

# On a collection of axiidean shrimp (Decapoda: Callianassidae, Callichiridae and Callianideidae) from the Gulf of Aqaba, Red Sea

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## Abstract

A summary of species from four axiidean families collected between 2000 and 2002 in Aqaba, Jordan and in 2005 in Dahab, Egypt (Red Sea, Gulf of Aqaba) is presented. The family Callianassidae, represented by five species, is the most diverse. The species *Paratrypaea bouvieri* (NOBILI, 1904) occurs in high numbers in the intertidal of Dahab, *P. maldivensis* (BORRADAILE, 1904) was the most common species in subtidal sediments of Dahab, second most common in Aqaba, *Aqaballianassa aqabaensis* (DWORSCHAK, 2003) the most common from sublittoral sediments at Aqaba and second most at Dahab, only one specimen each was found of *Spinicallianassa spinicauda* (KOMAI, MAENOSONO & FUJITA, 2014) and *Praedatrypaea praedatrix* (DE MAN, 1905). Represented by one species each is the Callichiridae with *Glypturus laurae* (DE SAINT LAURENT, 1984) and Eucalliidae with *Calliixina kensleyi* (DWORSCHAK, 2005), respectively. Found only in Aqaba was the member of the Callianideidae, *Thomassinia gebioides* DE SAINT LAURENT, 1979. Figures for *P. praedatrix* and *S. spinicauda* (Callianassidae) and for *C. kensleyi* (Eucalliidae) are presented. In addition, information on the burrows of the five more common species are given.

**Key words:** Axiidea, Callianassidae, Callichiridae, Eucalliidae, Callianideidae, Red Sea, Aqaba, Dahab, burrowing shrimp.

## Introduction

Sampling of burrowing shrimps from sublittoral sandy bottoms at Aqaba (Jordan) and Dahab (Egypt) in the Gulf of Aqaba, Red Sea revealed several new records and two undescribed species. One of those was described as *Callianassa aqabaensis* DWORSCHAK, 2003 (currently *Aqaballianassa aqabaensis*), the second species as *Eucalliix kensleyi* DWORSCHAK, 2005 (currently *Calliixina kensleyi*). The former species showed a high prevalence of an endoparasitic isopod that has been described as *Entophilus mirabiledictu* MARKHAM & DWORSCHAK, 2005 (currently *Axiophilus mirabiledictu*). Extensive material of the two most common species in intertidal and subtidal sediments, *Paratrypaea bouvieri* (NOBILI, 1904) and *P. maldivensis* (BORRADAILE, 1904) were used to clarify the identity of these two species (DWORSCHAK 2012).

The present paper deals with the remaining species, additional material from Dahab and comparative material from other Indo-Pacific locations.

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## Material and methods

Shrimps from sublittoral sediments were collected in October/November 2000, November 2001, and October/November 2002 in Aqaba, Jordan and in October 2005 in Dahab, Egypt with a yabby pump while SCUBA-diving at depths between 4 and 30 m. For the capture of large shrimps that produce large mounds and funnels, weighted lines have been applied in Aqaba (DE VAUGELAS, 1985). For locations in Aqaba see DWORSCHAK (2003), for locations in Dahab see DWORSCHAK (2012). Specimens were chilled on ice before they were fixed in 4% formaldehyde, Bouin's solution, 99% propyleneglycol, 96% or 75% ethanol. Size is given as total length (tl) and carapace length (cl) in mm in the format tl/cl or as cl only.

At Aqaba, burrow morphology of two species was studied by in situ resin casting using an epoxy resin (Araldit GY 257 with hardeners HY830 and HY 850, 25 : 7 : 8 parts by weight) based on the method outlined by PERVESLER & DWORSCHAK (1985). Surface openings were photographed using a Nikonos IV with 35 mm lens. Live specimens of three species were kept individually in narrow aquaria (100×130×5 mm) filled with natural sediment. Due to the dimensions of the aquaria, section of the burrows were constructed along the glass walls, could be photographed and animals be observed.

Drawings were made using a camera lucida mounted on a stereomicroscope, digitised and then inked and composed in Adobe Illustrator (COLEMAN 2003).

Material is deposited in following museums: Muséum National d'Histoire Naturelle, Paris, France (MNHN); Naturhistorisches Museum Wien, Austria (NHMW); National Taiwan Ocean University, Taiwan (NTOU); Forschungsinstitut Senckenberg, Frankfurt, Germany (SMF); University of Louisiana at Lafayette, Zoological Collection, USA (ULLZ); Zoological Museum University of Copenhagen, Denmark (ZMUC); Lee Kong Chian Natural History Museum (formerly the Raffles Museum of Biodiversity Research, Zoological Reference Collection), National University of Singapore (ZRC); National Museum of the Philippines, Manila (NMCR) and Natural History Museum and Institute, Chiba, Japan (CBM).

Other abbreviations used are: Mxp3, third maxilliped; P1–P5, first to fifth pereopod; Plp1–Plp5, first to fifth pleopod; RDC, Royal Diving Center, Aqaba, Jordan.

## Callianassidae DANA, 1852

### *Paratrypaea* KOMAI & TACHIKAWA, 2008

#### *Paratrypaea bouvieri* (NOBILI, 1904)

*Callianassa (Trypaea) Bouvieri* NOBILI, 1904: 236; – 1906: 101, 105, pl. 6, figs 3–3b.

*Callianassa (Trypaea) Gravieri* NOBILI, 1905: 396; – 1906: 107, pl. 6 fig. 4–4d [type locality: Obock].

*Callianassa (Trypaea) cristata* BORRADAILE, 1910: 263, pl. 6 fig.7 [type locality: Salomon Atoll, Chagos Archipelago].

*Paratrypaea bouvieri*; –KOMAI & TACHIKAWA, 2008: 36, figs 10–12; –DWORSCHAK, 2012: 45, figs 1D, 5A–I, 6A–J, 7A, B (extended synonymy); –KOMAI, 2017: 391–395, fig. 1; –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables S1, S2.

