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## **Axiidea of Panglao, the Philippines: families Callianideidae, Eucalliicidae and Callichiridae, with a redescription of *Callianassa calmani* NOBILI, 1904**

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### **Abstract**

A summary of species from three axiidean families collected during the Panglao Marine Biodiversity Project 2004 is presented. The family Callianideidae is represented by two species, *Callianidea typa* H. MILNE EDWARDS, 1837 and *Heardaxius rogerbamberi* POORE, 2015. The Eucalliicidae is represented by three species, *Eucalliix panglaoensis* DWORSCHAK, 2006, *E. inaequimana* DWORSCHAK, 2014, and *Calliixina novaebritanniae* (BORRADAILE, 1900). The family Callichiridae is the most diverse and represented by 7 species, *Lepidophthalmus tridentatus* (VON MARTENS, 1868), *Glypturus armatus* (A. MILNE-EDWARDS, 1870), *Corallianassa coutierei* (NOBILI, 1904), *Neocallichirus vigilax* (DE MAN, 1916), *N. jousseaumei* (NOBILI, 1904), *N. calmani* (NOBILI, 1904), and *N. mucronatus* (STRAHL, 1862). Descriptive notes and figures for three species of Eucalliicidae and four species of Callichiridae are presented. *Callianassa calmani* NOBILI, 1904 is redescribed with re-examination of type material. Among these species, four are recorded the first time from the Philippines.

**Key words:** Axiidea, Callianideidae, Eucalliicidae, Callichiridae, Panglao, Philippines, burrowing shrimp.

### **Introduction**

The international Panglao Marine Biodiversity Project in May-July 2004 consisted of an extensive sampling of molluscs and decapod crustaceans around the island of Panglao, southwest of Bohol, Philippines (BOUCHET et al. 2009). The special task of the author during this survey was to collect axiidean and gebiidean shrimp and their associated decapod and mollusc fauna with the aid of a yabby pump.

This sampling of axiideans and gebiideans revealed numerous new records and several undescribed species, that have been studied in earlier papers (DWORSCHAK 2006, 2007, 2011a, b, 2012, 2014, DWORSCHAK et al. 2006).

The aim of the present paper is to provide a summary of the species of the axiidean families Callianideidae, Eucalliicidae and Callichiridae. Descriptive notes and figures of the species collected at Panglao are presented in addition to a redescription of *Callianassa calmani* NOBILI, 1904 (currently *Neocallichirus calmani*).

### **Material and Methods**

Specimens from intertidal sediments were extracted with a stainless steel yabby pump (Emro, Caloundra, QLD) or with an improvised PVC pump of similar design or collected

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by hand. Shrimp were chilled on ice, then fixed in 75% ethanol. All drawings were made using a camera lucida mounted on a stereomicroscope, digitised and then inked and composed in Adobe Illustrator (COLEMAN 2003).

The material is deposited in the following repositories: Muséum National d'Histoire Naturelle, Paris, France (MNHN); Museo Regionale di Scienze Naturali, Torino, Italy (MRSN); Naturhistorisches Museum Wien, Austria (NHMW); National Museum of the Philippines, Manila (NMCR); Museums of Victoria, Melbourne, Australia (NMV); Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt a.M., Germany (SMF); Zoological Museum, University of Copenhagen, Denmark (ZMUC); Zoological Reference Collection, Lee Kong Chian Natural History Museum (ex Raffles Museum of Biodiversity Research), National University of Singapore (ZRC).

The size is expressed in mm as total length (TL) from the tip of the rostrum to the end of the telson and as carapace length (CL) from the tip of the rostrum to the posterior median edge of the carapace in the form (TL/CL). Other abbreviations used are: A1, first antenna (antennule); A2, second antenna; Mxp3, third maxilliped; P1–5, first to fifth pereopods, respectively; Plp1–2, first and second pleopods, respectively; coll., collector. Numbers preceded by “PD” are field collection numbers. For details on sampling sites and methods of the Panglao Marine Biodiversity Project 2004 see BOUCHET et al. (2009).

Synonyms of species referring are listed only for original descriptions and major revisions with more extensive synonymy listings.

Terminology for the orientation of the limbs follows POORE (1997) where “upper” is used to describe the extensor (or anatomically anterior) margin and “lower” the flexor (or posterior) margin.

## Systematic account

### Callianideidae KOSSMANN, 1880

#### *Callianidea* H. MILNE EDWARDS, 1837

##### *Callianidea typa* H. MILNE EDWARDS, 1837

*Callianidea typa* H. MILNE EDWARDS, 1837: 320, pl. 25bis, figs. 8–14; — SAKAI, 2011: 203, fig. 40A–E (extended synonymy); — DWORSCHAK, 2014: 231, figs. 1, 9a–e, 10a.

*Callianidea ryukyu* SAKAI, 2011: 199, figs. 38, 39.

**Material examined.** See DWORSCHAK (2014).

**Description.** See POORE (1997).

**Distribution.** Widely distributed in the Indo-Pacific (POORE 1997, SAKAI 2011, DWORSCHAK 2014).

#### *Heardaxius* SAKAI, 2011

##### *Heardaxius rogerbamberi* POORE, 2015

*Heardaxius rogerbamberi* POORE, 2015: 233, figs 1a–f, 2, 3.

**Material examined.** Momo Beach, (R37: 9°36.5'N, 123°45.6'E) sand near reef slope, 7 m, 1 female (14/3.9) NMCR 50123 (PD70), P. Dworschak coll 10 June 2004.

**Description.** See POORE (2015).

**Distribution.** Philippines: Panglao (this study); Papua New Guinea: Madang (type locality).

## **Eucalliidae MANNING & FELDER, 1991**

### ***Eucalliix* MANNING & FELDER, 1991**

#### ***Eucalliix panglaoensis* DWORSCHAK, 2006 (Fig. 1a)**

*Eucalliix panglaoensis* DWORSCHAK, 2006: 349, figs. 1–7; — KNEER et al., 2013a: 265.

*Calliixina panglaoensis*; — SAKAI, 2011: 501; SAKAI & TÜRKAY, 2014: 191, fig. 12.

**Material examined.** See DWORSCHAK (2006).

**Additional material.** Indonesia, Bali, Nusa Dua, intertidal, seagrass 1 male (21/4.4), 1 male (16/3.7) NHMW 25778, coll. June 2005. — Sulawesi, 1 female (49/11.7) NHMW 25785, 1 male (37/8.9) 1 female (48/11.7) NHMW 25786, 1 female (57/13) NHMW 25787, 1 female (46/10.9), 2 males (38/8.9, 38/8.6) NHMW 25788.

**Description.** See DWORSCHAK (2006).

**Distribution.** Indonesia: Bali, Sulawesi (this study); Philippines: Panglao (type locality); Papua New Guinea (SAKAI & TÜRKAY 2014); Japan: Ryukyu Is. (OSAWA & FUJITA 2016).

#### ***Eucalliix inaequimana* DWORSCHAK, 2014**

*Eucalliix inaequimana* DWORSCHAK, 2014: 236, figs 3–7, 9f, g, 10e, f.

**Material examined.** Momo Beach (M7: 9°36.1'N, 123°45.2'E), 3–7 m, reef platform with seagrass, 1 ovigerous female (22/6.7) NMCR 39097, P. Dworschak with yabby pump 1 June 2004 (PD02)

**Additional material.** Sulawesi, 1 male (42.4/8.7) NHMW 25645, 1 male (34/8.2) NHMW 25646, 1 female (32.6/6.7) NHMW 25647; — Cocos (Keeling) Is. (see DWORSCHAK 2014).

**Description.** See DWORSCHAK (2014).

**Distribution.** Cocos (Keeling) Is. (type locality); Indonesia: Sulawesi (this study); Philippines: Panglao (DWORSCHAK, 2014).

### ***Calliixina* NGOC-HO, 2003**

#### ***Calliixina novaebritanniae* (BORRADAILE, 1900) (Fig. 1b, c)**

*Callianassa novae-britanniae* BORRADAILE, 1900: 419, pl. 39 fig. 14a-d

*Paraglypturus novaebritanniae*; — SAKAI, 1999: 123, fig. 32d-f.

*Calliix novaebritanniae*; — DE SAINT LAURENT & MANNING, 1982: 211, figs. 1c, 2b, 6c; — SAKAI, 2005: 202.

*Calliixina novaebritanniae*; — NGOC-HO, 2003: 493; — SAKAI, 2011: 500 (extended synonymy); —

SAKAI & TÜRKAY, 2012: 750; — SAKAI et al., 2014: 492 (list); — SAKAI, 2015: 439.

*Calliixina* cf. *novaebritanniae*; — KNEER et al., 2013a: 265, 269.

Not *Callianassa novaebritanniae*; — SAKAI, 1966: 161, fig. 1–4 [= *Calliixina sakaii* (DE SAINT LAURENT in DE SAINT LAURENT & LEOEFF, 1979)].



Fig. 1: a, *Eucalliax panglaoensis* DWORSCHAK, 2006, NMCR 27000, male holotype (46/10.4) lateral view; b, *Calliaxina novaebritanniae* (BORRADAILE, 1900), NHMW 25811, female (25/7.4) dorsal view; c, same, lateral view; d, *Glypturus armatus* (A. MILNE-EDWARDS, 1870), NMCR 39031, male (82/23.5) lateral view. Photographs: Tin-Yam Chan and Chia-Wei Lin.

Not *Callianassa novaebritanniae* BORR. var. ?; — DE MAN, 1928a: 49, pl. 12, fig. 20–20g [= *Calliixina punica* (DE SAINT LAURENT & MANNING, 1982)]

**Material examined.** Outside Lagoon near Pontod Islet (R29: 09°33.5'N, 123°42.6'E), sand 3–4 m 1 male (17.4/4.8) NHMW 25813, coll. P. Dworschak 7 Jun.2004 (R29\_PD47); — Pontod Islet lagoon (R32: 9°33.1'N, 123°44.0'E), 4 m, sand with seagrass (*Thalassina*, *Enhalis*), *Halimeda*, *Cassiopeia*, 1 male (22.8/6.3 minor cheliped missing) MNHN-2016-3496 (R32\_PD59), 1 female (26/6.8) NMCR 39109 (R32\_PD58), P. Dworschak coll. with yabby pump 8 June 2004; 1 female (28.6/7.1) ZRC 2017.0417 (R32\_PD79), P. Dworschak coll. with yabby pump 10 June 2004; — lagoon near Doljo Point (R44: 9°33.3'/9°34.6'N, 123°43.9'/123°43.4'E), 4 m, fine sand with seagrass and *Halimeda*, 1 female (25.1/7.4) NHMW 25811 (R44\_PD96), 1 female (32.6/7.8) NHMW 21946 (R44\_PD97); 1 male (24.4/6.6) NHMW 25812 (R44\_PD183), P. Dworschak coll. with yabby pump 14 June 2004.

