

Glypturus motupore, a New Callianassid Shrimp (Crustacea: Decapoda) from Papua New Guinea with Notes on its Ecology

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ABSTRACT. A new callianassid shrimp, *Glypturus motupore*, is described from Papua New Guinea and compared with *G. acanthochirus*, *G. armatus* and *G. laurae*, three similar species of the genus from the Caribbean and Indo-West Pacific. *Glypturus motupore* is found intertidally and subtidally to depths of 30 m. The species processes large quantities of sediment and subtidally builds volcano-shaped mounds up to 46 cm high. Burrows are complex, extending up to 1.5 m deep and 2 m laterally. Burrows are lined with fine-grained sediments and include subsurface chambers accumulating coarse sediment.

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Only a single species of callianassid shrimp has been recorded from the nation of Papua New Guinea, *Callianassa novaebritanniae* Borradaile from the island of New Britain (De Man, 1928). However, De Man recorded 16 species from the family in the Indonesian archipelago. Three of these also occur in tropical Australia with two other species (Poore & Griffin, 1979). In addition, at least two undescribed species of callianassid shrimp are known from the Great Barrier Reef of Australia. It is probable therefore that the callianassid fauna of Papua New Guinea includes several species already described but the relatively abundant and newly discovered specimens described here could not be placed in a known species. This contribution describes the new species and provides some preliminary information about its ecology.

The diagnosis of this new species is based on that of the closely-related species *Glypturus laurae* (de Saint Laurent, in de Vaugelas & de Saint Laurent, 1984). The description follows the format used for several species in the family used by le Loeuff & Intes

(1974) and by de Saint Laurent & le Loeuff (1979). However, the generic placement of the new species differs from that of these authors who followed de Saint Laurent's (1973) concepts of callianassid genera. They included *G. laurae* and *G. armatus* (Milne Edwards) in *Callichirus* Stimpson. Manning & Felder (1986) have restricted *Callichirus* to *C. major* Say and three related species.

Manning (1987) revived and diagnosed *Glypturus* Stimpson for *G. acanthochirus* Stimpson and it is clear that our material can be assigned to this genus. Manning hesitated to include four other Indo-West Pacific species in *Glypturus*. They differ from the type species primarily in not having the anterolateral spines separated from the carapace by a non-calcified membrane. In a specimen from the Tuamotu Archipelago (nominally *G. armatus*) examined by GCBP the articulation was weak. The character would seem to be not important in the light of the many other similarities shared by this complex.

Type material is lodged in the Museum of Victoria, Melbourne (NMV), the Australian Museum, Sydney

(AM), the United States National Museum of Natural History, Washington (USNM), and the Muséum National d'Histoire Naturelle, Paris (MNHP).

CALLIANASSIDAE Dana

Glypturus Stimpson, 1866

Glypturus motupore n.sp.

Figs 1–3, 4a

Type material. HOLOTYPE: female, total length 134 mm, carapace length 38 mm, NMV J13811, Papua New Guinea, Bootless Inlet, Motupore Island (9°32'S, 147°16'E), intertidal sand flat north-east of University of Papua New Guinea's field station, collected by hand by T.H. Suchanek, June 1985, using the technique of de Vaugelas (1985). PARATYPES: male, tl. about 100 mm, cl. 29 mm, NMV J13812; female, tl. about 110 mm (damaged and incomplete), NMV J13813; female, tl. 104 mm, cl. 29 mm (no cheliped), NMV J13814; female, tl. 75 mm, cl. 22 mm (incomplete), NMV J13815; female, tl. 75 mm, cl. 22 mm; female, tl. 105 mm, cl. 29 mm, AM P37394; male, tl. 120 mm, cl. 34 mm (no cheliped), AM P37394; female, tl. 110 mm, cl. 30 mm, USNM 229516; male, tl. 82 mm, cl. 23 mm, USNM 229517; female, tl. 101 mm, cl. 21 mm, MNHP; all from type locality at different dates between 11 June and 28 July 1985.