*Gilvossius bouvieri*; –SAKAI, 2011: 374; –SAKAI et al., 2014: 497, fig. 2; –SAKAI, 2015: 424, fig. 1.

*Gilvossius gravieri*; –SAKAI, 2015: 428.

*Gilvossius chichijimaensis* SAKAI, 2015: 426.

**Material examined.** See DWORSCHAK (2012).

**Additional material.** See DWORSCHAK (2014).

**Description.** See DWORSCHAK (2012) and KOMAI (2017).

**Burrows.** See DWORSCHAK & PERVESLER (1988).

**Distribution.** Red Sea, Egypt, Sudan, Saudi Arabia; Gulf of Aden, Djibouti; Socotra; Persian Gulf; Madagascar; Chagos Archipelago, Indonesia; Cocos Keeling Is; Japan; Kiribati; Fiji (DWORSCHAK 2012, 2014, SAKAI et al. 2014).

### *Paratrypaea maldivensis* (BORRADAILE, 1904)

*Callianassa (Trypaea) maldivensis* BORRADAILE, 1903: 546 (nomen nudum)–1904: 753, pl. 58, fig. 3b [type locality: Maldives].

*Callianassa rectangularis* NGOC-HO, 1991: 292, fig. 5 [type locality: Atoll Surprise, New Caledonia]

*Callianassa bouvieri*; –SAKAI, 1999: 40 (part), figs 6a,b; –2005: 78 [not *Callianassa bouvieri* NOBILI, 1904]

*Paratrypaea rectangularis*; –KOMAI & TACHIKAWA, 2008: 36.

*Paratrypaea maldivensis*; –DWORSCHAK, 2012: 50, figs 1F, 5J–T, 6K–U, 7C (extended synonymy); –KOMAI & FUJITA, 2014: 1, figs 1–3; –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables S1, S2.

*Gilvossius maldivensis*; –SAKAI, 2015: 429.

**Material examined.** See DWORSCHAK (2012).

**Additional material.** None.

**Description.** See DWORSCHAK (2012) and KOMAI & FUJITA (2014).

**Burrows.** On the sediment surface, the burrows of *P. maldivensis* are characterised by small mounds – 3 to 5 cm in diameter at the base and 1 to 2 cm high – and small funnels – 1 to 1.5 cm in diameter – nearby (see DWORSCHAK 2012: fig. 1E). Resin casts made in Aqaba show that the shape of the burrow is similar to that of *P. bouvieri* (see DWORSCHAK & PERVESLER 1988: pl. 2).

**Distribution.** Red Sea; Maldives; Sri Lanka; Taiwan; New Caledonia (DWORSCHAK 2012); Japan, Ryukyu Is (KOMAI & FUJITA 2014).

### *Aqaballianassa* POORE, DWORSCHAK, ROBLES, MANTELATTO & FELDER, 2019

#### *Aqaballianassa aqabaensis* (DWORSCHAK, 2003)

*Callianassa aqabaensis* DWORSCHAK, 2003: 416, figs. 2–36 [type locality: Gulf of Aqaba]; –MARKHAM & DWORSCHAK, 2005: 413, fig. 3.

*Cheramus aqabaensis*; –SAKAI, 2011: 367; –SAKAI et al., 2014: 491 (table 1); –SAKAI, 2015: 424.

*Aqaballianassa aqabaensis*; –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables S1, S2.

**Material examined.** See DWORSCHAK (2003) and MARKHAM & DWORSCHAK (2005).

**Additional material.** Aqaba, RDC, 2 to 22 m depth, 25 males (cl 3.5–6.0) 35 females (cl 3.5–5.3) NHMW 26379–26426 and 26433–26439, 2 males (cl 4.9, 6.0) 2 females (cl 4.8, 4.9) CBM, 1 female (cl 5.2) ULLZ 7925, 1 female (cl 4.6) ULLZ 7924, coll. 26 October – 6 November 2002; Saudi Border, 8 m depth, 2 males (cl 4–5.3) 4 females (cl 4.1–5.5) NHMW 26427–26432, coll. 4 November 2002.

Dahab, NHMW 25461 2 males (cl 5.3, 4.3) 1 female (cl 5.1), Islands, coll. 1 November 2005; NHMW 25643 3 females (cl 3.7, 4.0, 4.7), Islands, 13 m, coll. 24 October 2005, NHMW 25642 2 females (cl 6.6, 6.9) Nabq, coll. 27 October 2005.

**Comparative material.** “Rotes Meer, Sudan, Shab Baraja Reef, N-lich Port Sudan, U-22, 13.5 m”, 1 female, SMF 40677, L. Karbe leg. October 1977. – Philippines, Bohol, Panglao I., 1 female (18.9/3.9), NHMW 26490, coll. Panglao Marine Biodiversity Project 2004. – Indonesia, Derewan, 1 female (26/6.1) NHMW 26335, coll. January 2010.

**Description.** See DWORSCHAK (2003).

**Burrows.** On the sediment surface, burrow openings of *A. aqabaensis* could not be differentiated from those of *P. maldivensis*. Resin casts made in Aqaba showed all the same general burrow shape, due to the lack of entombed shrimp, none could be assigned to one or the other of these two most common sublittoral species.

**Distribution.** Red Sea (type locality, DWORSCHAK 2003); Derewan, Indonesia; Panglao, Philippines (this study).

### *Praedatrypaea* POORE, DWORSCHAK, ROBLES, MANTELATTO & FELDER, 2019

#### *Praedatrypaea praedatrix* (DE MAN, 1905) (Fig. 1)

*Callianassa praedatrix* DE MAN, 1905: 607 [type locality: Indonesia, between Wowoni and Buton]; SAKAI, 1988: 59, fig. 4; –1999d: 51; –2005b: 100; –NGOC-HO, 1994a: 54, fig. 2.

