

Umalia trirufomaculata (Davie and Short, 1989) in India, with a note on the taxonomy of *U. misakiensis* (Sakai, 1937) (Decapoda: Brachyura: Raninidae)

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ABSTRACT

The rare raninid crab *Umalia trirufomaculata* (Davie and Short, 1989) is recorded from India for the first time. It is redescribed and compared at length with the related but poorly known *U. misakiensis* (Sakai, 1937) on the basis of a good series of specimens from the Philippines. Some of the supposed differences which have been documented between the two taxa (e.g., carapace proportions and features of the cheliped) are not valid; while new distinguishing characters associated with the male pleon and gonopods are observed.

KEYWORDS

taxonomy, Raninoidea, frog crab, Australia, Philippines, Japan, new record, diagnosis

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INTRODUCTION

The raninid genus *Umalia* Guinot, 1993, was established for six species previously placed in *Ranilia* H. Milne Edwards, 1837: *R. horikoshii* Takeda, 1975, *R. misakiensis* Sakai, 1937, *R. orientalis* Sakai, 1963, *R. ovalis* Henderson, 1888, *R. tenuiocellus* Davie and Short, 1989, and *R. trirufomaculata* Davie and Short, 1989. Guinot (1993) restricted *Ranilia* for American taxa and transferred the Indo-West Pacific members to *Umalia* (see also Serène and Umali, 1972). Chen and Sun (2002) described one more species, *R. chinensis*, from the South China Sea, and was referred to *Umalia* by Ng *et al.* (2008).

Recently, the authors examined a specimen collected from the Andamans belonging to *Umalia* which appeared to belong to *U. trirufomaculatus*, a species known only from Australia. This species is very similar to the type species, *U. misakiensis*. The Lee Kong Chian Natural History Museum, National University of Singapore, however, has a large series of *U. misakiensis* collected from the Philippines, which enabled detailed comparisons to be made. The present paper redescribes *U. trirufomaculatus*, records the species from India for the first time, discusses the taxonomy of *U. misakiensis* and elaborates on the differences between the two species.

MATERIAL AND METHODS

The terminology used follows Guinot (1993) and Davie *et al.* (2015). Measurements provided, in millimetres, are of the maximum carapace width and length (to the tips of the teeth), respectively. Specimens examined are deposited in the Western Australian Museum (WAM), Perth, Australia; Zoological Reference Collection (ZRC), Lee Kong Chian Natural History Museum, National University of Singapore; and the Zoological Survey of India (ZSI), Andamans, India.

SYSTEMATICS

Superfamily Raninoidea De Haan, 1839

Family Raninidae De Haan, 1839

Subfamily Notopodinae Serène and Umali, 1972

Genus *Umalia* Guinot, 1993

Umalia trirufomaculata (Davie and Short, 1989) (Figs. 1A, B, 2, 3A, B, 4A–E, 5A–C, 6A–G)

Ranilia trirufomaculata Davie and Short, 1989: 167, figs. 6a–h, 7A, 8a–c.

Umalia trirufomaculata – Guinot, 1993: 1330; Davie, 2002: 489; Ng *et al.*, 2008: 42; Van Bakel *et al.*, 2012: 214.

Material. Holotype: male (20.4 x 26.3 mm) (WAM 348-60), on sand, 7 miles west of Cape Contour, Bernier Island, Western Australia, 70 m, in Honolulu dredge, coll. RV *Davena*, 16 May 1960. Others: 1 male (11.8 x 15.6 mm) (ZSI/ANRC-22529), Great Nicobar Islands, 937.159°N 9244.011°E, India, coll. F.O.R.V. Sagar Sampada, K. K. Bineesh and R. R. Kumar 17 November 2017.

Comparative material. *Umalia misakiensis* (Sakai, 1937): 3 males, 3 females (ZRC 2001.0443), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, December 2000; 9 males (largest 26.0 x 34.2 mm, smallest 16.0 x 21.8 mm), 6 females (largest 26.0 x 34.2 mm, smallest 19.8 x 26.0 mm) (ZRC 2001.0637), Balicasag, 28 November 2001; 1 male, 2 females (ZRC 2008.0054), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, coll. June 2002; 1 female (ZRC 2008.0083), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, 23–30 July 2003; 1 male, 2 females (ZRC 2008.055), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, July 2003; 2 males (ZRC 2008.0096), Balicasag, Panglao, Bohol, Visayas, Philippines, in

tangle nets, coll. local fishermen, July 2003; 1 male, 1 female (ZRC 2008.0056), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, 2 March 2004; 1 male (ZRC 2018.0668), station PN1, Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, April 2004; 1 female (ZRC 2018.0669), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, April 2004; 1 male, 2 females (larger 35.1 x 43.0 mm), station PN1, Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, coll. 29 May 2004; 1 male, 1 female (ZRC 2018.0661), station PN1, Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, coll. local fishermen, 29 May 2004; 1 male, 1 female (ZRC 2018.0659), Balicasag, Panglao, Bohol, Visayas, 9°31.1'N 123°41.5'E, Philippines, in tangle nets, approximately 100 m, coll. local fishermen, 31 May 2004; 1 female (ZRC 2018.1376), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, 80–140 m, coll. local fishermen, 2004–2006; 1 female (ZRC 2018.1377), Balicasag, Panglao, Bohol, Visayas, Philippines, in tangle nets, approximately 200 m, coll. local fishermen, 20 December 2007; 1 male (23.4 x 28.9 mm) (ZRC 2018.1378), north coast of Panglao, Bohol, Visayas, Philippines, coll. J. Arbasto, July 2004 – May 2005. — *Umalia orientalis* (Sakai, 1963): 1 female (34.1 x 44.5 mm) (ZRC 2013.0086), Tashi port, Ilan County, northeastern Taiwan, from deep-water trawlers, coll. S.-H. Wu, 20 February 1998.