Additional material examined. 3 unattached large chelipeds, 1 unattached smaller cheliped, same locality, NMV J13816.

Diagnosis. Cephalothorax a little less than 0.3 of total length. Cervical groove strongly marked, at 0.7 of carapace length. Front tridentate, rostrum and anterolateral spines not articulating. Telson lateral margins diverging over proximal half, with strongly convex posterior margin, about 1.2 times as wide as long. Propodus of maxilliped 3 broadly dilated, slightly excavate distally. Chelipeds unequal; larger armed with spines on lower margins of ischium, merus and carpus (proximal oblique row of 2–3 and distal longitudinal row of 3–7 on merus); spines on upper margins of merus and propodus; areas of granules laterally and mesially on merus. Uropodal endopod ovoid-triangular, twice as long as wide.

Description. Cephalothorax a little less than 0.3 of total length; relative lengths of cephalothorax, abdominal somites 1–6 and telson — 2.5 : 1.0 : 1.1 : 0.8 : 0.7 : 0.9 : 1.3 : 0.6. Rostrum acute, broadly based, upturned from base of eyes; anterolateral spines acute, fixed, slightly inwardly curved. Branchiostegite obscurely sculptured anteriorly. Abdominal somite 1 with clear shoulders. Telson about 1.2 times as wide as long, with diverging straight lateral margins over proximal half, almost semi-circular posterior margin, a central depression on distal half defined by broad longitudinal and transverse ridges.

Eyestalks tapering from base, cornea lateral, ⅓ way along, apices rounded-triangular.

Antennule article 3 1.6 times length of article 2; flagella subequal, almost twice length of peduncle. Antenna peduncle exceeding antennule peduncle by its last article, article 5 shorter than article 4; flagellum twice as long as those of antennule.

Maxilliped 3 ischium 1.4 times as long as wide, crista dentata of 3 separate denticles proximally and a ridge of about 14 blunt denticles distally; merus about as long as greatest width; carpus longer than propodus and dactylus; propodus dilated, broader than long, distal margin slightly excavate. (See Fig. 3 for other mouthparts.)

Large cheliped (right in 6 cases, left in 5 cases) massive, as long as whole animal, without substantial sexual dimorphism. Ischium and merus of same length, carpus slightly shorter and propodus longer dorsally. Ischium with 8–11 spines on lower margin; merus with oblique row of 3 slightly curved spines proximally on lower margin, 3–6 (reducing distally) spines in longitudinal lower marginal row, 3 (rarely up to 8) spines on upper margin, lateral and mesial fields of granules; carpus with 6–11 distally-directed spines on lower margin, last 2 a distal pair; propodus with 3 spines on upper margin, rows of fine granules at base of dactylus, (6 scattered granules laterally at base of fixed finger only in AM P37394 female); fixed finger with blunt tooth on proximal half; dactylus longer than fixed finger, with proximal notch, blunt tooth, triangular notch and irregular cutting edge.

Small cheliped about ⅔ length of larger. Ischium with about 12 denticles on lower margin; merus with 3 proximal and 2 distal spines on lower margin, 3 on upper margin; carpus with 6 spines on lower margin, last defining corner; propodus unarmed; fixed finger with proximal blunt tooth; dactylus simple.

Pereopod 3 propodus 2.3 times as broad as long, with strong narrow posterior lobe. Pereopod 4 propodus with short posterodistal finger, almost chelate. Pereopod 5 chelate.

Female pleopod 1 uniramous, 2 articles, second 1.4 times length of first. Pleopod 2 biramous, endopod with subterminal curved appendix interna, exopod shorter than endopod. Pleopod 3 biramous, endopod triangular, partly divided into 2 articles, triangular appendix interna; exopod curved and enclosing endopod.

Male pleopod 1 uniramous, 2 articles, second shorter than first, with distal curved acute lobe. Pleopod 2 biramous, endopod apex bilobed, one triangular, other truncate, cylindrical appendix interna; exopod shorter than endopod.