*Callianassa (Cheramus) praedatrix*; –DE MAN, 1928b: 146, pl. 15, fig. 22–22d.

*Cheramus praedatrix*; –SAKAI, 2011: 370 (extended synonymy).

*Praedatrypaea praedatrix*; –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables S1, S2.

**Material examined.** Dahab, Laguna, 10 m, 1 ovigerous female (25/5.9) NHMW 24324 (DNA voucher Genbank MN237852, MN237657, MN238336, MN238056), coll. 30 October 2005 (#57).

**Comparative material.** Philippines, Bohol, Panglao I., 1 female (29/6.8) NMCR 50125, coll. Panglao Marine Biodiversity Project 2004.

**Description.** See DE MAN (1928).

**Distribution.** Indonesia, between Wowoni and Buton (DE MAN 1905), Western Australia (SAKAI 1988), Red Sea and Panglao, Philippines (this study).

**Remarks.** Four species have been placed into the genus *Praedatrypaea* by POORE et al. (2019): *P. praedatrix*, *P. propinqua* (DE MAN, 1905), *P. longicauda* (SAKAI, 1967), and *P. modesta* (DE MAN, 1905). They are characterised by a distal spine on the distal free margin of Mxp3 and a telson with prominent anterolateral lobes.

With its oval propodus of P3 the present material keys out near *P. propinqua* and *P. praedatrix* in the key (to west Indo-Pacific species of *Callianassa*) by SAKAI (1999). DE MAN (1928) and NGOC-HO (1994) considered *Callianassa propinqua* and *C. praedatrix* as closely related to each other. Ngoc-Ho outlined the differences between the two species. The present material is assigned to *P. praedatrix* rather than *P. propinqua* because of 1) its wider Mxp3, 2) its shorter pleomere 6 and 3) the shorter and stouter uropods. This species was known so far from only two specimens, the holotype lacking the minor cheliped and one specimen from Western Australia lacking both chelipeds (SAKAI, 1988).

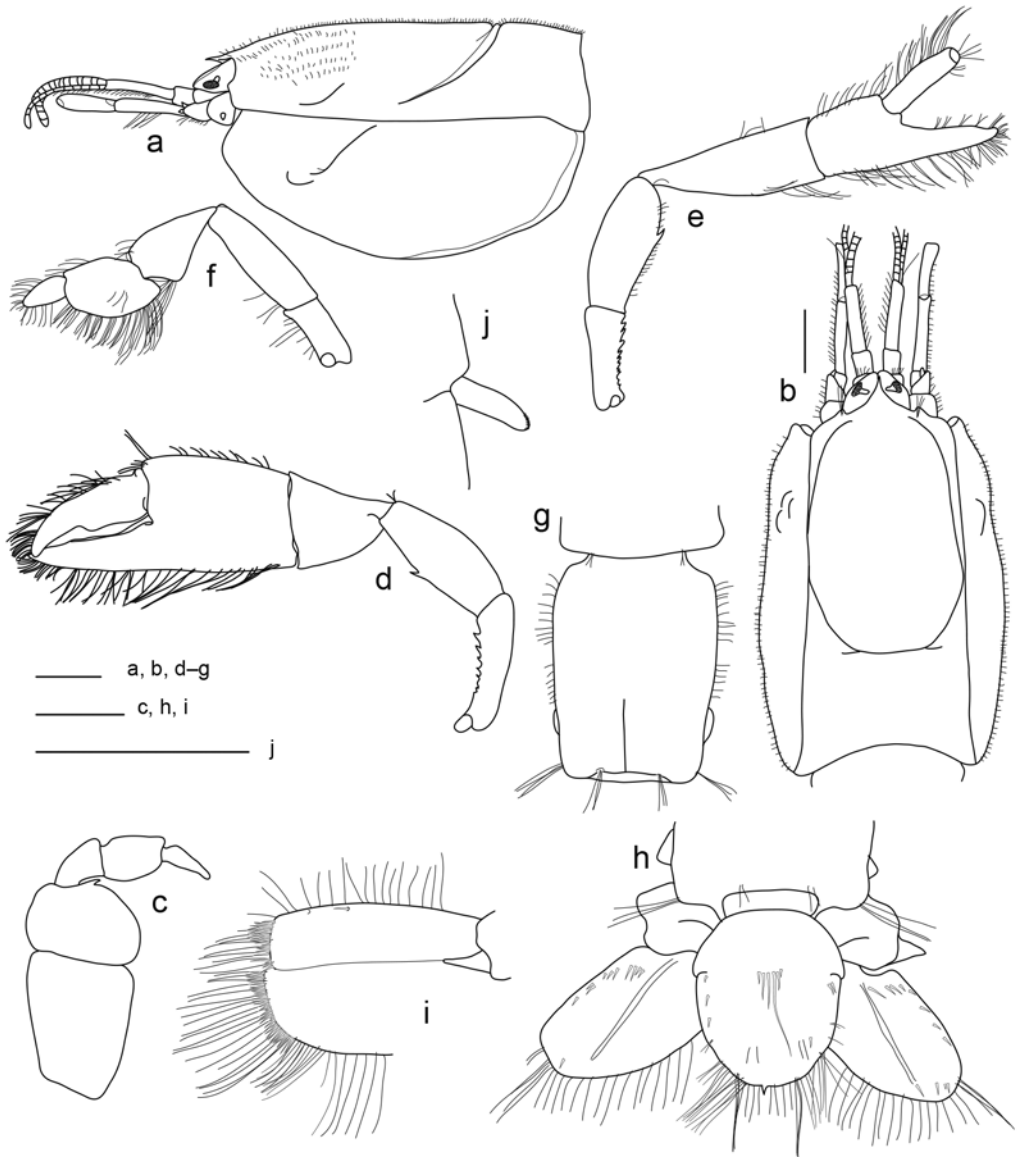


Fig. 1: *Praedatrypaea praedatrix* (DE MAN, 1905) NHMW 24324. (a) carapace, eyestalks, antennae, lateral view; (b) same, dorsal view; (c) Mxp3, lateral view (setation omitted); major (d) and minor (e) P1, mesial view; (f) P3, mesial view; (g) pleomere 6, dorsal view; (h) telson and uropodal endopods; (i) left uropodal exopod; (j) appendix interna on Plp3. Scale bar is 1 mm.