Description of male. Carapace elongate, ovate, with anterior half distinctly wider than posterior part; carapace length to width ratio 1.27–1.32; dorsal surface of anterior half clearly granulate to tuberculate, granules and tubercles on margins and in large specimens short, sharp; posterior surfaces with low flattened granules (especially along margins), punctate or rugose (Figs. 1A, B, 2A, 3A, B). Rostrum acutely triangular, sharp, straight to slightly upturned; longitudinal median rostral sulcus deep, relatively broad, extending short distance posteriorly into carapace; ventral margin with sulcus separating ocular peduncles (Figs. 2A, 3A, B). Orbit with acute inner tooth, separated from rostrum by concave granulate margin; external orbital tooth (outer orbital tooth) relatively lower, broader, separated from inner tooth by low, subtruncate lobe with uneven low spines and granules; ratio of distance between external orbital teeth and tips of anterolateral teeth 2.04–2.23

(Figs. 2A, 3A, B). Eye peduncle obliquely flattened, almost subparallel in dorsal view; folding obliquely downwards and posteriorly, cornea almost completely hidden in dorsal view when eye folded; cornea large, well developed, about half length of peduncle; peduncle stout, upper surface with small granules and short setae. Anterolateral tooth strong, sharp, directed obliquely laterally to almost directly anteriorly; separated from external orbital tooth by gently convex to straight granular margin (Figs. 2A, 3A, B). Posterolateral margins gently convex; anterior part of margin granulate, may appear subparallel; posterior part of margin converging to gently convex posterior carapace margin (Figs. 1A, B, 3A, B).

Third maxillipeds operculiform; basis and ischium separated by setose suture; basis-ischium longer than merus, distal part much wider than proximal section; merus longitudinally ovate, prominently pitted with numerous relatively short setae which do not obscure surface or margins; palp (carpus, propodus and dactylus) slender, about three-quarters length of merus, not hidden when folded to merus (Figs. 2C, 5A).

Chelipeds subequal, large, short, deep, laterally flattened (Fig. 1A, B). Merus trigonal in cross-section; inner surface with low rugosities, punctate, with short setae; outer surface with strong short striae, each with rows of short setae. Carpus elongate, upper part of outer surface covered with striae and low granules, lower part almost smooth; inner surface with striae and rows of setae (Fig. 1A, B). Palm of chela laterally compressed, deep; outer surface rugose, pitted, with very short setae in depressions; ventral margin gently sinuous, cristate with row of setae along subventral face, dorsal margin subcristate, uneven, with long or short sharp gently curved spine on subdistal edge; dactylus strongly curved, when completely closed meeting palm at base of propodal finger, subdorsal surface with shallow groove, with long setae on proximal part, cutting margin sharp, without teeth or denticles; propodal finger short, smooth, cutting margin (up to base of dactylus) with broad sharp, teeth, clump of long setae at base with dactylus (Figs. 2B, 5B).

Ambulatory legs short; surfaces almost smooth to gently punctate (especially those of fourth pair); margins of merus, carpus and propodus fringed with long setae (Figs. 1A, B, 4A–E). Second pair longest; first and third pairs subequal; last pair shortest, inserted