**Comparative material.** Philippines, northern Palawan, west coast of Cadlao Island, Cadlao lagoon, depth at low tide 0.5–1 m, firm sand, 1 male (35/9.3) NHMW 25366, A. Anker coll. with yabby pump, 25 January 2011. — Indonesia, Bali, Nusa Dua, intertidal, 1 female (35/8.2) NHMW 25777 coll. June 2005. — Sulawesi 1 ovigerous female (55/12.6) NHMW 25399, 1 ovigerous female (50/11.4) NHMW 25400, 1 male (33.6/7.6) NHMW 25780, 1 female (55.7/12.6) NHMW 25781, 2 females (38.1/9.6, -/12.4) 2 males (-/11.8 -/12.3 fragmented) NHMW 25782, 1 male (50/13.0) NHMW 25783, 1 female (48/12.7 carapace damaged) NHMW 25784.

**Descriptive notes.** Carapace lacking dorsal oval and cardiac prominence, with cardiac sulcus. Rostrum triangular flanked by deeply excavated shoulders forming anteriorly produced prominences lateral to margins of eyestalks. Antennal peduncles overreaching antennular peduncles. Mxp3 with exopod reaching to middle of merus. Chelipeds almost equal in size and shape in both sexes, major one with low median triangular tooth on fixed finger cutting edge, minor one with a small proximal tooth on fixed finger, cutting edge finely serrated distally, without acute spines at distal corners of carpus. Conspicuous ovoid plates of thickened integument present in both sexes on the first pleomere, anterior to the insertion of Plp1. Male Plp1 uniramous and composed of two articles: distal article with lateral, anteriorly directed, hook-shaped, apical process and two medial subapical processes, proximal one with cincinulli (= appendix interna); male Plp2 biramous, appendix masculina not overreaching endopod, with small appendix interna. Female Plp2 uniramous, proximal article not extended, distal article with shoulder; female Plp2 with appendix interna. Telson twice as broad as long, without transverse carina. Uropodal exopod with dorsal plate.

**Colour.** Generally white, front of carapace yellow.

**Habitat.** Intertidal to shallow subtidal sand, often with seagrass.

**Remarks.** DE SAINT LAURENT & LEOUEFF (1979) found that the Japanese *Callianassa novaebritanniae* illustrated by SAKAI (1966) differs from BORRADAILE'S species and gave it the name *Calliix sakaii*. DE SAINT LAURENT & MANNING (1982) figured several characters of the three similar *C. novaebritanniae*, *C. sakaii*, and their new species *C. punica*. The present material is attributed to *C. novaebritanniae* because of the respective shapes of rostrum, sternite 7, telson, and male Plp1. The male Plp1 displays variations, as one of the males (NHMW 25812) shows an appendix interna only on one side. None of the specimens studied here, however, showed a spiniform seta on the uropodal exopod as illustrated by DE SAINT LAURENT & MANNING (1982: fig. 2b). Such a spiniform seta is also not recognisable in the figure of the holotype (not lectotype) of *C. novaebritanniae* given by SAKAI (1999: fig. 32f).

**Distribution.** Indonesia: Ambon, Sulawesi (SAKAI 2005, SAKAI & TÜRKAY 2012), Bali; Philippines: Panglao, Palawan (this study); Papua New Guinea: New Britain (type locality).



Fig. 2: *Neocallichirus calmani* (NOBILI, 1904): a, NHMW 25842, male (48/12.4) lateral view; b, NHMW 25644, male (62/13.4) lateral view; c, same, dorsal aspect. *Neocallichirus mucronatus* (STRAHL, 1866): d, NMCR 39114, female (41/8.1) lateral view. Photographs: Tin-Yam Chan and Chia-Wei Lin.

**Callichiridae MANNING & FELDER, 1991*****Lepidophthalmus* HOLMES, 1904*****Lepidophthalmus tridentatus* (VON MARTENS, 1868)**

*Callianassa tridentata* VON MARTENS, 1868: 614.

*Callianassa (Callichirus) tridentata*; — DE MAN, 1928a: 27, pl. 7: figs 13-13h; — 1928b: 108; — SAKAI, 1970: 393, figs 1-3.

*Lepidophthalmus tridentatus*; — SAKAI, 1999d: 71, fig. 14e-f; — 2005: 156; — DWORSCHAK, 2007: 122, figs 2-39 (extended synonymy).

*Lepidophthalmoides tridentata*; — SAKAI, 2011: 445.

*L[epidophthalmus] tridentata*; — SAKAI, 2015: 433.

**Material examined.** See DWORSCHAK (2007).

**Additional material.** Japan, Ishigaki I., Fukido River, mouth, muddy sand, intertidal, 1 female (51/11.0 bopyrid right) NHMW 23821, T. Kosuge coll. 5 June 2007; — Japan, Okinawa, Nagura-Ampura, 1 female (56/11.4) NHMW 23011, T. Kosuge coll. 26 April 2007 (DNA voucher ULLZ 8890); — Indonesia, Bali, Nusa Dua, 1 female (39/8,4) NHMW 21249, 1 male (36/8,0) NHMW 21250, 1 male (31/7.6) NHMW 21251 coll. June 2005.

**Description.** See SAKAI (1970) and DWORSCHAK (2007).

**Distribution.** Sri Lanka (MIERS 1884; SAKAI 1970); Indonesia: Java (type-locality), Bali, (this study); Philippines: Panglao (DWORSCHAK, 2007); Japan: Ryukyu Is. (KOMAI 2009); Papua New Guinea: New Britain (SAKAI 1970).

***Glypturus* STIMPSON, 1866*****Glypturus armatus* (A. MILNE-EDWARDS, 1870) (Figs. 1d, 3, 4)**

*Callianassa armata* A. MILNE-EDWARDS, 1870: 90, 101, pl. 1.

*Glypturus motupore* POORE & SUCHANEK, 1988: 198, figs. 1–3, 4a.

*Glypturus armatus*; — KNEER et al., 2013a: 262–272; — KOMAI et al., 2015: 18, figs 1-7 (extended synonymy).

Not *Glypturus armatus*; — SAKAI et al., 2014: 491(list); SAKAI, 2015: 432 [= *Glypturus laurae* (DE SAINT LAURENT in DE VAUGELAS & DE SAINT LAURENT, 1984)]

**Material examined.** Doljo Point [M8(M5), 9°35.4'N, 123°44.3'E], mixed intertidal platform, fringe mangrove, seagrass, 1 male (82/23.5), NMCR 39031; lateral part of ischium of major cheliped, probably of exuvia (175/50 as estimated from regression) NHMW 25460, P. Dworschak coll. with yabby pump 3 June 2004.

**Comparative material.** *Glypturus armatus*: Tahiti, Vairao, Plongée, 1 male (130/38.8 minor cheliped missing) MNHN Th-654, 1 ovigerous female (120/34.8, minor cheliped missing) MNHN Th-657, J. de Vaugelas coll. 15. Sept. 1983. — Vietnam, Nhatrang, 1 male (76/21.9) NHMW 23822, 1 female (98/25.7) NHMW 21941, I. Marin coll. — Lontor, Banda, Kysten ved Lavvande [sea shore at low tide], 1 female (100/28.6) ZMUC CRU 2696, Den danske Expedition til Kei-Øerne 1922 coll. 7-6-1922.

Material previously attributed to *Glypturus motupore*: Papua New Guinea, Bootless Inlet, Motupore Island (9°32'S, 147°16'E), intertidal sandlat, T.H. Suchanek coll. June/July 1985, female holotype (134/38) NMV J13811, paratypes: 1 female (104/29) NMV J13814, 1 female (75/22) NMV J13815, 1 female (110/damaged) NMV J13813, 1 male (100/29) NMV J13812, 1 female (101/28) MNHN Th-915, 1 male (92/24) USNM 229516.

**Description.** See KOMAI et al. (2015).

**Distribution.** Vietnam; Japan: Ryukyu Is.; Philippines; Indonesia; Papua New Guinea; Fiji; New Caledonia (KOMAI et al. 2015).