***Spinicallianassa* POORE, DWORSCHAK, ROBLES, MANTELATTO & FELDER, 2019**

***Spinicallianassa spinicauda* (KOMAI, MAENOSONO & FUJITA, 2014) (Fig. 2)**

*Callianassa acutirostella*; –SAKAI, 2005: 64 (part), figs 13, 14 [not *Callianassa acutirostella* SAKAI, 1988: 57, fig. 2; –1999: 37].

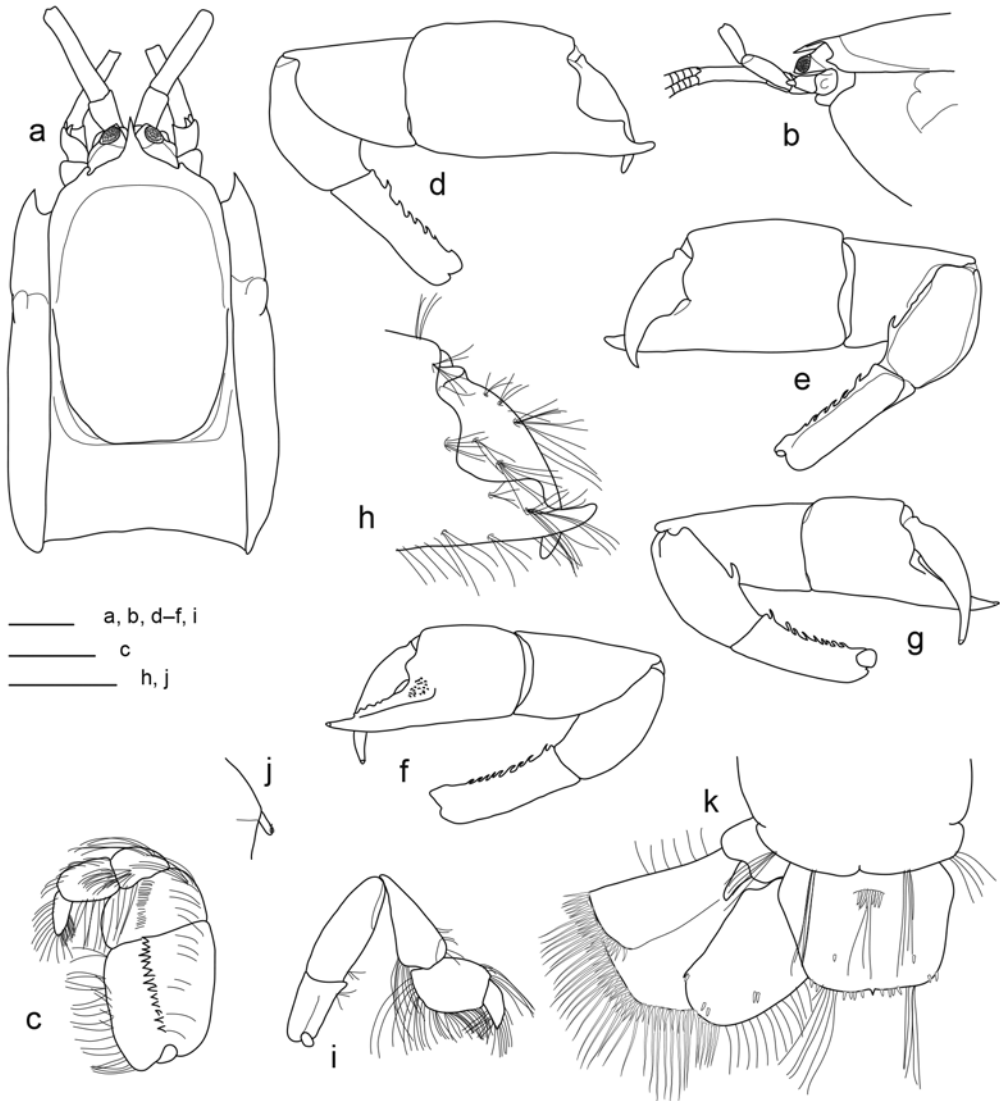


Fig. 2: *Spinicallianassa spinicauda* (KOMAI, MAENOSONO & FUJITA, 2014) NHMW 25372. (a) carapace, dorsal view; (b) front, lateral view; (c) Mxp3, mesial view; major cheliped in lateral (d) and mesial (e) view (setation omitted); minor cheliped in lateral (f) and mesial (g) view (setation omitted); (h) detail of major cheliped fingers, lateral view; (i) P3 in mesial view; (j) appendix interna on Plp3, posterior view; (k) telson and left uropods. Scale bar is 1 mm.

*Cheramus spinicauda* KOMAI et al., 2014: 505, figs 1–8 [type locality: Okinawa Island, Japan].

*Trypaea acutirostella*; –SAKAI, 2011: 390 (part.).

*Spinicallianassa spinicauda*; –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables S1, S2.

**Material examined.** Aqaba, RDC, seagrass, < 20 m, 1 female (20/5.1) NHMW 25372, coll. 3 November 2002 (#71); –Dahab, Pinnacles, 13 m, 1 female (23/5.1) NHMW 25373, coll. 24 October 2005 (#13A).