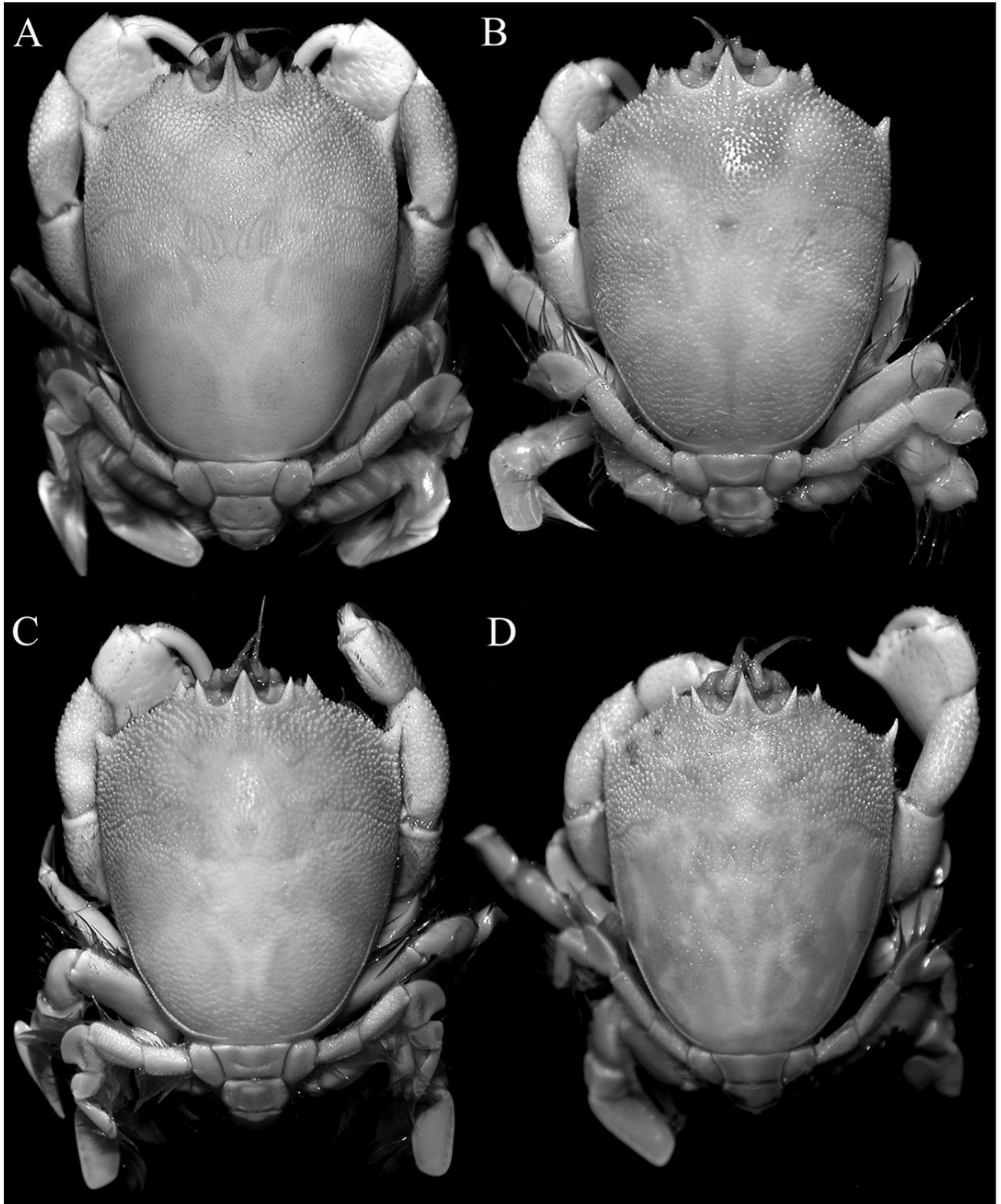


Figure 1. Overall dorsal habitus. **A**, *Umalia trirufomaculata*, holotype male (20.4 x 26.3 mm) (WAM 348-60), Western Australia; **B**, *U. trirufomaculata*, male (11.8 x 15.6 mm) (ZSI), Andamans; **C**, *U. misakiensis*, male (23.4 x 28.9 mm) (ZRC 2018.1378), Philippines; **D**, *U. misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines.

