

NEOCALLICHIRUS KEMPI SAKAI, 1999, A JUNIOR SYNONYM OF CALLIANASSA KARUMBA POORE & GRIFFIN, 1979 (DECAPODA: CALLIANASSIDAE)

Peter C. Dworschak

Dritte Zoologische Abteilung, Naturhistorisches Museum, Burgring 7, A 1010 Wien, Austria

Email: Peter.Dworschak@nhm-wien.ac.at

ABSTRACT. – Investigation of callianassid material from Thailand, Singapore, Taiwan and Papua New Guinea – together with re-examination of the type material of *Callianassa karumba* Poore & Griffin, 1979 – revealed that this species is identical to what has been attributed by Kemp (1915) and others to *Callianassa maxima* A. Milne-Edwards, 1870 which was established upon a subfossil cheliped. Later, Sakai (1999) considered the subfossil *C. maxima* and Kemp's recent material as separate species and erected the new name *Neocallichirus kempi*. As a consequence, the latter has to be considered a junior synonym of *Callianassa karumba*. This is the first record of this species from Thailand, Singapore, Taiwan and Papua New Guinea.

KEY WORDS. – *Neocallichirus karumba*, *Neocallichirus kempi*, synonymisation, Thailand, Taiwan, Singapore, Papua New Guinea.

INTRODUCTION

Callianassa maxima A. Milne-Edwards, 1870 was described based on a single subfossil chela found during construction of a channel in Siam (Thailand). Later, Kemp (1915) attributed specimens collected in Chilka Lake and near Madras, India to this species. Additional reports were from Central Travancore (Pillai, 1954) as well as Tamil Nadu and Andra Pradesh (Daniel, 1981).

Callianassa karumba Poore & Griffin, 1979 was described based on a single male specimen from the Norman River near Karumba in the Gulf of Carpentaria in Queensland, Australia.

Sakai (1999) argued that the subfossil chela of *Callianassa maxima* A. Milne-Edwards, 1870 differs both in size and dentition from that in the specimens attributed by Kemp (1915) to *C. maxima* and concluded that they represent separate species. He assigned Kemp's species with some uncertainty to the genus *Neocallichirus* Sakai, 1988 and proposed the new name *N. kempi*.

In the same paper (Sakai, 1999), *C. karumba* Poore & Griffin, 1979 is listed as a valid species and transferred to the genus *Neocallichirus* Sakai, 1988. Among all Indo-Pacific members of this genus, both *N. karumba* and *N. kempi* are the only ones mentioned to have a vestigial exopod on the third maxilliped.

One small specimen of a callianassid shrimp collected in Singapore was brought to my attention by Arthur Anker in 2002 and tentatively identified as *N. karumba* (Poore & Griffin, 1979). Additional material containing larger specimens from the same locality, received later, showed more similarity with *N. kempi* Sakai, 1999. The type material of the former was therefore re-investigated along with additional material from Thailand, Taiwan and Papua New Guinea which had been assigned to *C. maxima*, *N. kempi* or *N. karumba*.

The aim of this study is to demonstrate that *N. karumba* and *N. kempi* are one and the same species and that it shows a high degree of intraspecific variability. Assuming that the subfossil *Callianassa maxima* A. Milne-Edwards, 1870 represents yet another species, the name *C. karumba* Poore & Griffin, 1979 has precedence over *N. kempi* Sakai, 1999.

MATERIALS AND METHODS

Material is deposited in the following museums: Australian Museum, Sydney, Australia (AM); Muséum National d'Histoire Naturelle, Paris, France (MNHN); Naturhistorisches Museum in Wien, Austria (NHMW); National Taiwan Ocean University, Taiwan (NTOU); Queensland Museum, Brisbane, Australia (QM); and Zoological Reference Collection, Raffles Museum of Biodiversity Research, Singapore (ZRC).

Size is expressed as total length (tl in mm) from the tip of the rostrum to the end of the telson and as carapace length (cl in mm) from the tip of the rostrum to the posterior median edge of the carapace. Other abbreviations used include: A1, first antenna (antennule); A2, second antenna; Mxp2, second maxilliped; Mxp3, third maxilliped; P1, first pereopod; P3, third pereopod; Plp1, first pleopod; Plp2, second pleopod; coll., collector.

TAXONOMY

Neocallichirus karumba (Poore & Griffin, 1979)

(Figs. 1–6)

Callianassa (*Callichirus*) *maxima* – Kemp, 1915: 252, Pl. 13 Figs. 1–5; de Man, 1928: 29, 92, 112 [new synonymy][not *Callianassa maxima* A. Milne-Edwards, 1870]
Callianassa maxima – Pillai, 1954: 23–26; Daniel, 1981: 193, Pl. 6, textfig. 1, 2 (larvae); Tudge et al., 2000: 143 (list).
Callianassa karumba Poore & Griffin, 1979: 266, Figs. 30, 31.
Glypturus karumba – Sakai, 1988: 61; Tudge et al., 2000: 137, Fig. 3 (tree), 144 (list); Davie, 2002: 460.
Neocallichirus karumba – Sakai, 1999: 101; 2005: 180.
Neocallichirus kemp Sakai, 1999: 101, Fig. 24a–e; 2005: 180 [new synonymy].

Material examined. – Holotype (of *Callianassa karumba* Poore & Griffin, 1979): male (tl 34, cl 8.6) (AM P24678), Norman River at Karumba [17°19'S 140°50'E], Queensland, Australia, Gulf of Carpentaria prawn survey, beam trawl, CSIRO Fisheries coll. 10 Feb.1964.