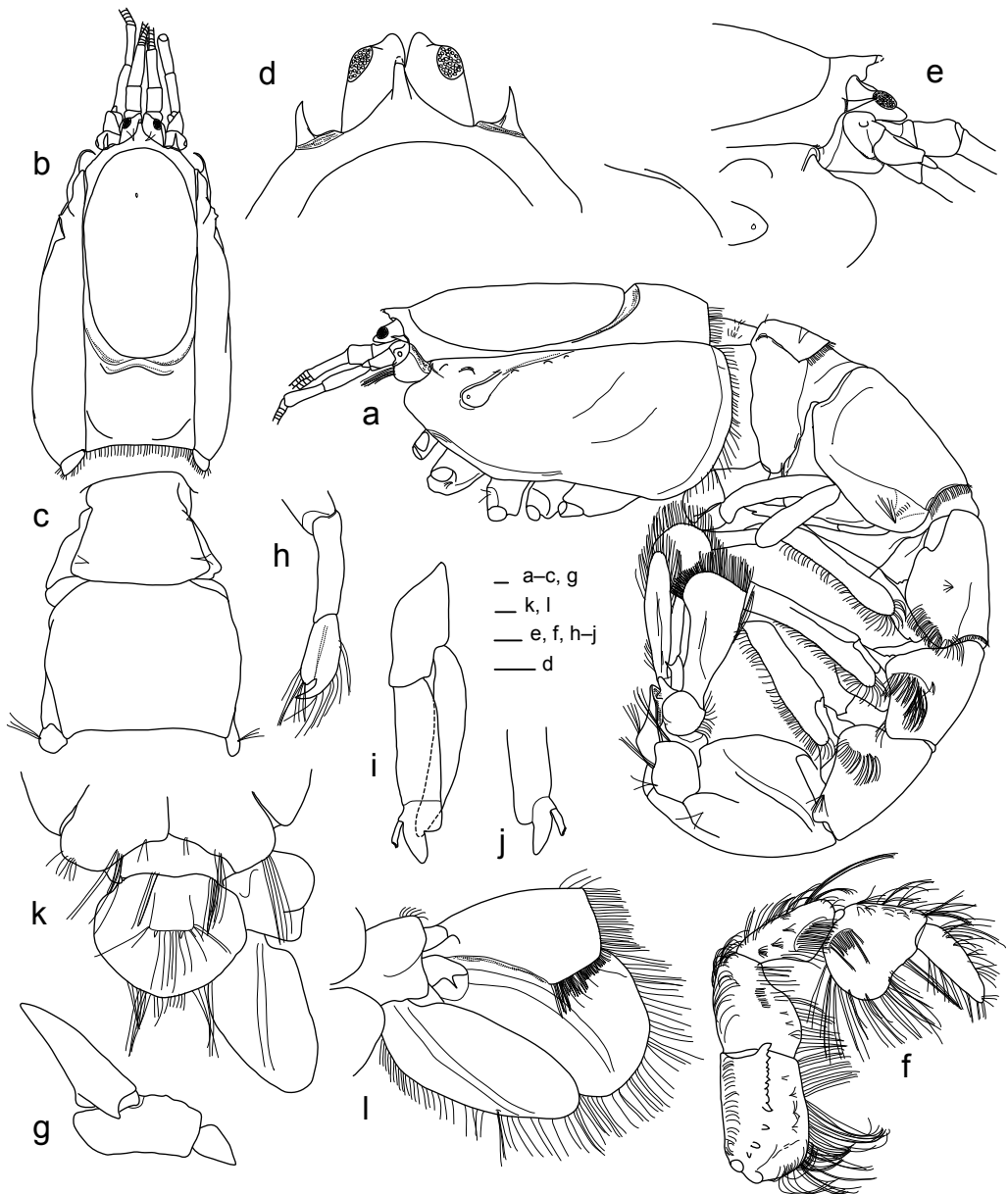


Fig. 3: *Glypturus armatus* (A. MILNE-EDWARDS, 1870), NMCR 39031, male (82/23.5). a, habitus (without pereopods), lateral view; carapace (b) and pleomeres 1–2 (c) in dorsal view; front in dorsal (d) and lateral (e) view; f, third maxilliped, mesial view; g, distal articles of P3, lateral view; h, left first pleopod, ventral (anterior) view; i, right second pleopod, anterior view; j, same, tip of endopod in posterior view; k, telson; l, uropods. Scale bar is 1 mm.



***Corallianassa* MANNING, 1987*****Corallianassa coutierei* (NOBILI, 1904) (Fig. 5)**

*Callianassa (Callichirus) Coutierei* NOBILI, 1904: 237; — NOBILI, 1906a: 101, 110, pl. 7, fig. 1; — NOBILI, 1906b: 60; — DE MAN, 1928b: 28(list), 109(key), 174, 179.

*Callianassa placida* DE MAN, 1905: 612.

*Callianassa (Callichirus) placida*; — DE MAN, 1928b: 29(list), 93(key), 108, 171, pl. 18 fig. 29–29b, pl. 19 fig. 29c–e.

*Corallichirus placidus*; — MANNING, 1992: 571.

*Glypturus coutierei*; — SAKAI, 1999: 78(part), figs 17a–f, 18a–b.

*Corallianassa coutierei*; — NGOC-HO, 2005: 71, fig. 13; — SEPAHVAND et al., 2013: 1001.

*Glypturus longiventris*; — SAKAI, 2011: 435(part); — [not *Callianassa longiventris*, A. MILNE-EDWARDS, 1870].

Not *Corallianassa coutierei*; — KNEER et al., 2008: 620–630; POUPIN & JUNCKER, 2010: 80, figs a–c; — KNEER et al., 2013a: 262–272; — 2013b: 265, 269; — SHEN et al., 2013: 776–789 [= *Corallianassa borradailei* (DE MAN, 1928)]

Not *Callianassa (Callichirus) placida*; — CHACE, 1962: 617 (partim) [= *Corallianassa xutha* MANNING, 1988].

Not *Callianassa placida*; — HERNÁNDEZ AGUILERA et al., 1986: 206 [= *Corallianassa xutha* MANNING, 1988].

**Material examined.** Napaling (B8: 9°37.1'N, 123°46.1'E), 3 m, subtidal reef platform, 1 female (30/6.7) NMCR 39099, coll. 7 June 2004.

**Comparative material.** Gulf of Aden, Djibouti, male (37/10.8) MNHN Th-75 [lectotype of *Callianassa (Callichirus) coutierei* NOBILI, 1904]; — Red Sea, Sudan, Al Bahr al Ahmar, SAN-144, Sanganeb-Atoll 28 km N Port Sudan, TQ1, aus toten *Pocillopora*, 8 m, 1 female (20/4.9) SMF 40681, coll. 1 October 1992; — Papua New Guinea, Maoang Prov., Hansa Bay, Laing I., 1 female (18/3.8) NHMW 25937, 1 female (23/5.3) NHMW 25938, S. De Grave coll. Oct. 1993.

*Corallianassa borradailei*: Indonesia, Sulawesi, Sarappokeke, seagrass 1 female (61/13.6 broken) NHMW 25797 (#5), D. Kneer coll. 20 September 2005; — Indonesia, Sulawesi, Bone Batang, 1 ovigerous female (62/14.7) NHMW 25793 (#6), 1 ovigerous female (62/14.3) NHMW 25794 (#7), Bone Batang, D. Kneer coll. 15 Sep 2005; — Indonesia, Bali, Nusa Dua, seagrass, 1 ovigerous female (27/6.2) NHMW 25775, 1 male (32/7.0) NHMW 25776, coll. June 2005; — Society Islands, Moorea St. 548, 1 ovigerous female (65/14.1) NHMW 25773, 1 female (63/12.8) NHMW 25772, 1 male (41/8.8) NHMW 25774, coll. Nov. 2010.

**Descriptive notes.** Carapace 0.22 of total length. Dorsal oval distinct, 0.6 as long as dorsal carapace. Rostrum as an acute spine, slightly shorter than eyestalk (Fig. 5a–c). Lateral projections in form of acute spines directed forward, half long as rostrum, with non-calcified base. Eyestalks shorter than first antennular article; cornea large, subterminal. Antennular peduncle reaching to middle of ultimate antennal article. Third maxilliped (Fig. 5d) with ischium-merus 2.2 times as long as wide, merus shorter than ischium; ischium with distinct crista dentata mesially, carpus articulating distolaterally on merus; propodus as wide as long, free distal margin slightly excavate; dactylus shorter than propodus width about 0.2 of propodus. Major cheliped (Fig. 5a, e) with ischium proximally unarmed, distal lower margin with four teeth distally increasing in size; merus with lower ridge of blunt tubercles; carpus higher than long, less than half length of propodus; upper and lower borders of propodus smooth, with upper crest on proximal 0.66; cutting edge of fixed fingers sharp, with low triangular tooth proximally; dactylus stout, longer than fixed finger, cutting edge sharp, without teeth. Small cheliped (Fig. 5h) with ischium proximally unarmed, distal lower margin with four teeth distally increasing in size, merus without lower spines; carpus, propodus elongate, carpus slightly shorter

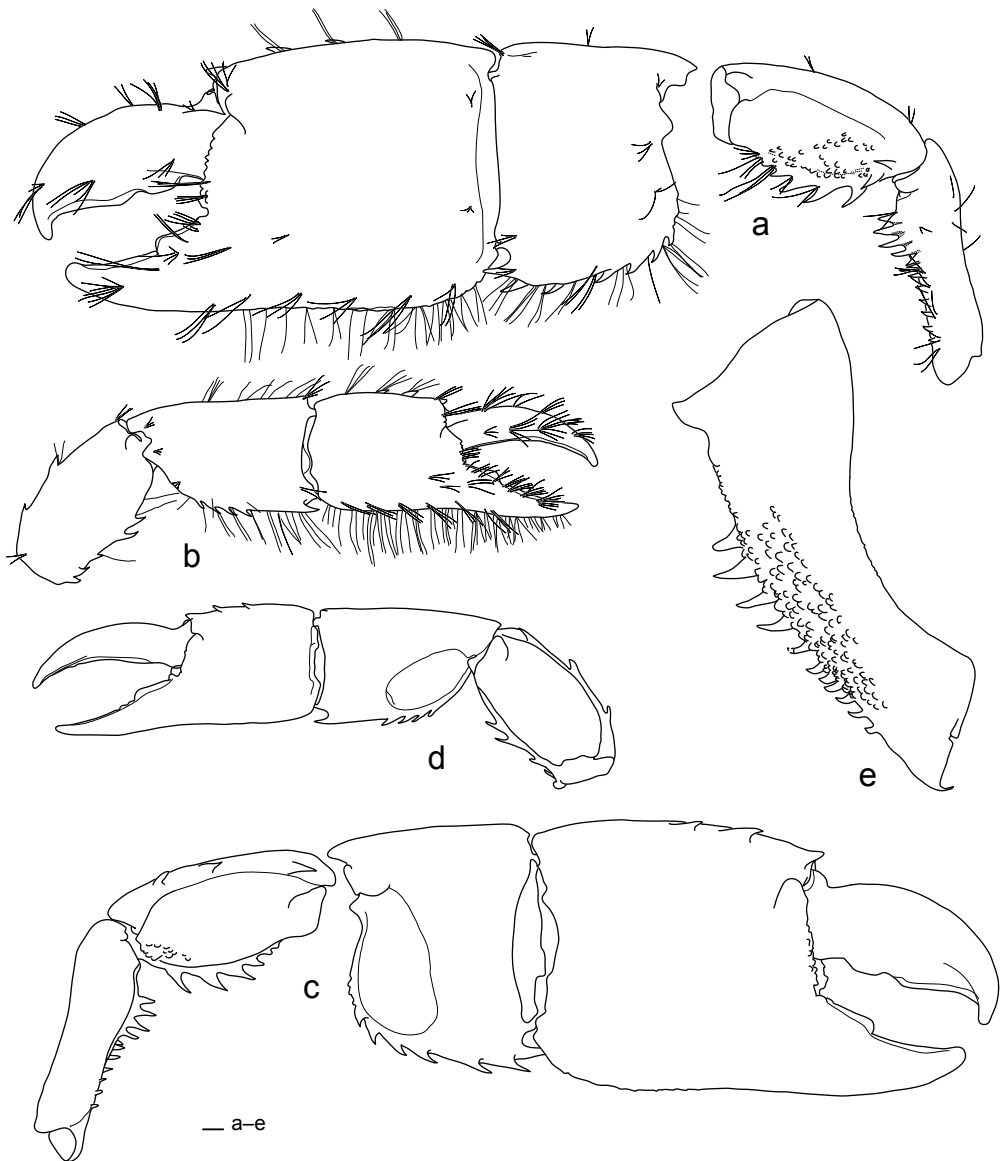


Fig. 4: *Glypturus armatus* (A. MILNE-EDWARDS, 1870). a–d, NMCR 39031, male (82/23.5); e, NHMW 25460. Major (a) and minor (b) cheliped in lateral view; major (c) and minor (d) cheliped in mesial view (setae omitted); e, ischium of major cheliped. Scale bar is 1 mm.

than upper margin of propodus; dactylus longer than carpus; cutting edges of fingers each with low median tooth. Third pereopod propodus 1.7 as long as high, not heeled (Fig. 5i). Second pleomere slightly longer than wide, 1.3 longer than sixth pleomere. Telson (Fig. 5j) trapezoidal, 1.9 times as wide as long, widest basally; dorsal surface convex (Fig. 5a), posterior border with weakly convex. Uropodal endopod (Fig. 5k) oval, longer

than telson, more than twice as long as wide; uropodal exopod (Fig. 5k) with strongly elevated dorsal plate, as long as endopod.

