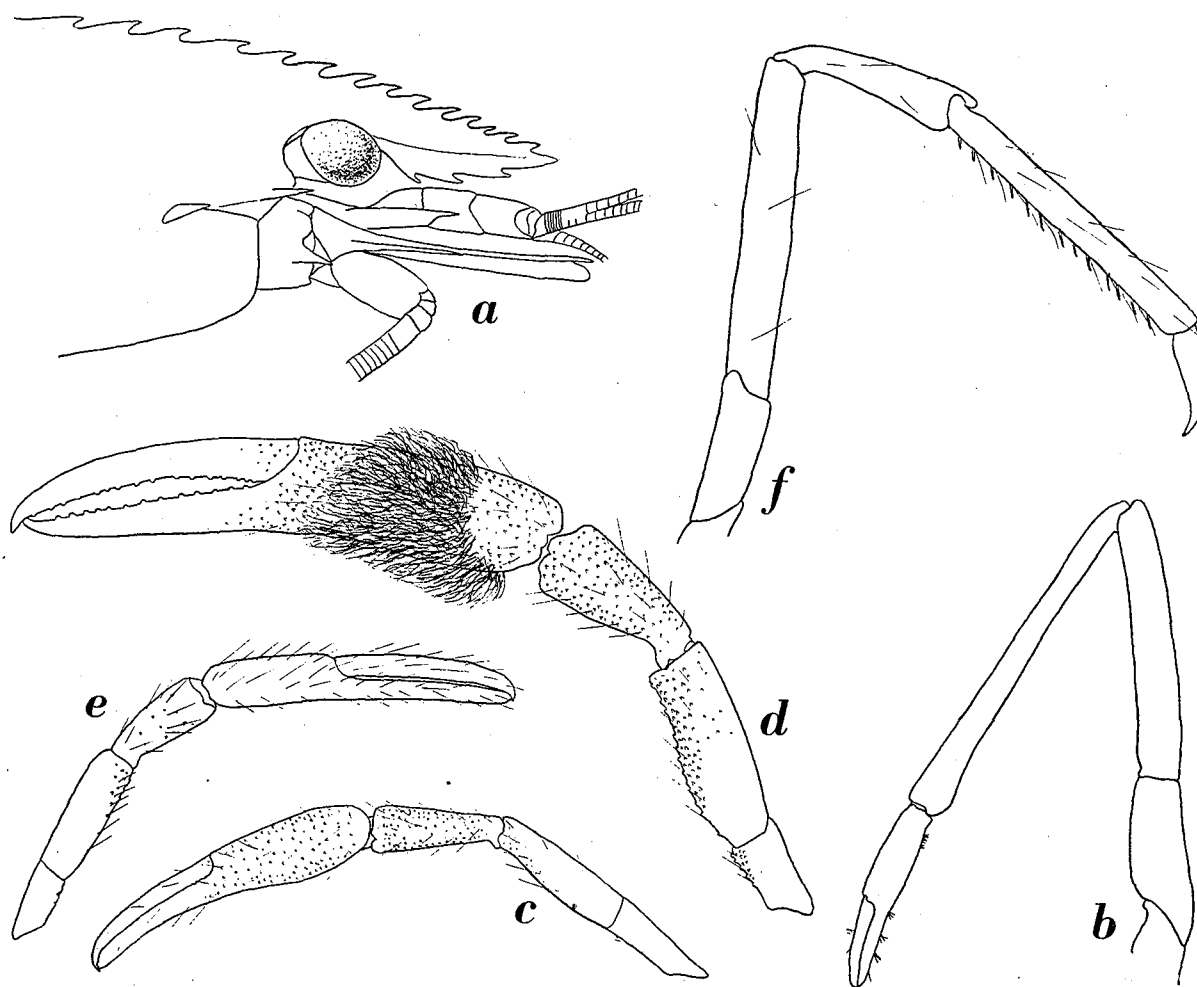


Fig. 47. *Macrobrachium jacobsoni* nov. spec. a, anterior part of body in lateral view; b, first pereiopod; c, second pereiopod of female; d, larger second pereiopod of adult male; e, smaller second pereiopod of adult male; f, third pereiopod. a, $\times 4$; c-e, $\times 2$; b, f, $\times 4.6$.

joint. The fifth leg just reaches the end of the scaphocerite. The propodus is thrice as long as the dactylus, twice as long as the carpus and as long as the merus. Except for some hairs and the posterior spinules of the propodus, the last three legs are smooth.

The pleopods and uropods are normal in shape.

The eggs are 0.50 to 0.63 mm in diameter. The ovigerous females in my material are rather small, being 40 to 60 mm long.

Colour: In my spirit specimens some traces of the original colour still are visible. The first pereiopod has a bluish band across the base of the fingers. The fingers of the second pereiopod in the adult males are bluish or reddish with white patches or white transverse bands, the tips often are

white; sometimes the white colour is dominating, the bluish colour then being reduced to one or two narrow bands.

The present species differs from most allied species (*M. scabriculum*, *M. petersii*, *M. sulcicapale* and *M. lorentzi*) by the very short and conical carpus of the second leg, in which character it resembles *M. pilimanus*; from the latter species, however, it differs in the pubescence of the chelae of the male and in the shape of the rostrum.

It gives me great pleasure to dedicate this pretty species to the memory of the late Dr. Edward Jacobson, who has contributed so much to our knowledge of the fauna of the Malay Archipelago, during his collecting trips throughout Java and Sumatra, and who discovered the present species at the island of Simalur.

Macrobrachium grandimanus (Randall)

- Palaemon grandimanus* Randall, 1839, Journ. Acad. nat. Sci. Philad., vol. 8, p. 142.
Palaemon gracilimanus Randall, 1839, Journ. Acad. nat. Sci. Philad., vol. 8, p. 143.
Palaemon grandimanus Gibbes, 1850, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
Palaemon gracilimanus Gibbes, 1850, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 198.
Palaemon grandimanus Gibbes, 1850a, Proc. Acad. nat. Sci. Philad., 1850, p. 25.
Palaemon gracilimanus Gibbes, 1850a, Proc. Acad. nat. Sci. Philad., 1850, p. 25.
Palaemon grandimanus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon acutirostris Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemon grandimanus Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 588.
Palaemon acutirostris Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 590.
Palaemon acutirostris Weitenweber, 1854, Lotos Praha, vol. 4, p. 61.
Palaemon grandimanus Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 12.
Palaemon acutirostris Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 39 fig. 1.
non *Palaemon grandimanus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45.
Palaemon acutirostris Streets, 1877, Bull. U.S. Nat. Mus., vol. 7, p. 119.
Palaemon grandimanus Kingsley, 1882, Bull. Essex Inst., vol. 14, p. 107.
Bitbynis grandimanus Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 793, pl. 129 figs. 2, 3.
non *Palaemon acutirostris* De Man, 1888, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 280, pl. 18 fig. 7.
Palaemon acutirostris Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 728 (non p. 707).
Palaemon grandimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 736.
Palaemon acutirostris Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 121.
Palaemon gracilimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon grandimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon grandimanus Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 436, pl. 32 figs. 4, 5.
Palaemon grandimanus Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Bitbynis grandimanus Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 923, pl. 22 fig. 5.
non *Palaemon grandimanus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
Palaemon grandimanus Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 18, textfig. 10, pl. 1 fig. C.

Museum Leiden

Honolulu, Oahu, Hawaiian Archipelago; December 13, 1917; leg. P. Buitendijk. — 10 specimens (6 ovigerous females) 51-66 mm.

? Sydney; leg. R. Schütte; coll. Mus. Göttingen. — 3 specimens 39-41 mm.

Locality unknown; leg. R. Schütte; coll. Mus. Göttingen. — 1 specimen 41 mm.

The rostrum is straight or has the tip curved slightly upwards, it reaches to or slightly beyond the end of the scaphocerite. The upper margin is convex in larger, straight or even slightly concave

in smaller specimens, it bears 14 to 17 (generally 14 or 15) teeth, which are regularly divided over the whole length, the first four or five teeth are placed behind the posterior limit of the orbit. The first tooth is slightly more remote from the second than the third is, it is placed somewhat before the middle of the carapace. The lower border bears 4 or 5 (in one abnormal specimen 7) teeth, the distance between the last tooth and the apex of the rostrum is larger than that between the teeth themselves. The rostrum is rather high, especially in the lower half. In the adult males the anterolateral part of the carapace is scabrous by numerous small spinules; in females and young males it is entirely smooth. The antennal spine is placed some distance below the rounded orbital angle and ends posteriorly in a short carina. The hepatic spine is distinctly smaller than the antennal and is placed obliquely behind it, lying almost in one line with it.

The abdomen is smooth (also in my adult male). The pleurae are of the normal shape, that of the fifth segment has the apex rounded. The sixth segment is about 1.5 times as long as the fifth.

The telson is distinctly longer than the sixth abdominal segment. It is smooth (also in my adult male) and has the two dorsal pairs of spines placed in the middle and at $\frac{3}{4}$ of its length. The apex of the telson ends in a sharp point which is distinctly overreached by the inner pair of posterior spines, the outer pair being very short. Numerous setae are present between the inner spines.

The eyes are large. The cornea is broader and slightly shorter than the stalk. The antennulae are normal.

The scaphocerite is slender, it is almost thrice as long as broad. The outer margin is concave. The final tooth is strong, but is overreached by the apex of the lamella, which has a bluntly angular antero-internal angle.

The oral parts are typical.

The first pereopods reach about with the chela beyond the scaphocerite. The fingers are slightly shorter than the palm. The carpus is somewhat less than twice as long as the chela and is about $\frac{5}{4}$ of the length of the merus. The second pereopods of the adult male are very unequal in shape. The larger leg reaches with about half the carpus beyond the scaphocerite. The fingers are slender, they are in my specimen about as long as the palm, in larger specimens (vid. Rathbun, 1906, pl. 22 fig. 5) they are much longer than the palm. The tips of the fingers are curved inwards. The surface of the fingers, as well as that of the palm is thickly covered with numerous very small spinules, which are placed up to the tips. The cutting edge of the dactylus possesses close near the articulation with the propodus two or three rather large teeth, which are placed close together and of which the distal is largest, then follows a large unarmed space (in the middle of this space a small denticle is visible in my specimen) at the end of which again a large tooth is present; between this tooth and the apex of the finger numerous (in my specimen 17) small teeth of about equal size are placed, these teeth become smaller distally. The cutting edge of the fixed finger is similarly armed, here only the gap between the two large teeth is much shorter than in the dactylus, so that the distal large tooth of the dactylus lies more anteriorly than that of the fixed finger, the proximal large teeth of both fingers being situated just opposite one another. The palm is rather high, being never more than 2.5 times as long as high and being highest in the proximal part; the palm is somewhat compressed (the relation between the height and length being 2:3). Just like the fingers the palm is covered with numerous small denticles over the entire surface. In the basal part of the palm, especially in the lower half, numerous long hairs, which are placed close together, are present. The carpus is slightly shorter than the palm, it narrows proximally and is somewhat less than thrice as

long as its greatest (= anterior) breadth. Like the palm it is covered with minute spinules. The merus is slightly shorter than the carpus, the ischium is about half as long as the merus, both joints are covered with many small spinules. The smaller second leg in my large male specimen reaches with the entire chela and a very small portion of the carpus beyond the scaphocerite. The fingers are very long and slender, they are about twice as long as the palm and are strongly gaping; the cutting edges bear no or only very inconspicuous teeth, while long and stiff hairs, which are directed inwards, are placed on the cutting edge of the fingers, shorter hairs are present on the rest of the surface. The palm is of the same breadth throughout its length and is about twice as long as broad. The carpus is about 1.5 times as long as the palm, it narrows posteriorly. The merus is slightly shorter than the carpus, the ischium is somewhat more than half as long as the merus. In the female and the young males the second legs are equal in shape, they are moreover more slender than in the male. The chela and part of the carpus reach beyond the scaphocerite. The fingers are slender and about as long as the palm. The cutting edge is entire but for some 3 or 4 inconspicuous teeth near the base, in young specimens these teeth are not yet visible. The fingers close over their entire length. The palm is about 4 times as long as broad and of about the same breadth throughout its length. The carpus is about as long as the palm and half the length of the fingers together, in younger specimens it even is relatively longer. The merus is slightly shorter than the carpus. The ischium is shorter than the merus. The entire leg is covered with minute spinules, which are very indistinct in young specimens. The third leg reaches with only part of the dactylus beyond the scaphocerite. The propodus is about 2.5 times as long as the dactylus. The carpus is more than half as long as the propodus. The merus is somewhat longer than the latter joint. The ischium is about half as long as the merus. The fifth leg just fails to reach the end of the scaphocerite. The propodus is thrice as long as the dactylus, the carpus is slightly more than half as long as the propodus, while the merus has the same length as the propodus, the ischium is slightly more than half as long as the merus. The propodus of all three legs bears the usual posterior spines, that of the fifth leg moreover is provided with transverse rows of setae.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, they are 0.6 to 0.7 mm in diameter.

Palaemon acutirostris Dana is based on female and young specimens of the present species as is already pointed out by Rathbun (1906).

Palaemon gracilimanus Randall undoubtedly also belongs to the present species, it probably is based on a female specimen.

The specimens said to be collected by R. Schütte (Museum Leiden) probably are incorrectly labelled, as is the case with a large part of the material obtained by the Leiden Museum from the Göttingen Museum; *M. grandimanus* namely is not known from Australia.

The specimens from the Philippines identified by Von Martens (1868) as *Palaemon grandimanus* do not belong there, but are *Macrobrachium latidactylus* (vid. p. 244). Estampador's record of "*Palaemon grandimanus*" from the Philippines is based on Von Martens's statement.

Kubo (1940) described this species from the Riukiu Islands. The only difference between his material and Hawaiian specimens seems to be that in the Japanese specimens the rostral formula is

$$\frac{11 - 15}{3}, \text{ while this formula in Hawaiian material is } \frac{14 - 17}{4 - 5}.$$

Distribution: Up till 1940 the species was considered to be endemic in the Hawaiian Islands. It furthermore is there the only representative of the genus *Macrobrachium* (as already pointed out

on p. 190, Armstrong's record of *Macrobrachium lar* from the Hawaiian Archipelago almost certainly is due to incorrect labelling of his specimen). In 1940 Kubo reported upon specimens collected in 1936 in one of the Riukiu Islands, which evidently belong to the present species; this is the first authentic record of the species outside the Hawaiian Archipelago. The records in literature are: Sira-kawa, Hora-gawa, and Simozi, Miyako Island, Riukiu Islands (Kubo, 1940), Hawaiian Islands (Randall, 1839; Dana, 1852; Weitenweber, 1854; Streets, 1877; Ortman, 1891; Sharp, 1893), Waimea River, Hanalei River, Hauapepe River and Huleia River, Kauai (Rathbun, 1906), Honolulu, Oahu (Bate, 1888; Thompson, 1901; Rathbun, 1906), Kalihi, Oahu (Lenz, 1901), Waianae, Heeia, and Kaneoke Cove, Oahu (Rathbun, 1906), Mauna Loa, Waiakla River and Hilo, Hawaii (Rathbun, 1906), Opaeha (Rathbun, 1906).

Macrobrachium joppae nov. spec. (fig. 48)

Museum Amsterdam

Nias; leg. J. P. Kleiweg de Zwaan. — 9 specimens (1 ovigerous female) 31-54 mm.

Description. The rostrum (fig. 48a) has the midrib slightly turned upwards near the tip, but the upper margin is straight. Anteriorly the rostrum reaches distinctly beyond the antennular peduncle, but fails to reach the end of the scaphocerite. The upper margin bears 13 to 15 equidistant teeth, the first 4 or 5 of which are placed on the carapace behind the orbit. The first tooth is somewhat smaller than the second and the distance between these two teeth is slightly larger than that between the other teeth. The first tooth is placed some distance before the middle of the carapace. The lower margin bears 4 or 5 teeth, which are placed closest together in the proximal part and widest in the distal part of that margin. The rostrum is, when compared with *M. hirtimanus*, *M. placidulum* and *M. placidum*, rather high, resembling more the shape of the rostrum in *M. grandimanus*. In my adult males the carapace is scabrous by the presence of numerous small spinules, which are most distinct in the anterolateral and least distinct in the posteromedian region of the carapace. The hepatic spine is placed behind and a small distance below the antennal and is slightly less strong than the latter. The two spines do not lie in one line.

The abdomen is smooth, even in the large males. The pleurae have the usual shape; the apex of the fifth pleura is more or less acute. The sixth abdominal segment is somewhat more than 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. Of the two dorsal pairs of spines the first is situated in the middle of the telson, the other lies halfway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a distinct sharp median point, which is flanked by two pairs of spines, the outer of which is very short, the inner pair is about 3 to 4 times as long as the outer and distinctly overreaches the apex of the telson. Between the inner spines numerous setae are present.

The eyes are large, the cornea is broad and kidney-shaped, it is broader than and about as long as the stalk.