Others: 1 ovigerous female (tl 73, cl 18.6, poor condition), 1 female abdomen (ZRC 2001.1173), Singapore, no further data, coll. 1960s; 1 female (tl 90, cl 22.0, carapace damaged (ZRC 2002.0274), Singapore, Lim Chu Kang, A. Anker et al. coll. with yabby pump 14 Jan.2002; 1 male (tl 66, cl 17.4) (ZRC 2002.0275), same data as ZRC 2002.0274; 1 male (tl 39, cl 10.0, left major cheliped missing), 1 female (tl 32, cl 8.8) (ZRC 2002.0276), same data as ZRC 2002.0274; 1 female (tl 30, cl 9.0) (NHMW 21897), same data as ZRC 2002.0274; 1 male (tl 63, cl 17.8) (QM W10245), Papua New Guinea, estuary near Lea [9°16'60"S, 146°58'60"E], N. Quinn coll. 23 Sep.1981; 1 male (tl 50, cl 14.5, right major cheliped missing) (QM W10240), Papua New Guinea, estuary near Lea, N. Quinn coll. 2 Nov.1981; 1 female (tl 100, cl 24), 1 female (tl 56, cl 15.5, major cheliped missing) (MNHN Th-1511), western coast of central Taiwan, coll. 4 Feb.1992; 1 female (tl 100, cl 24.5), 1 female (tl 76, cl 19.8, both cheliped missing), 1 male (tl 55, cl 14.8), 1 female (tl 38, cl 11.2), 1 male (tl 36, cl 11.5, both chelipeds missing), 1 male (tl 37, cl 10, both cheliped missing), 1 male (tl 32, cl 8.8) (MNHN Th-1512), western coast of central Taiwan, coll. 20 Jan.1992, det. (as *Callichirus* cf. *maximus*) M. de Saint Laurent; 1 male (tl ca 90, cl 21.4, damaged, minor cheliped missing) (NHMW 21936 ex NTOU 00014), Taiwan, Changhua County, Lugang, [24.06°N 120.43°E], sand, M.S. Hung coll. 1 Dec.1991; 1 female (tl 90, cl 22.3) (part of NTOU 00089), Taiwan, Changhua County, Shengang, [24.15°N 120.51°E], sand, F.J. Lin coll. 20 Jan.1998; 1 male (tl 30, cl 8.2), 1 male (tl 88, cl 22.4) (NHMW 21937), Taiwan, Changhua County, Shengang, [24.15°N 120.51°E], S. H. Peng. coll. 11 May 1999; 1 female (cl 26, abdomen from 4th abdominal somite on missing) (NHMW 21938 ex NTOU 00159), Taiwan, Changhua County, Shengang, [24.15°N 120.51°E], S. H. Peng. coll. 1 Dec.2000; 1 male (tl 65, cl 17.6), 1 female (tl 64, cl 17.4), 1 male (tl 48, cl 13.1), 1 male (tl 42, cl 12.8) (MNHN Th-

500), Bangkok (Siam) [Thailand], M. Harmand coll. 1882, det. (as *Callichirus maximus*) M. de Saint Laurent, 1976.

Diagnosis. – Dorsally, carapace as long as abdominal somites 1 and 2 combined (Figs. 1a, 3a). Rostrum triangular and acute, reaching from 1/4 to 1/2 visible length of eyestalks (Figs. 1a, b, 2a, b, m, n, 3a, b, j, 4a, f, g, 5a, b, i, j, 6a, f, g). Lateral projections of carapace obsolete. Carapace lacking cardiac prominence and dorsal carina; dorsal oval distinctly marked posteriorly by deep transverse cardiac furrow, the latter extending anteroventrally to either side above linea thalassinica as shallow groove marking posterior half of dorsal oval. Frontal margin of carapace continued ventrolaterally beyond intersection with linea thalassinica as thickened oblique ridge ending anteriorly at prominent hepatic boss. Subantennular region of epistome bearing dense tuft of long setae.

Eyestalks reaching to or beyond basal antennal article; shape and size of cornea variable (see below).

Antennular peduncle thicker, but only 0.8 to 0.9 times as long as antennal peduncle (i.e. Fig. 1a, 6f); second article slightly longer than basal article; terminal article 1.5 times as long as second.

Antennal peduncle with basal article with dorsolateral carina forming lip above excretory pore; second article ventrally with large suture; third article elongate, as long as basal and second article combined; fourth article narrower, 1.3 times as long as third article.

Third maxilliped (Figs. 1g, 2g, q, 3f, 4j, 5 f) with small, naked, rudimentary exopod and large endopod; one well-developed and one reduced arthrobranch; endopodal ischium 1.4 times as long as broad, mesial surface with row of teeth (crista dentata); merus subtriangular, as long as broad; carpus longer than broad; propodus ovoid, slightly broader than long; dactylus narrow, arcuate.

Major cheliped (Figs. 1c, d, 2e, f, o, p, 3c, d, k, l, 4 b, c, h, i, 5c, d, k, l, 6b, c) located on either right or left side of body, shape and ornamentation variable depending on size and slightly sexually dimorphic (see below). Ischium 2.6 times as long as broad, inferior margin with row of teeth; merus with strong teeth, largest proximally on inferior margin; carpus with straight superior and convex inferior margin; propodus with low keel in proximal 2/3 of superior margin; inferior margin of palm serrated; fixed finger slightly curved, large triangular tooth with denticulated upper margin proximally below articulation of dactylus; dactylus curved, about as long as fixed finger.

Minor cheliped (Figs. 1f, 3e, m, 5e, 6d) sparsely armed, ischium with row of minute denticles on inferior margin; merus unarmed, with rounded superior and inferior margins; carpus more than twice as long as high; palm of propodus 0.5 time length of carpus, fixed finger as long as palm, triangular; dactylus slightly curved; cutting edges of fixed finger and dactylus with small round corneous denticles. Tips of both fixed fingers and dactylus corneous.