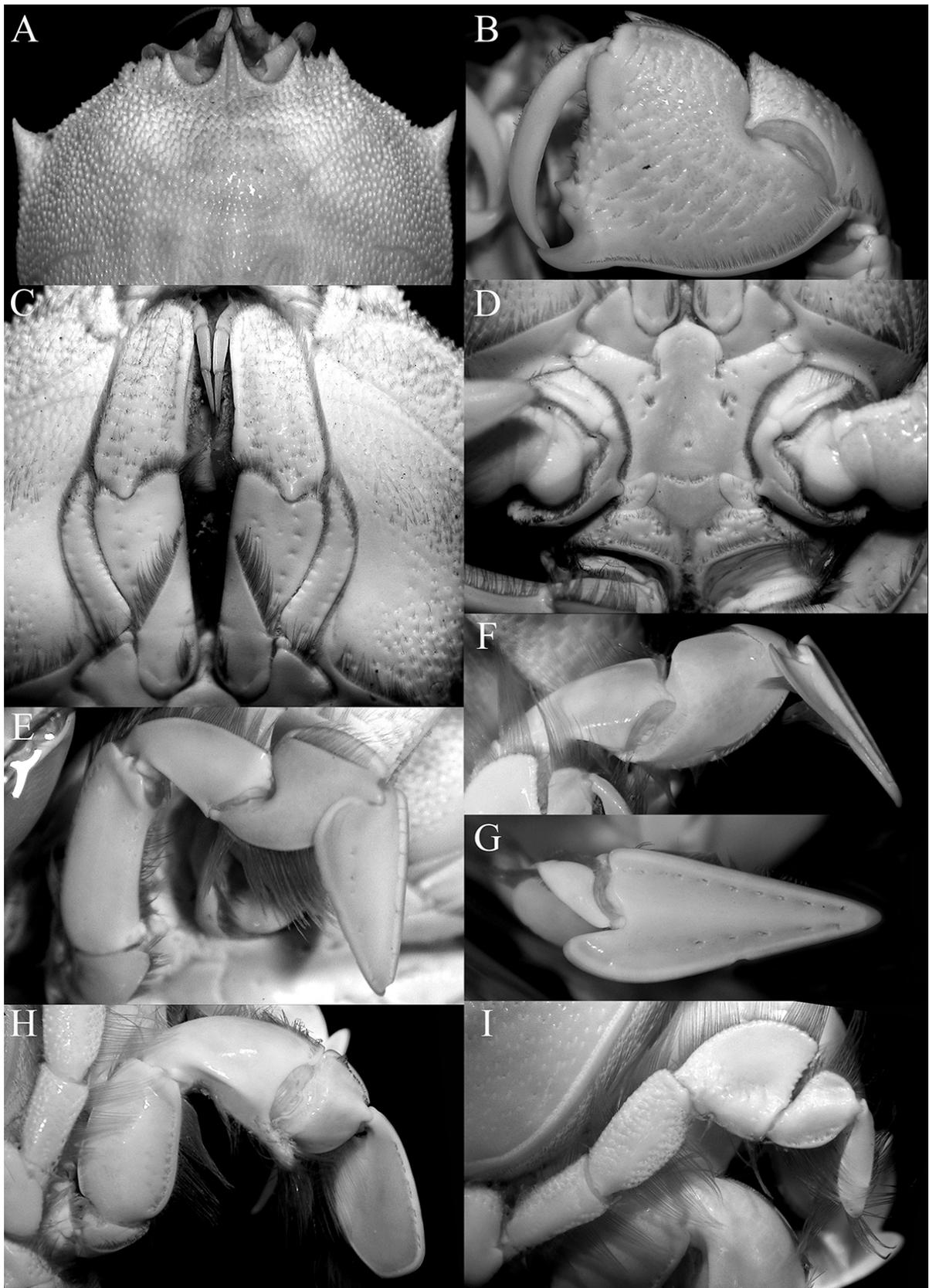


Figure 2. *Umalia trirufomaculata*, holotype male (20.4 x 26.3 mm) (WAM 348-60), Western Australia. **A**, anterior part of carapace showing front; **B**, outer view of left chela; **C**, third maxillipeds; **D**, anterior thoracic sternum; **E**, first ambulatory leg; **F**, carpus, propodus and dactylus of second ambulatory leg; **G**, marginal view of dactylus of second ambulatory leg; **H**, third ambulatory leg; **I**, right fourth ambulatory leg.

subdorsally with ischium elongate (Figs. 1A, B, 4A–E). First leg ischium with ventral crest; dorsal margin of merus with low crest, gently serrate, ventral margin cristate; margins of carpus and propodus sharp; carpus with submedian ridge on outer surface; dactylus blade-like with sharply tapering tip, margins sharp, without setae (Figs. 2E, 4A). Second leg merus with dorsal margin subcristate, ventral margin cristate; margins of carpus and propodus subcristate; dactylus twisted at insertion, asymmetrical in mesial view, with low broad longitudinal ridge (Figs. 2F, G, 4B, C). Third leg stoutest; merus, carpus and propodus with dorsal and ventral margins cristate; carpus with elongate tooth-like projection on ventral distal edge, tip rounded, reaching to at least half length of propodus; propodus quadrate; dactylus subrectangular, broad, dorsal and ventral margins gently convex to almost straight, may appear subparallel, dorsal margin distinctly longer than ventral margin, distal margin gently convex to almost straight (Figs. 2H, 4D). Last leg shortest, ischium elongate, subequal to merus; merus with dorsal and ventral margins subcristate, uneven; carpus very deep, prominently flattened laterally with dorsal margin high, cristate, lobiform; propodus subovate with margins cristate, dorsal margin distinctly higher; dactylus narrow, elongate, subspatuliform (Figs. 2I, 4E).

Anterior thoracic sternum with sternites 1–4 fused; sternites 1 and 2 almost round with sharp distal tip, separated from sternite 3 by lateral fissure; lateral margin of sternites 3 and 4 medially constricted; surface almost smooth with scattered pits and rugae, with rows and clumps of short setae (Figs. 2D, 5C).

Pleon elongate, slender, surfaces covered with low or small granules, more pronounced on margins; all somites and telson free; somite 1 trapezoidal, distinctly wider than long; somite 2 subovate with margins convex; somites 3–5 distinctly wider than long, lateral margins gently convex to almost straight; somite 6 trapezoidal, as long as broad; telson triangular with concave lateral margins (Fig. 6A).

G1 short, terminal article ovate with distal part more narrow; inner lateral surface with folds not meeting medially, longer fold tapering at tip, sometimes partially covering shorter fold (Fig. 6B, E, F). G2 distinctly longer than G1; basal article stout; distal article medially chitinous, with tip hooked (Fig. 6C, D, G).

Remarks. *Umalia trirufomaculata* was described (as a *Ranilia*) from two males and two females from Western Australia and Queensland (Davie and Short, 1989). They noted that *U. trirufomaculata* with *U. misakiensis* were close and discussed how the two species differ. Davie and Short (1989) did not have specimens of *U. misakiensis* to compare directly with *U. trirufomaculata* and relied only on the literature (notably Sakai, 1937; 1976; Serène and Umali, 1972). *Umalia misakiensis* was originally described from one female collected in Misaki, Japan, from 100–150 m depth; with more material subsequently recorded by Sakai (1965; 1976), all from Japan. Serène and Umali (1972) examined one male specimen from Japan but in an addendum, also recorded material from Panglao in the Philippines from 73–141 m (Serène and Umali, 1972: 102). In the ZRC is a large series of *U. misakiensis* collected from Balicasag Island in Panglao, Philippines, all obtained by tangle nets below 200 m.