The antennulae are of the normal shape.

The scaphocerite (fig. 48b) is slender; it is thrice as long as broad. The outer margin is slightly concave and ends in a strong final tooth, which almost overreaches the more or less truncate anterior end of the lamella.

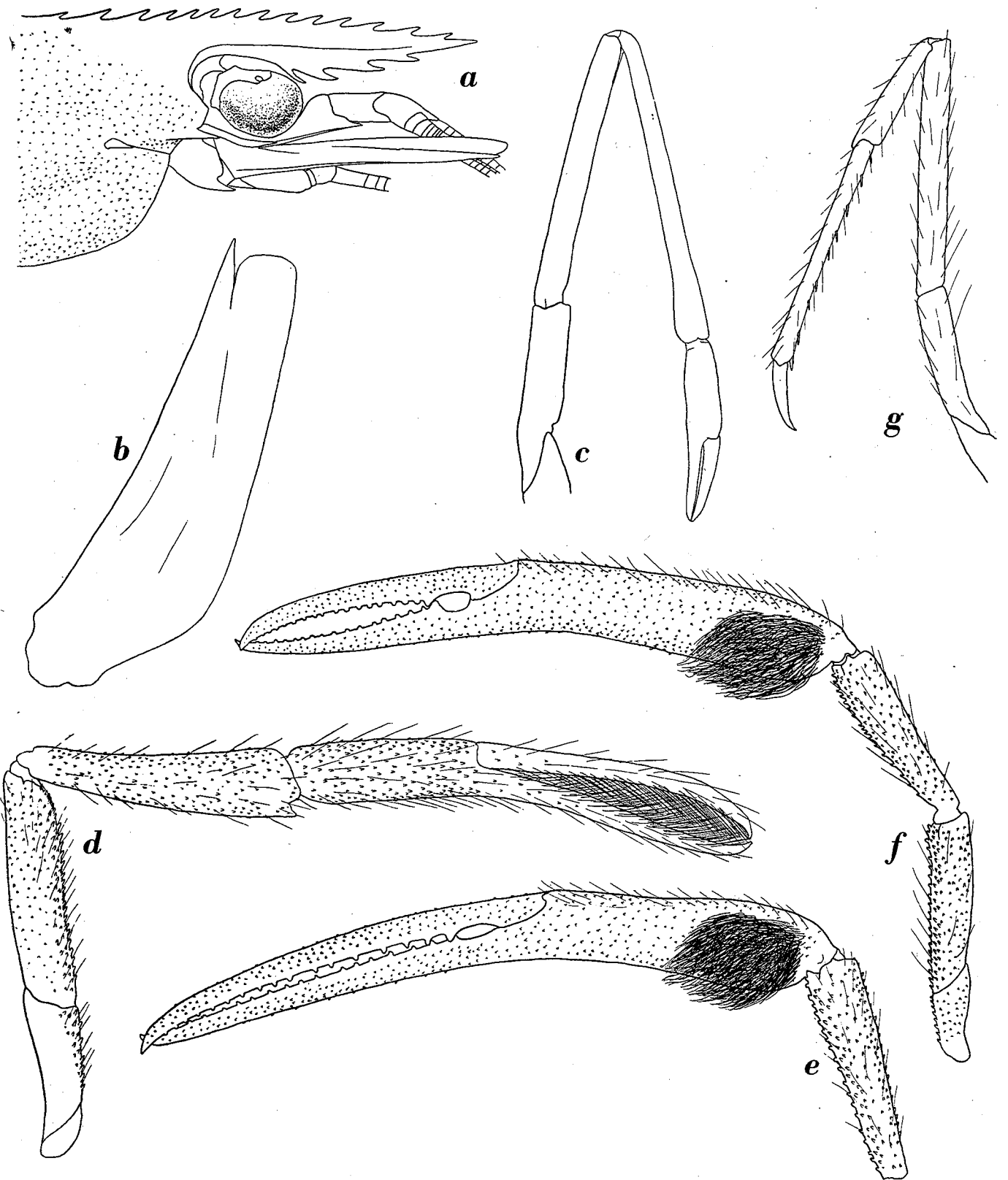


Fig. 48. *Macrobrachium joppae* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, first pereiopod; d, smaller second pereiopod of adult male; e, f, larger second pereiopods of adult males; g, third pereiopod. a, d, g, $\times 5.5$; b, c, $\times 8$; e, $\times 2.7$.

The oral parts are quite typical.

The first pereopods (fig. 48c) are slender, they reach with the entire chela or with part of it beyond the scaphocerite. The fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus measures about $\frac{4}{5}$ of the length of the carpus. The ischium is somewhat more than half as long as the merus. In the adult male the second pereopods are very unequal. The larger leg (figs. 48e, f) reaches with the carpus and the chela beyond the scaphocerite. The fingers are very long and slender, they are $\frac{3}{4}$ to $\frac{4}{3}$ as long as the palm. In the very proximal part the fingers close perfectly; at the end of this short distance, in which the cutting edges touch each other, one or two rather large teeth are present, then follows a distinct, but rather short gap in which the cutting edges are unarmed and are strongly concave. This gap is terminated in each finger by a rather large tooth; these two teeth are placed just opposite one another. The distance from these teeth to the base of the fingers is about one half to one third of the distance to the apex. Between the distal large teeth and the apex of the fingers, each cutting edge is provided with many (about 20) small teeth, which are placed at regular distances. The palm is cylindrical and slender, it is about thrice or more than thrice as long as broad. The palm as well as the fingers are scabrous by numerous spinules, which, however, towards the tips of the fingers become small and inconspicuous. Numerous closely packed long and soft hairs are placed in the lower part of the basal portion of the palm. Long and slender hairs, which are longer and more stiff than the hairs just mentioned and not so closely placed together, are present in the upper part of the basal portion of the palm. The carpus is slender, it is much narrower than the palm and measures $\frac{2}{3}$ of the length of the palm, it narrows posteriorly. The merus is as long as or slightly shorter than the carpus. The ischium is about half as long as the carpus. The ischium, carpus and merus are provided with numerous spines, which are largest in the lower portion, furthermore similar hairs as are present on the upper part of the palm are present on these three joints. The smaller leg (fig. 48d) reaches only with part of the carpus beyond the scaphocerite. The fingers are long and slender and gape throughout their length. They are 1.5 times or slightly more as long as the palm. The cutting edges of the fingers bear two or three teeth close near their base. Long and rather stiff hairs are present at both sides of the cutting edges. The palm is about 2.5 to 3 times as long as broad, it is of the same width throughout its length. Small spinules are present on the palm and the bases of the fingers. The carpus is about $\frac{4}{3}$ as long as the palm, it narrows posteriorly. The merus is about as long as or slightly shorter than the carpus. The ischium is somewhat more than half as long as the merus; spinules and scattered long hairs are present on ischium, merus and carpus. No soft hairs as on the palm of the larger leg are present here. Of the two females at my disposal, one misses both second legs, in the other only the right leg is present. The fingers are slender and close over their entire length, they show some two or three inconspicuous denticles in the proximal part of the cutting edges. The palm is slightly longer than the fingers and is cylindrical, it is about 2.5 times as long as broad. The carpus is about $\frac{5}{4}$ as long as the palm, it narrows proximally. The merus is somewhat shorter than the carpus and the ischium is almost as long as the merus. All joints, except the distal part of the fingers, are provided with minute spinules, while some scattered long hairs are present too. It is very probable, taking the close relation between the present species and *M. grandimanus* into account, that the second legs of the female are equal in shape and size. The third pereopod (fig. 48g) reaches about to the end of the scaphocerite, sometimes it overreaches that scale with the dactylus. The propodus is 2.5 to 3 times as long as the dactylus, and bears a row of 6 to 10 spinules at the posterior margin. The carpus is about half as long as the

propodus or is somewhat longer. The merus is slightly longer than the propodus. The ischium is about half as long as the merus. The fifth pereopod reaches to or just fails to reach to the end of the scaphocerite. The relation between the lengths of the various joints are as in the third leg, though they are more slender in the fifth leg; here of course the transverse rows of setae are present in the distal part of the posterior margin of the propodus.

The pleopods and the uropods are normal in shape.

The ovigerous female measures 31 mm. The eggs are rather numerous and small, they are 0.6 to 0.8 mm in diameter (the embryos are already visible).

The present species is most closely related to *M. grandimanus* (Randall) from the Hawaiian Archipelago. From this species, however, it at once may be recognized by the shape of the large chela of the adult male.

Macrobrachium bariense (De Man) (fig. 49)

Palaemon (*Macrobrachium*) *bariensis* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 496, pl. 29 fig. 50.

Palaemon bariensis Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 511.

Palaemon (*Macrobrachium*) *bariensis* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 341.

Palaemon (*Macrobrachium*) *bariensis* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 10.

Palaemon (*Macrobrachium*) *bariensis* J. Roux, 1928a, Treubia, vol. 10, p. 219.

Siboga Expedition

River near Station 53, Bay of Nangamesi, Sumba; April 21 and 22, 1899. — 28 specimens 14-36 mm.

River near Station 114, Kuandang Bay, N. Celebes; July 8, 1899. — 10 specimens 15-30 mm. (badly preserved).

Museum Amsterdam

Pajeti, Sumba. — 9 specimens (5 ovigerous females) 32-55 mm.

River near Berit (= Bari), W. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon bariensis* De Man. — 6 specimens (2 ovigerous females) 24-33 mm.

River near Konga, E. Flores; leg. G. A. J. van der Sande. — 1 specimen 47 mm.

Waiho River, Waigeo; in freshwater, upstreams of rapids; December 20, 1909; leg. L. F. de Beaufort. — 6 specimens 26-36 mm.

This characteristic small species has already been described and figured by De Man (1892). I should like to add the following details to De Man's description:

The scaphocerite is about 2.5 times as long as broad. The outer margin is straight or slightly concave. The final tooth is strong and reaches to or even slightly beyond the lamella, which has the antero-internal angle inconspicuously produced.

The oral parts are quite normal.

The first leg reaches with half the carpus beyond the scaphocerite. The fingers are about as long as the palm. The carpus is almost twice as long as the chela. The merus measures $\frac{4}{5}$ of the length of the carpus. The ischium is about half as long as the merus. The second legs are strongly unequal (sometimes the left is the larger, sometimes the right; De Man's (1892) statement that the left always is the larger is incorrect). The larger leg reaches with part of the carpus beyond the scaphocerite. The fingers in the adult male are as long as to distinctly shorter than the palm. The fingers

bear in the proximal part of the cutting edge one rather large tooth, distally of which there are 4 to 6 slightly smaller teeth, regularly divided over the cutting edge; proximally of the large tooth of the dactylus there are about 3 teeth, while the fixed finger bears a crenulated crista at that place. Except for some scattered hairs, the chela is naked, there are numerous small conical tubercles placed on the palm and the basal part of the fingers. The palm is distinctly broadened and compressed. The upper margin is rounded, but near the lower margin the palm is suddenly so strongly compressed, that a more or less sharp keel is formed. The carpus is short and conical, it is about half as broad as and distinctly shorter than the palm. The merus is slightly longer than the carpus. The ischium measures $\frac{2}{3}$ of the length of the merus or somewhat less. The smaller leg (fig. 49) reaches with the chela beyond the scaphocerite. The fingers are slender, they are from 1.5 times to almost twice as long as the palm. In large males they are gaping and provided with inwards directed hairs. The cutting edge possesses 4 to 6 small teeth in the extreme proximal portion. The palm is not broadened and bears a

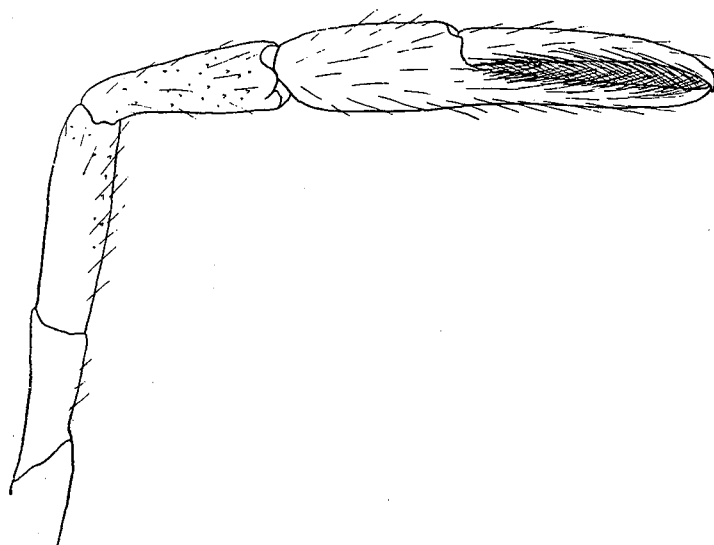


Fig. 49. *Macrobrachium bariense* (De Man). Smaller second leg of adult male. $\times 6$.

few scattered tubercles and long hairs. The carpus is about as broad and as long as or slightly longer than the palm, it too bears tubercles and long hairs. The relation between carpus, merus and ischium is like that in the large leg. In young males the second legs are not so strongly unequal: in a specimen of 18 mm the two legs do not differ in shape, though one is slightly stronger and longer than the other. The fingers measure $\frac{3}{4}$ of the length of the palm, their cutting edges bear 3 or 4 proximal teeth. The palm is slender. The carpus is somewhat shorter than the palm, the relation between carpus, merus and ischium is as in the adult male. All joints are smooth, being only provided with hairs. In the only ovigerous female at my disposal in which both second legs are present, these legs differ slightly in shape and size. In the more robust leg the fingers are distinctly shorter than the palm, in the other leg they have the same length as the palm. In the larger leg the chela is broader than in the smaller. In both some three or four teeth are present on the cutting edge of the fingers, while the fingers close over their whole length. The third leg reaches with the dactylus beyond the scaphocerite. The propodus is 2.5 to 3 times as long as the dactylus, twice or slightly less than twice as long as the carpus and as long as or slightly shorter than the merus. The ischium is about half as long as the merus. The fifth leg just reaches the end of the scaphocerite, it is somewhat more slender than the third leg; the

propodus is fully thrice as long as the dactylus, somewhat less than twice as long as the carpus and slightly longer than the merus.

The pleopods and uropods are normal in shape.

The eggs are 0.5 to 0.7 mm in diameter.

The specimen from Ceram identified by J. R o u x (1923) as *Palaemon bariensis* certainly does not belong to the present species. As the specimen, a large male, lacks one of the second legs it is not possible to identify it with certainty, in my opinion, however, it is most probable that it belongs to a new species. Its rostrum is straight, rather high and reaches almost to the end of the scaphocerite. The upper margin bears 11 teeth, 4 of which are placed behind the orbit, the fifth is situated just over the orbit. The first tooth is placed slightly before the middle of the carapace. The lower margin of the rostrum bears two teeth. The carapace is scabrous in the anterolateral part. The hepatic spine is somewhat smaller than the antennal and lies behind and somewhat below it.

The abdomen and telson are normal in shape, showing no difference with the typical *M. bariense*. The telson, however, bears only one pair of dorsal spines, which is placed in the middle of the telson. The absence of the posterior pair of dorsal spinules, in all probability is an abnormality.

The eyes are well developed, they are normal in shape. Antennulae normal.

The scaphocerite is about 2.5 times as long as broad. The outer margin is slightly convex. The final tooth is strong, it reaches to or slightly beyond the end of the lamella. The antero-internal angle of the scaphocerite is somewhat produced.

The oral parts are normal.

The first legs reach with the chela and a very small part of the carpus beyond the scaphocerite. The fingers are about as long as the palm. The chela is slightly more than half as long as the carpus. The merus is $\frac{3}{4}$ as long as the carpus, while the ischium is about half as long as the merus. The left second leg reaches with the chela beyond the scaphocerite. The fingers are as long as the palm. The cutting edge of both fingers is provided with three small proximal teeth, which are placed close together and about 10 somewhat larger teeth, which are divided over the rest of the cutting edge. The palm is not broadened, it is broadly rounded (not strongly compressed) ventrally, with velvety hairs on the outer and lower surface. This pubescent area does not reach to the articulation with the dactylus. Small tubercles are present on the palm and the bases of the fingers. The carpus is about as broad as the palm and is slightly more than half as long as that joint. The merus is $\frac{4}{3}$ as long as the carpus. The ischium is about half as long as the merus. The third leg reaches with part of the dactylus beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus, it is somewhat less than twice as long as the carpus and somewhat shorter than the merus. The fifth legs are missing in my specimen.

The pleopods and uropods are normal.

The present specimen differs from *M. bariense* in the shape and pubescence of the chelae of the second legs and by the shape of the rostrum. It shows most affinity to *M. jacobsoni*; more material, however, is needed to ascertain the real identity of the species, which may be new.

The specimens from Berit (= Bari) are the types of the species, those from Pajeti are mentioned by J. R o u x (1928), those from Waigeo by J. R o u x (1923).