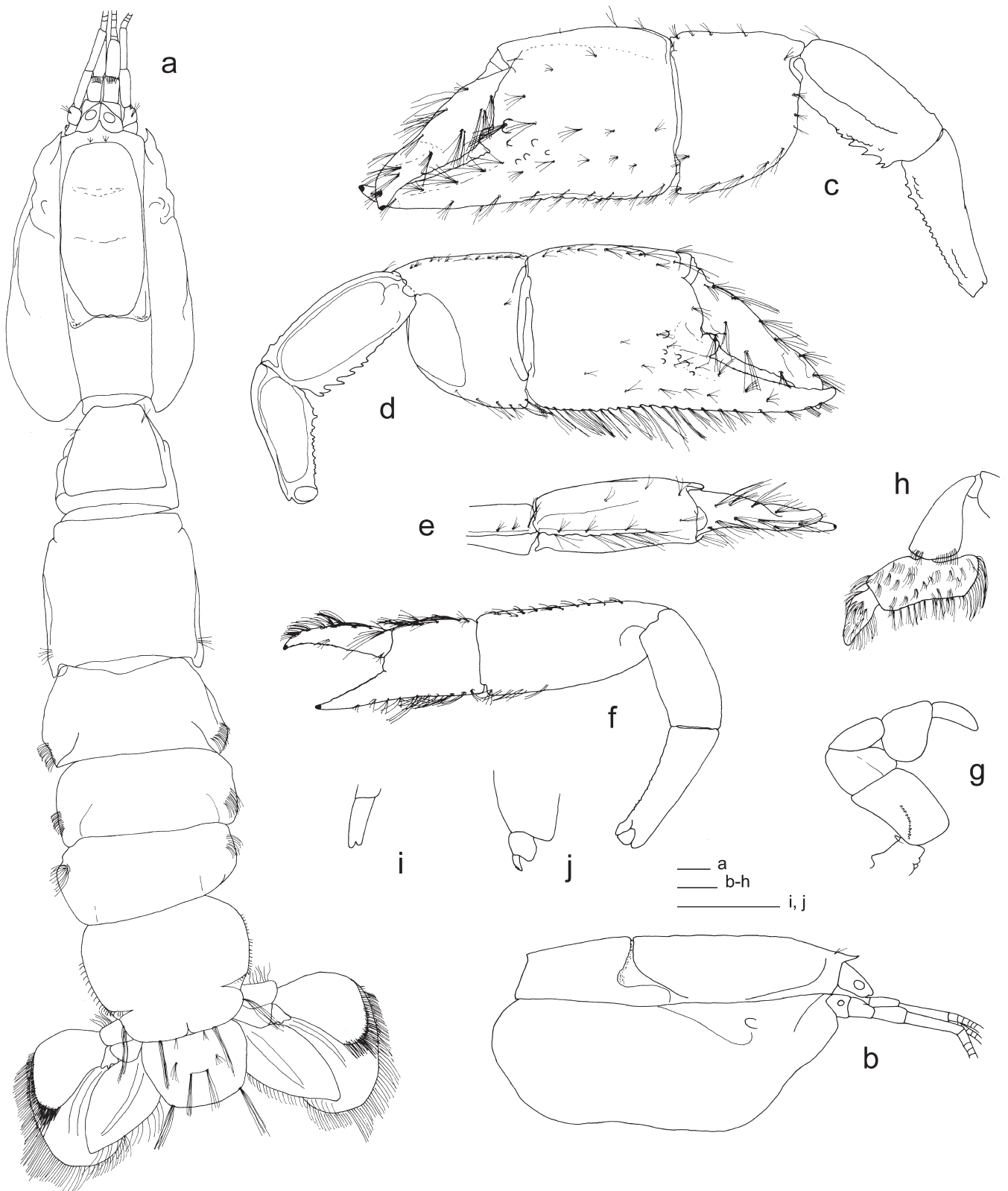


Fig. 1. *Neocallichirus karumba*, Norman River at Karumba, Queensland, Australia: male tl 34 (AM P24678, holotype of *Callianassa karumba* Poore & Griffin, 1979): a, e, dorsal view; b, c, h, lateral aspect; d, f, g, mesial aspect, i, j, ventral view; a, habitus; b, carapace (setae omitted); c–e, left major cheliped; f, minor cheliped; g, third maxilliped (setae omitted); h, distal articles of third pereopod; i, tip of right first pleopod (setae omitted); j, tip of right second pleopodal endopod (setae omitted). Scale bars = 1 mm.