Uropodal endopod ovoid-triangular, twice as long as wide, widest about ⅓ way along and tapering to rounded apex; exopod about as wide as long, anterior lobe obliquely truncate, posterior lobe broadly rounded, with proximal spine on rib.

Etymology. For Motupore Island, the type locality.

Distribution. Known only from Bootless Inlet, Papua New Guinea.

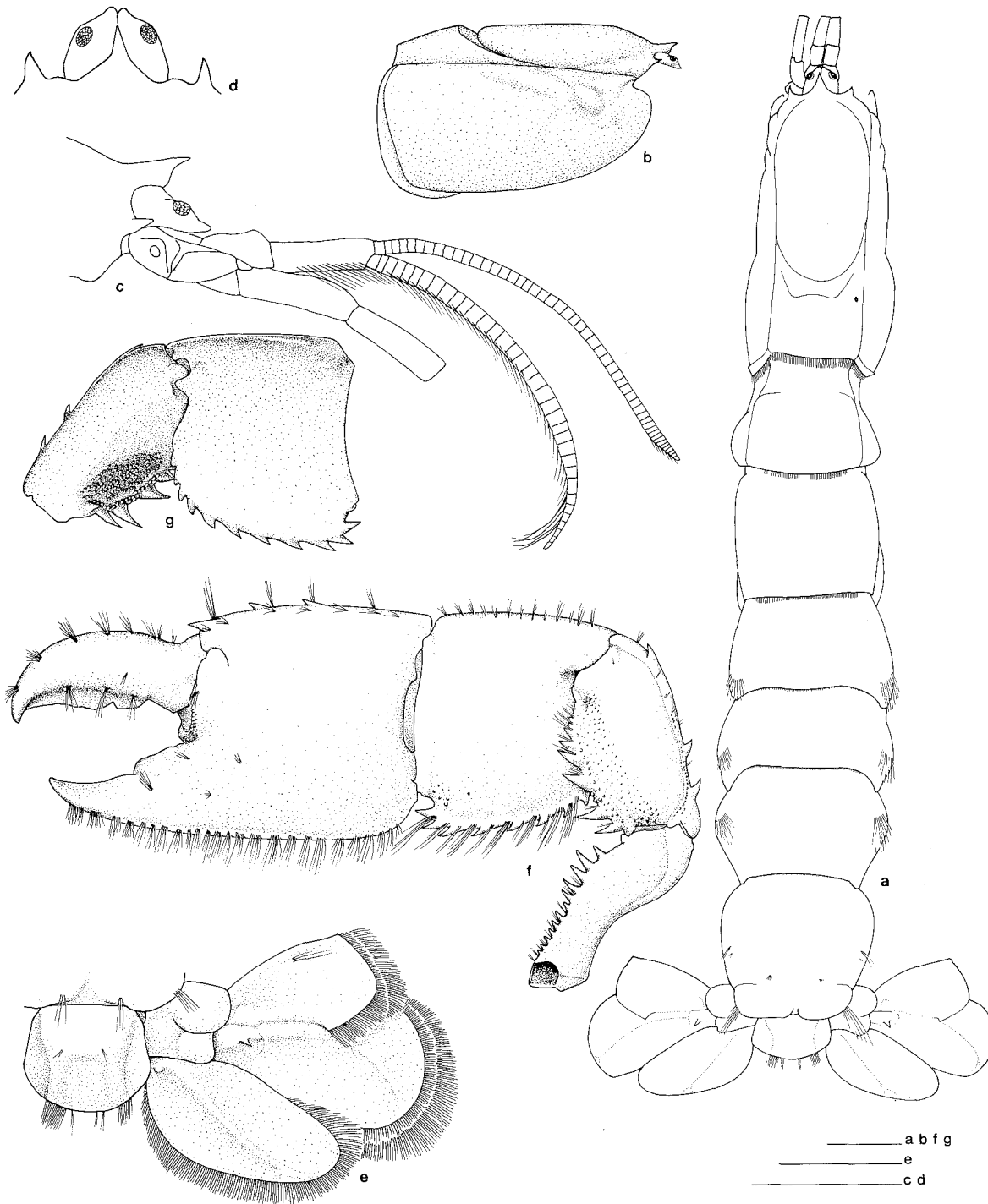


Fig.1. *Glypturus motupore* n.sp., holotype female: a, dorsal view (uropodal setae not shown); b, lateral view of cephalothorax; c, anterior section of cephalothorax, antennule and peduncle of antenna; d, anterior margin of cephalothorax and eyestalks; e, tailfan; f, larger right cheliped, mesial view; g, larger right cheliped merus and carpus, lateral view. (scale bars, 10 mm)