Distribution. *Macrobrachium bariense* lives in fresh water and up till now is only known from the eastern part of the Malay Archipelago. The records in literature are: Kambera River and Pajeti, Sumba (J. R o u x, 1928a), Berit, W. Flores (D e M a n, 1892), Kema, N. Celebes (S c h e n k e l, 1902), Waiho River, Waigeo (J. R o u x, 1923), between Erersin and Ngarangarin, Trangan Island, Aru Islands (J. R o u x, 1919).

Macrobrachium latidactylus (Thallwitz) (fig. 50)

- Palaemon grandimanus* Von Martens, 1868, Arch. Naturgesch., vol. 34 pt. 1, p. 45 (non Randall, 1837).
- Palaemon latidactylus* Thallwitz, 1891, Zool. Anz., vol. 14, p. 97.
- Palaemon latidactylus* Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 17, pl. 1 fig. 3.
- Palaemon (Eupalaemon) endebensis* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 465, pl. 27 fig. 42.
- Palaemon (Macrobrachium) lampropus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 493, pl. 29 fig. 49.
- Palaemon (Macrobrachium) latidactylus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 501, pl. 29 fig. 52.
- Palaemon lampropus* Lanchester, 1901, Proc. zool. Soc. Lond., 1901 pt. 2, p. 568.
- Palaemon (Macrobrachium) latidactylus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 802.
- ?*Palaemon (Macrobrachium)* sp. De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 805.
- Palaemon lampropus* Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 511.
- Palaemon latidactylus* Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 392, pl. 3 fig. 10.
- Palaemon lampropus* Kemp, 1918a, Mem. Asiat. Soc. Bengal, vol. 6, p. 267.
- Palaemon (Macrobrachium) latidactylus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 337.
- Palaemon (Macrobrachium) lampropus* J. Roux, 1919, Abh. Senckenb. naturf. Ges., vol. 35, p. 340.
- Palaemon (Macrobrachium) lampropus* J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 9.
- Palaemon (Macrobrachium) latidactylus* J. Roux, 1928a, Treubia, vol. 10, p. 220.
- Palaemon (Parapalaemon) scabriculus* J. Roux, 1930, Rev. Suisse Zool., vol. 37, p. 361.
- Palaemon (Macrobrachium) latidactylus* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3 pt. 14, p. 8.
- Palaemon latidactylus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
- Palaemon grandimanus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 489.
- Macrobrachium lampropus* Suvatti, 1937, Check List aq. Fauna Siam, p. 49.

Siboga Expedition

- Station 4, Anchorage off Djangkar (E. Java), 7° 42' S, 114° 12'.6 E; shore; depth 9 m; bottom coarse sand; March 9, 1899. — 1 ovigerous female 51 mm.
- River near Station 19, Bay of Labuhan Tereng, westcoast of Lombok, 8° 44'.5 S, 116° 2'.5 E; March 19-21, 1899. — 34 specimens (included ovigerous females) 13-67 mm (one specimen bopyrized).
- Station 33, River near Pidjot, Lombok; March 25, 1899. — 2 specimens 59 & 63 mm.
- River near Station 53, Bay of Nangamesi, Sumba; April 21 and 22, 1899. — 2 specimens 25 & 27 mm.
- Station 58, Anchorage off Seba, Sawu Island; dredge and shore exploration; depth up to 27 m; bottom sand; April 25, 1899. — 6 specimens (included ovigerous females) 14-80 mm.
- River near Station 114, Kuandang Bay, N. Celebes, 0° 58'.5 N, 122° 55' E; July 8, 1899. — 5 specimens 28-40 mm.

Snellius Expedition

- Rivulet near Menado; 0-1 m; August 28, 1929. — 9 specimens (included ovigerous females) 15-34 mm.
- Kupang, Timor; fresh water; November 17, 1929. — 6 specimens 30-59 mm.
- Beo, Talaud Islands; fresh water; June 14-21, 1930. — 2 specimens (included 1 ovigerous female) 54 and 58 mm.

Museum Leiden

- Ba River, near Ende, Flores; 1888-1889; leg. M. Weber; cotype of *Palaemon endebensis* De Man. — 1 specimen 39 mm.

Bantimurong near Maros, Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 3 specimens 29-44 mm.
 Air Lorike, Hitu Peninsula, Amboina; March 17, 1923; leg. F. Kopstein. — 1 specimen 32 mm.

Museum Amsterdam

Pajeti, Sumba; July, 1924; leg. J. Lambooy. — 6 specimens 27-63 mm.
 Rivers near Berit (= Bari) and Reo, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endebensis* De Man. — 16 specimens 17-44 mm.
 River near Berit (= Bari), W. Flores; 1888-1889; leg. M. Weber. — 4 specimens 16-45 mm.
 Raka-mbaha (= Mbawa), S. Flores; near the sea; 1888-1889; leg. M. Weber; cotypes of *Palaemon endebensis* De Man. — 3 specimens 32 and 37 mm.
 Raka-mbaha, S. Flores; near the sea; 1888-1889; leg. M. Weber. — 1 specimen 28 mm.
 Ba River, near Ende, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endebensis* De Man. — 12 specimens (included ovigerous females) 21-47 mm.
 Ba River, near Ende, Flores; 1888-1889; leg. M. Weber. — 1 specimen 43 mm.
 Nargi River near Konga, E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon endebensis* De Man. — 2 specimens (one ovigerous female) 40 & 45 mm.
 Koinino River, near Kupang, Timor; 1888-1889; leg. A. Wichmann; cotypes of *Palaemon lampropus* De Man. — 2 specimens 30 & 41 mm.
 River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 10 specimens (included one ovigerous female) 35-68 mm.
 River near Parepare, S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 4 specimens 16-42 mm.
 Bantimurong near Maros, S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon lampropus* De Man. — 13 specimens 31-51 mm.
 River near Mumes, Waigeo; December 29, 1909; leg. L. F. de Beaufort. — 1 ovigerous female 40 mm.
 Waiho River, Waigeo; fresh water, collected upstreams of some rapids; December 20, 1909; leg. L. F. de Beaufort. — 10 specimens 31-36 mm.
 Rabiai River, Waigeo; December 31, 1910; leg. L. F. de Beaufort. — 3 specimens 38-54 mm.

The present species is extensively described by De Man (1892) and C ó w l e s (1914), while R o u x (1919) also gave some interesting details. The following remarks may be added:

The rostrum is straight or directed slightly downwards, sometimes the extreme tip is slightly curved upwards, it reaches about to the end of the antennular peduncle. The upper margin bears 13 to 18 teeth (generally 15 or 16), 3 to 5 of which (generally 4) are placed on the carapace behind the orbit. The distance between the first tooth and the posterior limit of the orbit varies between $\frac{1}{2}$ and $\frac{1}{3}$ (in large male specimens even to $\frac{1}{4}$) of the length of the carapace, measured from its posterior margin to the posterior margin of the orbit. In larger males that distance generally is smaller than in younger specimens or females. At first I thought the character of the length of the distance between the first dorsal rostral tooth and the posterior limit of the orbit to be of value to separate *M. latidactylus* from *M. endehense*. In the type material of *M. endehense* that distance namely varies between $\frac{1}{2}$ to $\frac{1}{2.7}$ of the length of the carapace, being generally more than $\frac{1}{2.5}$ of that length. In larger specimens of *M. latidactylus* this relation generally was $\frac{1}{3}$. Other material, however, showed the variability of this character, so in the material of Siboga Sta. 58, the adult male has this distance $\frac{1}{4}$, the two ovigerous females $\frac{1}{2.7}$ and $\frac{1}{2.5}$ of the length of the carapace. The lower margin of the rostrum bears 2 to 5 teeth (generally 3 or 4). The carapace in adult specimens is roughened in the anterior and lower portions by minute spinules.

The fifth abdominal segment has the pleurae ending in an acute angle. The sixth segment is only slightly longer than the fifth.

The telson is somewhat less than 1.5 times the length of the sixth abdominal segment. The anterior pair of dorsal spines is placed in the middle of the telson, or slightly behind it. The second pair is situated midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a median point, which is distinctly overreached by the inner pair of spines, between which about three pairs of feathered setae are present. The outer pair of spines is very short.

The eyes have the cornea very broad, being about as long as and distinctly broader than the stalk. An ocellus is present.

The scaphocerite (fig. 50a) has the outer margin about straight, the final tooth just fails to reach the end of the lamella, which is broadest slightly above the base and gradually narrows towards the apex.

The oral parts are quite typical.

The first pereopods are slender, in the adult male they reach with the chela and part of the carpus beyond the scaphocerite, while in the ovigerous females and younger males only the larger part of the chela overreaches that scale. In adult males the carpus is twice as long as the chela, in females and young males it is relatively shorter. The merus measures $\frac{4}{5}$ of the length of the carpus. The second legs of the adult males have been extensively described by De Man (1892) and Cowles (1914). The variation shown in the shape of the large chela of the adult male in Cowles's and De Man's material may also be observed in my specimens. The palm of some specimens is considerably higher than in others, sometimes it is strongly narrowed posteriorly, sometimes the fingers are much shorter, sometimes they are as long as the palm, the fixed finger may be very high at its base, but sometimes it is more slender there. These differences are individual variations and are connected by many transitions, so that they have no specific value at all. Also the smaller second leg of the adult male has the relation between the length of the fingers and that of the palm very variable, generally, however, the fingers are much longer than the palm. The form described by De Man (1892) as a new species under the name *Palaemon lampropus*, belongs to the present species. The "adult" male of De Man's *Palaemon lampropus* is a male of *Macrobrachium latidactylus*, in which the second pereopods have not yet attained their final development ("mâle féminisé" of Coutière, 1901), this at once becomes clear, when we compare the various male cotypes of *P. lampropus* with the other material at hand: all transitions of the typical *lampropus* leg (fig. 50e) and the typical *latidactylus* leg are present. Fig. 50g represents the larger leg of a male cotype of *P. lampropus*, which shows already the strongly curved dactylus, while fig. 50f represents the chela of a young *latidactylus* specimen in which the leg still more resembles the typical *latidactylus* type. Cowles figured such transitional chelae too (cf. his fig. 10c). Like in the adult males, the chelae of the "mâles féminisés" too are very variable in shape: generally the fingers are distinctly shorter than the palm (fig. 50e). In a specimen from the river Ba, Flores, described by De Man (1892) as *Palaemon (Macrobrachium) latidactylus* var., the fingers are as long as the palm (fig. 50d), while in a specimen of 40 mm from the river near Siboga Sta. 114 the fingers are distinctly longer than the palm (fig. 50c), in the same locality, however, a male with the typical "*lampropus*" chela was collected. I have too little material at my disposal to make a final conclusion whether the form with the long fingers really is varietally distinct or not, but I think it rather improbable, the more as the large chela of the adult male too shows such a large variability. The smaller chelae which in

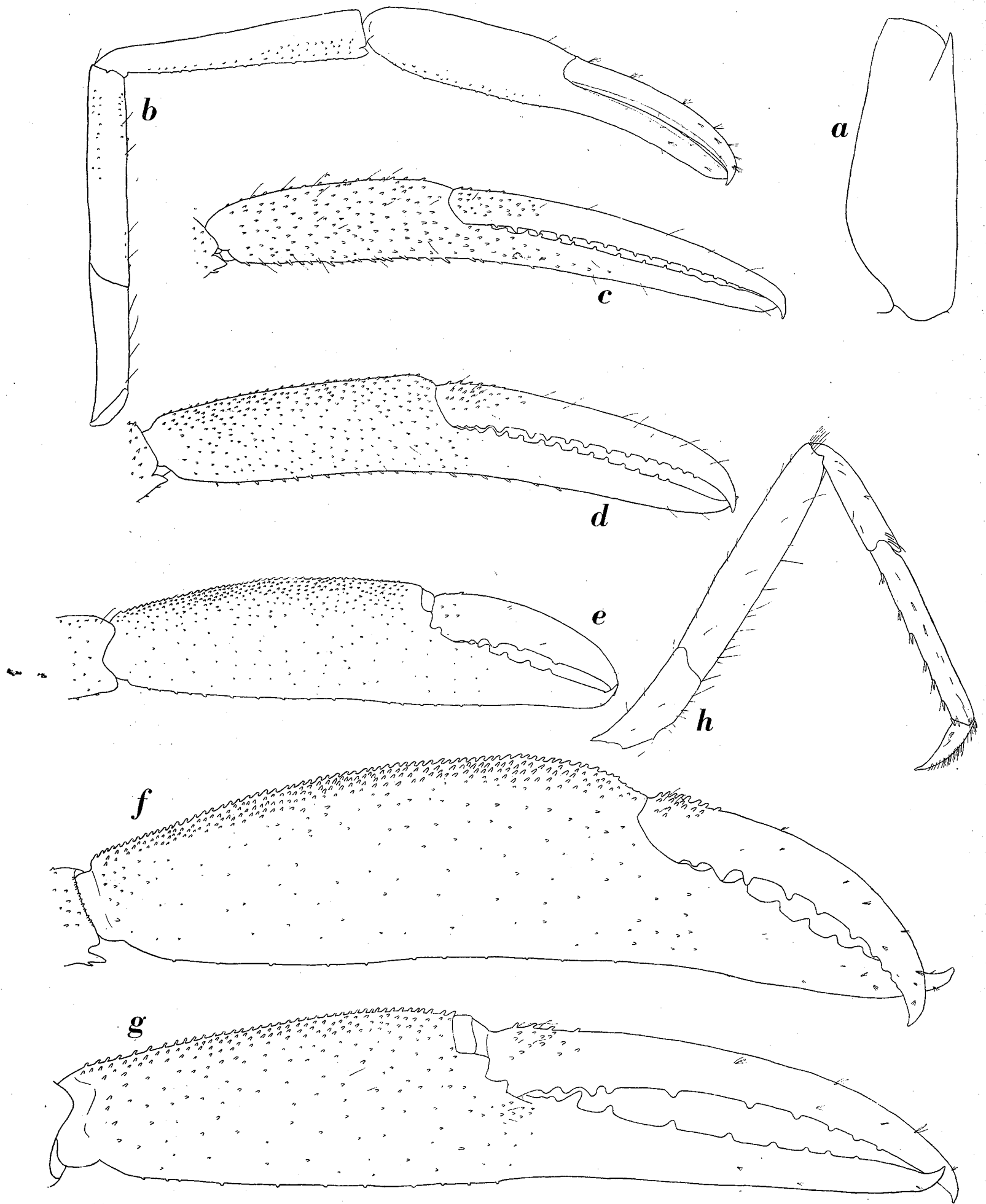


Fig. 50. *Macrobrachium latidactylus* (Thalwitzer). a, scaphocerite; b, second pereiopod of female; c, d, e, f, g, chelae of second legs of males (c, from Siboga Sta 114; d, from Ba River, Flores; e, from Bantimurong, Celebes, cotype of *Palaemon lampropus* De Man; f, from Siboga Sta. 19; g, from Bantimurong, Celebes, cotype of *Palaemon lampropus* De Man, ex. coll. Mus. Leiden); h, third leg. a-h, $\times 6$.

the "mâle féminisé" has the fingers closed, gradually gets its final shape with the gaping fingers, which are provided at their inner margins with stiff inwards directed hairs. Also *Palaemon endehensis* De Man can not be separated from the present species. De Man, while placing *P. latidactylus* in the subgenus *Macrobrachium*, brings *P. endehensis* in the subgenus *Eupalaemon*. These two subgenera should differ by the fact that the palm of the second chela is cylindrical in *Eupalaemon* and compressed in *Macrobrachium*. This difference, as pointed out by later authors (e.g. Henderson & Matthai, 1910) is of no value, since the palm in young specimens of all species of the present genus is cylindrical and in some forms may become compressed, while many transitions exist. When comparing the type material of *P. endehensis* with my material of *Macrobrachium latidactylus* the only difference I could find was shown by the second legs of the large male type of *P. endehensis*. The difference of the dentition of the rostrum, which I first thought to be of specific value, proved to be worthless (vid. p. 240). The chela of the large second leg of the larger male type of *P. endehensis* very much resembles the chelae of the "mâles féminisés" of *M. latidactylus*; the smaller second leg, however, shows the same shape as that of the adult males of *M. latidactylus*. It is therefore very probable that *P. endehensis* is based on a specimen of *Macrobrachium latidactylus* which is a full grown male, in which the larger second leg for some reason or other has not (yet) reached its final stage of development. Also the fact that the types of *P. endehensis* have been found together with *Macrobrachium latidactylus* in the same localities is a point in favour of the supposition that the two forms are identical. In the females and young males of my "latidactylus", "lampropus" and "endehensis" material not the least difference could be observed. The larger (ovigerous) females have the second pereopods (fig. 50b) equal in shape and size. The legs reach with a small part of the carpus beyond the scaphocerite. The fingers are slender and close over their entire length. They are slightly shorter than or as long as the palm and often are directed obliquely downwards in relation to the palm. The cutting edge of the dactylus shows three, that of the fixed finger 2 small teeth in the proximal portion, the rest of the margin is entire. The palm is only slightly compressed. The carpus is somewhat longer than the palm and is about $\frac{2}{3}$ as long as the chela. The merus is shorter than the carpus. The ischium is distinctly shorter than the merus. All joints are provided with numerous small spinules, which are placed in more or less distinct longitudinal rows. The last three pairs of pereopods are similarly built. The third (fig. 50h) reaches with a part of the dactylus only beyond the scaphocerite. The propodus is 2.5 times as long as the dactylus (in old specimens the dactylus seems to be shorter, as its apex has been worn off). There is a distinct row of spines present along the posterior margin of the propodus. The carpus is somewhat more than half as long as the propodus. The merus is longer than the propodus. The fifth pereopod distinctly fails to reach the end of the scaphocerite. The propodus is about thrice as long as the dactylus and is, apart from the posterior spines, provided with the usual transverse rows of hairs in the distal part of the posterior margin. The carpus is about half as long as the propodus and the merus is slightly shorter than the propodus. All joints of the last three pereopods are provided with scattered stiff and long hairs. The merus of the third leg (sometimes also that of the fourth) in the adult male moreover bears along its posterior margin similar spinules as are present in the second legs.