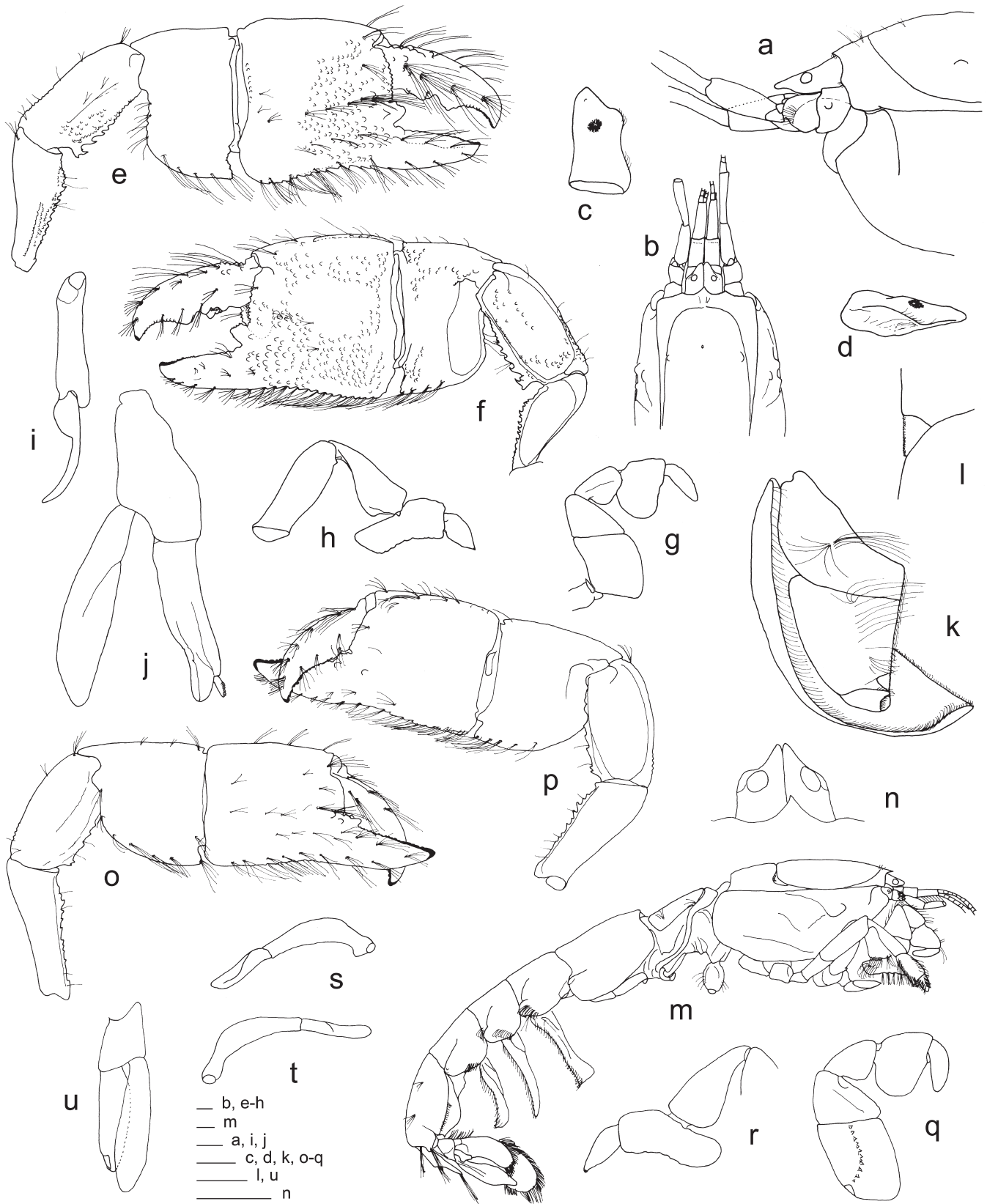


Fig. 2. *Neocallichirus karumba*, Singapore: a–l, female tl 90 (ZRC 2002.0274); m–u, female tl 32 (ZRC 2002.0276); a, d, e, g, m, o, r, s, lateral view; b, c, n, dorsal view; f, h, i, p, q, mesial view; j, k, t, u, posterior view; l, anterior view; a, b, n, front of carapace; m, habitus; c, d, right eyestalk; e, f, o, p, right major cheliped; h, r, left P3 (setae omitted); g, right and q, left Mxp3 (setae omitted); i, s, t, left Plp1 (setae omitted); j, left and u, right Plp2 (setae omitted); k, right Plp3; l, appendix interna on Plp3 (setae omitted). Scale bars = 1 mm.