Three of the characters noted by Davie and Short (1989: 171) to separate *U. trirufomaculata* from *U. misakiensis* (carapace proportion, structure of the carpus of the cheliped and armature on the palm) cannot be used. The carapace proportions were cited as a character, with that of *U. trirufomaculata* supposedly narrower than that of *U. misakiensis* (ratio of distance between external orbital teeth and tips of anterolateral teeth 2.04–2.23 versus 2.43–2.56) but the good series of *U. misakiensis* on hand now shows that the carapace shape varies too substantially (Fig. 3C–H) to be a reliable character. Davie and Short (1989) commented that there is a setose crest on the carpus of the cheliped of *U. misakiensis* which is absent in *U. trirufomaculata* but comparison of the current material show no differences. In specimens of similar sizes, there is a very low crest lined by distinct setae in both species and in some specimens of *U. misakiensis*, appears somewhat stronger, but it is too subtle and variable to be useful. The presence of a prominent spine on the distal edge of the dorsal margin of the palm of *U. trirufomaculata* (Fig. 2B) was listed as possible distinguishing feature, but *U. misakiensis* also has a spine at this position and it varies in size (Fig. 5E). In some specimens (e.g., ZRC 2018.1378), this spine is as strong as that in *U. trirufomaculata*. In the small male of *U. trirufomaculata* from the Andamans, there

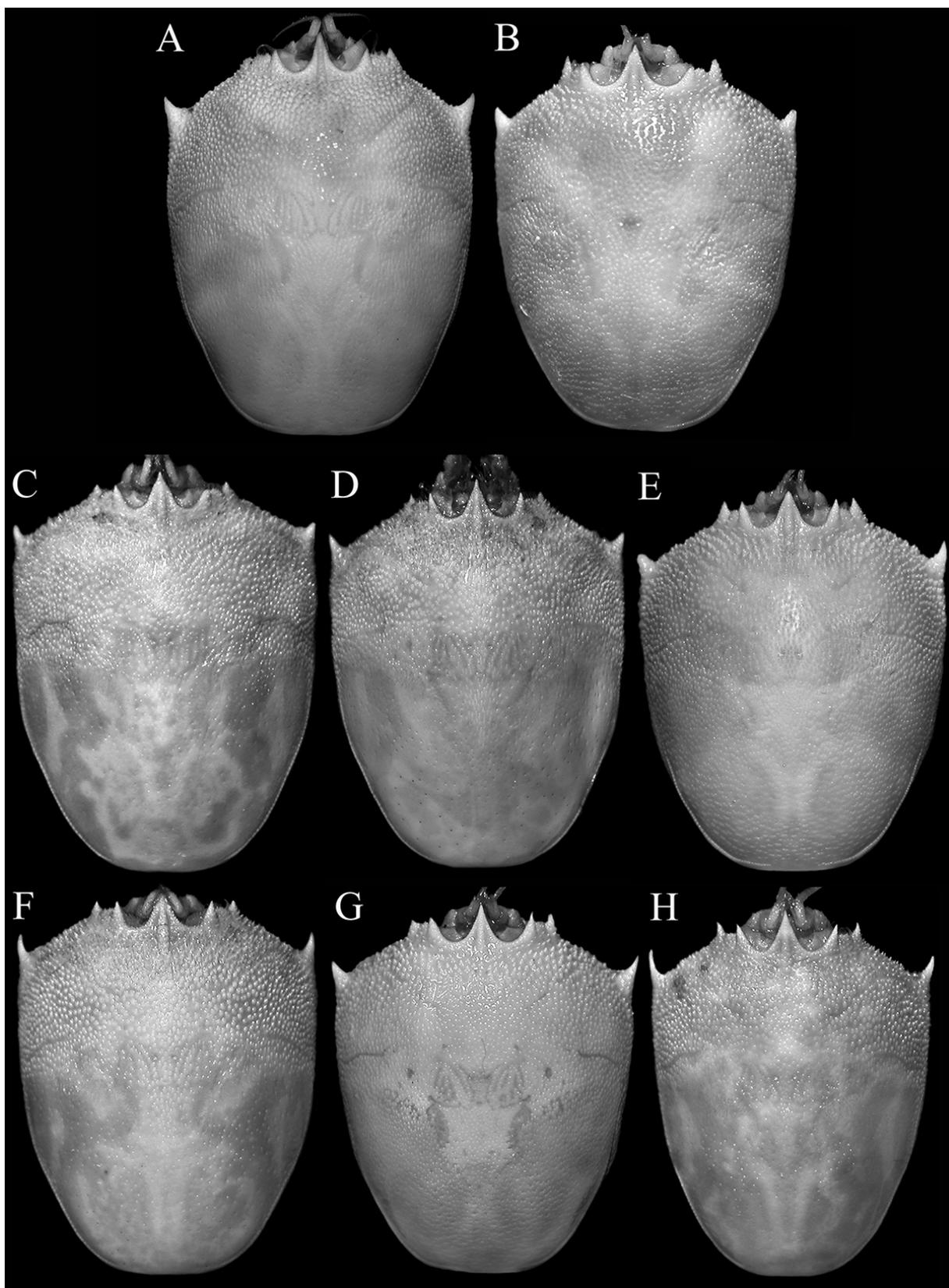


Figure 3. Dorsal view of carapace. **A**, *Umalia trirufomaculata*, holotype male (20.4 x 26.3 mm) (WAM 348-60), Western Australia; **B**, *U. trirufomaculata*, male (11.8 x 15.6 mm) (ZSI), Andamans; **C**, *U. misakiensis*, male (26.0 x 34.2 mm) (ZRC 2001.0637), Philippines; **D**, *U. misakiensis*, male (23.9 x 31.2 mm) (ZRC 2001.0637), Philippines; **E**, *U. misakiensis*, male (23.4 x 28.9 mm) (ZRC 2018.1378), Philippines; **F**, *U. misakiensis*, male (22.6 x 27.7 mm) (ZRC 2001.0637), Philippines; **G**, *U. misakiensis*, male (18.0 x 21.8 mm) (ZRC 2001.0637), Philippines; **H**, *U. misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines.