The endopod of the first pleopod of the male is rather slender, it further is of the typical shape: oval with a concave inner margin. The other pleopods too are normal in shape, just like the uropods.

The very young specimens show most resemblance to the females, they only have the legs shorter and without spinules.

The specimen from Manila described by Von Martens under the name *Palaemon grandimanus* Randall, does not belong to that species, but to *Macrobrachium latidactylus*, as already has been showed by Thallwitz (1892), De Man (1892) and Cowles (1914). The record of Estampador (1937) of *Palaemon grandimanus* from the Philippines is based on that of Von Martens.

As has already been pointed out above *Palaemon lampropus* and *P. endehensis* of De Man can not be separated from the present species. The differences in the armature of the rostrum between *P. latidactylus* and *P. lampropus* as they have been given by De Man do not exist, because in typical specimens of *M. latidactylus* the number of dorsal teeth varies between 13 and 18 (a number also found by Roux, 1919, p. 338).

The specimens from Lombok described by J. Roux (1930) as *Palaemon (Parapalaemon) scabriculum*, in all probability belong here, as J. Roux's description much better fits for *M. latidactylus* than for *M. scabriculum*. It is difficult, however, to make a final statement without examination of the specimens, as these both are females. The fact that *M. latidactylus* is rather common at Lombok, while *M. scabriculum* is not known from that locality also supports my supposition.

The specimens of the Leiden and Amsterdam Museums from Flores, Timor and Celebes have already been described by De Man (1892); part of this material served De Man for the original descriptions of his new species *Palaemon endehensis* and *P. lampropus*. The specimens from Waigeo collected by De Beaufort (Mus. Amsterdam) were mentioned by J. Roux (1923) those from Sumba (Mus. Amsterdam) by the same author (J. Roux, 1928a).

Distribution: The species lives in fresh water, though the records from Sta. 4 and Sta. 58 of the Siboga Expedition point to the possibility, that it sometimes occurs in sea. *Macrobrachium latidactylus* is only known from Malaysia. The records in literature are: Aring, Kelantan (Lanchester, 1901), Patani River, Siamese Malay States (Kemp, 1918a), Klong Nakorn Noi and Ban Kiri Wong, Nakorn Sritamarat State, Siamese Malay States (Suvatti, 1937), Mariveles, Bataan Province, Luzon, Philippines (Estampador, 1937), neighbourhood of Manila, Luzon, Philippines (Cowles, 1914), Province Camarines Sur, Southern Luzon, Philippines (Von Martens, 1868), Samar, Philippines (Cowles, 1914), Gandara, Samar (Estampador, 1937), Borongan, Samar, Philippines (Von Martens, 1868), Jaro, Leyte, Philippines (Cowles, 1914; Estampador, 1937), Agusan River, Mindanao, Philippines (Cowles, 1914; Estampador, 1937), North Celebes (Thallwitz, 1891, 1892), between Borau and Menangalu, Luwu, Central Celebes (Schenkel, 1902), Palopo, Luwu, Central Celebes (De Man, 1892), Parepare, S.W. Celebes (De Man, 1892), Bantimurong near Maros, S.W. Celebes (De Man, 1892), Lombok (J. Roux, 1930), Ba River, Flores (De Man, 1892), Berit, Reo, Raka-mbaha and Konga, Flores (De Man, 1892), Pajeti and Mao Marru, Sumba (J. Roux, 1928a), Koinino River near Kupang, Timor (De Man, 1892), Kau, Halmahera (De Man, 1902), Mumes, Waiho and Rabiai Rivers, Waigeo Island, off N.W. New Guinea (J. Roux, 1923), Enralang, Groot Kai, Kai Islands (J. Roux, 1919), Sungai Manumbai, Aru Islands (J. Roux, 1933), Panua-bori, Matora and Waskai rivers along Sungai Manumbai, Wokam, Aru Islands (J. Roux, 1919), Seltutti, Kobroor, Aru Islands (J. Roux, 1919).

Macrobrachium lepidactylus (Hilgendorf)

Palaemon (s.s.) lepidactylus Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 838, pl. 4 figs 14-16.

- non *Palaemon lepidactylus* Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.
Palaemon lepidodactylus p.p.? Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
Palaemon lepidactylus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 735.
Palaemon (Macrobrachium) lepidactylus Hilgendorf, 1898, Deutsch O. Afrika, vol. 4 pt. 7, p. 32, fig. B.
Palaemon (Macrobrachium) Hilgendorfi Coutière, 1899, Bull. Mus. Hist. nat. Paris, vol. 5, p. 382.
Palaemon (Macrobrachium) lepidactylus Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Palaemon (Macrobrachium) Hilgendorfi Coutière, 1900, C. R. Acad. Sci. Paris, vol. 130, p. 1267.
Palaemon (Macrobrachium) lepidactylus Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 272, pls. 10, 11 fig. 13.
Palaemon (Macrobrachium) Hilgendorfi Coutière, 1901, Ann. Sci. nat. Zool., ser. 8 vol. 12, p. 281, pl. 11 figs. 14-17.
Macroterocher lepidactylus Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 40.
Macroterocher lepidactylus Stebbing, 1910, Ann. S. Afr. Mus., vol. 6, p. 386.
Palaemon (Macrobrachium) lepidactylus Calman, 1913, Proc. zool. Soc. Lond., 1913, p. 926.
non *Palaemon lepidactylus* Cowles, 1914, Philipp. Journ. Sci., vol. 9 sect. D, p. 389, pl. 3 fig. 9.
Palaemon (Macrobrachium) lepidactylus J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 541.
non *Palaemon lepidactylus* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.

Macrobrachium lepidactylus is very closely related to the next species. By some authors the two forms are considered to be identical. My reasons for their separation as two distinct species will be given below under *M. hirtimanus*.

Palaemon Hilgendorfi can not be considered a distinct species, as is already pointed out by Calman (1913) and J. Roux (1934).

The specimens named by Miers (1880), Cowles (1915) and Estampador (1937) *Palaemon lepidactylus* do not belong here, but are *Macrobrachium hirtimanus* (vid. there).

According to Hilgendorf (1898) the specimens mentioned by Pfeffer (1889) under the name *Palaemon lepidodactylus*, at least those from Zanzibar, belong to *Macrobrachium lar*.

Distribution: The species inhabits fresh water of E. and S.E. Africa and Madagascar. The records in literature are: Korogwe, N. Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Zanzibar (Coutière, 1901), Uzaramo, S. Tanganyika (Pfeffer, 1889; Hilgendorf, 1898), Quelimane and Tete, Mozambique (Hilgendorf, 1879, 1898), Barberton, Transvaal (Stebbing, 1910), Umgeni lagoon near Durban, Natal (Stebbing, 1908, 1910), Madagascar (Coutière, 1900, 1901), Ambatonharanana, Mangoro Terrace, N.W. of Tamatave (Calman, 1913), Ifotry, near Tamatave, E. Madagascar (Calman, 1913), Bétampona, Tamatave Region (J. Roux, 1934), Betsileo, Central Madagascar (Calman, 1913), Onilahy River near Tulear, S.W. Madagascar (J. Roux, 1934).

Macrobrachium hirtimanus (Olivier) (fig. 51a)

- Palaemon hirtimanus* Olivier, 1811, Enc. méth. Hist. nat., vol. 8, p. 663.
Palaemon hirtimanus Lamarck, 1818, Hist. nat. Anim. s. Vert., ed. 1 vol. 5, p. 207.
Palaemon hirtimanus Latreille, 1818, Tabl. enc. méth., vol. 24, p. 5, pl. 318 fig. 2.
Palaemon hirtimanus H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 400.
Palaemon hirtimanus H. Milne Edwards, 1838, Lamarck's Hist. nat. Anim. s. Vert., ed. 2 vol. 5, p. 367.
Palaemon hirtimanus White, 1847, List Crust. Brit. Mus., p. 79.
Palaemon hirtimanus De Haan, 1849, Fauna Japonica Crust., atlas, pl. P.
Palaemon hirtimanus A. Milne Edwards, 1862, Maillard's Notes Ile Réunion, Ann. F, p. 16.

- Palaemon hirtimanus* Von Martens, 1876, Preuss. Exped. Ost-Asien, Zool., vol. 1, p. 315.
Palaemon hirtimanus Miers, 1879, Philos. Trans. Roy. Soc. Lond., vol. 168, p. 493.
Palaemon lepidactylus Miers, 1880, Ann. Mag. nat. Hist., ser. 5 vol. 5, p. 384.
Palaemon hirtimanus Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 737, pl. 47 fig. 10.
Palaemon hirtimanus De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 486.
Palaemon (*Macrobrachium*?) sp. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 488, pl. 28 fig. 47.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 489.
Palaemon (*Macrobrachium*) *lepidactyloides* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 497, pl. 29 fig. 51.
Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.
Palaemon (*Macrobrachium*) *lepidactyloides* De Man, 1893, Notes Leyden Mus., vol. 15, p. 308, pl. 7 fig. 8.
Palaemon hirtimanus Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 122.
Palaemon lepidactyloides Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 514.
Palaemon lepidactylus Cowles, 1915, Philipp. Journ. Sci., vol. 9 sect. D, p. 389, pl. 3 fig. 9.
Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* p.p. J. Roux, 1923, Capita Zool., vol. 2 pt. 2, p. 11.
Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* J. Roux, 1928a, Treubia, vol. 10, p. 220.
Palaemon (*Macrobrachium*) *hirtimanus* J. Roux, 1934, Faune Colon. Franç., vol. 5, p. 543.
Palaemon lepidactylus Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 488.
Palaemon hirtimanus Ward, 1942, Mauritius Inst. Bull., vol. 2, p. 57.

Siboga Expedition

Station 33, River near Pidjot, Lombok; March 25, 1899. — 1 loose large chela of adult male and 1 ovigerous female 61 mm.

Museum Leiden

- Sumba; leg. P. J. Lambooy. — 1 ovigerous female 51 mm.
 Maumere, northcoast of E. Flores; 1891; leg. H. ten Kate. — 5 specimens (4 ovigerous females) 39-59 mm.
 Besar Island (= Groot Bastaard), off N.E. Flores; 1891; leg. H. ten Kate. — 1 specimen 76 mm.
 N. New Guinea; April 5, 1911; leg. K. Gjellerup; New Guinea Expedition 1910-1911. — 1 specimen 58 mm.
 Indian Archipelago. — 2 specimens 79 and 85 mm.
 Fiji Islands; 1887; Museum Godeffroy. — 1 specimen 66 mm.
 Pacific Ocean; Museum Godeffroy. — 1 specimen 81 mm.

Museum Amsterdam

- Lolowau, Nias; W. of Sumatra; leg. J. P. Kleiweg de Zwaan. — 27 specimens 33-74 mm.
 Nias; leg. J. P. Kleiweg de Zwaan. — 7 specimens (1 ovigerous female) 31-48 mm.
 Raka-mbaha (= Mbawa), W. Flores; in river upstreams of a waterfall; 1888-1889; leg. M. Weber; type of *Palaemon lepidactyloides* De Man. — 1 specimen 45 mm.
 Ndonga River, near Ende, S. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 specimens 30-34 mm.
 Lela River, near Sikka, Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 ovigerous females 43 and 44 mm.
 River near Palopo, Luwu, Central Celebes; fresh water; 1888-1889; leg. M. Weber. — 1 ovigerous female 46 mm.
 Batjan, N. Moluccas; December 11, 1909; leg. L. F. de Beaufort. — 2 specimens 24 and 26 mm.
 Tuba River, W. Ceram, Moluccas; February, 1910; leg. L. F. de Beaufort. — 3 specimens 41-47 mm.

Rivulet near Honitetu, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 1 specimen 57 mm.
Upper Riuapa River, W. Ceram; February 22, 1910; leg. L. F. de Beaufort. — 4 specimens (1
ovigerous female) 24-87 mm.

The rostrum is about straight, above the eyes it mostly is slightly convex, but the tip is directed straight forwards. The rostrum is very narrow and is of about equal width throughout its length. It reaches generally to the end of the second segment of the antennular peduncle, sometimes it reaches to the middle of the third segment, but never overreaches the antennular peduncle. The upper margin bears 10 to 13 teeth in my material, 5 to 7 (generally 6) of these teeth are placed behind the posterior limit of the orbit. The teeth are divided regularly over the upper margin of the rostrum, though the first three or four stand somewhat wider apart than the others; all teeth are short and small. The first tooth is placed somewhat before the middle of the carapace, the distance between this tooth and the posterior margin of the orbit is 0.39 to 0.48 of the length of the entire carapace (in *M. lepidactylus* this distance is 0.23 to 0.32 of the length of the entire carapace). The lower margin bears 2 (seldom 3) teeth. The carapace is smooth, even in adult males. The hepatic spine is somewhat smaller than the antennal and is placed behind and below it, not lying in one line with it.

The abdomen is smooth in all stages. The first three pleurae are broadly rounded. Those of the fourth and fifth segment are more triangular; that of the fifth segment ends in a more or less acute point. The sixth segment is only slightly longer than the fifth.

The telson is almost 1.5 times as long as the sixth abdominal segment. Of the two pairs of dorsal spines, the anterior is situated in or somewhat behind the middle of the telson, the posterior pair about halfway between the anterior pair and the posterior margin of the telson. The apex ends in a sharp point, which is generally worn off in adult specimens, which thereby have the end of the telson truncated. In young specimens the apex of the telson is horny and transparent. The inner pair of spines of the posterior margin distinctly overreaches the end of the telson, the outer pair is short. Numerous setae are present between the inner spines.

The eyes and the antennulae are normal in shape.

The scaphocerite is about 2.5 times as long as broad. The outer margin is slightly concave, the lamella overreaches the final tooth and is angular antero-internally.

The oral parts are typical.