**Comparative material.** Philippines, Palawan, west coast of Cadlao I., Cadlao lagoon, 0.5–1 m, firm sand 1 ovigerous female (33/7.7) NHMW 25368, 1 female (21/5.3) NHMW 25367, A. Anker coll. 25 October 2011; – Arafura Sea, 1 female (18/4.1) ZMUC CRU3774, 2 ovigerous females (cl 4.4, 4.5) 2 females (cl 4.1, 4.2) ZMUC CRU3773, Galathea Expedition 27 September 1951. – Philippines, Bohol, Panglao I., 11 females (13–27/3.2–7.4), NHMW 21949, 26328–26334, NMCR 50802–50804, coll. Panglao Marine Biodiversity Project 2004. – Indonesia, Derewan, 31 females (22–37/5.3–8.9) NHMW 26339–26366, coll. January 2010 – Japan, Ohmine, Naha, Okinawa Island, 0–1 m, sand flat near seagrass bed, T. Maenosono coll. 25. Dec. 2011, 1 female (cl 6.3 mm) NHMW 25648 (paratype of *Cheramus spinicauda* Komai, Maenosono & Fujita, 2014).

**Description.** See KOMAI et al. (2014).

**Distribution.** Okinawa, Ryukyu Is (type locality, KOMAI et al. 2014); Arafura Sea (SAKAI 2005); Red Sea; Panglao and Palawan, Philippines (this study).

**Remarks.** The specimen has been assigned originally to *Callianassa acutirostella* SAKAI, 1988. This species has been described from a single specimen lacking both chelipeds. SAKAI (2005) reported it from several specimens collected in the Arafura Sea and figured the chelipeds. Later, KOMAI et al. (2014) described a new species from the Ryukyu Is (as *Cheramus spinicauda*) and compared it with *C. acutirostella*. The specimens studied here comply with their telson spination rather with the former than the latter. SAKAI'S (2005) specimens from the Arafura Sea are also attributable to *S. spinicauda* (see synonyms and material above). This species is known from females only. Of the 51 specimens studied, all had female gonopores, 45 specimens had also male gonopores.

## Callichiridae MANNING & FELDER, 1991

### *Glypturus* STIMPSON, 1866

#### *Glypturus laurae* (DE SAINT LAURENT, 1984)

*Callichirus laurae* DE SAINT LAURENT (in DE VAUGELAS & DE SAINT LAURENT), 1984: 147, pl. 1 figs A-D [type locality: Gulf of Aqaba].

*Glypturus laurae*; –POORE & SUCHANEK, 1988: 201, fig. 4c; –DWORSCHAK, 1992: 209; –HYŽNÝ & MÜLLER, 2012: 975, figs 3J, 4B; –KOMAI et al., 2015: 15 (table 1), 18; –HYŽNÝ & KLOMPMAKER, 2015: fig. 1A, B. *Glypturus armatus*; –SAKAI, 1999: 76; –2005: 137; –2011: 432; [part, Red Sea material, not *Callianassa armata* A. MILNE-EDWARDS, 1870]

**Material examined.** Aqaba, RDC, NHMW 21939 (DNA voucher GenBank EU874985, EU874935, MN238500, MN238316), 1 female (134/35, right major cheliped missing), NHMW 21940 (DNA voucher GenBank MN238044, MN238501, MN238317) 1 female (153/33.4 left major P1 missing), 13 m, coll. 4 and 5 November 2002; NHMW 19628 1 female (138/29.4 both P1 missing); NHMW 24923 1 female (143/37 right major P1 missing), same locality, coll. 31 October and 3 November 2000; NHMW 25452 1 male (90/25.7 both P1 missing) same locality, coll. 9 November 2001.

**Comparative material.** Paratypes: MNHN Th-650, 1 male (110/32), Aqaba, Jordanie, J. de Vaugelas coll. Jan. 1983; – MNHN Th-649, 1 male (90/26.4), Aqaba, Jordanie, J. de Vaugelas coll. Jan. 1983.

NHMW 6973, 1 female (123/34.3), Aqaba, J. Courboules leg. – ZRC 1989.2872, 1 major cheliped, Singapore, Labrador Park, P.K.L. Ng coll. Sep. 1989 [de Saint Laurent det.]; – ZRC 1992.10272, 1 female (62/18, major cheliped missing), Singapore, Sentosa Reef, P.K.L. Ng coll. 1986 [M. de Saint Laurent det., specimen shown in LIM et al., 1994: 112].

**Description.** See DE SAINT LAURENT (in DE VAUGELAS & DE SAINT LAURENT 1984).

**Burrows.** The burrows of this shrimp are characterized by numerous large mounds (up to 40 cm high) and funnels. Their shape is that of a spiral with several radiating branches leading to the surface and deeper blind chambers often filled with shell particles reaching to a depth of over 1 m (DE VAUGELAS 1984).

**Distribution.** Red Sea (type locality); Singapore (this study).

**Remarks.** SAKAI (1999, 2005, 2011) synonymised *G. laurae* with *G. armatus* while HYŽNÝ & MÜLLER (2012) consider the former as distinct species. This is corroborated by the molecular phylogenetic study of ROBLES et al. (2020).

## Eucalliidae MANNING & FELDER, 1991

### *Calliuxina* NGOC-HO, 2003

#### *Calliuxina kensleyi* (DWORSCHAK, 2005) (Fig. 3)

*Eucalliux kensleyi* DWORSCHAK, 2005: 209–216, figs 1–5 [type locality: Gulf of Aqaba]; –SAKAI, 2015: 439; –2017: 1122–1224(partim), fig. 2A–C, E–G; –2018: 742; SAKAI & TÜRKAY, 2015: 500(list).

*Calliuxina kensleyi*; –SAKAI et al., 2014: 492 (table 1), 508; –LIU & LIANG, 2016: 82 (key); –POORE et al., 2019: table 1; –ROBLES et al., 2020: suppl. tables 1, 2; –POORE, 2021: 5(key), 6, figs 1b, c, 6, 7, 12b, c, i.