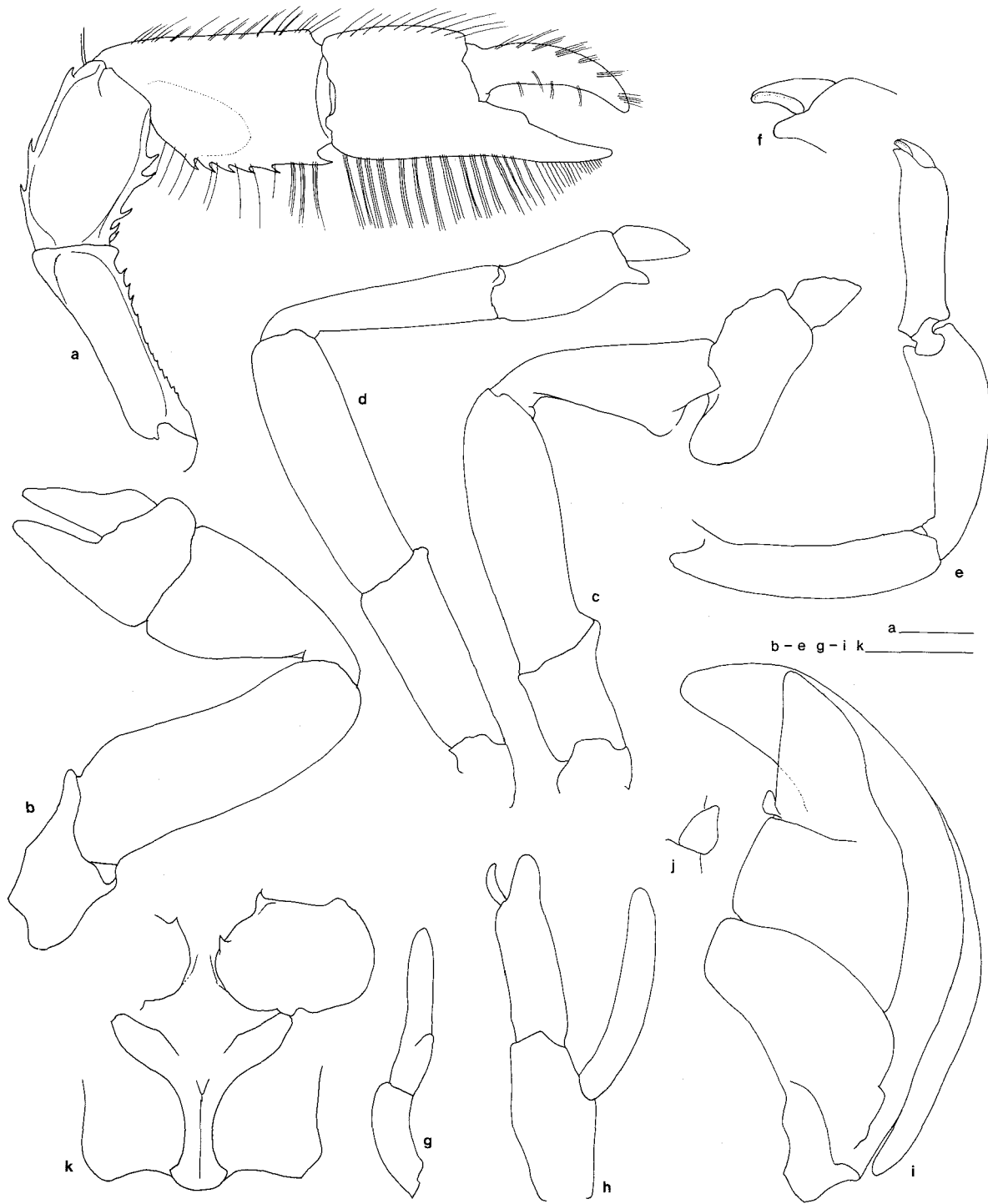


Fig. 2. *Glypturus motupore* n.sp., holotype female: a, smaller left cheliped, mesial view; b-e, left pereopods 2-5; f, left pereopod 5 dactylus; g-i, left pleopods 1-3; j, pleopod 3 appendix interna, posterior view; k, sternal plate and coxa 4. (scale bars, 10 mm; setae shown only on a)