**Colour.** Whitish to translucent yellow; carapace with tinge of light brown; chelipeds mottled with white and light brown.

**Habitat.** Shallow sublittoral, in sand with coral rubble.

**Remarks.** *Corallianassa* was treated as a junior synonym of *Glypturus* Stimpson, 1866 in several studies by SAKAI (1999, 2005, 2011). In this study, KOMAI et al. (2015) is followed in adopting NGOC-HO's (2005) and MANNING's (1987) definitions of the genera *Glypturus* and *Corallianassa* and treating *Corallichirus* MANNING, 1992 as a synonym of *Corallianassa*.

*Corallianassa borradailei* has been considered a junior synonym of *C. coutierei* until KOMAI et al. (2015) redescribed it and considered it different from *C. coutierei* based on the keel on the upper border of major P1. SAKAI (2011) synonymised *C. coutierei* (and *C. placida*) with *C. longiventris* implying a circumtropical distribution of the species, while he considered *C. borradailei* as valid species. KOMAI et al. (2015) rejected this synonymy, but considered *C. placida* a junior synonym of *C. coutierei*. *Corallianassa coutierei* and *C. longiventris* differ by the shape of the major and minor cheliped, more slender in *C. longiventris* with triangular carpus instead of rectangular carpus in *C. coutierei* which in addition lacks spines at the lower border of minor P1 merus.

**Distribution.** The real distribution of the present species in the Indo-Pacific remains unclear because of the taxonomic confusion with *C. borradailei* (type locality: Maldives). Known with certainty from Gulf of Aden: Djibouti (type locality); Red Sea: Sudan (this study); Arabian Gulf and Madagascar (NGOC-HO 2005); Gulf of Oman (SEPAHVAND et al. 2013); Indonesia (DE MAN 1905 as *C. placida*); Philippines: Panglao; Papua New Guinea (this study); French Polynesia: Marquesas Is. (NGOC-HO 2005).

### *Neocallichirus* SAKAI, 1988

#### *Neocallichirus vigilax* (DE MAN, 1916)

*Callianassa* (*Callichirus*) *vigilax* DE MAN, 1916: 57, pl. 1 figs 1–6.

*Neocallichirus vigilax*; — SAKAI, 1999: 108; 2005b: 183; 2011: 464; DWORSCHAK, 2011b: 138, figs 1–79 (extended synonymy); — KNEER et al., 2013a: 262–272.

*Neocallichirus denticulatus* NGOC-HO, 1994: 56, fig. 4; — SAKAI, 1999d: 98; — 2005b: 178; — 2011: 455.

**Material examined.** See DWORSCHAK (2011b).

**Description.** See DWORSCHAK (2011b).

**Distribution.** See DWORSCHAK (2011b), and Japan, Ryukyu Is. (OSAWA & FUJITA 2016).

#### *Neocallichirus jousseaumei* (NOBILI, 1904)

*Callianassa* (*Cheramus*) *Jousseaumei* NOBILI, 1904: 236; — 1906: 101, pl. 6 fig. 2.

*Neocallichirus jousseaumei*; — DWORSCHAK, 2011a: 2, figs 1–4, 6F–H (extended synonymy); — 2014:

232, fig. 10b; — SAKAI, 2011: 458; 2015: 436; — NADERLOO & TÜRKAY, 2012: 18; — SEPAHVAND & SARI, 2013: 1002; — KNEER et al., 2013a: 262–272; — SAKAI & TÜRKAY, 2014: 180 (key); — GOTO et al., 2014: 201, fig. 1B; — SAKAI & TÜRKAY, 2015: 500(list); — SAKAI, 2015a: 436.

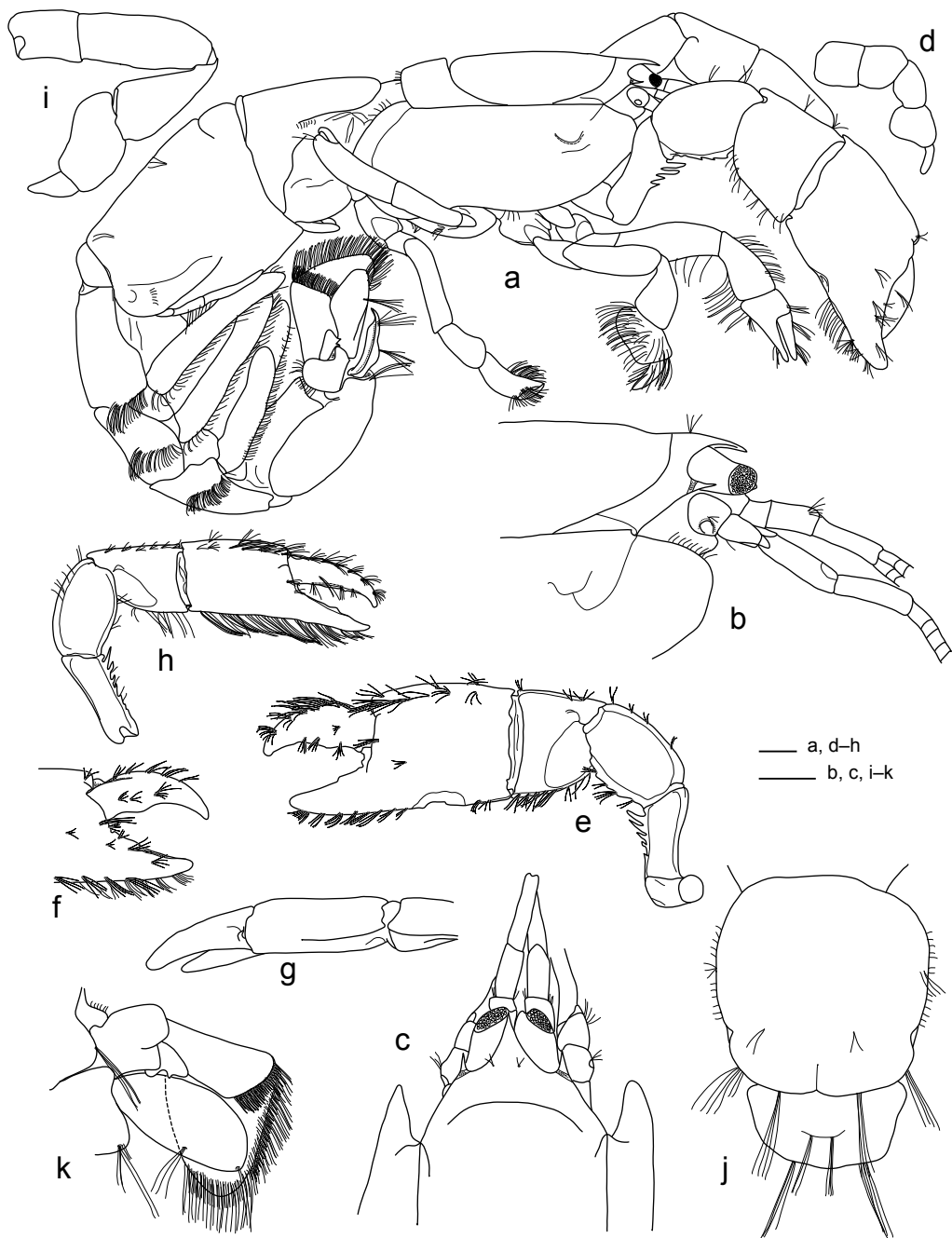


Fig. 5: *Corallianassa coutierei* (NOBILI, 1904), NMCR 39099, female (30/6.7). a, habitus, lateral view; front in lateral (b) and dorsal (c) view; d, third maxilliped, lateral view; major (e) and minor (f) cheliped in mesial view; g, major cheliped, fingers in lateral view; h, major cheliped, dorsal view; i, third pereopod, mesial view; j, sixth pleomere and telson, dorsal view; k, uropods. Scale is 1 mm.

*Neocallichirus indicus*; — SEPAHVAND & SARI, 2011: 46; — SAKAI, 2011: 458; — 2015: 434; — SAKAI & TÜRKAY, 2014: 182; — SAKAI et al., 2014: 492 (table I); — SAKAI & TÜRKAY, 2015: 500 (list).

**Material examined.** See DWORSCHAK (2011a)

**Additional material.** Australia: Cocos (Keeling) Is. (see DWORSCHAK 2014). — Philippines, northern Palawan, west coast of Cadlao Island, Cadlao lagoon, depth at low tide 0.5–1 m, firm sand, 1 female (56/15.0) NHMW 25369, A. Anker coll. with yabby pump 25. January 2011. — Iran, Gulf of Oman, Ziarat-Kaleh, 1 male (42/11.1) NHMW 24991, V. Sepahvand coll. — Indonesia, Sulawesi, 1 male (56/17) NHMW 25803, coll. Jan 2010.

**Description.** See DWORSCHAK (2011a).

**Distribution.** Gulf of Aden: Djibouti, Perim, Gulf of Tadjourah; Red Sea (type locality); Socotra; Persian-Arabian Gulf; Indonesia (type locality of *C. indica* DE MAN, 1905); Thailand; Philippines; Japan: Ryukyu Is. (GOTO et al. 2014); Cocos (Keeling) Is. (DWORSCHAK 2014); Indonesia: Sulawesi (this study); French Polynesia (type locality of *N. taiaro* NGOC-HO, 1995) (see DWORSCHAK 2011a).