**Material examined.** See DWORSCHAK (2005).

**Additional material.** Dahab, Laguna, 10–13 m, 1 male (32/7.6) NHMW 25374 (DNA voucher GenBank MN237901, MN237703, MN238108), 1 ovigerous female (36/7.4) NHMW 25375, coll. 28 October 2005. –Indonesia, Bali, Nusa Dua, intertidal, 1 male (15/3.7) NHMW 26503, coll. June 2005.

**Description.** See DWORSCHAK (2005) and POORE (2021).

**Supplementary description.** Male more heterochelous than females, major cheliped more massive than minor (and major of females), with triangular tooth on fixed finger cutting edge, minor without such a tooth, row of setae on propodus-dactylus articulation mesially. Male first pleopod consisting of two articles of same length; distal article with curved apex, appendix interna with cincinnuli. Male second pleopod with exopod and endopod of same length, appendix masculina articulating at mid-length and reaching to tip of endopod, appendix interna half as long and wide as appendix masculina. Female with slightly unequal chelipeds, larger with small tooth on upper propodus border distally and row of setae at propodus-dactylus articulation mesially, minor with triangular tooth on fixed finger.

**Distribution.** Red Sea, Aqaba (type locality), Dahab (this study), Saudi Arabia (POORE 2021); Madagascar (POORE 2021); Indonesia, Bali (this study).

**Remarks.** This species has been described only from females (DWORSCHAK 2005). In Dahab, a male-female pair could be collected. The chelipeds, first and second pleopods of the male are figured here. The male specimen from Bali is rather small, has a simple first pleopod, a second pleopod with appendix masculina, distinct male gonopores, but shows also female gonopores.



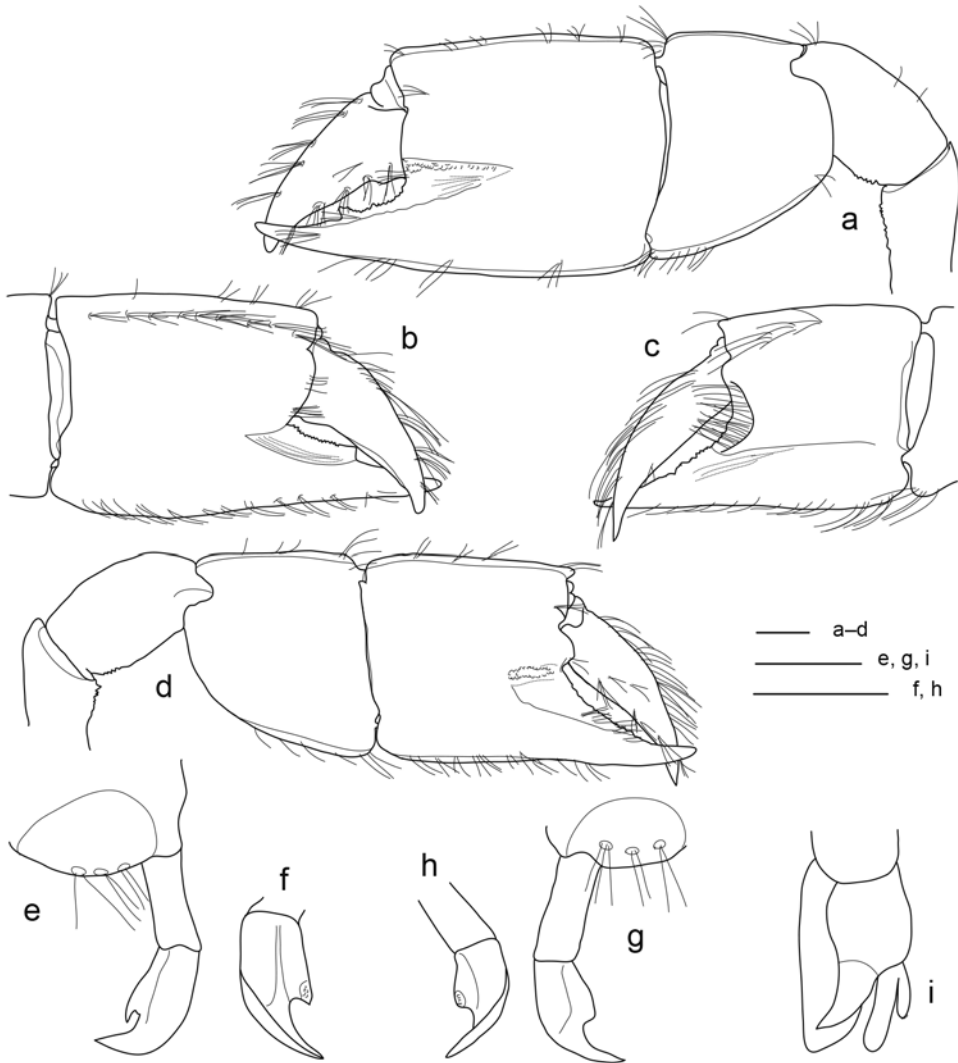


Fig. 3: *Calliaxina kensleyi* (DWORSCHAK, 2005) male (cl 7.6 mm, NHMW 25374). (a) major P1, lateral view; (b) same, propodus and dactylus, mesial view; (c) minor P1, lateral view; (d) same, propodus and dactylus in mesial view; (e) left Plp1, lateral view; (f) same, tip in mesial view; (g) right Plp1, mesial view; (h) same, tip in lateral view; (i) left Plp2, posterior view. Scale bar is 1 mm.