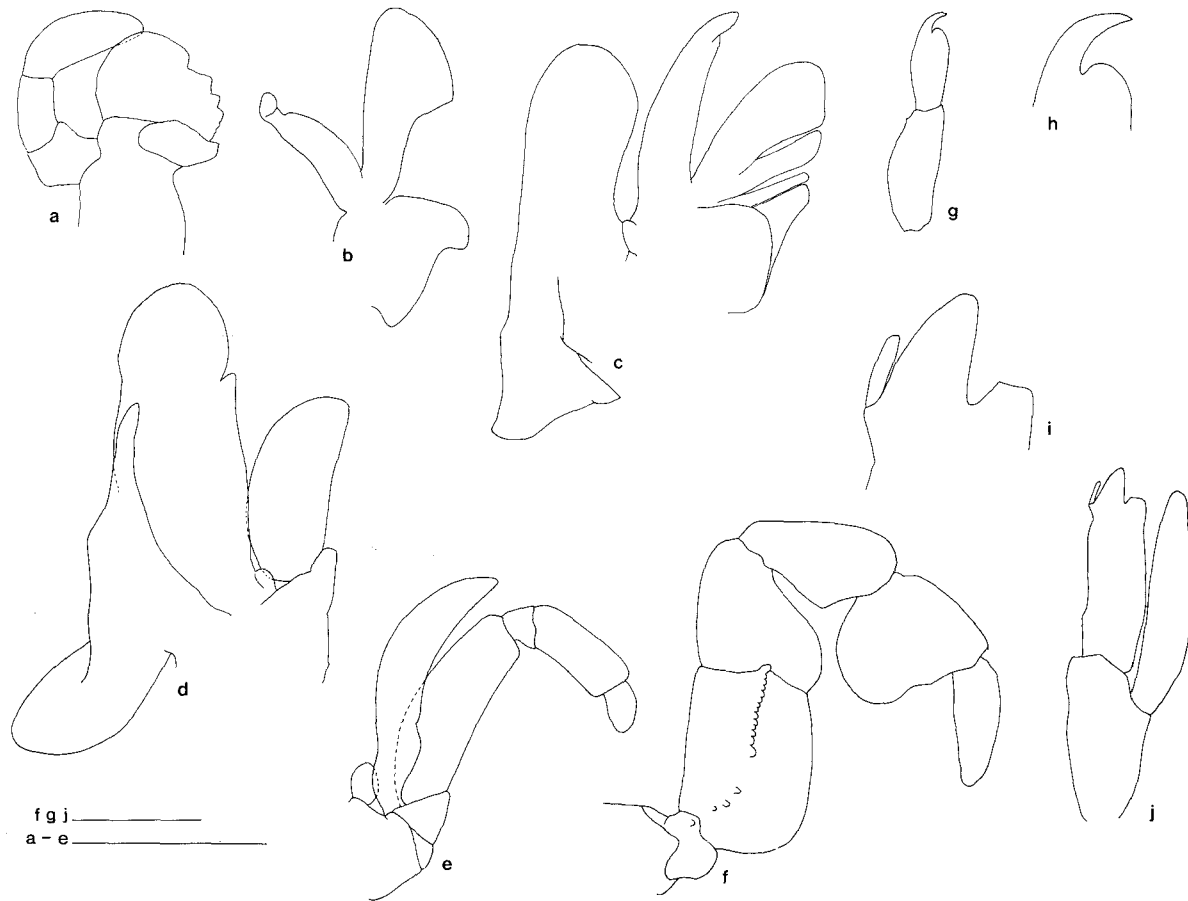


Fig.3. *Glypturus motupore* n.sp., holotype female: a, mandible; b, maxillule; c, maxilla; d-f, maxillipeds 1-3. Paratype male, NMV J13812: g,h, left pleopod 1 and detail of apex; i,j, left pleopod 2 and apex of endopod. (scale bars, 10 mm; setae not shown)

Taxonomic remarks. *Glypturus motupore* is closest to two other species from similar habitats in the Indo-West Pacific: *G. armatus* (Milne Edwards) described from Fiji and *G. laurae* (de Saint Laurent) from Aqaba, Red Sea; and to *G. acanthochirus* Stimpson from the Caribbean and south-eastern United States. A female of *G. armatus* (cl. 28 mm, MNHN Th. 656) from Mataiva, Tuamotu Archipelago; a female of *G. acanthochirus* (cl. 26 mm, USNM 122438) from Dry Tortugas, Florida; and a male of *G. laurae* (cl. 36 mm, NMV J11574) from the Gulf of Aqaba were used for comparison. Fig. 4 shows the important differences in the rostrum, eyestalks and tailfan. We do not agree with Manning (1987) who believed that *G. armatus* is a junior synonym of *G. acanthochirus*. The specimen of *G. acanthochirus* examined has the telson much more rounded posteriorly, and the uropodal endopod more acute. These observations are confirmed by Manning's (1987) and Biffar's (1971) figures.

Glypturus motupore shares with *G. armatus* and *G. acanthochirus* a similar elongate uropodal exopod

and the absence of granules on the propodus of the larger cheliped. It differs from *G. armatus* in the form of the uropodal exopod (slightly shorter in *G. armatus*), in the shape of the telson (of a more even width proximally in *G. armatus*), in the form of the rostrum (much narrower), in the eyestalks (broader, shorter and with larger cornea), and the greater number of ventral spines on the carpus (4-6 in *G. armatus*, 6-10 in *G. motupore*). *G. motupore* differs from *G. acanthochirus* in the shape of the telson (parallel-sided proximally in *G. acanthochirus*), uropodal endopod (wider proximally), and uropodal exopod (posterior section more square terminally).

Glypturus motupore shares with *G. laurae* a broadly-based upturned rostrum, tapering eyestalks with a small cornea but differs most importantly in the shape of the telson (narrower proximally in *G. motupore*), in the uropodal endopod (broader and more truncate in *G. laurae*), and the lobes of the uropodal exopod (anterior margin more curved and both slightly shorter in *G. laurae*). The larger chelipeds of the two species differ in the shape of the cutting edge of the dactylus (without a notch in *G.*