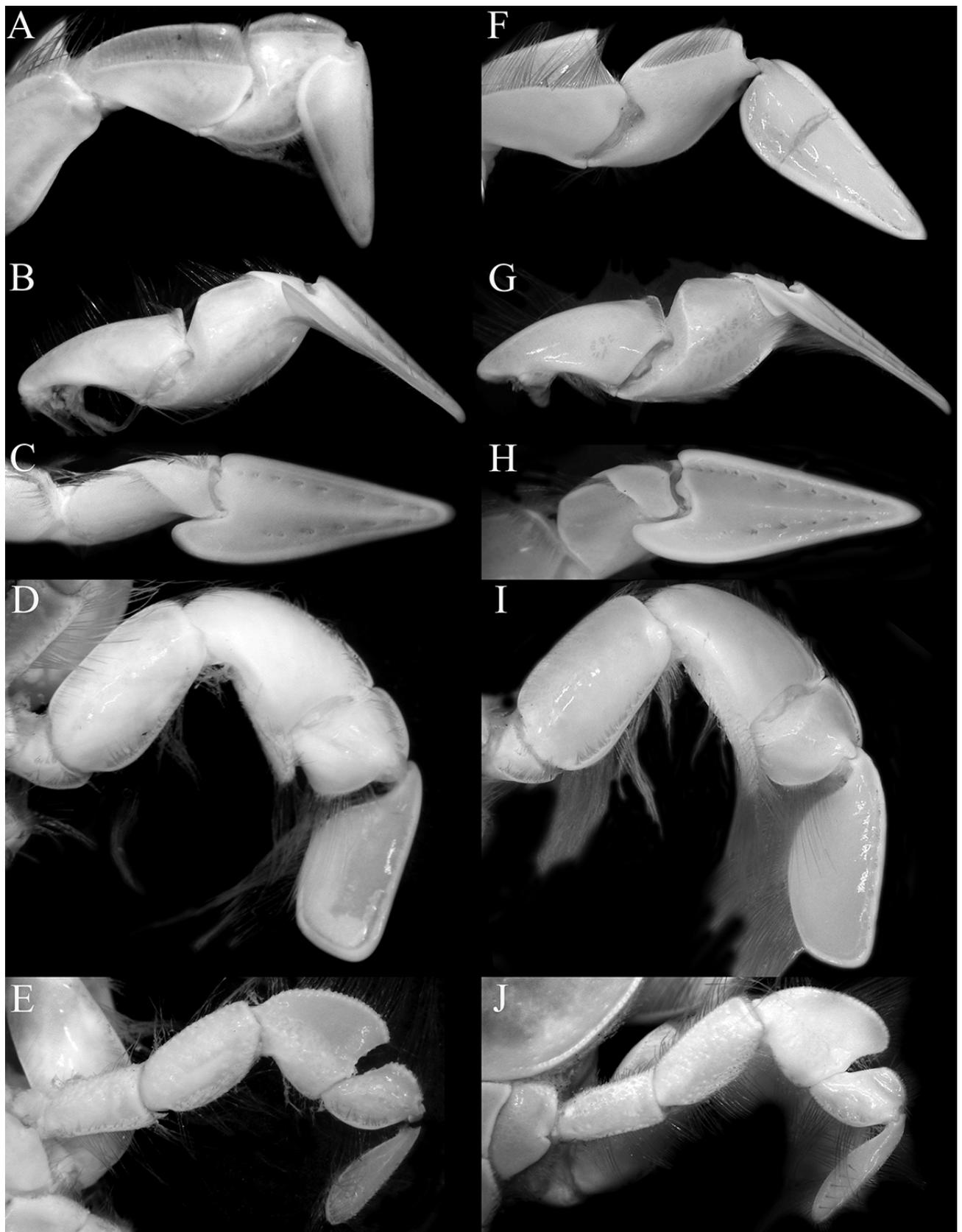


Figure 4. A–E, *Umalia trirufomaculata*, male (11.8 x 15.6 mm) (ZSI), Andamans; F–J, *U. misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines. A, F, carpus, propodus and dactylus of first ambulatory leg; B, G, carpus, propodus and dactylus of second ambulatory leg; C, H, marginal view of dactylus of second ambulatory leg; D, I, right third ambulatory leg; E, F, right fourth ambulatory leg.



Figure 5. A–C, *Umalia trirufomaculata*, male (11.8 x 15.6 mm) (ZSI), Andamans; D–F, *U. misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines. A, D, third maxillipeds; B, E, outer view of left chela; C, F, anterior thoracic sternum.