**Remarks.** DWORSCHAK (2011a) redescribed the species based on the type material from the Gulf of Aden and additional material from the Red Sea, Thailand, and Panglao. He synonymised it with *Neocallichirus indicus* but this was rejected by SAKAI et al. (2014) and SAKAI & TÜRKAY (2014, 2015). SAKAI (2015) recognised three different groups according to shape of male Plp1 within one population. Differences between the terminal article of male Plp1, ranging from simple, bilobed or with rounded lobe and acute tip (DWORSCHAK 2011a: figs 1L, 3Q, 4H–I) and the development of the appendix interna of the male pleopod 2 (DWORSCHAK 2011a: figs. 1M, N, 3R, 4J, K, M–O) are related to maturity and are not specific differences. Such variations in the shapes of male Plp1–2 have also been observed in other species of the genus, namely in *N. cacahuate*, *N. grandimana* (see FELDER & MANNING 1995), *N. karumba* (see DWORSCHAK 2008) and *N. vigilax* (see DWORSCHAK, 2011b).

### *Neocallichirus calmani* (NOBILI, 1904) (Figs. 2a–c, 6–9)

*Callianassa (Cheramus) Calmani* NOBILI, 1904: 237; — 1906: 104, pl. 5 fig. 2.

*Callichirus calmani*; — DE SAINT LAURENT & LELOEUFF, 1979: 97

*Callianassa calmani*; — DWORSCHAK, 1992: 192, fig. 3.

*Neocallichirus calmani*; — SAKAI, 1999d: 96, fig. 22a–d; — 2005: 177; — 2011: 455; — 2015: 434, table I; — SEPAHVAND & SARI, 2013: 1002; — SAKAI et al., 2014: 491 (table I); — SEPAHVAND, 2014: 68.

**Material examined.** Alona Beach (M1: 09°32.9'N, 123°46.6'E), intertidal, 1 male (48/12.4) NHMW 25842 (Photo sp.3), coll. P.K.L. Ng 3 June 2004; 1 ovigerous female (56/14.8) ZRC 2017.0412 (PD028), 1 f (25/7.2) NHMW 25834 (PD027), 1 f (36/9.2) NHMW 25833 (PD026), 1 female (36/10.4) NHMW 25832 (PD024), 1 m (62/13.4) NHMW 25644 (PD029), coll. P. DWORSCHAK 5 June 2004; 1 female (47/11.8) NHMW 25840 (PD031/3), 1 female (42/10.6) NHMW 21943 (PD031/4), 1 ovigerous female (46/12.2) NHMW 25839 (PD031/2), 1 ovigerous female (51/14. ) NHMW 25838 (PD031/1), 1 male (41/10.2) NHMW 25841 (PD031/5), coll. P. Dworschak 6 June 2004; 1 male (28/7.2) ZRC 2017.0413 (PD101), 1 male (34/10.0) MNHN-2016-3494 (PD106/2), 1 male (35/8.8) NMCR 39105 (PD107), 1 male (40/11.0) MNHN-2016-3493 (PD106/1), 1 ovigerous female (45/12.4) MNHN-2016-3492 (PD104), 1 ovigerous female (39/10. ) ZRC 2017.0414 (PD103), 1 male (34/9.4) MNHN-2016-3491 (PD102), 1 male (43/11.2) NMCR 39106 (PD108), coll. P. Dworschak 15 June 2004; 1 ovigerous female (48/13.4) NMCR 39101 (JL004), 1 ovigerous female (38/10.6) MNHN-2016-3488 (JL008), 1 ovigerous female (44/12.4) ZRC 2017.0407 (JL006), 1 m (53/13.6) NMCR 39102 (JL006), 1 female (39/10.2) ZRC 2017.0408 (JL007), 1 male (27/7.2) NMCR 39100 (JL003), 1 male (30/8.2) NMCR 39103 (JL009), coll. Joelle Lai 16 June 2004; 1 female (47/9.0) NHMW 25836 (PD143), 1 female (40/12.0) NHMW 25835 (PD143), 1 female (27/7.2) NHMW 25837 (PD143), coll. P. Dworschak 18 June 2004; 1 male (45/12.0) NMCR 39104 (PD001/1), 1 male (33/8.8) ZRC

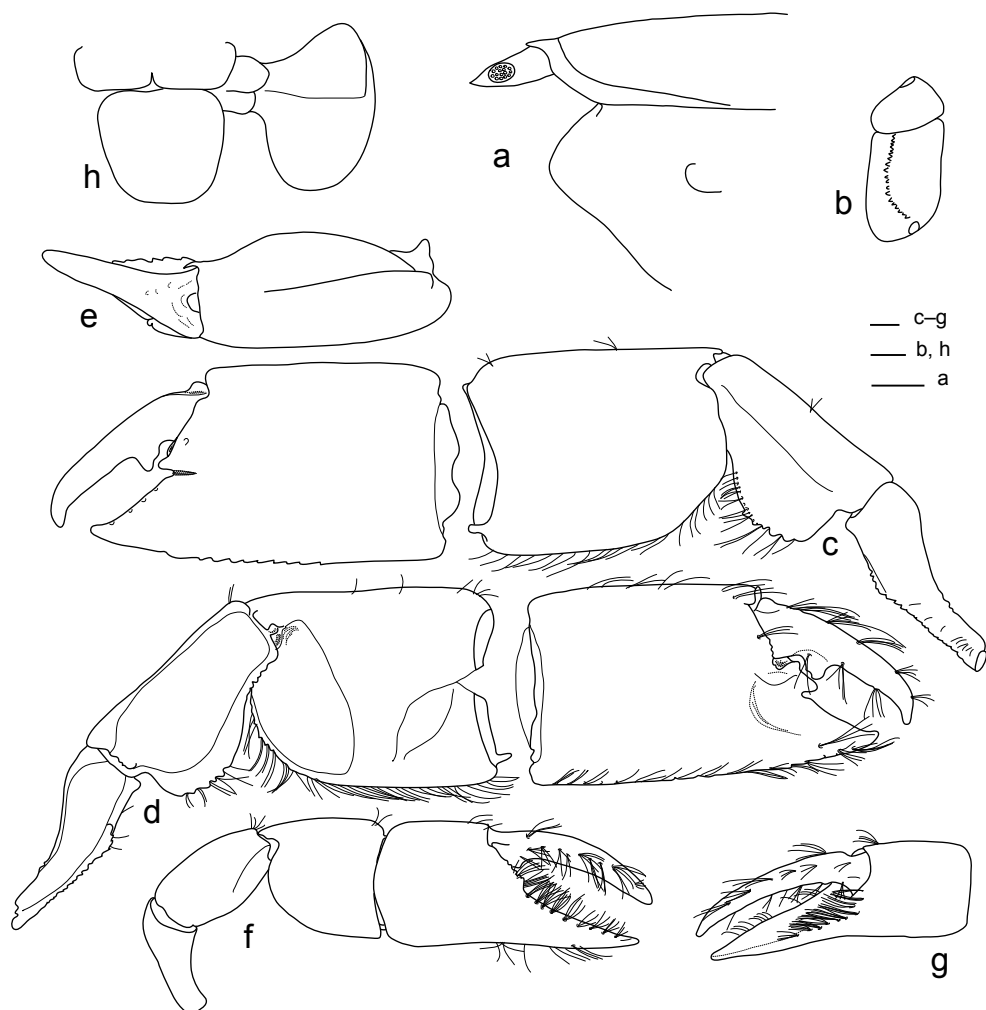


Fig. 6: *Neocallichirus calmani* (NOBILI, 1904), MNHN Th-71 (holotype of *Callianassa calmani* NOBILI, 1904, cl 11.4). a, front in lateral view; b, third maxilliped ischium-merus, mesial view (setae omitted); major cheliped (broken) in lateral (c) and mesial (d) view; e, major cheliped, propodus and dactylus, dorsal view (setae omitted); f, minor cheliped, lateral view; g, minor cheliped, propodus and dactylus, mesial view; h, telson and uropodal exopod, dorsal view (setae omitted). Scale bar is 1 mm.

2017.0411 (PD001/2), 1 male (26/7.8) MNHN-2016-3489 (PD001/3), 1 female (33/9.8) MNHN-2016-3490 (PD001/4), coll. P. Dworschak 30 June 2004; 1 ovigerous female (34/9.0) ZRC 2017.0410, 1 male (46/11.8) ZRC 2017.0409, coll. June 2004; 1 female (41/11.6) NHMW 25818, 1 female (27/7.6) NHMW 25825, 1 ovigerous female (33/8.8) NHMW 25831, 1 male (35/9.0) NHMW 25830, 1 female (30/8.0) NHMW 25829, 1 male (31/9.0) NHMW 25827, 1 female (36/10.2) NHMW 25826, 1 male (36/11.0) NHMW 25824, 1 female (27/7.6) NHMW 25823, 1 male (32/8. ) NHMW 25822, 1 male (33/9.8) NHMW 25821, 1 male (47/12.6) NHMW 25819, 1 male (54/11.4) NHMW 25817, 1 female (30/7.6) NHMW 25828, 1 female (49/11.2) NHMW 25816, 1 male (47/13.4) NHMW 25820, coll. P.K.L. Ng 3 July 2004.

**Comparative material.** Gulf of Aden, Obock, holotype [of *Callianassa (Cheramus) Calmani* NOBILI, 1904], unsexable (fragments of carapace cl 11.4, detached major and minor cheliped, incomplete left mxp3 attached, all other legs and pleon missing) MNHN Th-71, M. Jousseume coll. 1897. — Red Sea, Aqaba, 1 male (53/12) 1 female (55/14.2) NHMW 6780, J. de Vaugelas coll. December 1987. — Madagascar, Nosy Be, Palm Beach Hotel Bay, fine sand, intertidal, 1 male (53/13.6) 3 females (51/12.9, 50/12.2, 43/11.1) NHMW 19384, D. Abed-Navandi coll. April 2000. — Indonesia, Bali, Nusa Dua Beach, 1 female (38/7.8) NHMW 25609, 1 female (42/9.3) NHMW 25610, coll. June 2005. — Vietnam, Nhatrang Bay, Nhatrang City, northern beach, sand, intertidal, 1 ovigerous female (33/7.0) NHMW 25611, I. Marin coll. 22 May 2004.