The first pereopod (fig. 51a) reaches with about half the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is somewhat less than twice as long as the chela. The merus measures $\frac{4}{5}$ of the length of the carpus. The ischium is about half as long as the merus. The second pereopods of the full grown male are very unequal. The larger leg in the adult male is larger than the whole body, it reaches with part of the merus beyond the scaphocerite. The fingers are slender and generally longer than the palm. In the proximal part the fingers bear some large teeth: the dactylus bears 2 or 3 such teeth, one close near the base, one in the middle and sometimes one between these two teeth; between the most distal of the large teeth and the apex of the dactylus a double row of about 12 small, sharp, anteriorly directed teeth is present. The fixed finger possesses only two large teeth, one at the base of the finger, the other at about $\frac{3}{4}$ of its length; between these teeth the cutting edge is distinctly concave; a similar double row of about 6 to 12 teeth as on the dactylus is present between the distal large tooth and the apex of the fixed finger. In the specimen from Besar Island (Museum Leiden) only the basal large teeth are present, the other teeth are missing and the double row in the distal part of the cutting edge consists of 20 teeth. The palm generally is much

compressed, but the strength of the compression is very variable. The palm generally is twice or less than twice as long as high. The palm and the entire fingers are closely beset with numerous spinules which are more or less pressed against the surface; in the fingers the spinules are placed so close together, that they partly overlap each other. Along the lower margin the spinules are more erect. The carpus is slightly longer than the merus in adult specimens, in young specimens it sometimes is shorter. Posteriorly the carpus narrows considerably, being about half as broad posteriorly than anteriorly. The merus is somewhat broadened in the middle and is somewhat less than twice as long as the ischium. All joints are covered with numerous similar spinules as are present on the palm. The smaller second leg of the adult male reaches with the chela and carpus beyond the scaphocerite. The fingers are about twice as long as the palm, they gape generally considerably, sometimes, however, the fingers are more straight and leave less space between them. The entire inner surface of the

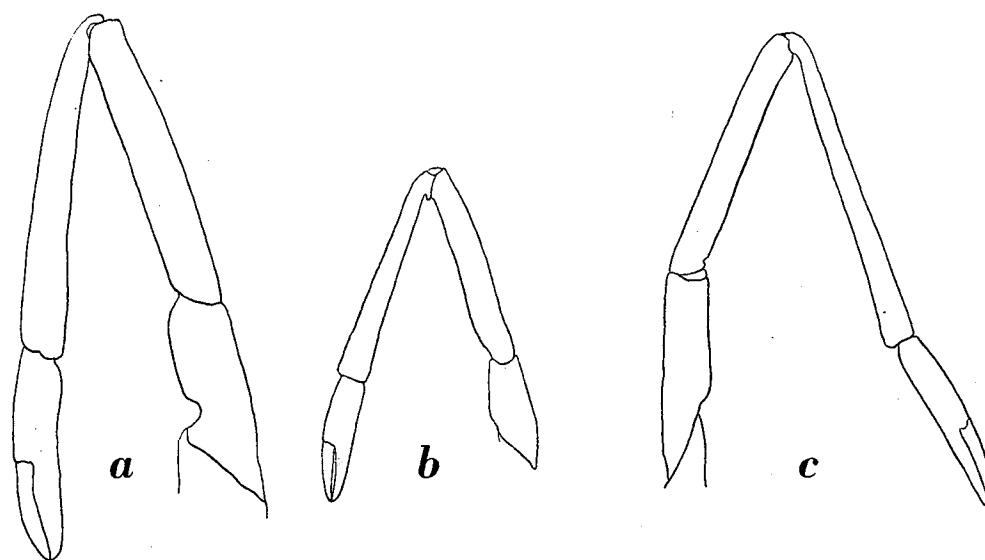


Fig. 51. First pereiopod. a, of *Macrobrachium hirtimanus* (Olivier); b, of *Macrobrachium placidum* (De Man); c, of *Macrobrachium placidulum* (De Man). a-c, $\times 4$.

fingers is closely beset with numerous stiff setae, which are directed inwards, so that nothing of the cutting edge is visible. As far as I can make out no teeth are present on the cutting edge. The palm is short, about as long as broad. The carpus is short and broad, more or less abruptly narrowing towards the base, it is about as long as the merus (it may be slightly longer or slightly shorter). The ischium is $\frac{3}{4}$ as long as the merus or longer. All joints are provided with numerous spinules as in the larger leg. In the females and the young male the second legs are more equal in length and in shape. In the young male of 38 mm from W. Ceram already something of the differences in the two legs is visible (vid. table), the palm of the smaller leg already is much shorter than the fingers, the fingers of this leg have already some of the long stiff hairs on their inner surface, while the cutting edges bear some 2 to 4 very small teeth in the proximal portion. In the larger leg already something of the final arrangement of the teeth is visible, here some of the long stiff hairs, which are so characteristic for the smaller leg, are still visible. The measurements (in mm) of the various joints of the second legs in my material are as follows:

| material | body length | leg 1) | second legs | | | | | | |
|--------------------|-------------|-----------|-------------|--------|--------|--------|-------|---------|------|
| | | | fingers | palm | | carpus | merus | ischium | |
| | | | | length | height | | | | |
| Siboga Sta.33 | ♂ | ? | l | 35.0 | 24.0 | 17.2 | 26.0 | 23.0 | 14.0 |
| Besar Island | ♂ | 76.0 | l | 34.0 | 17.0 | 14.2 | 21.0 | 19.0 | 10.0 |
| | | | s | 17.0 | 9.0 | 7.2 | 12.0 | 12.0 | 8.0 |
| Indian Archipelago | ♂ | 85.0 | l | 30.0 | 22.0 | 16.0 | 24.0 | 21.0 | 12.0 |
| | | | s | 22.0 | 11.0 | 9.0 | 15.0 | 14.0 | 9.5 |
| Fiji Islands | ♂ | 79.0 | l | 26.0 | 23.0 | 17.0 | 22.0 | 19.0 | 11.0 |
| | | | s | 20.0 | 10.0 | 8.0 | 13.0 | 12.0 | 8.0 |
| | | | l | 22.0 | 21.0 | 14.5 | 18.0 | 17.0 | 9.5 |
| Pacific Ocean | ♂ | 81.0 | s | 18.0 | 8.0 | 5.8 | 11.0 | 11.0 | 8.0 |
| | | | l | 16.0 | 14.0 | 8.0 | 12.0 | 11.0 | 7.0 |
| Lolowau, Nias | ♂ | 74.0 | s | 11.0 | 6.0 | 4.0 | 8.0 | 8.0 | 5.0 |
| | | | l | 16.0 | 10.0 | 6.0 | 12.0 | 12.0 | 8.0 |
| W. Ceram | ♂ | 87.0 | s | 14.0 | 8.0 | 5.4 | 10.0 | 10.0 | 6.0 |
| | | | — | 10.0 | 9.0 | 5.0 | 9.0 | 9.2 | 7.0 |
| ov. | ♀ | 70.0 | l | 5.2 | 4.2 | 2.7 | 4.3 | 5.2 | 3.7 |
| | | | s | 4.7 | 3.0 | 2.0 | 4.2 | 5.0 | 3.5 |

1) l = larger leg, s = smaller leg.

The third leg reaches with about $\frac{1}{3}$ to $\frac{1}{2}$ of the propodus beyond the scaphocerite; it is rather heavily built. The dactylus bears a small lobe at the posterior margin slightly before the apex. The propodus is somewhat more than twice as long as the dactylus. The carpus measures $\frac{2}{3}$ of the length of the propodus. The merus is distinctly longer than the propodus. The ischium is about half as long as the merus. The fifth leg reaches to or slightly beyond the scaphocerite. The relations between the joints are as in the third leg, though the fifth is more slender. Of the last three pereiopods of the adult male all joints, even the dactylus, are provided with numerous horny scale-shaped spinules. In large females too traces of these scales are visible. Furthermore there are also the usual spinules along the posterior margin of the propodus, and the transverse rows of hairs in the distal part of the propodus of the fifth leg. These latter rows of hairs are placed close together so as to form a bushy organ at the end of the propodus.

The pleopods and uropods are normal in shape. The uropodal exopod sometimes is slightly longer, sometimes slightly shorter than the endopod.

The eggs are numerous and small, they are 0.45 to 0.6 mm in diameter.

Coutière (1901), came to the conclusion that the separation of the Malay species *Palaemon lepidactyloides* De Man, from the East African *Palaemon lepidactylus* Hilgendorf is not justified. One by one he discusses the 5 characters mentioned by De Man (1892) for separating the two forms. These five characters are:

1. The rostrum of *P. lepidactylus* reaches the end of the antennular peduncle, while in *P. lepidactyloides* it does not overreach the second segment of that peduncle.
2. The first tooth of the rostrum of *P. lepidactylus* is situated in the anterior third of the carapace, in *P. lepidactyloides* it stands on the middle of the carapace.
3. The fingers of the large chela in *P. lepidactylus* are much longer than the palm, in the other

species the fingers and the palm are of about equal length. The fingers of the former bears very feeble teeth, while the teeth of the latter are strong.

4. The spinulation of the two sides of the palm of the large chela are similar in *P. lepidactylus*, different in *P. lepidactyloides*.

5. The exopod of the uropod is larger than the endopod in *P. lepidactylus*, smaller in *P. lepidactyloides*.

Coutière showed that the length of the rostrum in his specimens was variable, that it sometimes overreached the peduncle, but generally did not extend beyond the second segment. In my material too the length of the rostrum is variable, but generally is shorter than that of the Madagascar specimens, as it never reaches beyond $\frac{3}{4}$ of the length of the distal segment of the peduncle. The character, however, is insufficient to be used for separating species. The curvature of the rostrum is variable in both species and it thus can not be used as a specific character, at least many of my specimens show the curvature figured by Coutière. I only should like to remark that in none of my specimens the rostrum is so deep as figured by Coutière (1901, pl. 10 fig. 1); in Hilgendorf's (1878, pl. 4 fig. 15) figure, however, the rostrum is much narrower.

The second point can not be explained by Coutière as in his material from Madagascar the relation between the length of that part of the carapace which bears rostral teeth and the entire length of the carapace (rostrum excluded), varies between $\frac{1}{3.1}$ to $\frac{1}{4.4}$. In all my material from the Malay Archipelago and Oceania this relation varies between $\frac{1}{2.2}$ and $\frac{1}{2.6}$, while also the specimen from the Philippines mentioned by Cowles (1915) has this relation $\frac{1}{2.6}$. This difference thus seems to be very constant, and I can not agree with Coutière in considering it of minor importance. In combination with some other differences I think it of specific value.

The three other points indeed are of no value as Coutière pointed out. The dentition of the fingers of the large chela of the adult male varies in both the East African and the Malay specimens in the same way, which also is shown by my material. The relation between the length of the uropodal endo- and exopods is variable, which is already pointed out above for my Malay specimens, while Coutière showed the variability in the East African specimens.

The main difference between the two forms thus lies in the distance over which the dorsal teeth of the rostrum continue on the carapace. A further difference is the fact that the rostrum generally is somewhat longer in the East African specimens, though this is of very little importance. A third character is the fact that in *M. lepidactylus* the number of dorsal teeth of the rostrum placed on the carapace is smaller (3-5) than that number (5-7) in the present species from the Malay Archipelago. Furthermore the carpus of the large chela of the adult male is as long as or even shorter than the merus in *M. lepidactylus*, while in the eastern form it constantly is somewhat longer than the merus. As no material of *P. lepidactylus* from E. Africa is at my disposal, it is possible that more differences may be found between the two species. It is to be regretted that Coutière in his extensive report on *P. lepidactylus* does not give the relations between the various joints of the second legs of his material.

Palaemon hirtimanus of Olivier undoubtedly is identical with *Palaemon lepidactyloides* De Man, as is shown by the description of Olivier (1811) and the figure of Latreille (1818). De Man (1892) gave additional details (e.g., the measurements of the joints of the second legs) of Olivier's types, which also agree with my specimens of *P. lepidactyloides*. It is to be regretted that De Man gave no more details about the specimens and also did not figure them. That *P. hirtimanus*

is not identical with *P. lepidactylus* is shown by the situation of the rostral teeth on the carapace and by the fact that the carpus of the larger leg of the male is longer than the merus. Also J. R o u x's (1934) specimens, which he considered to be *Palaemon hirtimanus* from Mauritius are in good agreement with my material.

The largest specimen labelled "Indian Archipelago" (Museum Leiden) lacks the oral parts (only the left maxillula is still present). These oral parts obviously have been dissected by W. d e H a a n for examination and are figured by him on pl. P of the volume on the Crustacea of Fauna Japonica as *Palaemon hirtimanus*; the shape of the above mentioned maxillula perfectly agrees with that figured by D e H a a n. The oral parts themselves are no longer extant in the collections of the Leiden Museum. Though of many other species of Crustacea the oral parts dissected by Dr. d e H a a n still are present, being dry and pasted on cardboard, none of those of the Palaemonidae could be found.

The above specimens from Maumere, Flores (Museum Leiden) have been mentioned by D e M a n (1893) under the name *Palaemon placidulus*; examination of this material showed that it in reality belongs to *M. hirtimanus*. Among the specimens identified by D e M a n (1892) as a new species *Palaemon placidulus*, there are several specimens (mostly females and juveniles) which belong to *M. hirtimanus*, as is shown by the shape of their first legs and the scaphocerite; these specimens came from Ndonga and Lela Rivers, Flores. In the same paper D e M a n (1892) described and figured a form, of which ovigerous females were at his disposal. He thought these specimens possibly to be identical with *M. placidulum*. In the material at hand only one of these females is present, it distinctly shows to be *M. hirtimanus*.

The specimen from Batumerah, Amboina and some of those from Tuba River, W. Ceram, identified by J. R o u x (1923) as *Palaemon lepidactylus* var. *lepidactyloides* (= *M. hirtimanus*) in reality belong to *M. placidulum*.

Distribution. The present species lives in fresh water. It occurs in Oceania and the Malay Archipelago and extends westwards to Réunion and Mauritius; on Madagascar and in E. Africa it seems to be replaced by *M. lepidactylus*. The records in literature are: Indopacific region (S h a r p, 1893), Réunion (A. M i l n e E d w a r d s, 1862), Marsouins River, Réunion (J. R o u x, 1934), Mauritius (H. M i l n e E d w a r d s, 1837; D e M a n, 1892; S h a r p, 1893), Tamarind Falls, Mauritius (W a r d, 1942), Rodriguez (M i e r s, 1879), Indian Ocean (O l i v i e r, 1811; L a m a r c k, 1818; H. M i l n e E d w a r d s, 1837, 1838; W h i t e, 1847), Malaysian Region (M i e r s, 1880), Sisiman, Bataan Province, Luzon (C o w l e s, 1915; E s t a m p a d o r, 1937), Tomohon River near Manado, N. Celebes (S c h e n k e l, 1902), Palopo, Central Celebes (D e M a n, 1892), Batjan, N. Moluccas (J. R o u x, 1923), Riuapa and Tuba Rivers and rivulet near Honitetu, Ceram, S. Moluccas (J. R o u x, 1923), Kambera River and Mao Marru, Sumba, Lesser Sunda Islands (J. R o u x, 1928a), Flores (V o n M a r t e n s, 1876), Raka-mbaha, W. Flores (D e M a n, 1892), Rana Mesè, W. Flores (J. R o u x, 1929), Ndonga River near Ende, and Lela River near Sikka, S. Flores (D e M a n, 1892), Maumere, E. Flores (D e M a n, 1892), Besar Island (= Groot Bastaard) near E. Flores (D e M a n, 1893), Fiji (O r t m a n n, 1891).

Macrobrachium placidum (De Man) (fig. 51b)

Palaemon (*Macrobrachium*) *placidus* De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 483, pl. 28 fig. 46.

Palaemon (Macrobrachium) placidus Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 488.

Palaemon (Macrobrachium) placidus J. Roux, 1932, Arch. Hydrobiol., suppl. vol. 11, pp. 566, 572.

Museum Leiden

Java. — 4 specimens (1 ovigerous female) 44-71 mm.

Indian Archipelago. — 4 specimens 63-78 mm.

Indonesia. — 1 specimen 76 mm.

Locality unknown. — 1 specimen 63 mm.

Museum Amsterdam

Kajutanam, N. of Padang, W. Sumatra; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidus* De Man. — 7 specimens 39-81 mm.

The present species is closely related to *Macrobrachium hirtimanus*, which it resembles in almost all characters. The main differences between the two species may be found in the shape of the second legs of the adult male. In *M. hirtimanus* the palm of the smaller second leg is about as long as broad (the relation length/height varying in adult males between 1.22 and 1.25, in young specimens becoming 1.5), in *M. placidum* it is about twice as long as broad (varying in old specimens between 2.0 and 2.3, in young specimens becoming 2.5). Also the relations between the joints of this leg are different, so the fingers are about as long as the palm (in *M. hirtimanus* the fingers are 1.5 times to twice as long as the palm). Also the palm of the larger second leg in *M. hirtimanus* is less elongate than in *M. placidum*. The shape and the formula of the rostrum is the same in the two species, just like the situation of the hepatic and antennal spines, the smoothness of the carapace and the abdomen, the shape of the telson, the eyes, antennulae and antennae. The first tooth of the rostrum is separated from the posterior margin of the orbit by $\frac{1}{2.0}$ to $\frac{1}{2.4}$ of the total length of the carapace. The oral parts of the present species are typical. The first legs (fig. 51b) reach about with $\frac{3}{4}$ of the length of the carpus beyond the scaphocerite, being thus longer than in *M. hirtimanus*. The last three legs much resemble those of *M. hirtimanus*, but they generally are shorter, the third reaches only with the dactylus beyond the scaphocerite. The second legs are built on the same plan, but never seem to develop such high palms as in *M. hirtimanus*. The measurements (in mm) of the various joints of the second pereopods of my material are given here:

| material | body-length | sex | leg ¹⁾ | fingers | palm | | carpus | merus | ischium |
|--------------------|-------------|-------|-------------------|---------|--------|--------|--------|-------|---------|
| | | | | | length | height | | | |
| Indian Archipelago | 78 | ♂ | l | 24.0 | 25.0 | 10.0 | 22.0 | 18.0 | 12.0 |
| | | | s | 17.5 | 16.0 | 7.0 | 18.0 | 15.0 | 11.0 |
| | 74 | ♂ | l | 23.0 | 22.5 | 10.5 | 21.0 | 16.0 | 12.0 |
| | | | s | 17.5 | 15.0 | 7.5 | 17.0 | 14.0 | 9.0 |
| | 63 | ♂ | l | 18.0 | 17.5 | 8.0 | 17.0 | 14.0 | 9.5 |
| | | | s | 13.0 | 11.0 | 5.0 | 12.0 | 10.0 | 7.0 |
| 64 | ♂ | s | 14.0 | 12.5 | 6.0 | 13.5 | 11.5 | 8.0 | |
| Indonesia | 76 | ♂ | l | 20.0 | 22.0 | 9.0 | 20.0 | 17.0 | 11.5 |
| Locality unknown | 63 | ♂ | l | 13.0 | 14.0 | 6.5 | 14.0 | 12.0 | 7.0 |
| | | | s | 10.0 | 9.0 | 4.5 | 10.5 | 10.0 | 7.0 |
| Kajutanam | 81 | ♂ | l | 21.8 | 21.1 | 8.0 | 22.5 | 17.0 | 11.0 |
| | | | s | 16.0 | 16.0 | 7.0 | 18.0 | 15.0 | 10.0 |
| | 59 | ♂ | l? | 21.0 | 18.0 | 8.0 | 21.0 | 14.0 | 9.0 |
| | | | l | 15.0 | 15.0 | 7.0 | 15.0 | 13.0 | 9.0 |
| | 56 | ♂ | s | 10.0 | 10.0 | 4.0 | 11.0 | 10.0 | 7.0 |
| | | | ♀ | — | 6.0 | 5.5 | 2.5 | 10.0 | 6.7 |
| | 46 | ♂ | ? | 4.0 | 3.8 | 1.6 | 6.3 | 4.6 | 4.4 |
| | 48 | ov. ♀ | — | 6.0 | 4.5 | 2.3 | 8.5 | 6.0 | 5.2 |

1) l = larger leg, s = smaller leg.