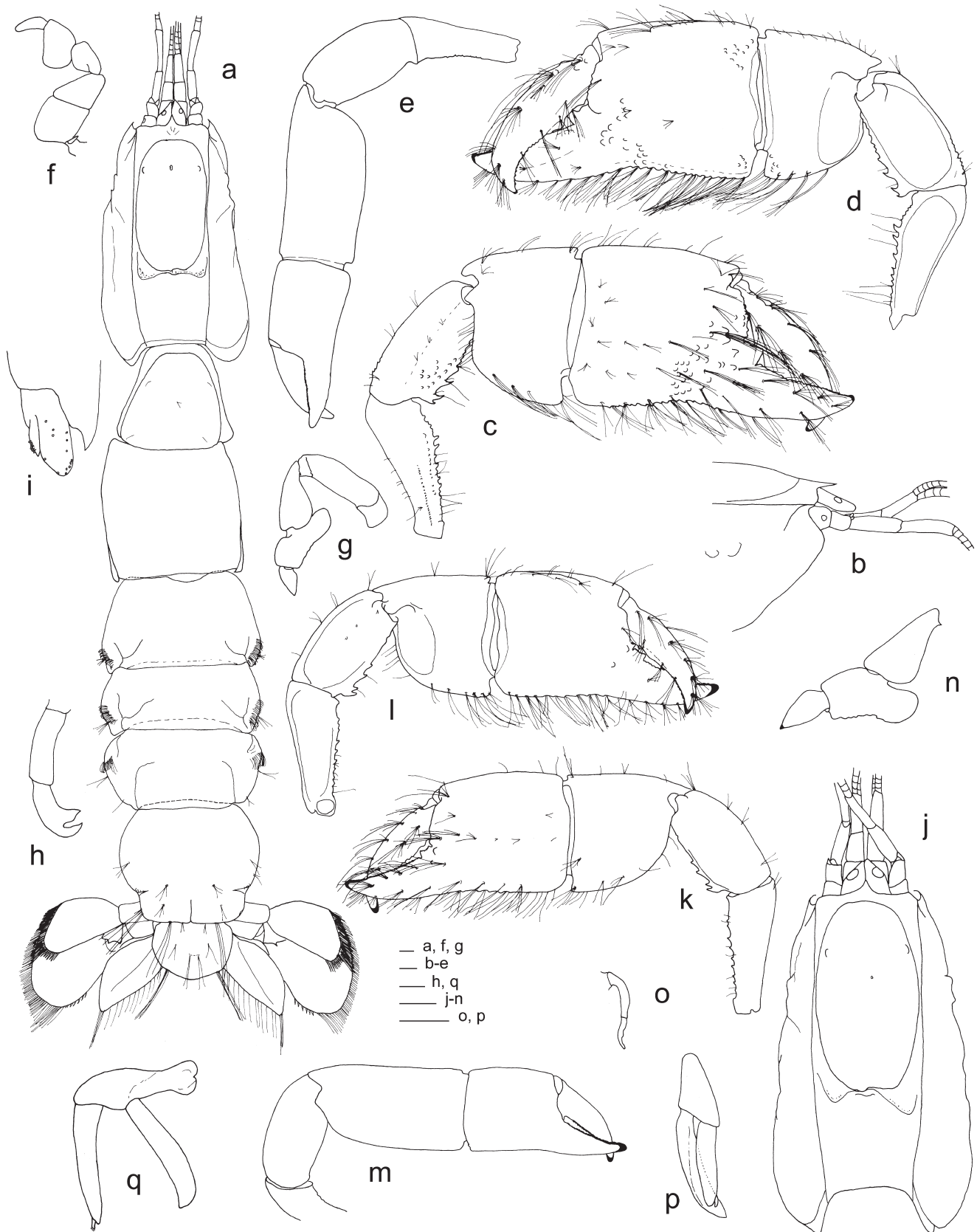


Fig. 3. *Neocallichirus karumba*, Singapore: a-i, male tl 66 (ZRC 2002.0275); j-p, female tl 30 (NHMW 21897); q, ovigerous female tl 73 (ZRC 2001.1173); a, j, dorsal view; b, c, f, g, h, k, m, n, o, lateral view; i, p, q, posterior view; a, habitus; b, front of carapace; c, d, right major cheliped; k, l, left major cheliped, e, m, minor cheliped (setae omitted); f, left Mxp3 (setae omitted); g, n, left P3 (setae omitted); h, right and o, left Plp1 (setae omitted); i, q, right and p, left Plp2 (setae omitted). Scale bars = 1 mm.

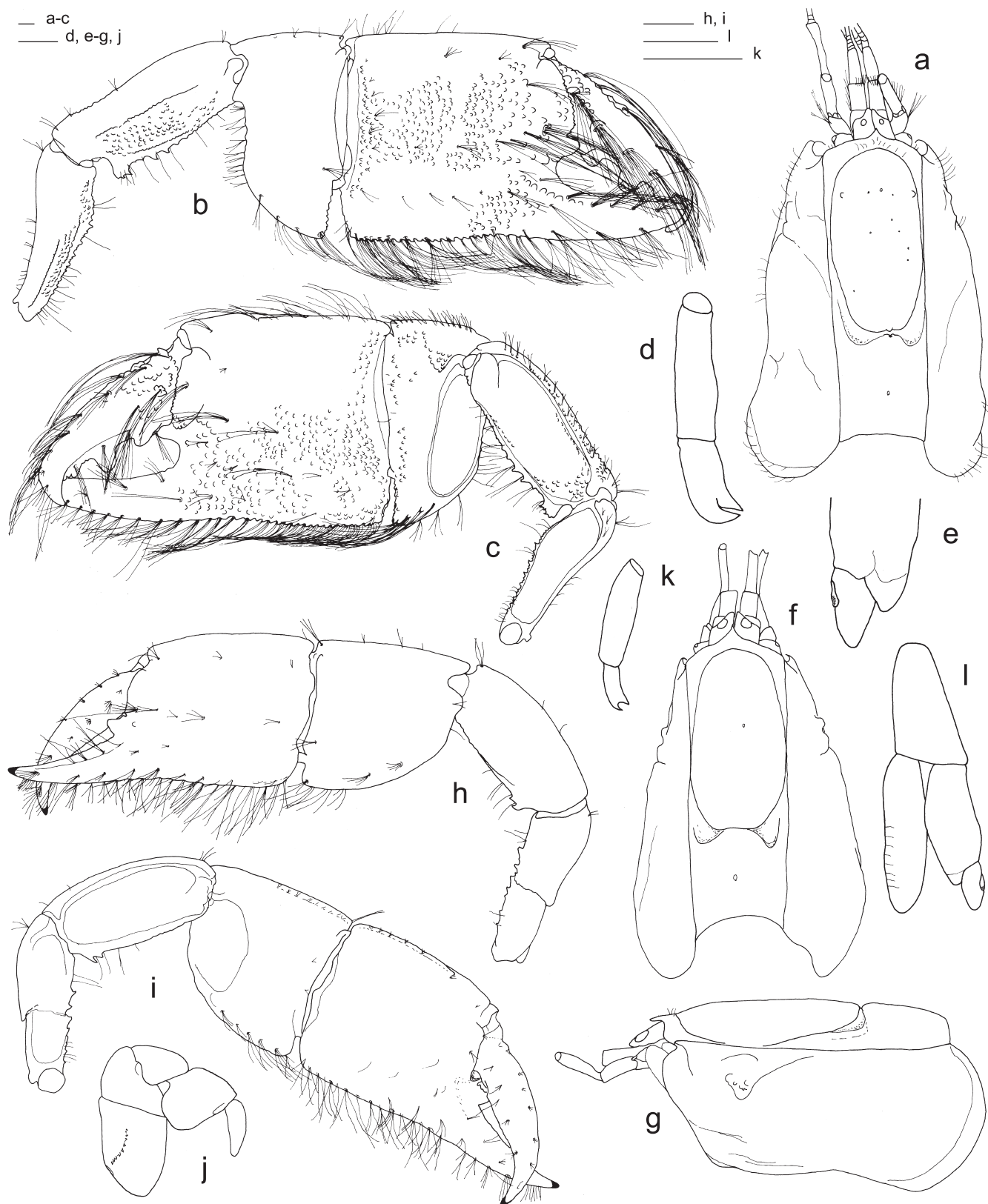


Fig. 4. *Neocallichirus karumba*, Taiwan: a–e, male t1 88; f–l, male t1 30 (NHMW 21937); a, f, dorsal view; b, g, h, lateral view; c, i, j, mesial view; d, e, posterior view; k, l, anterior view; a, f, g, carapace; b, c, right major cheliped; h, i, left major cheliped; j, left Mxp3 (setae omitted); d, left and k, right Plp1 (setae omitted); e, right and l, left Plp2 (setae omitted). Scale bars = 1 mm.

Third pereopod (Figs. 1h, 2h, r, 3g, n, 5 m, 6 e, h) propodus rhomboidal, heeled.

Abdomen 2.5 times as long as carapace (Figs. 1a, 2m, 3a); dorsal length ratio (along midline) of first to sixth abdominal somites 1.0: 1.45: 0.85: 0.8: 0.8: 1.2 [holotype].