**Redescription.** Carapace dorsally as long as pleomeres 1 and 2 combined, ca 0.2 to 0.25 of total length (Fig. 7a). Frontal margin with three anterior prominences, lateral prominences obtusely angular; median prominence reaching beyond laterals, forming short, broadly rounded rostrum (Fig. 7b). Carapace flat, only slightly elevated over rostrum, lacking cardiac prominence and dorsal carina, with distinct linea thalassinica; 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 (Fig. 7a). Sclerotised ridge along anterodorsal margin of anterior branchiostegal lobe articulating at junction of oblique ridge and linea thalassinica. Subantennular region of epistome bearing dense tuft of long setae.

Eyestalks not reaching to end of basal antennular article, ca 1.5 times as long as broad; outer margins convex, terminating in a dorsoventrally flattened rounded lobe (Figs. 6a, 7a, b). Cornea black, situated dorsolaterally in distal 0.5 of eyestalk, ca 0.5 width of eyestalk.

Antennular peduncle thicker, but shorter than antennal peduncle; second article slightly shorter than basal article; terminal article 1.4 times as long as second.

Antennal peduncle basal article with dorsolateral carina forming lip above excretory pore; second article longer than first, third article short, visible in lateral view as short triangle ventral to second article and vestigial antennal scale; fourth article elongate, as long as basal, second and third article combined; fifth article narrower, as long as fourth article.

Mouthparts typical for genus. Mandible with toothed molar process. Third maxilliped (Figs. 6b, 7c, 9l) without exopod; endopodal ischium 1.7 to 1.9 times as long as broad, mesial surface with row of teeth (crista dentata); merus triangular, 1.0 to 1.5 times as broad as long; carpus triangular, longer than broad; propodus large, ovoid, as broad as long; dactylus narrow, arcuate.

Major cheliped massive, (Figs. 6c–e, 8a–c, 9a–i) located on either right or left side of body (Panglao: 25 left, 29 right), shape sexually dimorphic (see below). Ischium denticulated on ventral border, proximal 1/4 smooth, two to four tubercles on dorsal border in proximal half; merus with triangular denticulated blade on ventral border, tubercles on mesial face proximally; carpus long, about as long as palm, denticulate on lower border proximally, upper border smooth; propodus with lower border denticulate along a mesially directed keel, upper border smooth; fixed finger short, triangular, tip curved upwards, with incision on lateral face below articulation with dactylus, deep triangular excavation below articulation with dactylus on mesial face, cutting edge smooth in

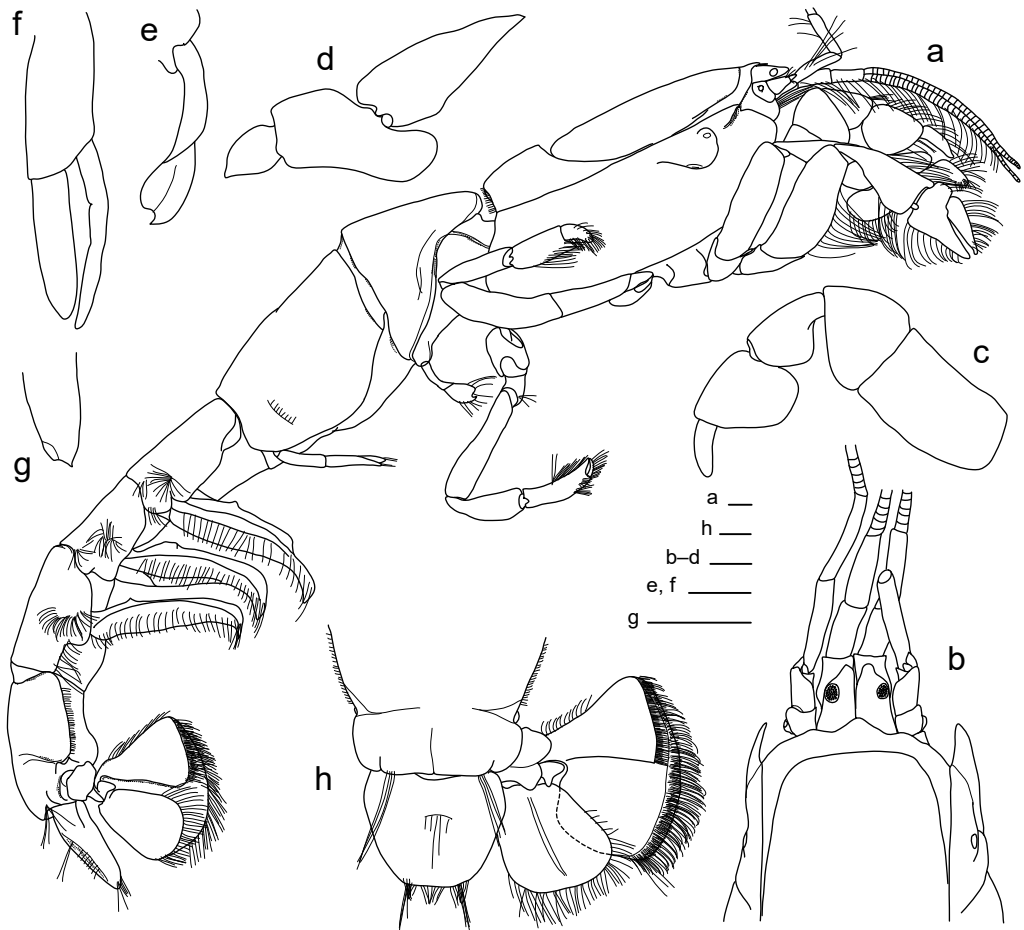


Fig. 7: *Neocallichirus calmani* (NOBILI, 1904), NHMW 25644 (male 62/13.4). a, habitus (without chelipeds), lateral view; b, front, dorsal view; c, third maxilliped, lateral view (setae omitted); d, distal articles of third pereopod, lateral view (setae omitted); e, left first pleopod, lateral view (setae omitted); f, left second pleopod, anterior view (setae omitted); g, same, endopod in posterior view (setae omitted); h, telson and uropod, dorsal view. Scale bar is 1 mm.

males with blunt denticles proximally, with sharp teeth in females; dactylus slender, longer than fixed finger, curved, with one large denticulate tooth on cutting edge proximally in large males, smooth distally, dactylus in small males and females with a rectangular tooth proximally and a triangular tooth distally.

Minor P1 (Figs. 6f, g, 8d–f, 9j, k) massive, about 0.6 times as long and 0.6 times as high as major P1, with smooth borders of ischium, merus, carpus and propodus; carpus as long as palm; fingers as long as palm; fixed finger widely excavated, bordered by dense setae on mesial face in larger specimens, few teeth on lateral upper border below articulation with dactylus; dactylus curved, with blunt tooth on cutting edge proximally.



Second to fifth pereopod typical for genus. Third pereopod (Figs. 7d, 9m, n) propodus rhomboidal with proximally directed lobe of inferior margin reaching beyond broadest part of carpus (heeled). Fourth pereopod subchelate.

Pleon long (Fig. 7a); dorsal length ratio (along midline) of first to sixth abdominal somites 1.0: 1.27: 0.88: 0.77: 1.0: 1.0 (NHMW 25644).

Male Plp1 consisting of two articles, terminal one with pointed tip and rounded lobe, uniform over the entire size range (Figs. 7e, 9p–s). Female first pleopod simple (Fig. 9o), consisting of two articles; terminal article with shoulder at midlength.

Male Plp2 biramous (Figs. 7f, 9t), exopod slightly longer than endopod, clearly demarcated appendix masculina recognisable in small specimens (CL 3.7, Fig. 9v, w), the endopod appearing bifid in larger-sized males (CL 9.8–13.4, Fig. 9x, y) showing a weak demarcation of appendix masculina recognisable in posterior view only. None of the males show any sign of cincinulli (appendix interna). Female second pleopod biramous, endopod with appendix interna (Fig. 9u).

Third to fifth pleopods with appendix interna embedded into mesial margin of endopod.

Telson ca 1.3 times as broad as long, broadest proximally, lateral and posterior margins convex. Uropodal endopod slightly longer than telson, rhomboidal, about as long as wide. Uropodal exopod longer than endopod, with anterodorsal plate (Figs 6h, 7h).

**Size.** TL 25–62 mm, CL 7.2–14.8 mm.

**Colour.** Whitish with a touch of pink on the cheliped, abdomen yellow to orange.

**Habitat.** Lower intertidal in coral rubble covered by fine sand (see DWORSCHAK 2011a: fig. 6A).

**Remarks.** *Neocallichirus calmani* was collected at Alona Beach together with *N. jousseaumei* and *Eucalliax panglaoensis* with no difference between the burrow openings. *Neocallichirus calmani* was the most common (57 specimens) followed by *N. jousseaumei* (46 specimens). *Neocallichirus calmani* was only found at Alona Beach, whereas *N. jousseaumei* occurred also at Sungcolan (M11). At first, *N. calmani* appears similar to *N. jousseaumei* but can easily be differentiated by its yellowish colour (versus pinkish in the latter species); a less arched carapace; eyes devoid of extracorneal pigment and tubercles, distally divergent; a more slender pleon; a relatively longer carpus of the major P1 and a heeled P3 propodus.

Ten of 27 females were ovigerous, embryo diameter is 500–535 µm.

**Distribution.** Gulf of Aden: Obock (NOBILI 1904, 1906; type locality); Red Sea: Aqaba (DWORSCHAK 1992; SAKAI 1999), Saudi Arabia (SAKAI et al. 2014); Persian Gulf (SEPAHVAND 2014); Gulf of Oman (SEPAHVAND & SARI 2013); Madagascar; Vietnam; Indonesia: Bali; Philippines: Panglao; (this study).

### ***Neocallichirus mucronatus* (STRAHL, 1862) (Fig. 1d, 10, 11)**

*Callianassa mucronata* STRAHL, 1862: 1056; — ESTAMPADOR, 1937: 499; — 1959: 46.

*Neocallichirus mucronatus*; — SAKAI, 1999: 105, fig. 26a–i; — 2005: 182; — 2011: 462; 2015: 438; — SAKAI et al., 2014: table I, 501 figs 3, 4; — SAKAI & TÜRKAY, 2014: 185 (extended synonymy).