In the females and the young males the second legs are equal in shape and size. The fingers close over their entire length and have the cutting edges provided with some three denticles in the proximal part. All the joints are slender and beset with numerous spinules. A transverse blue band is visible over the fingers of the second legs. The spinulation of the last three legs is already visible in young specimens and in females.

The eggs are numerous and small, they are 0.5 to 0.6 mm in diameter. The ovigerous female is 48 mm long.

It is to be regretted that no adult males are present in the material from Java (Museum Leiden), the females, however, possess sufficient characters to make their identification certain.

Though the present species is closely related to *M. hirtimanus*, the differences offered seem to be constant enough to be of specific value. The species more or less forms a transition between *M. hirtimanus* and *M. placidulum*.

The specimens from Kajutanam (Museum Amsterdam) are the types of the present species.

Distribution. The species lives in fresh water. It has been recorded only from W. Sumatra, in the region of Padang: Kajutanam, N. of Padang (De Man, 1892), Airmantjur near Singalang mountain (Nobili, 1900), near Padang (J. Roux, 1932).

Macrobrachium placidulum (De Man) (fig. 51c)

?*Palaemon spinimanus* Latreille, 1818, Tabl. encycl. méth., vol. 24, p. 5, pl. 319 fig. 1.

Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1892, Weber's Zool. Ergebn., vol. 2, p. 489, pl. 28 fig. 48.

Palaemon (*Macrobrachium*) *placidulus* p.p. De Man, 1893, Notes Leyden Mus., vol. 15, p. 305.

?*Palaemon* (*Macrobrachium*) *placidulus* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 490.

Palaemon (*Macrobrachium*) *placidulus* De Man, 1915, Zool. Jb. Syst., vol. 38, p. 444.

Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1917, Nova Guinea, vol. 5, p. 601.

Palaemon (*Macrobrachium*) *lepidactylus lepidactyloides* p.p. J. Roux, 1923, Capita Zool., vol. 2, pt. 2, p. 11.

Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1928a, Treubia, vol. 10, p. 219.

Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1933, Rés. sci. Voy. Pr. Belg. Ind. or., vol. 3, pt. 14, p. 7.

Palaemon (*Macrobrachium*) *placidulus* J. Roux, 1934a, Rev. Suisse Zool., vol. 41, p. 218.

Siboga Expedition

Station 33, River near Pidjot, Lombok; March 25, 1899. — 1 specimen 54 mm.

River near Station 114, entrance to Kuandang Bay, N. Celebes; June 9-11, 1899. — 1 specimen 52 mm.

Station 131, Beo, Talaud Islands; reef exploration; depth 13 m; bottom mud and sand; July 24 and 25, 1899. — 1 specimen 38 mm.

Museum Leiden

Wukur River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 4 specimens (2 ovigerous females) 34-38 mm.

Besar Island (= Groot Bastaard), off N. E. Flores; 1891; leg. H. ten Kate. — 10 specimens (9 ovigerous females) 40-52 mm.

Celebes; April 18, 1878; leg. C. B. H. von Rosenberg. — 2 specimens 52 and 55 mm.

Hollandia, N. New Guinea; May 19, 1911; Dutch N. New Guinea Expedition 1910-1911. — 2 specimens 44 and 52 mm.

Museum Amsterdam

- Pajeti, Sumba. — 5 specimens 33-39 mm.
 Raka-mbaha (= Mbawa), S. Flores; river above waterfall; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 3 specimens (1 ovigerous female) 21-37 mm.
 Ba River, W. of Ende, S. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 2 specimens (1 ovigerous female) 31 & 38 mm.
 Lela River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 15 specimens (13 ovigerous females) 26-35 mm.
 Wukur River near Sikka, S. E. Flores; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 20 specimens (13 ovigerous females) 19-39 mm.
 Koinino River near Kupang, Timor; 1888-1889; leg. A. Wichmann; cotype of *Palaemon placidulus* De Man. — 1 ovigerous female 31 mm.
 River near Palopo, Luwu, Central Celebes; 1888-1889; leg. M. Weber; cotype of *Palaemon placidulus* De Man. — 1 ovigerous female 43 mm.
 Bangkalan River, Salajar, off S. W. Celebes; 1888-1889; leg. M. Weber; cotypes of *Palaemon placidulus* De Man. — 4 specimens (1 ovigerous female) 35-44 mm.
 Tuba River, W. Ceram; February, 1910; leg. L. F. de Beaufort. — 11 specimens 34-53 mm (1 specimen bopyrized).
 Batumerah, Amboina; December 6, 1909; leg. L. F. de Beaufort. — 1 specimen 24 mm.
 Waitjiri River, N. New Guinea, 2° 26.5 S, 140° 34.5 E; May 23, 1903; Dutch New Guinea Expedition, 1903. — 5 specimens (2 ovigerous females) 27-37 mm.

The present species is closely related to both *M. hirtimanus* and *M. placidum*. It has with these species in common the narrow and straight rostrum, which reaches to the end of the second, or at most to the end of the third segment of the antennular peduncle, the rostral formula $\frac{4-6}{1-2} \frac{11-12}{1-2}$ also is the same, while the dorsal teeth of the rostrum begin slightly before the middle of the carapace (the relation between the length of the toothed part of the rostrum and the length of the entire rostrum varies in the present species between $\frac{1}{2} \cdot 0$ and $\frac{1}{2} \cdot 4$). The carapace always is smooth. The hepatic spine is placed rather close behind the antennal spine, on a lower level, but the distance between the two spines is rather variable.

The abdomen and telson have the same shape as those of the two previous species, just like the eyes and antennulae.

The scaphocerite is about 2.5 times as long as broad, it has the outer margin somewhat concave and ending in a strong tooth, which almost reaches the end of the lamella, which is more rounded and not so much produced as in *M. hirtimanus* and *M. placidum*.

The oral parts are typical.

The first pereiopods (fig. 51c) reach with part of or with the entire carpus beyond the scaphocerite. The fingers are as long as the palm, the carpus is somewhat less than twice as long as the chela and is 1.5 (in old males) to 1.25 times as long as the merus. The adult male has (like in the two previous species) the second legs very unequal. The shape of these legs has already been extensively described and figured by De Man (1892). I give here some measurements (in mm) of the joints of the second legs in my material:

| material | body-length | sex | leg 1) | fingers | palm | | carpus | merus | ischium |
|---------------|-------------|-------|-----------|---------|--------|--------|--------|-------|---------|
| | | | | | length | height | | | |
| Salajar | 44.0 | ♂ | l | 9.0 | 15.0 | 6.0 | 13.0 | 10.2 | 6.2 |
| | | | s | 9.3 | 10.0 | 4.5 | 11.0 | 9.0 | 6.7 |
| | 35.0 | ♀ | l | 4.2 | 4.2 | 2.3 | 4.6 | 4.8 | 4.2 |
| | | | s | 3.2 | 3.7 | 1.2 | 3.8 | 4.8 | 3.2 |
| Siboga Sta.33 | 54.0 | ♂ | l | 12.7 | 18.0 | 7.0 | 15.5 | 13.5 | 8.7 |
| | | | s | 11.0 | 13.0 | 6.0 | 14.0 | 12.0 | 8.0 |
| Celebes | 61.0 | ov. ♀ | ? | 6.7 | 4.9 | 2.1 | 5.8 | 6.2 | 5.5 |
| | | | ♂ | l | 11.0 | 19.5 | 7.2 | 16.0 | 14.0 |
| Hollandia | 56.0 | ♂ | s | 11.0 | 13.5 | 6.0 | 14.5 | 12.0 | 8.5 |
| | | | ♂ | s | 10.5 | 12.0 | 5.0 | 13.0 | 10.0 |
| Wukur River | 44.0 | ♂ | s | 8.0 | 9.5 | 4.2 | 10.5 | 9.0 | 7.0 |
| | | | ♂ | l | 6.0 | 10.0 | 4.5 | 7.2 | 6.5 |
| | 33.0 | ov. ♀ | l | 3.8 | 4.8 | 2.2 | 4.8 | 4.0 | 3.2 |
| | | | s | 3.2 | 3.1 | 1.2 | 4.0 | 3.5 | 3.5 |
| | 37.0 | ♂ | l | 8.0 | 11.6 | 4.5 | 10.5 | 8.0 | 6.0 |
| | | | s | 7.0 | 8.0 | 3.3 | 8.5 | 7.2 | 4.6 |
| Besar Island | 52.0 | ♂ | l | 13.0 | 17.0 | 6.2 | 17.0 | 14.0 | 10.0 |
| | | | s | 9.0 | 10.8 | 4.7 | 12.0 | 10.5 | 7.8 |
| Pajeti | 39.0 | ♂ | s | 7.0 | 7.2 | 3.2 | 7.3 | 6.0 | 5.0 |
| Raka-mbaha | 38.0 | ov. ♀ | l | 5.3 | 7.0 | 2.9 | 5.4 | 5.2 | 4.2 |
| | | | s | 4.1 | 4.0 | 1.5 | 5.0 | 5.0 | 4.0 |
| Palopo | 43.0 | ov. ♀ | s? | 6.0 | 5.0 | 2.8 | 7.0 | 7.0 | 4.5 |

1) l = larger leg, s = smaller leg.

The third pereopod reaches with the dactylus, or at most with a small part of the propodus beyond the scaphocerite, while the fifth leg largely fails to reach the end of that scale. The relation between the various joints is like that in the two previous species, while all three pairs of legs in the males as well as in the females are covered with scale-shaped tubercles. Behind the apex of the dactylus a lobiform process is visible, which may be compared with a similar structure found in *Palaemon paucidens* De Haan (vid. p. 73), and which also is found in *Macrobrachium hirtimanus* and *M. placidum*.

The pleopods and uropods are normal in shape.

The eggs are numerous and small, their diameter varies between 0.5 and 0.7 mm.

Though the differences in the second legs of the adult males of *Macrobrachium hirtimanus*, *M. placidum*, and *M. placidulum* seem to be constant, so that the males of these three species easily may be separated, it is extremely difficult to find constant differences between the females and the young specimens. *M. placidum* and *M. placidulum* have the last three pairs of pereopods shorter than those of *M. hirtimanus*. *M. placidulum* may be separated from the two other species by the more rounded anterior margin of the scaphocerite and by the very long first legs, which reach with almost the entire carpus beyond the scaphocerite, while also the hepatic and antennal spines generally are placed closer together than in the other forms. Further in females of *M. placidum* the carpus of the second legs is distinctly longer than the merus, while in *M. hirtimanus* and *M. placidulum* the merus is as long as or longer than the carpus. The females of *M. placidulum* have the second pereopods unequal in strength, while they are equal in *M. hirtimanus*. Each of the characters mentioned here

is rather vague, but together they form a strong indication for the identity of female and young specimens, especially the character of the long and slender first legs of *M. placidulum* is constant and is of large value.

Among the typematerial of *P. placidulus* some specimens (ovigerous females and juveniles) of *M. hirtimanus* were present, namely all specimens reported by De Man under the name *P. placidulus* from Ndonga River, Flores and 2 ovigerous females from Lela near Sikka, Flores. Also the material from Maumere, E. Flores assigned by De Man (1893) to the present species certainly does not belong here, but is *M. hirtimanus*. This material consists of 4 ovigerous females and one young male (not 5 ovigerous females as De Man incorrectly states). The specimens from Amboina and part of those from Tuba River, W. Ceram reported upon by J. Roux, 1923, as *Palaemon lepidactylus* var. *lepidactyloides* do not belong to *M. hirtimanus*, but to the present species. All these incorrect identifications are due to the large resemblance between the females of *M. hirtimanus* and *M. placidulum*, which, to enlarge the difficulties, often are found together in one locality. The difference in the shape of the first leg made it possible for me to separate the two forms in my material.

Distribution. The species lives in fresh water, though the record from Sta. 131 of the Siboga Expedition, if correct, seems to indicate that it sometimes is found near the coast in salt water; there is a possibility, however, that the label of the material from that Station is not correct and that the material was found in a river near Beo, Talaud Islands. *Macrobrachium placidulum* is recorded in literature from: Lolomboli, Nias? (Nobili, 1900), Pajeti, Sumba (J. Roux, 1928a), Raka-mbaha, S. Flores (De Man, 1892), Ba River near Ende, S. Flores (De Man, 1892), Lela and Wukur Rivers near Sikka, S. Flores (De Man, 1892), Besar Island, off N.E. Flores (De Man, 1893), Timor (De Man, 1893), Koinino River, near Kupang, Timor (De Man, 1892), Palopo, Luwu, Central Celebes (De Man, 1892), Bangkalan River, Salajar (De Man, 1892), Tuba River, Ceram (J. Roux, 1923), Batumerah, Amboina (J. Roux, 1923), Sorong, Doom Island, off N.W. New Guinea (J. Roux, 1933), Waitjiri River, N. New Guinea (J. Roux, 1917), Hollandia, N. New Guinea (De Man, 1915), Likding, New Hannover (J. Roux, 1934a).

Macrobrachium oenone (De Man)

Palaemon (*Macrobrachium*) *oenone* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 784, pl. 25 fig. 49.

Palaemon (*Macrobrachium*) sp. De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 791.

Palaemon (*Macrobrachium*) *oenone*? De Man, 1915, Zool. Jb. Syst., vol. 38, p. 439, pl. 29 fig. 15.

Palaemon (*Macrobrachium*) *oenone papuana* J. Roux, 1927, Nova Guinea, vol. 15, p. 324, fig. 2.

Museum Leiden

Kau River, Halmahera; 1893-1894; leg. W. Kükenthal; cotype of *Palaemon oenone* De Man. — 1 specimen 52 mm.

Museum Amsterdam

Kau River, Halmahera; 1893-1894; leg. W. Kükenthal; cotype of *Palaemon oenone* De Man (♂ no. 5). — 1 specimen 45 mm.

The present species has been extensively described and figured by De Man. It is closely related to *M. cowlesi* and *M. esculentum*, but the relations between these three species are not yet very clear. Of each form only a small number of specimens is known, which makes it very difficult to get a clear conception of the variability of the various characters.

I have only two specimens at my disposal; of one of these (the specimen of the Leiden Museum) the larger second leg is missing, so that I can add very little to make the situation clearer.

De Man (1915) mentioned an aberrant form from New Guinea, which was made by J. Roux (1927) the type of a new variety. This variety should differ from the typical form only in the shorter fingers of the large chela, which moreover should lack the anastomosing grooves. Furthermore the fingers of the smaller leg are not gaping, but are almost entirely closed.

The specimen of the Amsterdam Museum, which is the male no. 5 of De Man's type material of *Palaemon oenone*, is intermediate between the typical form from Kau as figured by De Man (1902) and the var. *papuana*, by having the second legs like in the var. *papuana*, but they indeed bear the anastomosing grooves on the fingers of the larger leg. Now the typical specimens of *M. oenone* are much smaller than the Papuan specimens, so that it is possible, as is also supposed by De Man, that these differences only are due to differences of age. I consider therefore the two forms as one species until more material may decide in this question. Also De Man's (1902) *Palaemon* (*Macrobrachium*) sp. in all probability must be placed here.

Distribution. The present species lives in fresh water and is reported from: Kau, Saluta and Soakonora, N. Halmahera (De Man, 1902), Pioneer Bivouac, Mamberamo River, N. New Guinea (J. Roux, 1927), tributary of the lower Sermowai River, N. New Guinea (De Man, 1915).

Macrobrachium cowlesi nov. spec.