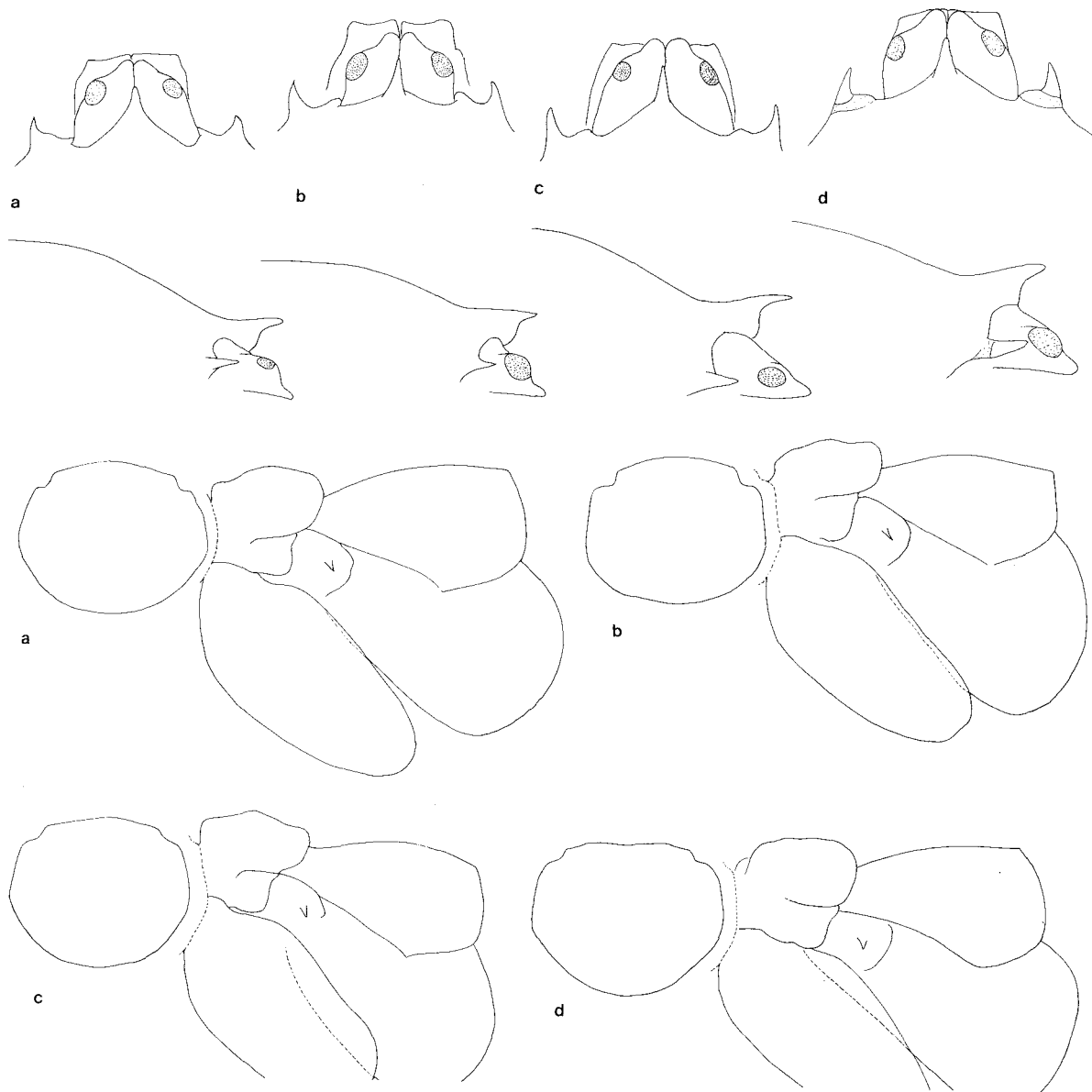


Fig.4. Rostrum, eyestalks and tailfan of four species of *Glypturus*. a, *G. motupore*, holotype, cl. 38 mm, Papua New Guinea, NMV J13811; b, *G. armatus*, cl. 28 mm, Taumotu, MNHN Th.656; c, *G. laurae*, cl. 35 mm, Aqaba, NMV J11574; d, *G. acanthochirus*, cl. 26 mm, Dry Tortugas, USNM 122438.

laurae), and in that lateral granules at the base of the fixed finger are absent in *G. motupore* (except in one individual) but are a constant prominent feature of *G. laurae*. The apex of pleopod 2 of the male is more rounded in *G. motupore* than in *G. laurae*.

A specimen from Mauritius described and figured by Kensley (1975) as *Callianassa armata* seems very similar to *G. motupore* especially in the shape of the telson and ornamentation of the large cheliped.