**Material examined.** Arco Point (B3: 9°33.5'N, 123°48.6'E), 8 m, base of reef slope, dead corals and sand, 1 female (41/8.1) NMCR 39114, P. Petit de Voize et al. coll. 31 May 2004; — Dao (R33: 9°33.9'N,

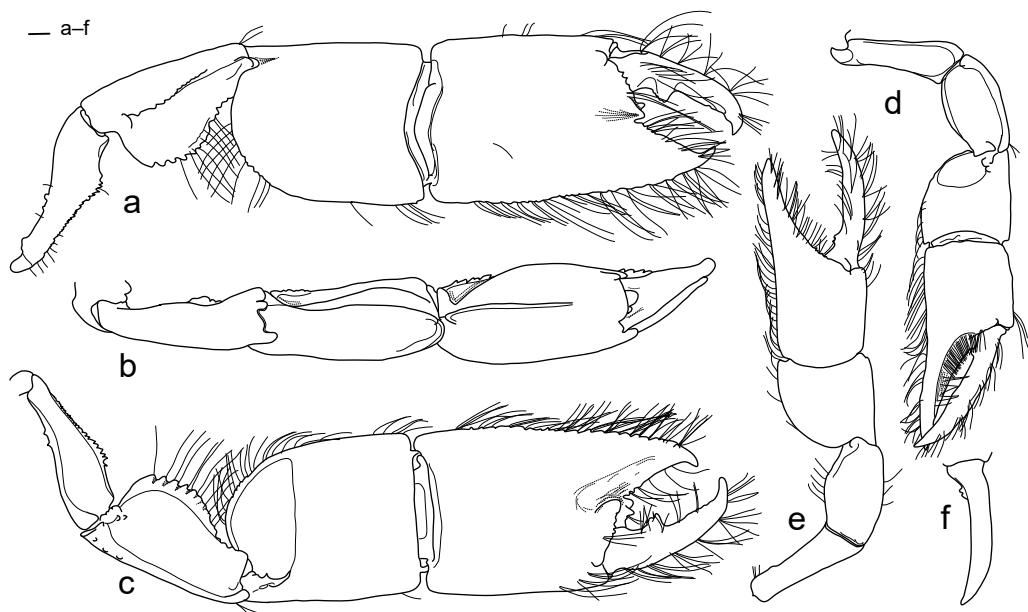


Fig. 8: *Neocallichirus calmani* (NOBILI, 1904), NHMW 25644 (male 62/13.4). Major cheliped in lateral (a), dorsal (b) and mesial (c) view; minor cheliped in mesial (d) and lateral (e) view; f, minor cheliped dactylus, mesial view (setae omitted). Scale bar is 1 mm.

123°48.8'E), 1–4 m, coral platform with seagrass, picked up while lifting stone, 1 female (45/9.2) NHMW 21944, S. Schiaparelli coll. 9 June 2004; — Ubajan (S26: 9°41.5'N, 123°51.0'E), mud, 21 m, 1 ovigerous female (16/3.6) MNHN-2016-3501 (PD202), P. Petit de Voize et al. coll. 23 June 2004.

**Comparative material.** Philippines, Luzon, 1 female (43/8.9) NHMW 6706., Semper don. 1861; — Red Sea, Sudan, Al Bahr al Ahmar, SAN-44, Sanganeb-Atoll 28 km N Port Sudan, bei Wrack SAIDA III, aus toten Korallen und Steinen, 5 m, 1 female (35/7.5) SMF 40679, coll. 25 March 1991; SAN-101, Sanganeb-Atoll 28 km N Port Sudan, S-Mole, Riffdach, aus toter *Stylophora*, 1 female (14/3.0) SMF 40680, coll. 26 September 1992; SAN-166, Port Sudan, Wingate Reef, aus toten Korallen, 5 m, 1 female (18/3.7) SMF 40682, coll. 21 September 1992; — Baia di Djibouti (Somalia), 3 males (CL 6.6–8.3) 4 females (CL 6.3–10.8) MRSN Cr402, L. Gravier coll. 1904, G. NOBILI det. 1913; — Papua New Guinea, Maoang Prov., Hansa Bay, Laing I., 1 female (26/5.1) NHMW 25939, 1 female (30/6.7) NHMW 25940, 1 female (21/4.0) NHMW 25941, 1 male (27/6.3) NHMW 25942, 1 ovigerous female (44/8.6) NHMW 25943, 1 female (35/6.3) NHMW 25944, 1 female (28/6.0) NHMW 25945, 1 male (21/4.0) NHMW 25946, 1 male (24/4.8) NHMW 25947, 1 juvenile (14/2.7) NHMW 25948, 1 juvenile (7.4/1.9) NHMW 25949, S. De Grave coll. Oct. 1993.

**Descriptive notes.** Carapace short, 0.2 of total length. Dorsal oval distinct, 0.74 length of dorsal carapace. Rostrum in form of acute spine with non-calcified base, half as long as eyestalk (Figs. 10a, 11a, h). Lateral projections of carapace obsolete. Eyestalks longer than first antennular article; cornea large, subterminal. Antennular peduncle slightly shorter than antennal peduncle (Figs. 10a, 11h. Third maxilliped (Fig. 11i) with ischium-merus 2.2 times as long as wide, merus shorter than ischium; ischium with distinct crista dentata mesially, propodus as wide as long, dactylus about 0.2 width of propodus, as long as propodus. Major cheliped (Figs. 10a, 11b, j, k) with ischium proximally unarmed, distal lower margin with small low teeth; merus as high as long, with lower

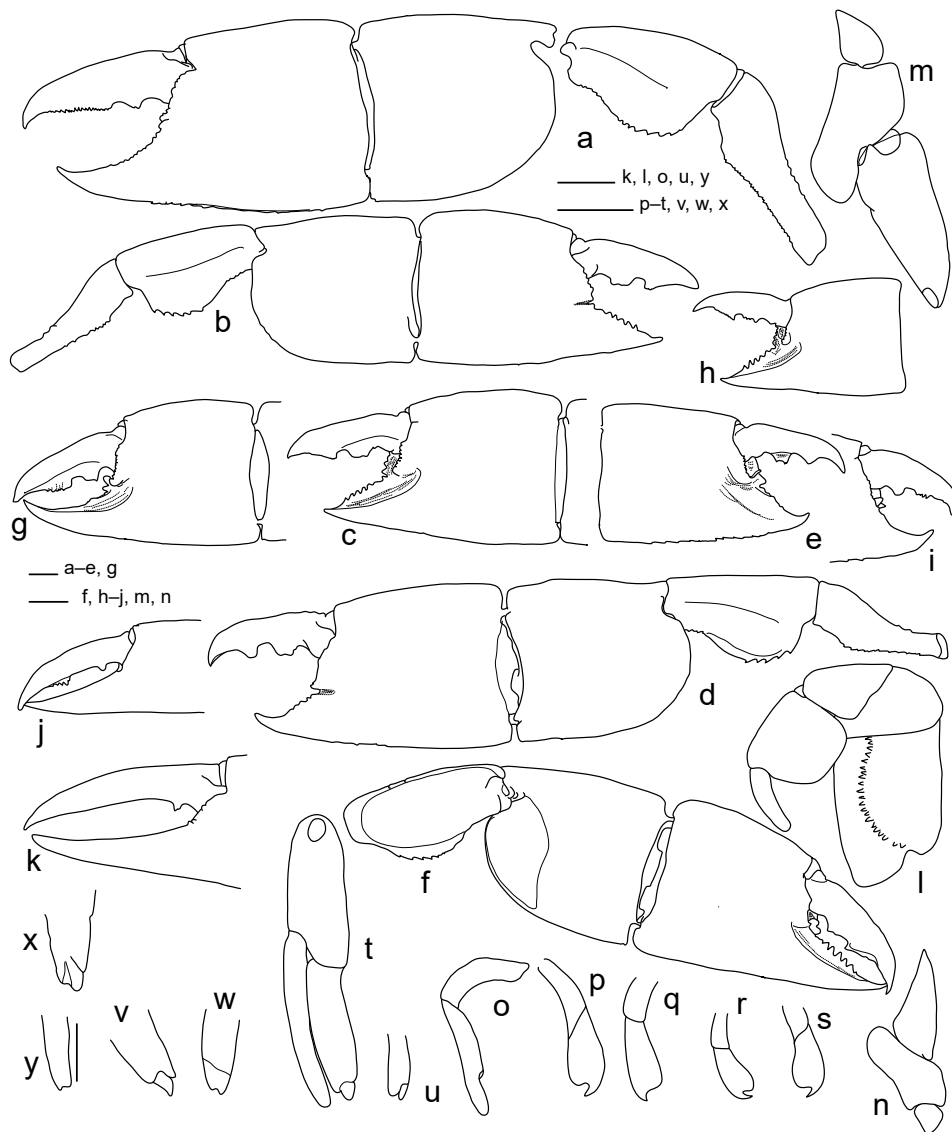


Fig. 9: *Neocallichirus calmani* (NOBILI, 1904). a, b, d, major P1 lateral view; f, major P1 mesial view; c, e, g, h, i, major P1 propodus, mesial view; j, k, minor cheliped fingers mesial view; l, Mxp3 mesial view; m, n, distal articles P3 mesial view; o-s, Plp1 lateral view; t, left Plp2 posterior view; u, v, tip of Plp2 endopod, lateral view; w, x, y, same lateral view. a, NHMW 25838, ovigerous female (51/14); b, c, NHMW 25832, female (36/10.4); d, e, q, MNHN-2016-3494, male (34/10); f, ZRC 2017.0410 ovigerous female (34/9); g, NHMW 25816, female (49/11.2); h, NHMW 25834, female (25/7.2); i, x, NMCR 39104, male (45/12); j, m, ZRC 2017.0412, ovigerous female (56/14.8); k, NMCR 39103, male (30/8.2); l, MNHN-2016-3490, female (33/9.8); n, NHMW 25833, female (36/9.2); o, u, ZRC 2017.0408, female (39/10.2); p, MNHN-2016-3491, male (34/9.0); r, ZRC 2017.0413, male (28/7.2); s, NHMW 25644, male (31/9.0); t, NMCR 39106, male (43/11.2); v, w, NHMW 25819, male (47/12.6); y, ZRC 2017.0407, male (53/13.6). All setae omitted. Scale bar is 1 mm.