Male first pleopod consisting of two articles (Figs. 1i, 3h, 4d, k, 5n, 6i); second article 0.5 times length of first, with

a deep notch at the end of the mesially curved apex. Female first pleopod simple (Figs. 2i, s, t, 3o, 5g), consisting of two articles; terminal article with shoulder at midlength.

Male second pleopod biramous (Fig. 4l), well-demarcated appendix masculina reaching beyond distal part of endopod, small appendix interna mesially on appendix masculina (Figs. 1j, 3i, 4e, 5o, 6j). Female second pleopod biramous (Figs. 2j, u, 3p, q), endopod with appendix interna (Fig. 5h).

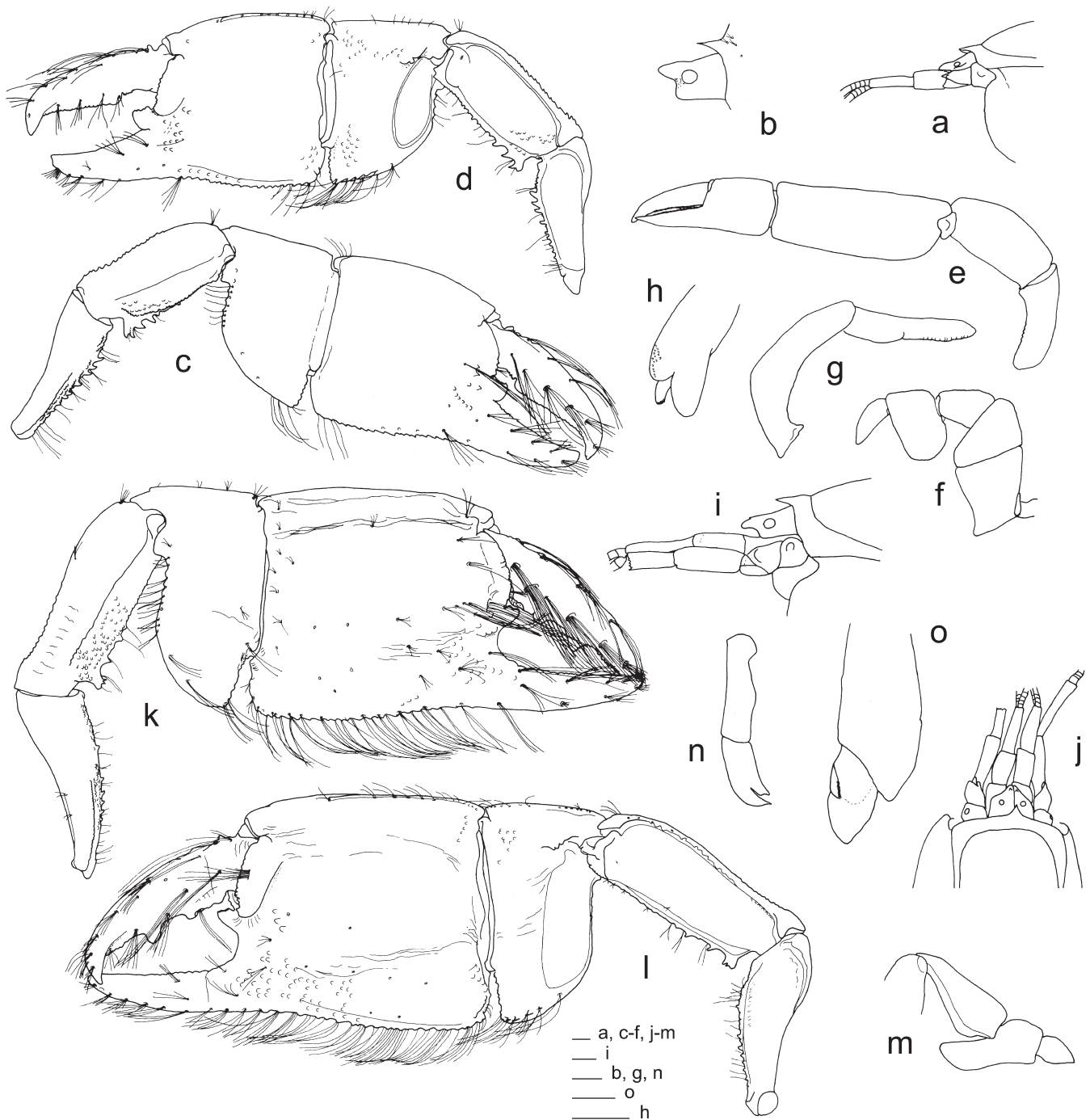


Fig. 5. *Neocallichirus karumba*, Taiwan: a–h, female tl 90 (NTOU 00089); i–o, male tl 90 (NHMW 21936); a, c, e, f, g, i, k, lateral view; b, j, dorsal view; d, l, m, mesial view; h, n, o, anterior view; a, i, j, front of carapace; b, front and left eyestalk; d, c, k, l, right major cheliped; e, minor cheliped (setae omitted); f, left Mxp3 (setae omitted); m, left P3 (setae omitted); g, left and n, right Plp1 (setae omitted); h, o, right Plp2 (setae omitted). Scale bars = 1 mm.

Third to fifth pleopods with appendix interna embedded in mesial margin of endopod (Fig. 2k, l).

Telson (Figs. 1a, 3a) 1.5 times as broad as long, broadest proximally, lateral and posterior margins continuous. Uropodal endopod twice as long as telson, lanceolate, about twice as long as wide. Uropodal exopod longer than endopod, with anterodorsal plate.

Embryos between 1.09 and 1.23 mm in diameter.

Variations. – This species shows some variable characters which appear related to growth. In small specimens the eyestalks are triangular in dorsal and lateral view, the cornea situated dorsomesially, occupying 0.5 to 0.75 times eyestalk width (Figs. 1a, 2n, 3j, 6a, f); in large specimens the eyestalks are widened proximally, forming a lateral ridge, tapering distally, sometimes with a tubercle dorsally near the tip, the cornea is situated dorsally, occupying only 0.2 to 0.3 times eyestalk width (Figs. 2c, d, 3a, b, 4a, 5a, j). The relatively large cornea in a small specimen (tl 15 mm) compared to the small cornea in a large specimen (tl 80 mm) was also noted for materials from India (Kemp, 1915: 256).