Palaemon sp. Cowles, 1915, Philipp. Journ. Sci., vol. 9 sect. D, p. 397, pl. 3 fig. 11,

This species, which is closely related to *M. oenone* and *M. esculentum*, has been extensively described and figured by Cowles (1915). It is characterized by the curious pubescence of the palm of the large, and sometimes also of the smaller second leg. In *M. oenone* the palm, apart from some widely scattered hairs, is naked, in *M. esculentum* the entire palm is covered with woolly hairs, in *M. cowlesi*, however, the palm is naked except for two large patches of hairs in the proximal portion. Now the pubescence of the large chelae in the present genus is remarkably constant within the species, and therefore we safely may consider these three forms to be three distinct species. But as already pointed out under *M. oenone*, more material is needed to disclose the real relations between these species.

Distribution. *Macrobrachium cowlesi* is known only from 2 specimens from the Manila water supply (Luzon, Philippines).

Macrobrachium esculentum (Thallwitz)

Palaemon esculentus Thallwitz, 1891, Zool. Anz., vol. 14, p. 98.

Palaemon dulcis Thallwitz, 1891, Zool. Anz., vol. 14, p. 99.

Palaemon esculentus Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 18, pl. 1 fig. 1.

Palaemon dulcis Thallwitz, 1892, Abh. zool.-anthrop. Mus. Dresden, 1890-91 pt. 3, p. 18, pl. 1 fig. 2.

non? *Palaemon* (*Macrobrachium*) *dulcis* Nobili, 1900, Ann. Mus. Stor. nat. Genova, vol. 40, p. 490.

Palaemon (*Macrobrachium*) *esculentus* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 784.

Palaemon dulcis De Man, 1915, Zool. Jb. Syst., vol. 38, p. 443.

Thallwitz (1892) described and figured two species of the present genus from N. Celebes under the names *Palaemon esculentus* and *P. dulcis*. De Man (1902 and 1915) gave additional details of the types of both these species. The only difference between them may be found in the

shape of the second legs. In *P. dulcis* the fingers are shorter than the palm, in *P. esculentus* longer. Now the character of the relative length between the fingers and the palm of the large chelipede is very variable in this group, as we have seen for instance in *M. oenone*. As no other differences are found, the two forms, in my opinion, must be considered synonymous, the more as they originate from the same locality. Examination of more material is badly needed.

The loose chela from Buabua (Sumatra) referred by Nobili (1900) to *Palaemon dulcis*, does not belong here as the palm is naked. I can not make out, however, to which species that chela belongs.

Distribution. The present species is only known from Thallwitz's specimens which originate from North Celebes.

Macrobrachium geron nov. spec. (fig. 52)

Museum Leiden

Banka, E. of Sumatra; 1867; leg. J. A. Buddingh. — 1 specimen 61 mm.

Of this species only an adult male is at my disposal. The description of this specimen runs as follows:

The rostrum (fig. 52a) is directed straight forwards, it reaches slightly beyond the middle of the third segment of the antennular peduncle, and is, when compared with that of *M. hirtimanus*, rather high. The upper margin bears 11 teeth, the proximal of which are placed farther apart than the distals. Three of the upper teeth are placed behind the orbit, while the fourth is situated just above the posterior orbital margin. The upper margin of the rostrum is somewhat convex. The lower margin bears four teeth in the distal half. The carapace is scabrous by the presence of many small tubercles, which are most distinct in the anterolateral angles of the carapace. The hepatic spine is somewhat smaller than the antennal and is placed slightly below and distinctly behind the latter, which posteriorly continues in a short carina; the two spines do not lie in one line.

The abdominal segments are smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth are narrower. The fifth pleura ends in a blunt apex. The sixth segment is about 1.5 times as long as the fifth.

The telson is about 1.5 times as long as the sixth abdominal segment. The two dorsal spines of the telson are placed in the middle and at $\frac{3}{4}$ of the length of the telson. The posterior margin ends in a sharp median point, which is flanked by two pairs of spines, the inner of which is long and slender, distinctly overreaching the apex of the telson, the outer is very short. Numerous setae are present between the inner spines.

The eyes are normal in shape, just like the antennules.

The scaphocerite (fig. 52b) is about twice as long as broad. The outer margin is straight (or slightly convex in the basal part). The final tooth is strong, but just fails to reach the rounded apex of the lamella.

The oral parts are typical, as far as I can control without damaging the only specimen at my disposal.

The first pereiopod is slender, it reaches with half the carpus beyond the scaphocerite. The fingers are as long as the palm. The carpus is slightly less than twice as long as the chela, and about $\frac{4}{3}$ as long as the merus. The ischium is slightly more than half as long as the merus. The second

pereiopods are very unequal. In my specimen the right leg (fig. 52c) is much stronger than the left, it reaches with the larger part of the carpus beyond the scaphocerite. The fingers of the larger leg measure $\frac{3}{4}$ of the length of the palm. In the basal part of the finger the surface bears some spines, furthermore both fingers have their surfaces thickly covered with numerous tufts of long and soft

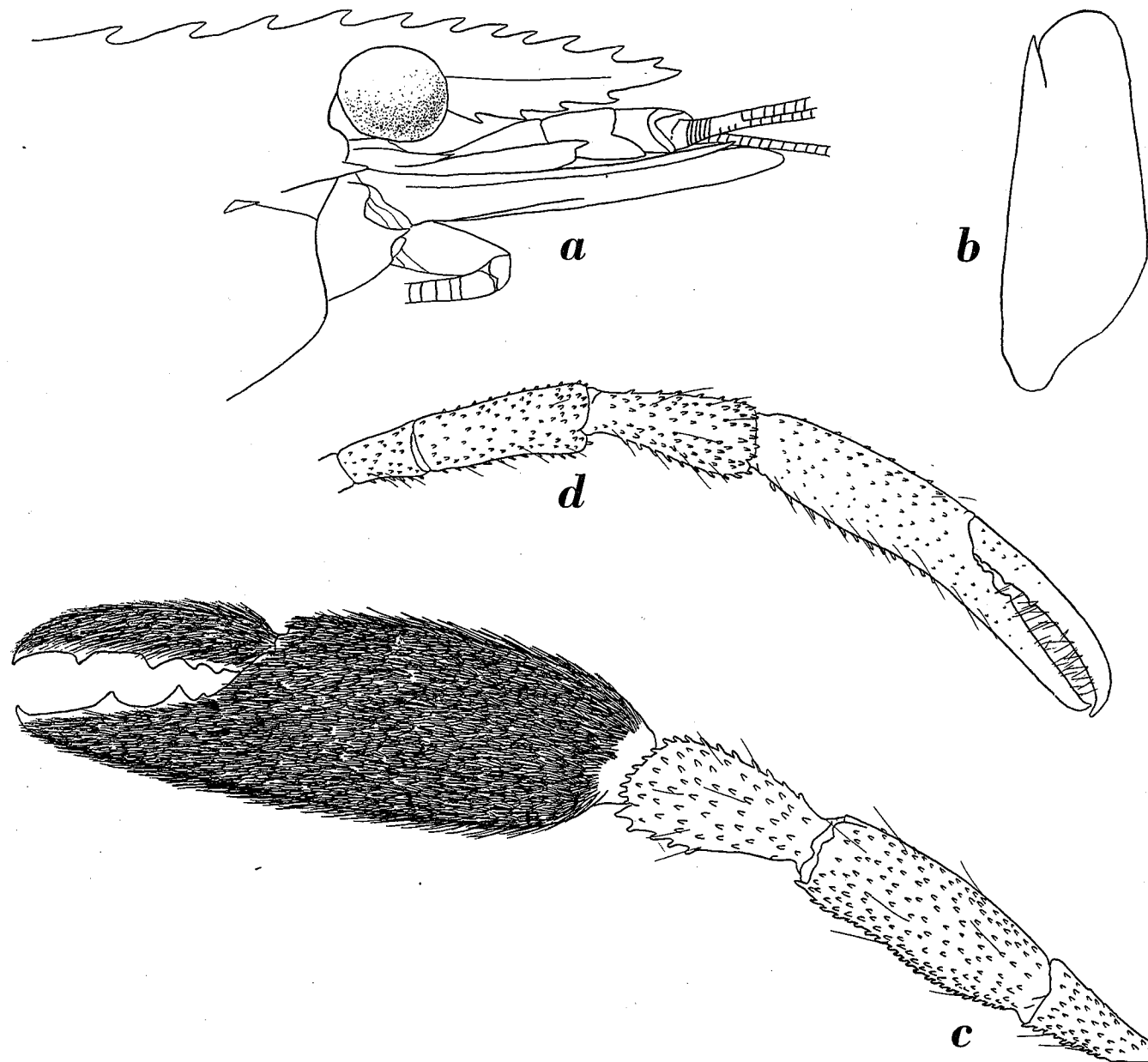


Fig. 52. *Macrobrachium geron* nov. spec. a, anterior part of body in lateral view; b, scaphocerite; c, larger second leg; d, smaller second leg. a, b, $\times 5$; c, d, $\times 3.3$.

hairs, which are placed close together. The cutting edge of the dactylus bears in the extreme proximal part two small teeth; further there are two large teeth on the cutting edge, placed so as to divide the cutting edge into three about equal parts. The fixed finger shows the same armament of the cutting edge; the large teeth of this finger are placed proximally of those of the dactylus. The palm is rather high and compressed, it is about twice as long as high and 1.7 times as high as broad. The entire palm is covered with spinules and with similar long hairs as are present on the fingers. The carpus is about half as long as the palm, it narrows proximally and bears numerous rather strong spines, which are

arranged in more or less distinct rows, the lower spines are stronger than the upper, some scattered stiff hairs are present too, but soft hairs as on the chela are entirely absent. The merus is $\frac{5}{4}$ as long as the carpus, it is provided with similar spines and hairs as the carpus. The ischium measures $\frac{2}{3}$ of the length of the merus, here too hairs and spinules as on the carpus are present. The smaller second leg (fig. 52d) reaches with less than half the carpus beyond the scaphocerite. The fingers are slender and gaping, they are about as long as the palm. Their cutting edge is provided in the proximal half with 4 or 5 teeth, which become larger distally. Inwards directed hairs are present at both sides of the cutting edge (in my specimen not many of these hairs are present, probably they have been lost during the long period, 79 years, of preservation). Small spinules are present in the basal part of the fingers. The palm is about twice as long as broad, it is only slightly compressed, numerous spinules are placed over the whole surface of the palm. The carpus much resembles that of the larger leg, it is $\frac{2}{3}$ as long as the palm, while the merus is about as long as the palm. The ischium is $\frac{2}{3}$ of the length of the merus. Ischium, merus, carpus and palm all are covered with spinules, which are more or less longitudinally arranged, and with some scattered stiff hairs, no soft hairs like those on the palm of the larger leg are present. The last three pereopods are smooth. The third leg reaches with the carpus slightly beyond the end of the antennal peduncle. The other legs are detached and all lack the dactylus and propodus.

The shape of the pleopods and uropods is normal.

The present species is most closely related to *M. oenone*, *esculentum* and *cowlesi*, from all three of which it immediately may be separated by the small number of teeth on the cutting edges of the large chela, from *M. oenone*, *M. hirtimanus*, *M. lepidactylus*, *M. placidum*, and *M. placidulum* by the villose chela and again by the dentition of the fingers of the large chela.

I have ventured to describe this new species after a single specimen, because that specimen is a full grown male and because it is so very characteristic, differing strongly from all other known species.

The trivial name *geron* ($\gamma\epsilon\rho\omega\nu$, greyhead) is chosen on account of the long grey (in my spirit specimen) hairs on the large chela, and at the same time on account of the respectable age of 79 years of the typespecimen.

ADDENDUM

The manuscript of the present paper was finished in 1946, but printing did not start till the end of 1949. I have tried to keep the text as much up to date as possible, and have inserted all species known to me, which were published up to 1950. Since the Zoological Record of 1947 and later could not be consulted by me, the list of species of this subfamily given at the beginning of the present paper necessarily had to remain incomplete as far as the species described after 1946 are concerned. When printing was already in an advanced stage I received Kubo's (1940-1949) papers on the Japanese Palaemonids. The species mentioned therein could still be inserted in the present work, though no extensive discussion of these highly important publications could be made in the text. Tiwari's (1949) papers were received too late to have the new species described therein inserted in the list of all genera and species of Palaemoninae known to me (pp. 6 to 23 of the present paper) and in the key to the species of the genus *Macrobrachium* (pp. 105 to 111). Tiwari's species therefore are enumerated in this addendum:

Macrobrachium Bate

choprai (Tiwari, 1949). Synonym: *Palaemon choprai* Tiwari, 1949. Distribution: N.E. India (Benares, Behar, Assam). Fresh water.

kempi (Tiwari, 1949a). Synonym: *Palaemon kempi* Tiwari, 1949a. Distribution: Chittagong district, Bengal, India. Fresh water.

villosimanus (Tiwari, 1949a). Synonym: *Palaemon villosimanus* Tiwari, 1949a. Distribution: India (Calcutta and Chittagong district), Burma (Rangoon).

Macrobrachium choprai and *M. villosimanus* are closely related to *M. rosenbergii* (De Man), which species they resemble in the shape of the telson and the presence of an elevated basal crest of teeth on the dorsal margin of the rostrum. *M. choprai* may at once be distinguished by the short rostrum, which fails to reach the end of the scaphocerite, and which has the lower margin provided with only 4 to 6 teeth. *M. villosimanus* is characterized by the shape of the second legs of the adult male, which have the carpus as long as, slightly longer, or slightly shorter than the chela, while the fingers of that leg are usually a little less than half as long as the palm. *Macrobrachium kempi* is stated by Tiwari to be very close to *M. hendersoni*; it should differ from that species by having the fingers of the second legs without grooves and pubescence and by possessing a dense pubescence on the inner side of the palm.

N.B. The words carpus, merus, chela, etc., used in the key refer to the joints of the second pereiopods, unless stated otherwise.

INDEX

The generic, subgeneric, specific and subspecific names used in the lists of pp. 6 to 23, and 261, of the present paper are indexed here. Not inserted are the correct names of the species incorrectly assigned to the present subfamily. The subgeneric names are treated in this index as if they are generic names; so for instance *Palaemon* (*Nematopalaemon*) *tenuipes* may be found under *Palaemon tenuipes* as well as under *Nematopalaemon tenuipes*. In the above mentioned lists further references are given to those places in the text, where a species is treated more extensively.

The intention of this index is not only to facilitate finding a certain name used in the present paper, but also to provide an enumeration of every published nomenclatorial combination in which the generic and subgeneric names of this subfamily are involved, as far as they are known to me.

- | | | |
|------------------------------------|-----------------------------------|-----------------------------------|
| <i>Alaocaris antrorum</i> 11 | <i>Bitbynis spinimanus</i> 14 | <i>Eupalaemon lar</i> 16 |
| <i>Allocaris sinensis</i> 10 | <i>sundaicus</i> 14 | <i>lenzi</i> 13/14 |
| <i>Alpheus cogneti</i> 20 | • <i>Brachycarpus advena</i> 12 | <i>longipes</i> 14 |
| <i>margaritaceus</i> 21 | <i>audouini</i> 22 | <i>macrobrachion</i> 16 |
| <i>Anchistia lacustris</i> 10 | <i>biunguiculatus</i> 12 | <i>mariae</i> 15 |
| <i>migratoria</i> 10 | <i>dentatus</i> 21 | <i>multidens</i> 15 |
| <i>Astacus albescens</i> 10 | <i>jamaicensis</i> 12 | <i>nasutus</i> 14 |
| <i>carcinus</i> 13, 18 | <i>laccadivensis</i> 23 | <i>nattereri</i> 13 |
| <i>jamaicensis</i> 13 | <i>neapolitanus</i> 12 | <i>neglectus</i> 15 |
| <i>locusta</i> 6 | <i>savignyi</i> 12 | <i>niloticus</i> 17 |
| <i>serratus</i> 8, 17, 21 | <i>Calmania biunguiculata</i> 12 | <i>nipponensis</i> 17 |
| <i>Bitbynis acanthurus</i> 12 | <i>Cancer armiger</i> 20 | <i>novae-hollandiae</i> 17 |
| <i>amazonicus</i> 12 | <i>caementarius</i> 11 | <i>paucidens</i> 18 |
| <i>appuni</i> 14 | <i>carcinus</i> 13, 18 | <i>philippinensis</i> 16 |
| <i>aztecus</i> 13 | <i>jamaicensis</i> 13 | <i>praecox</i> 18 |
| <i>brasilienis</i> 17 | <i>squilla</i> 8 | <i>reunionnensis</i> 16 |
| <i>ensiculus</i> 12 | <i>Coutierella tonkinensis</i> 10 | <i>ritsemae</i> 15 |
| <i>faustinus</i> 14 | <i>Creaseria morleyi</i> 6 | <i>robustus</i> 15 |
| <i>forceps</i> 12 | <i>Cryphiops caementarius</i> 11 | <i>rosenbergi</i> 18 |
| <i>grandimanus</i> 14 | <i>spinuloso-manus</i> 11 | <i>rudis</i> 18 |
| <i>hendersoni</i> 14 | <i>Desmocariss trispinosa</i> 6 | <i>sintangensis</i> 18 |
| <i>hildebrandti</i> 14 | <i>Eupalaemon acanthosoma</i> 14 | <i>sollaudi</i> 18 |
| <i>jamaicensis</i> 13 | <i>acanthurus</i> 12 | <i>sundaicus</i> 14 |
| <i>jamaicensis vollenhoveni</i> 19 | <i>alcocki</i> 18 | <i>sundaicus baramensis</i> 14 |
| <i>jelskii</i> 15 | <i>cognatus</i> 20 | <i>sundaicus brachydactyla</i> 14 |
| <i>lamarrei</i> 12 | <i>dispar</i> 13 | <i>ustulatus</i> 13 |
| <i>lar</i> 16 | <i>dux</i> 13 | <i>vagus</i> 16 |
| <i>longimana</i> 11 | <i>dux congoensis</i> 14 | <i>venustus</i> 19 |
| <i>longipes</i> 14 | <i>dux tenuicarpus</i> 14 | <i>weberi</i> 19 |
| <i>montezumae</i> 13 | <i>elegans</i> 18 | <i>wolterstorffi</i> 16 |
| <i>nattereri</i> 17 | <i>endebensis</i> 16 | <i>Exopalaemon annandalei</i> 9 |
| <i>nipponensis</i> 17 | <i>foai</i> 14 | <i>carinicauda</i> 9 |
| <i>obionis</i> 17 | <i>idae</i> 15 | <i>macrogenitus</i> 9 |
| <i>olfersi</i> 17 | <i>idae idella</i> 15 | <i>mani</i> 9 |
| <i>paucidens</i> 18 | <i>idae subinermis</i> 15 | <i>modestus</i> 9 |
| <i>savignyi</i> 12 | <i>lanchesteri</i> 16 | <i>orientis</i> 9 |