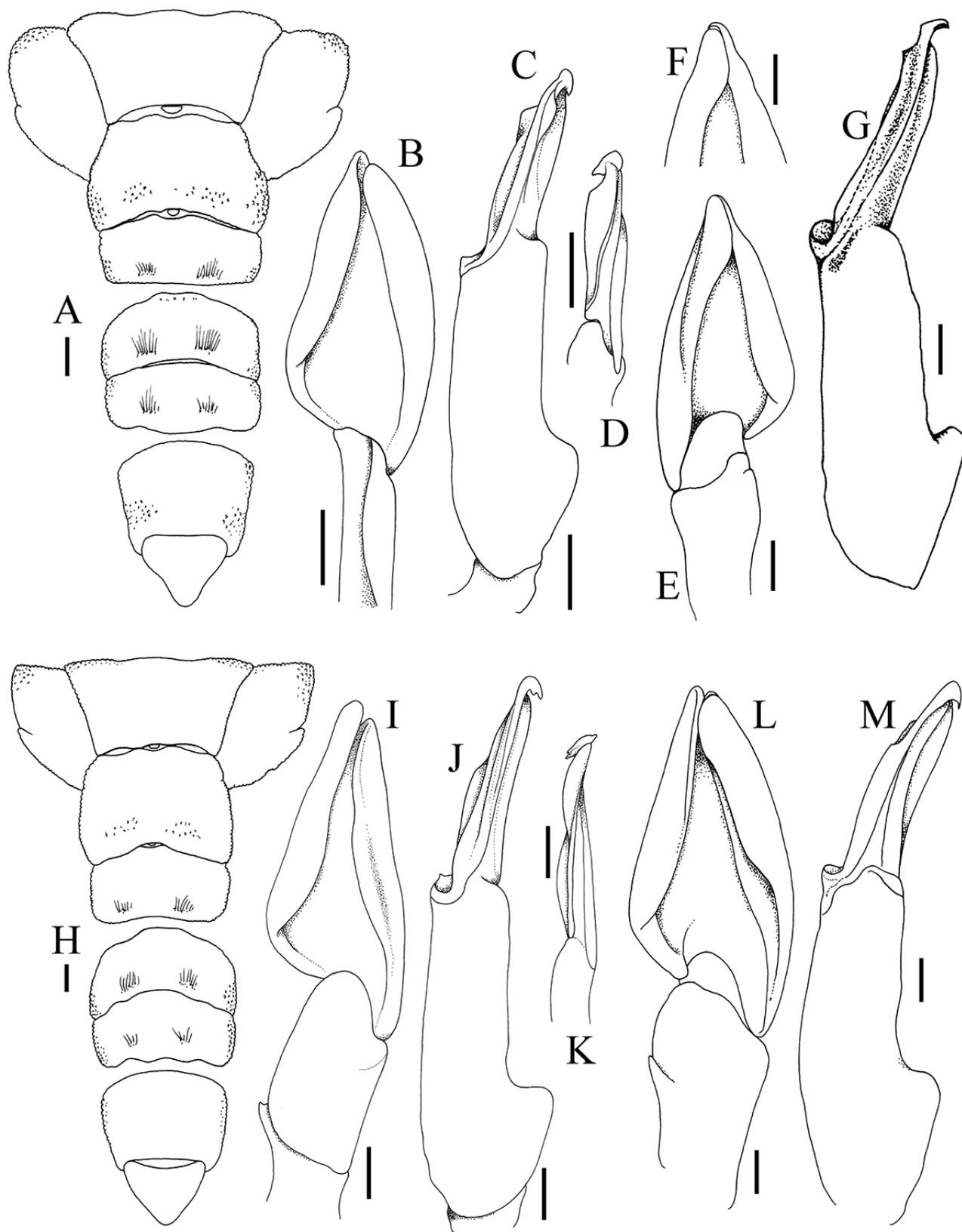


Figure 6. *Umalia trirufomaculata*, A, E–G, holotype male (20.4 x 26.3 mm) (WAM 348-60), Australia; B–D, *U. trirufomaculata*, male (11.8 x 15.6 mm) (ZSI), Andamans; H, L, M, *U. misakiensis*, male (23.4 x 28.9 mm) (ZRC 2018.1378), Philippines; I–K, *U. misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines. A, H, male pleon (lateral setae not drawn); B, I, L, left G1 (inner lateral view); C, J, M, left G2; D, K, distal part of left G2; E, F, right G1 (inner lateral view); G, right G2. G after Davies and Short (1989: fig. 8b). Scale bars: A, H = 1.0 mm; B–G, I–M = 0.5 mm.

seems to be a small spine at this position but the tip is broken off (Fig. 5B).

The proportions of the third maxillipeds and fourth ambulatory legs can be used to separate the two species. The merus of the third maxilliped is consistently relatively shorter than the basis-ischium in *U. trirufomaculata* (Figs. 2C, 5A) (versus relatively more slender and longer than the basis-ischium in *U. misakiensis*; Fig. 5D), and this character is stable even in larger specimens. The ischium and merus of the fourth ambulatory leg is indeed relatively stouter in *U. trirufomaculata* (Figs. 2I, 4E) (versus relatively more slender in *U. misakiensis*; Fig. 4J), and this character is valid for the series of specimens of *U. misakiensis* examined. The shape of the dactylus of the third ambulatory leg is slightly different, being relatively shorter and more quadrate with the distal margin somewhat longer in *U. trirufomaculata* (Figs. 2H, 4D) (versus more elongate and slightly subovate with the distal margin shorter in *U. misakiensis*; Fig. 4I).

With regards to the G1, Davie and Short (1989: 171) noted that compared to the G1 of *U. misakiensis* (citing Serène and Umali [1972] for the figure), that of *U. trirufomaculata* “is narrower distally, has a different apical configuration and also differs in the size and shape of the lateral calcified plates”. The photograph of the G1 in Serène and Umali (1972: pl. 2 fig. 3) of *U. misakiensis*, however, is too poor to see much. Comparing the present material, there are subtle differences in their G1 and G2 structures. The G1 of *U. trirufomaculata* is relatively shorter (Fig. 6B, E, F) (see also Davie and Short, 1989: fig. 8a) (versus G1 relatively longer with the tip of the longer fold straight and gently tapering in *U. misakiensis*; Fig. 6I, L). In addition, the G2 of *U. trirufomaculata* is proportionately shorter and stouter (Fig. 6C, D, G) (see also Davie and Short, 1989: fig. 8b, c) when compared to similar sized specimens of *U. misakiensis* (Fig. 6J, K, M).