Distribution and Density

Glypturus motupore seems to be exceptionally catholic in its choice of habitats, being found both intertidally as well as subtidally in diverse conditions. Extensive populations, as evidenced by

their mound excavations, were found on intertidal sand flats on the northern (leeward) side of Motupore Island, Loloata Island and Manununa Island (also known as Lion Island). Dense populations were also found subtidally to 30 m depth on fine sandy bottoms throughout most of Bootless Inlet (Table 1.) On and around Motupore Island, mounds were also found in mostly subtidal (but occasionally intertidal habitats occupied by seagrasses (e.g., *Enhalus acoroides*, *Thalassia hemprichii*, *Cymodocea rotundata*, *Halophila ovalis* and *Halodule uninervis*).

Behaviour Patterns

SEDIMENT PROCESSING. This species processes large volumes of carbonate sediment in a manner

Table 1. Population density of *Glypturus motupore* as estimated by mound densities.

Habitat	Mean mound density (per m ²)	Mean maximum mound height (cm)	Range of maximum height (cm)	Number of 1 m ² quadrats
Subtidal (20 m) sand flats (Manununa Island)	2.36±1.40	19.13±8.89	5-46	39
Subtidal (c. 6 m) grass beds (north-east Manununa Island)	1.29±1.17	11.13±3.72	5-17	63
Intertidal sand flats (north-east Motupore Island)	1.55±1.20	n/a	n/a	60

apparently similar to other tropical thalassinidean shrimps studied to date (Suchanek, 1985). Sediment is drawn into the burrow system partially by gravity by opening one or more intake pits located at the sediment/water interface. Sand grains are then presumably gleaned to remove organic detritus. After removal of organics, fine-grained sediments are pumped (with the aid of pleopodal currents) to the surface. Subtidally, ejected sediments form volcano-shaped mounds ranging up to at least 46 cm in height. Sediment processing continues day and night, with 24-hour pumping rates of c. 200-400 ml of sediment per mound.

GRASS PULLING. In addition to drawing sediment into the burrow system, the species has been seen to pull seagrass blades into the burrow via the intake pits. It is not known whether it feeds directly on seagrass detritus as does *Upogebia affinis* (Pearse, 1945). Alternatively, it may store these blades in subsurface chambers and cultivate bacteria or fungi on which to feed at a later date (see Braithwaite & Talbot, 1972; Frey & Howard, 1975; Ott *et al.*, 1976; and Suchanek, 1985 for discussion).

Burrow Characteristics

PHYSICAL COMPLEXITY. The burrow system of this species is especially complex. Suchanek *et al.* (in prep.) will show a photograph of a burrow resin cast. From both resin casting and grass-feeding experiments, burrows were found to extend 1.5 m or more below the sediment surface. From resin casts and dye experiments for lateral connectedness, large burrows were found to extend at least 2 m laterally. Most burrows had typical sediment surface openings (the bottom opening of intake pits) ranging from 11-23 mm in diameter. Dimensions for typical internal diameters of subsurface burrows (from one large burrow resin cast) ranged from 23-26 mm, with many enlarged turnaround sites (up to 54 X 74 mm), and several "refuse" chambers up to 220 X 170 mm (see Suchanek *et al.* (in prep.) for details). Although never captured, thalassinidean shrimps from Enewetak Atoll show very similar mound excavations and burrow structures as evidenced by

resin casting techniques (Suchanek *et al.*, 1986).

INTAKE PITS. The burrow system typically has 1-3 (or more) funnel-shaped intake pits through which surface sediments (and/or seagrass blades) are drawn into the burrow.

MOUNDS. Typically at least 3-4 volcano-shaped mounds are associated with each burrow system. The burrow lining that passes out through the mounds is typically very thin and non-compacted.

BURROW LINING. The burrow lining is approximately 8-15 mm in thickness and is composed internally (the portion facing the inside of the burrow) of compacted fine-grained sediments and externally (the portion in communication with the surrounding sediments) of coarse-grained particles (coral fragments and shell debris). No grass was found incorporated into burrow lining.

SUBSURFACE REFUSE CHAMBERS. Subsurface burrow chambers are numerous and complex and accumulate coarse-grained sediments (similar to those found in burrow systems of Caribbean *Callianassa rathbunae* by Suchanek, 1983). No grass-filled chambers were found.

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