- Exopalaemon styliferus* 9
Gammarellus armiger 20
Hippolysmata paludosa 10
Hippolyte caroliniana 10
 gracilipes 20
 paludosa 10
Homelys major 19
 minor 19
Leander adspersus 8
 adspersus fabricii 8
 affinis 7
 annandalei 9
 annandalei stylirostris 9
 antennarius 10
 attenuatus 7
 beauforti 7
 belindae 7
 brandti 8
 brasiliensis 10
 brevirostris 20
 capensis 7
 carinatus 9
 celebensis 6
 concinus 7
 cubensis 8
 czerniauskyi 9
 czerniauskyi lacustris 9
 debilis 7
 deschampsii 20
 dionyx 16
 distans 20
 edwardsi 7
 edwardsi brevidigitata 7
 edwardsi helleri 7
 edwardsi brevirostris 7
 edwardsi intermedia 7
 edwardsi prototypa 7
 edwardsi similis 7
 edwardsi simplicior 7
 edwardsi typica 7
 erraticus 6
 exilimanus 7
 fagei 8
 fluminicola 11
 fluviatilis 22
 gardineri 7
 gilchristi 7
 gracilis 7
 gravieri 7
 hammondi 20
 bastatus 9
 imbellis 8
 indicus 20
- Leander intermedius* 20
 japonicus 9
 kempi 6
 latirostris 6
 latreillianus 8
 latreillianus aberrans 8
 latreillianus gigantea 8
 latreillianus intermedia 8
 latreillianus sculpta 8
 latreillianus transitans 8
 latreillianus typica 8
 lepidus 13
 litoreus 20
 longicarpus 7
 longipes 7
 longirostris 7
 longirostris carinatus 9
 longirostris japonicus 9
 longirostris robusta 7
 macrodactylus 7
 macrogenitus 9
 maculatus 8
 mani 9
 minans 8
 miyadaii 7
 modestus 9
 modestus sibirica 9
 natator 6
 northropi 9
 pacificus 7
 pandaliformis 7
 pandaloides 22
 paucidens 8
 paulensis 6
 peringueyi 7
 potamiscus 11
 potitinga 7/8
 quoyanus 7
 rectirostris 8
 rectirostris octodentatus 8
 rectirostris transitans 8
 rectirostris typica 8
 ritteri 8
 semmelinki 9
 serenus 7
 serratus 8
 serratus treillianus 8
 serrifer 8
 serrifer longidactylus 8
 sewelli 8
 squilla 8
 squilla brevidigitata 8
 squilla elegans 8
- Leander squilla intermedia* 8
 squilla prototypa 8
 squilla typica 8
 styliferus 9
 stylirostris 9
 tenuicornis 6
 tenuipes 9
 tenuirostris 6
 treillianus 8
 urocaridella 6
 varians 10
 vulgaris 11
 wieneckeii 6
 xiphias 8
Leandrites celebensis 6
 indicus 6
 stenopus 6
Leptocarpus fluminicola 11
 potamiscus 11
Macrobrachion vid. *Macrobrachium*
Macrobrachium acanthurus 12
 acanthurus panamense
 17
 aemulum 12
 africanum 11
 altifrons 12
 amazonicum 12
 americanum 12
 asperulum 12
 australe 12
 australiense 13
 bariense 13
 borellii 13
 brasiliense 13
 caledonicum 13
 callirhoë 13
 carcinus 13
 cavernicola 13
 chevalieri 13
 choprai 261
 clymene 13
 cowlesi 13
 crenulatum 13
 dayanum 13
 diguetti 13
 dux 13
 equidens 14
 esculentum 14
 faustinum 14
 felicinum 14
 fluviale 14
 foai 14
 formosense 14

- Macrobrachium gangeticum* 21
geron 14
grandimanus 14
hainanense 14
hancocki 14
handschbini 21
hendersoni 14
heterochirus 14
hildebrandti 14
hilgendorfi 16
hirtimanus 15
horsti 15
idae 15
idella 15
iberingi 15
inca 15
insulare 15
jacobsoni 15
jamaicense 13
jamaicense angolense 19
japonicum 15
jaroense 15
javanicum 15
jelskii 15
joppae 15
kempi 261
kiukianense 15
lamarrei 15
lampropus 16
lanceifrons 15
lanceifrons montalbanaense 15
lanchesteri 15
lar 16
latidactylus 16
latimanus 16
lepidactyloides 15
lepidactylus 16
longidigitum 12
longipes 14
lorentzi 16
lujae 16
macrobrachion 16
malcolmsoni 16
mammillodactylus 16
minutum 16
mirabile 16
moorei 16
naso 16
nattereri 17
neglectum 15
niloticum 17
nipponense 17
- Macrobrachium novae-hollandiae* 17
occidentale 17
oenone 17
oenone papuanum 17
obione 17
olfersi 17
palaemonoides 17
panamense 17
patsa 17
petersi 17
petiti 17
pilimanus 17
pilimanus leptodactylus 17
pilimanus malayanus 17
placidulum 17
placidum 17
potiuna 18
praecox 18
pygmaeus 17
quelchi 18
raridens 18
rathbunae 18
rosenbergi 18
rude 18
savignyi 12
scabriculum 18
singalangense 16
sintangense 18
sollaudi 18
sophronicum 18
sulcicarpale 18
superbum 18
surinamicum 18
tenellum 18
transandicum 18
trompi 18
venustum 19
villosimanus 261
vollenhoveni 19
weberi 19
yui 19
zariquieyi 19
- Macroterocheir jamaicensis* 13
jamaicensis herklotsi 19
lepidactylus 16
- Melicerta triliana* 8
- Micropsalis bolcensis* 19
papyracea 19
- Nematopalaemon hastatus* 9
schmitti 9
tenuipes 9
- Palaeander elegans* 8
- Palaeander floridanus* 8
maculatus 8
northropi 9
semmelinki 9
- Palaemon abbotti* 21
acanthosoma 14
acanthurus 12
aciculatus 21
d'acqueti 18
acutirostris 14
adriaticus 20
adspersus 8
aemulus 12
affinis 7, 21
africanus 11, 16
alcocki 18
alphonsianus 12
altifrons 12
amazonicus 12
amboinensis 21
americanus 12
annandalei 9
anophthalmus 19, 22
antennarius 10
appuni 14
appuni aequatorialis 13
armiger 20
asper 17, 22
asperulus 12
asperulus brevirostris 12
audouini 20, 22
australis 12, 13
aztecus 13
bariensis 13
beaupresi 22
belindae 7
bidens 22
bipunctatus 21
biunguiculatus 12
boninensis 15
bonnensis 19
borellii 13
brachydactylus 13
brachylabis 9
brandti 8
brasiliensis 10, 13, 21
brevicarpus 13
brevicarpus heterochirus 19
brevimanus 20
brevirostris 20, 22
brongniarti 21
caementarius 11
caledonicus 13

- Palaemon callirhoë* 13
canaliculatus 22
capensis 7
carcinus 13, 18
carcinus rosenbergi 18
carinatus 9, 22
carinicauda 9
carolinus 11
cavernicola 13
celebensis 6
chevalieri 13
chlorotocus 22
choprai 261
clymene 13
cognatus 20
cognatii 20
colombicus 21
concinus 7
consobrinus 17
coromandelianus 21
crenulatus 21
creusa 22
cubanus 14
cubensis 8
custos 22
cydippe 22
danae 12
dasydactylus 12
dayanus 13
debilis 7
debilis attenuatus 7
delagoae 14
delaseri 22
dentatus 22 (2 ×)
desausuri 17
dieperinki 12
digueti 13
dispar 12
distans 20
diversimanus 22
dolichodactylus 18
dubius 18
dulcis 14
dumerili 22
dux 13
dux congoensis 14
dux tenuicarpus 14
edwardsi 7, 22
electra 22
elegans 8, 18
endebensis 16
ensiculus 12
ensiferus 23
- Palaemon equidens* 14
erraticus 6
esculentus 14
euryrhynchus 16
exilimanus 7
exilipes 10
exul 19
fabricii 8, 19
faustinus 14
flavescens 23
floridanus 8
fluvialis 14, 22
fluviatilis 10, 14, 23
foai 14
forceps 12
formosensis 14
fucorum 23
gangeticus 22
gaudichaudi 11
gladiator 7
glauce 22
gracilimanus 14
gracilirostris 18
gracilis 7
grandimanus 14
gravieri 7
hainanensis 14
hammondi 20
hancocki 7
handschini 21
bastatus 9
bendersoni 14
beterochirus 14
hildebrandti 14
hilgendorfi 16
hirtimanus 15
hispidus 23
horsti 15
horsti brevidigitus 15
hypsa 22
idae 15
idae idella 15
idae inermis 15
idae mammillodactylus 16
idae subinermis 15
iberingi 15
imbellis 8
indicus 20
inermis 22
insularis 15
intermedius 20
jamaicensis 12, 13
jamaicensis africanus 19
- Palaemon jamaicensis angolensis* 19
jamaicensis berklotsi 19
jamaicensis vollenhoveni 19
japonicus 9, 15
jaroensis 15
javanicus 15
jelskii 15
kempi 261
kiukianensis 15
laccadivensis 23
lacustris 10
laevirhincus 23
lagdaoensis 7
lamarrei 15
laminatus 13
lampropus 16
lanceifrons 15
lanceifrons montalbanensis 15
lanchesteri 16
lancifer 23
lar 16
latidactylus 16
latimanus 16
latirostris 6
latreillei 22
leachi 8
lenzi 13/14
lepidactyloides 15
lepidactylus 16
locusta 6
longicarpus 7
longicornis 23
longidigitus 12
longimanatus 23
longimanus 16
longipes 7, 14, 18, 23
longirostris 7, 9
lorentzi 16
lujae 16
luzonensis 9
macrobrachion 16
macrodactylus 7
macrogenitus 9
macrorhynchus 22
maculatus 8
madagascariensis 16
malcolmsoni 16
malliardi 12/13
mani 9
margaritaceus 21
mariae 15
marmoratus 23
mayottensis 16

- Palaemon mexicanus* 12
microramphos 23
minans 8
minutus 16
mirabilis 16
miyadaii 7
modestus 9, 18
modestus brevimanus 18
montezumae 13
moorei 16
morleyi 6
mortuus 19
mossambicus 18
multidens 15
narval 23
naso 16
nasutus 14
nataator 6
nattereri 13, 17
neglectus 15
niciphe 22
niloticus 17
nipponensis 17
nitescens 23
nobilii 12
noctilucus 23
northropi 9
novae-hollandiae 17
oenone 17
oenone papuana 17
obioensis 17
obionis 17
olfersi 17
olivieri 23
oratelli 22
orientalis 23
orientis 9
ornatus 13, 16
ornatus vagus 16
ortmanni 7
pacificus 7
paludosus 10
palustris 10
pandaliformis 7
pandaloides 23
parvulus 21
parvus 12, 21
patsa 17
paucidens 8, 15, 18
paulensis 6
pelasgicus 23
peruanus 8
petersi 17
- Palaemon petiti* 17
petitthouarsi 23
philippinensis 16
pilimanus 17
pilimanus leptodactylus 17
pilimanus malayanus 17
pinnophylax 23
placidulus 17
placidus 17
potamiscus 11
potieté 12
potiporanga 17
potitinga 8
potiuna 18
praecox 18
pristis 23
procles 22
punctatus 13
pusillus 22
pygmaeus 17
quelchi 18
quoyanus 7
ravidens 18
recticornis 22
rectirostris 8
rectirostris octodentatus 8
reunionnensis 16
ritsemae 15
ritteri 8
riukiensis 21
robustus 15
roemeri 19
rosenbergi 18
rostratus 8
ruber 16
rudis 18
savignyi 12
scabriculus 18
schmitti 9
semmelinki 9
serratus 8, 21
serrifer 8
setiferus 23
sewelli 8
sexdentatus 12
siamensis 22
similis 14
sinensis 17
singalangensis 16
sintangensis 18
sogionti 22
sollaudi 18
spectabilis 16
- Palaemon spinimanus* 17 (2 ×)
spinipes 18, 23
spinipes birmanicus 16
spinosus 23
splendens 22
squilla 8
stresemanni 21
styliferus 9
sulcatus 14, 23
sundaicus 12, 14
sundaicus baramensis 14
sundaicus bataviana 14
sundaicus brachydactyla 14
sundaicus demani 14
superbus 18
swainsoni 12
talaverae 16
tarentinum 23
tenellus 18
tenuicauda 23
tenuicornis 6
tenuipes 9, 23
tenuirostre 6
tenuirostris 6
thienemanni 18/19
torensis 6
tranquebaricus 21
treillianus 8
tridens 16
trisetaceus 21
trilianus 8
trompi 19
trompi armatus 19
ustulatus 13
vagus 16
variabilis 10
varians 10
varians thermaiophilus 10
vedianti 22
venustus 19
villosimanus 261
villosus 23
vollenhoveni 19
vulgaris 11
walchi 21
weberi 19
whitei 18
wolterstorffi 16
xiphias 8
yunnanensis 14
- Palaemon* vid. *Palaemon*
Palaemonella gracilis 8
orientalis 23

- Palaemonella rathbunensis* 12
 tenuipes 23
Palaemonetes africanus 9
 antennarius 10
 antrorum 11
 argentinus 10
 australis 10
 calcis 11
 carolinus 11
 carteri 10
 chankensis 10
 cubensis 8
 eigenmanni 11
 exilipes 10
 gibarensis 11
 hiltoni 10
 hornelli 6
 inermis 11
 intermedius 10
 ivonicus 10
 kadiakensis 10
 lacustris 10
 lamarrei 15
 mesogenitor 10
 mesopotamicus 10
 pacificus 7
 paludosus 10
 palustris 10
 pugio 10
- Palaemonetes punicus* 10
 schmitti 10
 sinensis 10
 tonkinensis 10
 trispinosus 6
 varians 10
 varians lacustris 10
 varians macrogenitor 10
 varians mesogenitor 10
 varians mesopotamicus 10
 varians microgenitor 10
 varians occidentalis 10
 varians thermaiophilus 10
 venepicus 10
 vulgaris 11
 zariquieyi 11
Palaemonopsis carolinus 11
 exilipes 10
 vulgaris 11
Parapalaemon aemulus 12
 asperulus 12
 australis 13
 dolichodactylus 18
 hainanensis 14
 hendersoni 14
 horsti 15
 horsti brevidigitus 15
 insularis 15
 japonicus 15
- Parapalaemon javanicus* 15
 lorentzi 16
 lujae 16
 modestus 18
 modestus brevimanus 18
 patsa 17
 petersi 17
 scabriculus 18
 stresemanni 21
 tbienemanni 18/19
 trompi 18
 trompi armatus 19
 vollenhoveni 19
Pelias migratorius 10
Penaeus adspersus 6
 punctatissimus 6
Peneus vid. *Penaeus*
Periclimenes migratorius 10
 portoricensis 13
Propalaemon minor 20
 osborniensis 20
Pseudopalaemon bouvieri 11
 iberingi 11
Troglocubanus calcis 11
 eigenmanni 11
 gibarensis 11
 inermis 11
Urocaridella borradalei 14
 gracilis 6