We also observe differences in the form of the male pleon, with that of *U. trirufomaculata* having the somites relatively wider with the lateral margins of the telson gently concave (Fig. 6A) (versus somites relatively narrower with the lateral margins of the telson gently convex to straight in *U. misakiensis*; Fig. 6H) when specimens of similar sizes are compared.

The differences in coloration are probably the best way to separate the two species. As noted by Davie and Short (1989), *U. trirufomaculata* is characterised by

possessing two large ovate red or maroon patches on each side of the branchial regions with a smaller spot medially on the gastric region. This color pattern can be discerned even in the faded small specimen of *U. trirufomaculata* from the Andamans. In *U. misakiensis*, the carapace also has a small median maroon spot but the branchial regions have an uneven network of broad and narrow maroon lines and patches (Fig. 7). The figure of *U. misakiensis* in Sakai (1965: pl. 1 fig. 2; 1976: pl. 19 fig. 2) is somewhat misleading as it shows the whole carapace reddish-orange. None of the specimens of *U. misakiensis* examined show such a color pattern. The figure of a fresh specimen by Miyake (1983: 2, pl. 1 fig. 4) is probably more accurate and agrees well with the present specimen from the Philippines (Fig. 7).

Sakai (1965; 1976) had 10 specimens of *U. misakiensis* and noted that they were collected from sandy to sand-muddy bottoms at depths of 30–150 m. Three were from tangle nets used to catch lobsters. *Umalia trirufomaculata* was dredged from coral sand

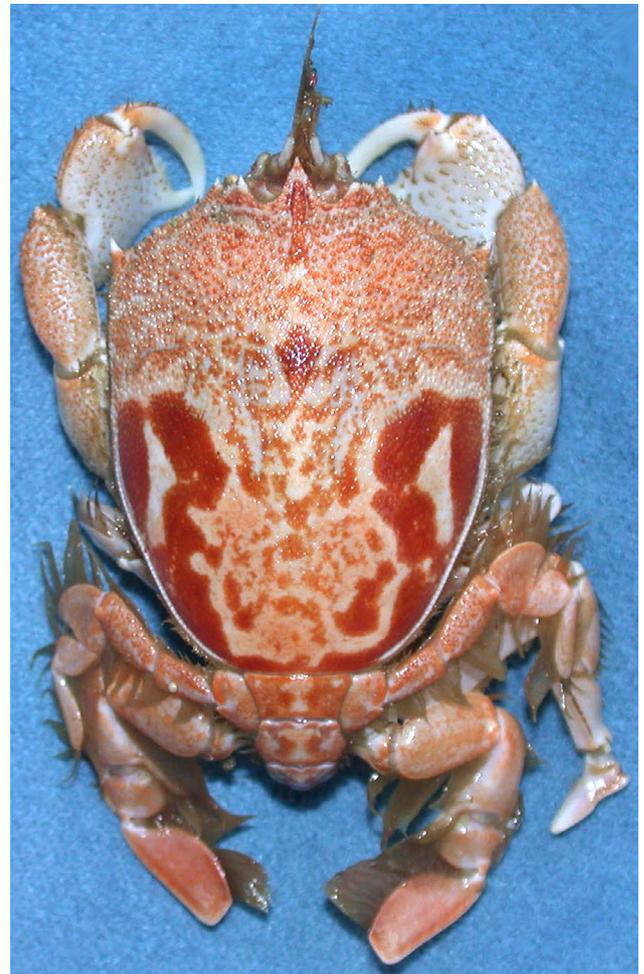


Figure 7. Color in life. *Umalia misakiensis*, male (16.0 x 21.8 mm) (ZRC 2001.0637), Philippines.

and shell fragment bottoms at depths of 150–270 m. The species has also been recorded from Japan in recent years (Guinot, 1993: 1325, 1330; Muraoka, 1998: 16; Marumura and Kosaka 2003: 22; Waugh *et al.*, 2009: 20, 27, 32, figs. 1(8), 7(7); Van Bakel *et al.*, 2012: 214; Karasawa *et al.*, 2014: 219, 261) but there is no additional taxonomic or ecological information. The large collection of *U. misakiensis* from the Philippines (over 40 specimens) were all from tangle nets used by fishermen to collect molluscs for collectors and set against deep sea cliffs below 200 m (Ng *et al.*, 2009). While raninoids burrow into soft substrates, the preferred habitat of *Umalia* species is probably in the sand or rubble zones between the rocky areas in these deep-water cliffs, and the apparent rarity of specimens in the past is because their presence in more level areas which can be easily dredged or trawled is incidental (see Mendoza *et al.*, 2010).

Kathirvel (2008) reported *U. ovalis* from the Gulf of Manaar in southern India (see also Kathirvel and Gokul, 2010; Trivedi *et al.*, 2018) but this record will need to be checked to see if it may be *U. trirufomaculata* instead. *Umalia ovalis* has been previously recorded from Kei Islands in Indonesia, Japan and Australia (Henderson, 1888; Yokoya, 1933; Tyndale-Biscoe and George, 1962; Sakai, 1976). This species can easily be distinguished from *U. trirufomaculata* and *U. misakiensis* by the curved dactylus of the third ambulatory leg (see Davie and Short, 1989: 171).

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