In large animals the dorsal oval has a distinct tubercle on each side of anterior third (Figs. 2a, b, 3a, j, 4a); these are

missing in small specimens (Figs. 1a, b, 2m, 4f, g). The propodus of P3 is 1.8 to 2.4 times as long as high in small specimens (Figs. 1h, 2r, 3n, 6h); in large specimens this ratio ranges between 2.6 and 3.6 (Figs. 2h, 3g, 5m, 6e). The propodus thus appears more heeled in large specimens than in small ones.

Generally, major chelipeds of small specimens (tl < 40) have the merus about two times as long as high; the carpus is as long as high; all surfaces are smooth except for a few low tubercles on the lateral face of the propodus below the articulation with the dactylus; the cutting edges of both the fixed finger and the dactylus have a row of corneous teeth and the tips are corneous (Figs. 1c, d, 2o, p, 3k, l, 4h, i). In large specimens (tl > 40), the major cheliped has a merus which is 2 to 3 times as long as high, the proximal tooth on the inferior margin pronounced and bi- to trifid; the carpus is 1.4 to 2.2 times as high as long, undulated on the posterior margin; the palm of the propodus is between 2 and 3 times as long as the carpus and as high as long, the fixed finger and the dactylus show corneous teeth only on the proximal 1/3 of the cutting edges (Figs. 2e, f, 3d, c) or are completely missing (Figs. 4b, c, 5c, d, k, l, 6b, c). In small specimens, cheliped size does not differ very much between sexes (compare Fig. 2o, p with Fig. 4h, i). In large specimens (cl > 20), male chelipeds have a longer and higher propodus

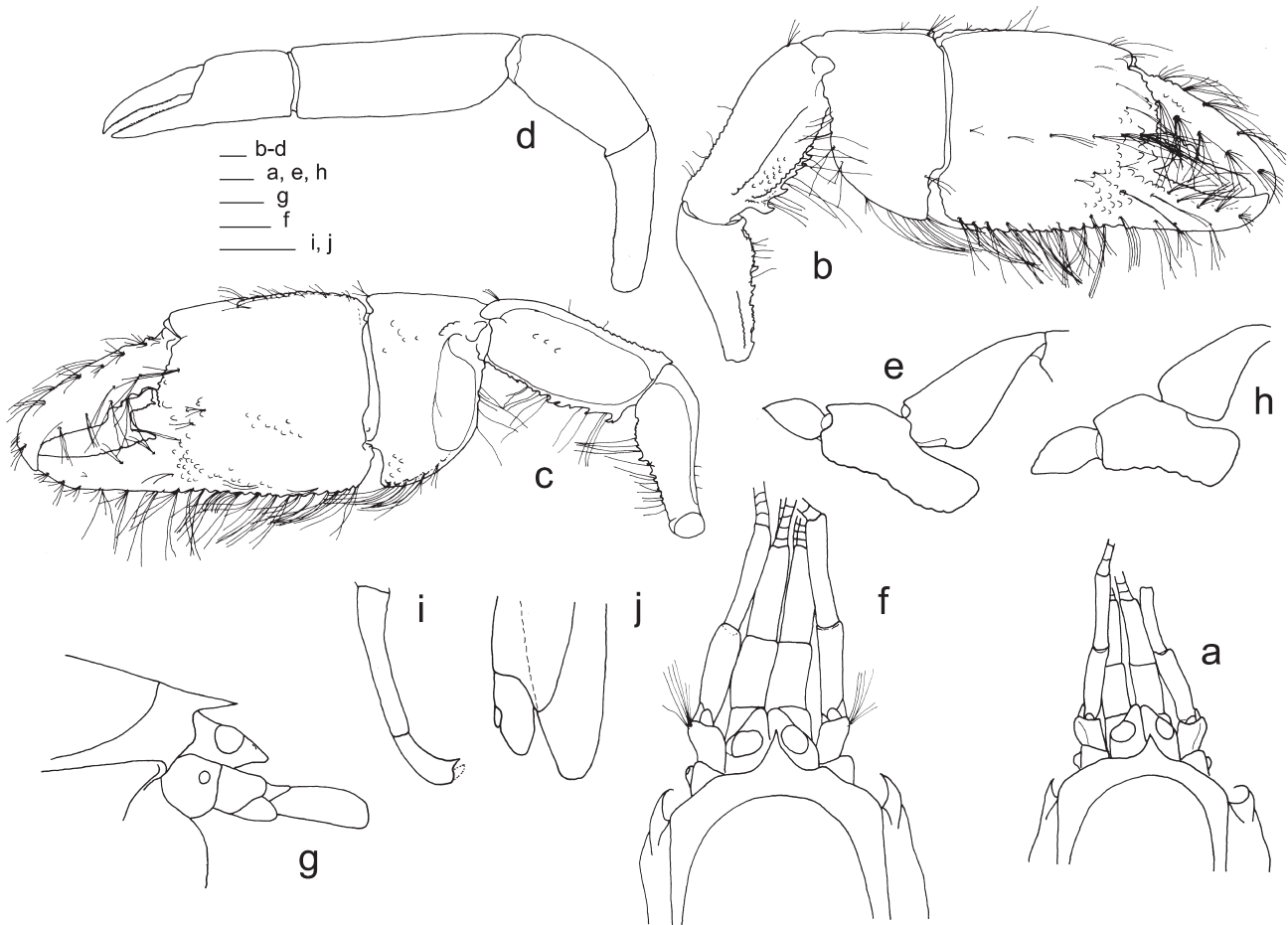


Fig. 6. *Neocallichirus karumba*, Papua New Guinea: a–e, male tl 63 (QM W10245); e–j, male tl 50 (QM W19240); a, f, dorsal view; b, d, g, h, lateral view; c, e, mesial view; i, j, posterior view; a, f, g, front of carapace; b, c, right major cheliped; d, minor cheliped (setae omitted); e, h, P3 (setae omitted); i, right Plp1 (setae omitted); j, left Plp2 (setae omitted). Scale bars = 1 mm.