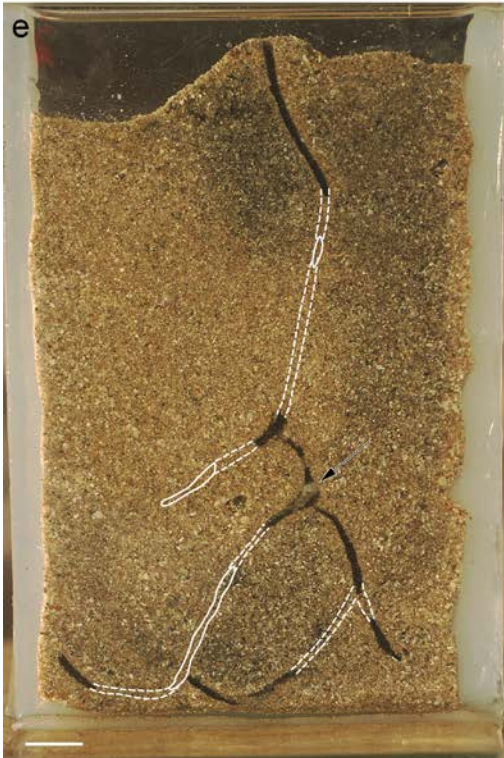
**Callianideidae KOSSMANN, 1880**

***Thomassinia* DE SAINT LAURENT, 1979**

***Thomassinia gebioides* DE SAINT LAURENT, 1979 (Figs 4, 5)**

[*Thomassinia* sp.1 THOMASSIN, 1978]

*Thomassinia gebioides* DE SAINT LAURENT, 1979: 1396 [type locality: Madagascar]; -POORE, 1997: 413, figs 36, 37; -2015: 238.



**Material examined.** Aqaba, RDC, 8–10 m, 1 female (7.6/1.71) NHMW 26270, 1 female (6.82/1.53) NHMW 26271, 1 female (5.39/1.28) NHMW 26272, coll. 25 October 2000; 10–14 m, 1 female (8.85/1.93) NHMW 26273, 1 female (7.5/1.67) NHMW 26274, coll. 1 November 2000; 1 female (12.8/2.6) NHMW 26275, 1 female (9.1/2) NHMW 26275, coll. November 2000; 4.5 m, 1 male (6.7/2) NTOU A00833, coll. 1 November 2001; 11–17 m, 1 female (7.8/2) NHMW 26277, coll. 2 November 2001; 6–11 m, 1 male (8.1/1.8) NHMW 26281, 1 female (8/1.9) NHMW 26282, 1 male (8.82/1.9) NHMW 26283, 1 male (5.9/1.3) NHMW 26284, 1 male (7.1/1.6) NHMW 26285, 1 female (7.82/1.5) NHMW 26286, coll. 3 November 2001; 1 female (9.4/2.2) NHMW 26278, 1 male (10/2.3) NHMW 26279, coll. 4 November 2001; 4 m, 1 female (13/2.8) NHMW 26287, 1 female (10/2.2) NHMW 26288, 1 female (9.3/2) NHMW 26289, coll. 5 November 2001; 4–10 m, 2 males (8.2/2.1, 6.4/1.7) ULLZ 8903, 1 female (8.4/1.9) NHMW 26276, coll. 10 November 2001; 4 m, 2 females (10.5/2.3, 9.1/2) ULLZ 8903 (DNA voucher GenBank EU874936), coll. 11 November 2001; 1 female (11.1/2.64) NHMW 26280, coll. 12 November 2001; 7–8 m, 1 female (11.6/2.5) NHMW 26290, coll. 26 October 2002 (#3); < 10 m, 1 male (12.4/3) NHMW 26291 (#43), 1 female (9.28/2) NHMW 26292 (#43a), 1 female (13.3/3) NHMW 26293 (#44), coll. 31 October 2002; seagrass, 1 male (11.7/2.8) NHMW 26294 (#60), 1 female (12.5/2.1) NHMW 26295 (#61), 1 male (12.8/2.5) NHMW 26296 (#62), coll. 3 November 2002; 2 m, 1 male (10/2.4) NHMW 26297 (#64), 1 female (13/2.8) NHMW 26298 (#68), coll. 3 November 2002; Saudi Border, 8 m, 1 male (12.5/2.7) NHMW 26299 (#77), 1 female (12.5/2.6) NHMW 26300 (#80), coll. 4 November 2002; 1 male (12.5/2.6) NHMW 26301, 1 female (13.4/2.42) NHMW 26302, coll. 5 November 2002; 1 male (13/3) NHMW 26303, coll. October 2002; 1 juv (3.6/0.8) NHMW 26304, J.A. Ott coll. October 1996.

**Comparative material.** Paratypes: MNHN Th-826, 2 specimens (cl 2.6–2.9), Tuléar, Madagascar, St. 700, B. Thomassin coll.; MNHN Th-825, 2 males (cl 2.1–2.4), Tuléar, Madagascar, St. 707, B. Thomassin coll.

“Rotes Meer, Sudan, Shab Baraja Reef, N-lich Port Sudan”, 1 ovigerous female (4.5/1.1) SMF 40675, U-14, 12 m; – 1 female (4.1/1.0) SMF 40676, same locality, U-22, 13.5 m; 1 male (3.9/1.2) 1 female (5.5/1.6) 2 juveniles (2.2/0.6, 2.8/0.8) SMF 40678, same locality, U-23, 19.1 m, L. Karbe leg. October 1977. – Indonesia: Derewan, 4 males (13.6–16.1/2.7–3.7) 2 females (17.1–21.4/3.6–3.7) 9 ovigerous females (13.4–19.6/2.6–3.6) NHMW 26313–26327, coll. January 2010; – Lombok, female (17/3.6) NHMW 26308, coll. May 2014; Bali, Nusa Dua, 1 female (12.4/2.7) NHMW 26305, 1 female (11/2.8) NHMW 26307, 1 female (12.1/2.5) NHMW 26306, coll. July 2005.