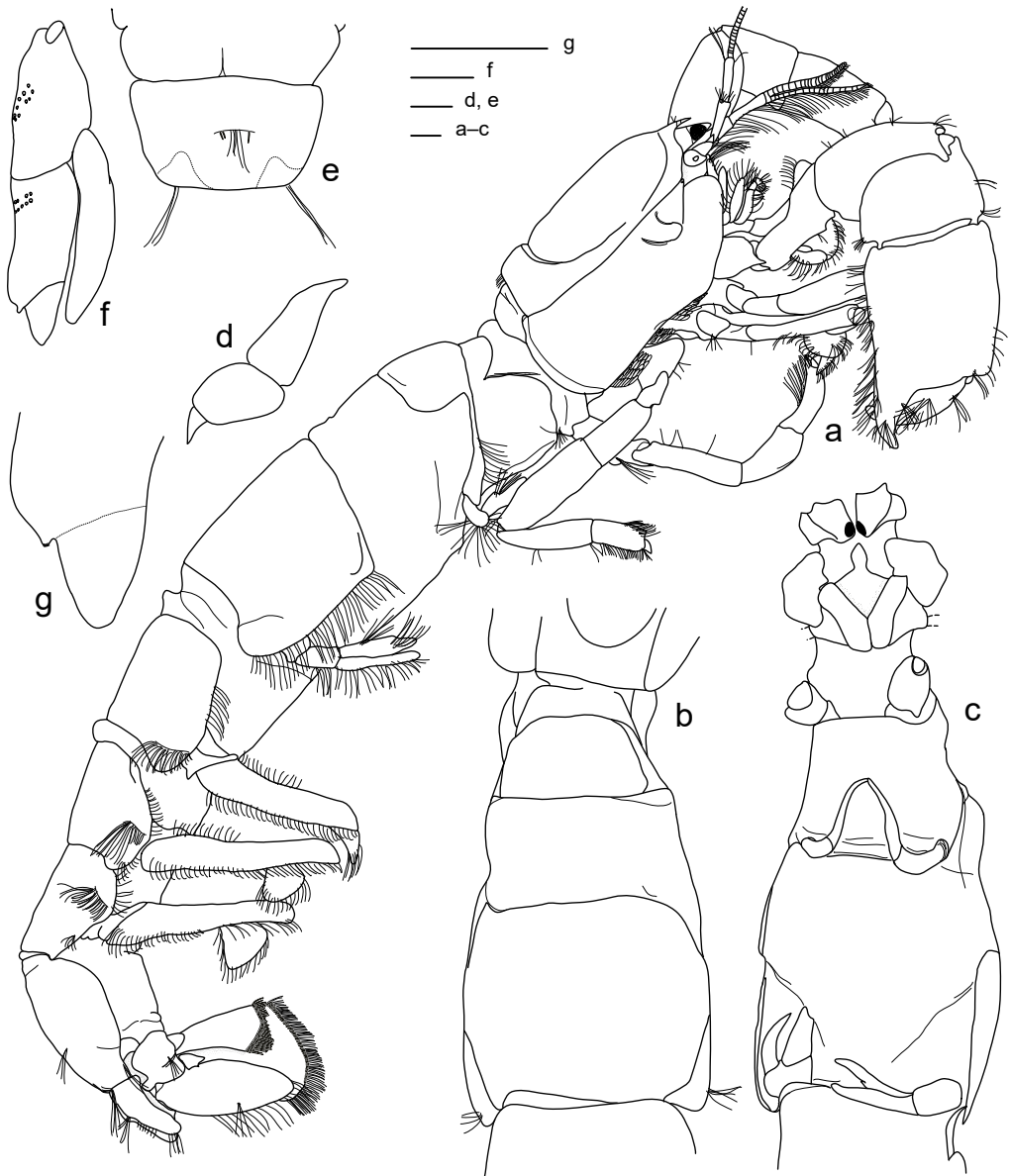


Fig. 10: *Neocallichirus mucronatus* (STRAHL, 1862). a–g, NHMW 21944, female (45/9.2). a, habitus, lateral view; b, first and second pleomere, dorsal view; c, thoracomeres 6–8, pleomeres 1–2 in ventral view; d, distal articles of P3, lateral view; e, telson, dorsal view; f, right second pleopod, posterior view; g, same, detail. Scale bar is 1 mm.

ridge of blunt tubercles; carpus 1.7 high as long, half as long as palm; upper and lower borders of propodus smooth; cutting edge of fixed finger with low triangular tooth at midlength; dactylus stout, longer than fixed finger, cutting edge with two low teeth. Minor cheliped (Fig. 11c, l, m) with ischium proximally unarmed, distal lower margin

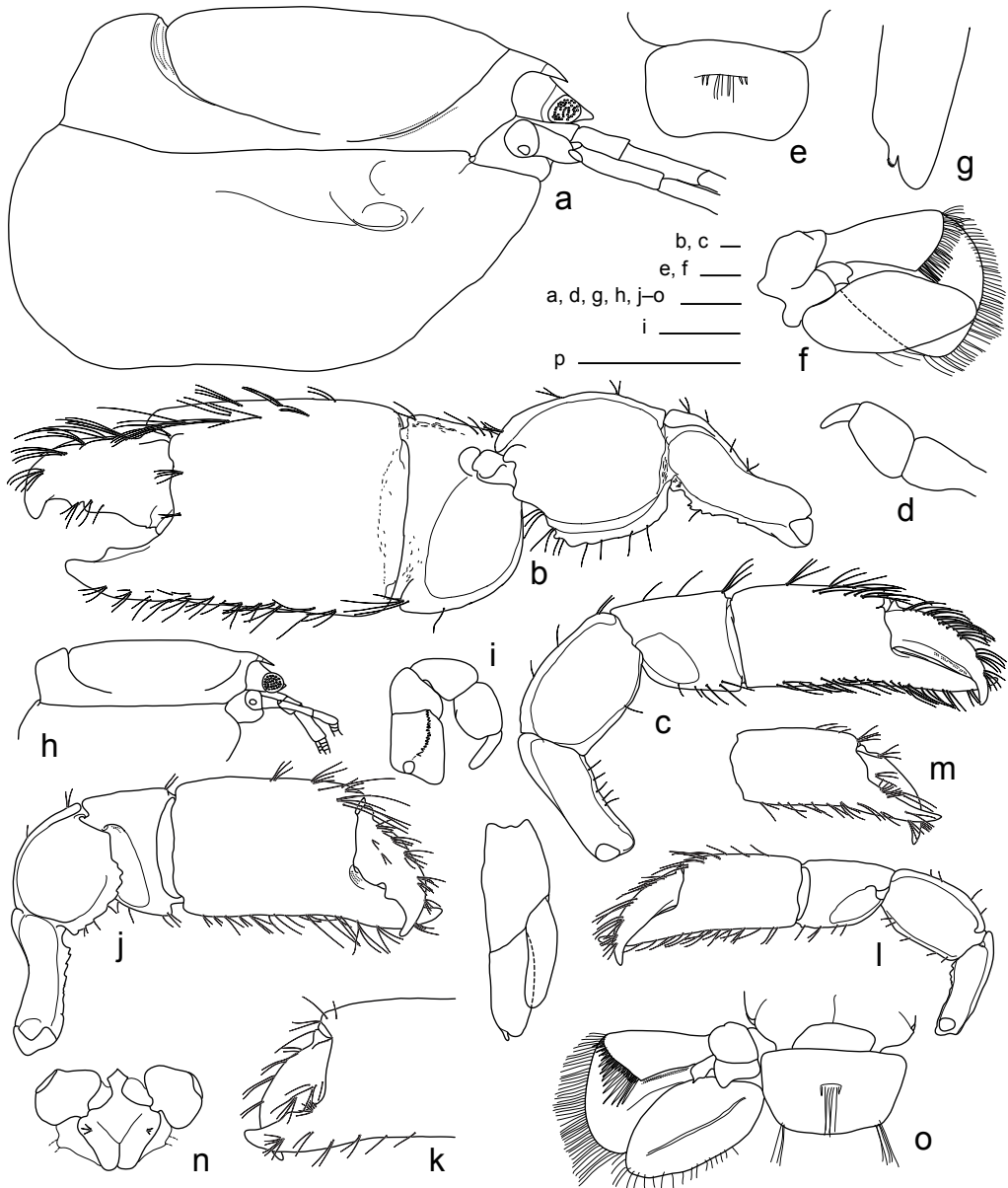


Fig. 11: *Neocallichirus mucronatus* (STRAHL, 1862). a–g, NMCR 39114, female (41/8.1); h–o, MNHN-2016-3501, ovigerous female (16/3.6) a, h, carapace, lateral view; major (b, j) and minor (c, l) cheliped in mesial view; k, m, same, propodus in lateral view; i, third maxilliped, mesial view; n, sternite 7, ventral view; o, telson, left uropods; p, right second pleopod, posterior view. Scale bar is 1 mm.

with low teeth distally or unarmed, merus lower border unarmed; carpus, propodus elongate, carpus slightly shorter than upper margin of propodus; dactylus as long as carpus; cutting edges of fingers unarmed. Third pereopod propodus 1.5 as long as high, not

heeled (Figs. 10d, 11d). Second pleomere 1.2 times longer than wide, 1.1 longer than sixth pleomere. Telson (Fig. 10e, 11e, o) trapezoidal, 1.7 times as wide as long, widest at base; dorsal surface convex (Fig. 10a), posterior border with weak convexity or concavity. Uropodal endopod (Fig. 11f, o) oval, longer than telson, more than twice as long as wide; uropodal exopod (Fig. 11f, o) with strongly elevated dorsal plate, as long as endopod. Embryos of ovigerous female 320  $\mu\text{m}$  in diameter.

**Colour.** Whitish, pleon translucent with orange ovaries in mature females.

**Habitat.** Sublittoral, 1–21 m depth, in coral rubble.

**Remarks.** This species was described by STRAHL (1862) from one female specimen. The holotype ZMB 1128 was subsequently redescribed and figured by TIRMIZI (1977). SAKAI (1999d) further studied the type material, but found a second specimen among the “type specimens” of ZMB 1128. He considered the larger female as the holotype of *C. mucronata* and described the smaller male as a new species, *Callianassa gruneri*. He further mentioned that TIRMIZI (1977: fig. 1B) shows *C. gruneri* rather than *C. mucronata* although she explicitly mentioned only the holotype of the latter. He argues “Fig. B (anterior part of carapace with eyestalks, part of A1-2) shows the other specimen which has the A2 peduncle directed forward as was observed in the male which is now described as the new species, *Callianassa gruneri*”. His arguments can not be followed, as the left antennal peduncle is shown only up to article 4 in TIRMIZI (1977: fig. 1B) and the right antenna is lacking in the figure of *C. gruneri* (SAKAI, 1999d: fig. 8a).

**Distribution.** Madagascar; Zanzibar; Gulf of Aden: Djibouti and Perim; Maldives; Indonesia; Papua New Guinea; Australia: Queensland; Philippines: Luzon, (type locality) (see SAKAI & TÜRKAY 2014).

#### Acknowledgements

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