than females of the same size (compare Fig. 5c, d with 5k, l). The lateral surfaces of ischium and merus show tuberculated ridges with low tubercles near the inferior margins; the propodus has numerous low tubercles proximally to the fixed finger and near the inferior margin, and the dactylus a few tubercles proximally (Figs. 2e, 3c, 4b, 5 c, k, 6b). The mesial surfaces of merus, carpus and propodus are tuberculated in a variable density and pattern (Figs. 2f, 3d, 4c, 5d, l, 6c). The cutting edge of the dactylus is either straight and minutely denticulated (Figs. 3c, d, 5c, d) or shows two larger round tooth, for example in the largest males (Figs. 4b, c, 5k, l). Only these males show also a deep incision in the propodus below the dactylus articulation.

The pleopods are also variable. Plp1 in females is quite simple in small specimens (Fig. 3o); a prominent shoulder on the distal article is visible only in large females (i.e. Fig. 2i). The Plp2 of females are quite uniform, except for the ovigerous one (ZRC 2001.1173), where the basis was expanded mesially (Fig. 3q). In males, the Plp1 of small individuals (tl < 40) shows a bifid terminal article (Figs. 1i, 4k), whereas this article has a deep notch at the end of the mesially-curved apex in large specimens (Figs. 3h, 4d). The Plp2 of males shows an appendix masculina with a clearly demarcated appendix interna throughout the entire size range. In small males, the appendix masculina is situated distally on the endopod and distally bears the appendix interna (Fig. 1j), whereas in large males the appendix masculina is situated distomesially on the endopod and the appendix interna mesially on the appendix masculina (Figs. 3i, 4e).

Size. – Materials studied here range in size from tl 30 to 100 and cl 8.2 to 26. Reports from the literature are from tl 15 (Kemp, 1915) to tl 131/cl 30 (Sakai, 1999).

Habitat. – In Singapore, the specimens were collected from firm sand near the mangrove system of Lim Chu Kang. Burrow openings were characterised by a small mound or a simple hole, often surrounded by lighter sediment (A. Anker, pers. comm.). In Taiwan, the specimens were found in small numbers in muddy-sandy tidal flats dominated by the upogebiid *Austinogobia edulis* (Ngoc-Ho & Chan, 1992)(T.-Y. Chan, pers. comm.). In India, this species has been found in soft muddy sand at salinities between 15 and 36 ppm (Kemp, 1915). Daniel (1981) reported this species as a pest in saltpans in India.

Distribution. – Australia, Norman River, Karumba, Queensland (type locality of *C. karumba* Poore & Griffin, 1979); Papua New Guinea, estuary near Lea (this study); Taiwan, Changhua County, Shengang and Lugang (this study); Singapore, Lim Chu Kang (this study); Bangka, Indonesia (type locality of *N. kempi* Sakai, 1999); Bangkok, Thailand (this study); Voyalur, Chingleput District, Tamil Nadu and Manginapudi, Krishna District, Andhra Pradesh, India (Daniel, 1981); Nalbano Island and Barhampur Island, Chilka Lake and near Madras, India (Kemp, 1915); Kayamkulam Lake, Central Travancore, India (Pillai, 1954); N. Parur, Travancore, India (Sakai, 1999).

Remarks. – The description of *C. karumba* by Poore & Griffin (1979) is brief but sufficient to recognise the species. It is not surprising that these authors described a new species for a juvenile specimen of what Kemp (1915) at that time considered as *C. maxima*. The chelipeds of the latter have been figured based only on large specimens, although Kemp (1915: 256) mentioned in the text that the cheliped of the juvenile specimen (tl 15) has a longer than broad carpus and that “the surface of the entire limb is smooth and polished”. In addition, all authors before Sakai (1999) did not mention the vestigial exopod on Mxp3. Comparison of the type of *C. karumba* (Fig. 1) with small specimens from Taiwan and Singapore (Figs. 2m–u, 3j–p, 4f–l) clearly shows that they represent the same species.

In Sakai’s (1999: 94) key to the species of Indo-Pacific members of *Neocallichirus*, both species key out at couplet 17. The further distinction is rather arbitrary: for *N. kempi* numerous characters are listed, among others “chela of larger cheliped...broadly concave at proximal corner of fixed finger”, while for *N. karumba* the chela of the larger cheliped is said to be “narrowly concave”. In view of the highly variable shape of the chelipeds within the Callianassidae, such a character is certainly not suitable to differentiate between species.

The major cheliped of the holotype, however, is damaged either due to an earlier intraspecific encounter, to collection or to an unsuccessful attempt to open the claw of the preserved animal. The dactylus is squeezed at midlength and thus distorted, crossing with the fixed finger laterally (Fig. 1e) instead of mesially as in all other major chelipeds studied. The cutting edges have been abraded, but traces of the corneous teeth are still detectable at higher magnification.

There is some confusion with respect to the generic placement of this species (see synonymy above). It does not fit the description of *Glypturus* Stimpson, 1856 (sensu Manning, 1987) because the front of the carapace lacks the lateral spines marked by a noncalcified membrane proximally and both major and minor chelipeds lack the spines on the upper border of the propodus. It also has some similarities with *Lepidophthalmus* (sensu Manning & Felder, 1991) with its rostral projection, a minute exopod on Mxp3 and the shape of the uropods, but differs in that: 1) the A1 peduncles are shorter than those of A2; 2) the major P1 in males lacks a meral hook; and 3) it lacks the bilobed propodus of P3 characteristic for all species of that genus (pers. obs.). The genus *Neocallichirus* Sakai, 1988 was originally defined – and later amended – by a Mxp3 without exopod. Sakai (1999, 2005), however, placed both species (*N. kempi* and *N. karumba*) possessing an exopod on Mxp3 into *Neocallichirus*. This generic placement is tentatively followed here.

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