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

**Burrows.** On the sediment surface, the burrow openings are characterised by small, black mounds – 1.5 to 2 cm in diameter at the base and 0.5 to 1 cm high – and simple holes nearby (Fig. 4a, b). In a narrow aquarium filled with ambient sediment, the shrimp dug a mainly vertical burrow with a single surface opening that reached the bottom (13 cm sediment depth) within three days. Three days later, the burrow had been extended by three oblique branches (Fig. 4e). After another two days, the two upper branches had been abandoned and the deepest branch extended upwards to a second opening at the surface.

**Remarks:** This species was briefly described by DE SAINT LAURENT (1979). POORE (1997) was the first who provided a detailed description and figures based on the holotype (MNHN Th-819, male tl 8 mm) and one female paratype (MNHN Th-818, no size stated). The same author erected two new species, *Thomassinia aimsae* and *T.*

- ◀ Fig. 4: *Thomassinia gebioides* DE SAINT LAURENT, 1979. (a, b) burrow openings at Aqaba (photographs M. Stachowitsch); (c) male specimen (cl 2.7 mm, NHMW 26299); (d) female specimen (cl 2.6 mm, NHMW 26300); (e) burrow in narrow aquarium after 6 days (solid lines represent burrow parts visible on backside of narrow aquarium; dashed lines parts not visible on either side as reconstructed by path of shrimp within its burrow, arrow points to specimen in burrow); (f) same after 8 days. Scale bars are 10 cm (a, b), 1 cm (c–f).



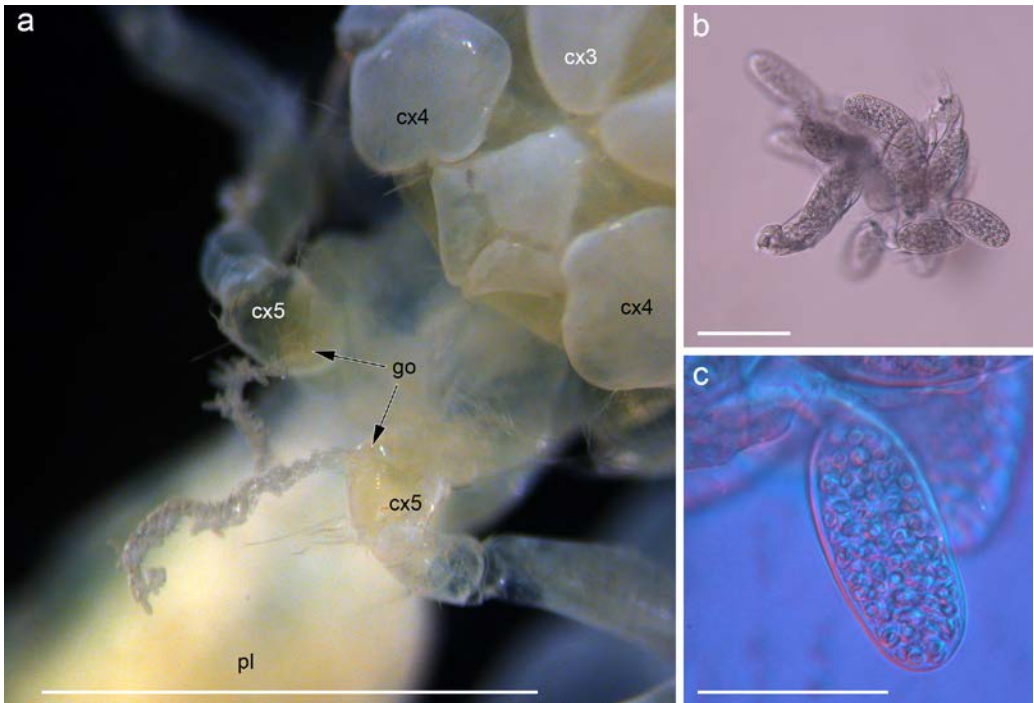


Fig. 5: *Thomassinia gebioides* DE SAINT LAURENT, 1979. (a) male in ventral view showing threads with spermatophores emanating from gonopores; (b) detail showing cluster of spermatophores; (c) single spermatophore filled with spermatozoa. cx5 coxa of P5; cx4, coxa of P4; cx3, coxa of P3; go, gonopores; pl, pleon. Scale bar is 1 mm (a), 0.1 mm (b), 0.05 mm (c).

*moorea* based on one specimen each, both very similar to *T. gebioides*. The first differs from *T. gebioides* in the presence of a weak crista dentata on mxp3 and the absence of a podobranch above P3. The second has a shorter telson and a more slender P1 than *T. gebioides*.

In the material from Aqaba, some specimens showed a weak indication of a crista dentata, others not. These small denticles on the proximal mesial face of Mxp3 is visible only under high magnification. No correlation was observed between size of the specimen and the presence of a crista dentata. The shape of the cheliped is rather variable. In most cases, the major stout P1 could easily be distinguished from the minor one with a shorter propodus, longer fingers and a gape between dactylus and fixed fingers. In some specimens, however, both cheliped appeared equal in shape and size.

The number of spiniform setae at the uropodal endopod is quite variable (even between right and left) and ranges from 5 to 14 in the specimens from Aqaba.

The linea thalassinica reached almost to the posterior end of the carapace in all studied specimens.

POORE (1997) speculated about the “solid connection” between cephalothorax and abdomen that the animal is “designed to walk about the surface of the sediment cleaning

detritus with the maxillipedal brush". The observations presented here, however, show that this species is clearly burrowing and rarely – if ever – comes out of its burrow.

Embryos range in diameter from 428–535  $\mu\text{m}$ , some females carried a few very small embryos (142  $\mu\text{m}$ ).

One male that was fixed in glutardialdehyde, showed threads with spermatophores emanating from the gonopores. Numerous ellipsoid spermatophores filled with sperms are arranged in racemose clusters (Fig. 5).

**Depth distribution.** 2 to 17 m.

**Distribution.** Madagascar (type locality), Red Sea (POORE 2015, this study), Indonesia (this study).

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