

CRABS OF THE FAMILY HEXAPODIDAE (DECAPODA:
BRACHYURA) FROM TAIWAN, WITH DESCRIPTION OF
A NEW GENUS AND NEW SPECIES

Jung-Fu Huang, Pan-Wen Hsueh, and Peter K. L. Ng

(J-FH) Department of Aquaculture, National Kaohsiung Institute of Marine Technology, Kaohsiung, Taiwan 811, R.O.C. (corresponding author e-mail: jfhuang@mail.nkimt.edu.tw);

(P-WH) Department of Zoology, National Chung Hsing University, Taichung, Taiwan 402, R.O.C. (e-mail: pwhsueh@dragon.nchu.edu.tw);

(PKLN) Department of Biological Science, National University of Singapore, Kent Ridge, Singapore 119260, Republic of Singapore (e-mail: peterng@nus.edu.sg)

A B S T R A C T

Hexapodid crabs are recorded from Taiwan for the first time. A new genus and new species, *Latohexapus granosus*, is described. Most similar to *Hexapus* and *Hexapinus*, *Latohexapus* can easily be distinguished by its proportionately much broader carapace with prominent granulated and well-defined regions, a very broad thoracic sternum which has a deep transverse groove between thoracic sternites 3 and 4, and a male first pleopod which extends well beyond the male telson. *Paeduma orientalis* (Rathbun, 1909) is also recorded from Taiwan on the basis of a female specimen.

In the most recent appraisal of the Taiwan brachyuran fauna, Ng *et al.* (2001) recorded 548 species from the island. One of the several families which they listed as yet to be recorded from the island was the Hexapodidae. Huang (1994) had reported “*Hexapus anfractus* (Rathbun, 1910)” from an unspecified site in the Taiwan Straits but in the absence of more precise locality data, Ng *et al.* (2001) decided not to include this record for the Taiwanese fauna, although they commented that the family is almost certainly present there. In the present paper, two species of hexapodids are recorded from Taiwan, one of which is a new species belonging to a new genus.

Specimens examined in this study are deposited in the Department of Aquaculture of the National Kaohsiung Institute of Marine Technology (NKIMT), Taiwan, R.O.C.; and Zoological Reference Collection (ZRC) of the Raffles Museum, National University of Singapore. The abbreviations G1 and G2 are used for the male first and second pleopods respectively. Measurements provided are of the carapace length and width respectively.

TAXONOMY

Family Hexapodidae Miers, 1886

Remarks.—Manning and Holthuis (1981) reviewed the state of taxonomy of the Hexa-

podidae and regarded it as a distinct family following Guinot (1978, 1979) (see also Guinot and Richer de Forges, 1997; Guinot and Bouchard, 1998; Ng, 1998). It had traditionally been classified as a subfamily of the Goneplacidae and its affinities may well be there (see Pereya Lago, 1988). Manning and Holthuis (1981) recognised 11 genera (four of which were new), and clarified the identity of the type genus *Hexapus* De Haan, 1835. They recognised 18 species, but Manning (1982) subsequently argued that *Hexapus estuarinus* Sankarankutty, 1975, is a junior synonym of *H. sexpes* (Fabricius, 1798). However, Manning and Holthuis (1981) missed two new species described by Serène and Soh (1976) from the Andaman Sea, viz. *Hexapus edwardsi* and *H. stephensi*.

Hexapus edwardsi has a combination of characters which makes its generic assignment very difficult. It was described from a very small immature male specimen 4.8 by 3.0 mm, and is diagnostic in having the lateral margins strongly convex from orbit to the posterolateral edge (described by Serène and Soh (1976: 25) as “hemicircular”), with a very broad front which is about half the carapace length (Serène and Soh, 1976: 25, 26). The condition of the male abdomen was not described, and the figure (Serène and Soh, 1976: Fig. 27B) is ambiguous in that it does not state how many

segments were actually drawn or which are fused. Their figure shows five somites (including the telson) and appears to show that segments 5 and 6 are free, with the second somite appearing to be composed of two (or more) fused segments. With juveniles, the condition of the male abdomen may change, with segments fusing as the animal matures. Also, just because a suture is visible between abdominal segments is no assurance that the segments are actually mobile; they may in fact be fused (see Ng and Chia, 1994). The exopod of the third maxilliped also appears to lack a flagellum (Serène and Soh, 1976: Fig. 25A). It is not possible at the moment to assign *H. edwardsi* to any of the known genera recognised by Manning and Holthuis (1981). Certainly, the type will need to be re-examined and adult male specimens obtained before more can be said. For the moment, we are referring this species to *Hexapus* (with doubt) purely for convenience.

Hexapus stephensi, on the other hand, seems to be closest to *Tritoplax* Manning and Holthuis, 1981, and is provisionally referred there. Serène and Soh (1976: 25, Fig. 25B) described and figured the abdomen, showing a somewhat trilobate telson and segments 3 to 5 fused, which are two of the diagnostic characters of *Tritoplax*. The structure of their G1s also agree in general form. Manning and Holthuis (1981: 180) noted that the condition of the exopod of the third maxilliped was not known (it is apparently absent in *H. stephensi*, cf. Serène and Soh, 1976: Fig. 25A). In the type species, *Hexapus stebbingi* Barnard, 1947, segment 6 is also longitudinally divided by a groove, but Manning and Holthuis (1981: 180) noted that this may not be present in all species (absent in *H. stephensi*). In describing *Tritoplax*, Manning and Holthuis (1981: 180) had actually noted that the specimens referred to "*H. sexpes*" by Stephensen (1946) did not belong to this species and is probably a species of *Tritoplax* as well. Serène and Soh (1976: 24), in describing *H. stephensi*, actually referred Stephensen's (1946) "*H. sexpes*" to this species. Also worth commenting is the doubtful identity of the two male specimens referred to "*H. sexpes*" from the Andaman Sea by Serène and Soh (1976: 24, Fig. 24), which also have a trilobate telson and a G1 like those of *Tritoplax* species, but apparently have all the abdominal segments freely articulating and the exopod of third maxilliped possesses a long flagellum (absent in *H. stephensi*). While it

is clear that Serène and Soh's (1976) specimen of "*H. sexpes*" is not this species (*sensu* Manning, 1982), in lieu of examining these specimens, nothing else can be said. The value of the trilobate male telson should be re-examined. While the male telson of *T. stebbingi* is prominently trilobate, that of *T. stephensi* is less obviously so. Even in *Latopilumnus granosus* (Fig. 3B), the telson can be described as somewhat trilobate.

With the description of a new genus and new species in this study, *Latohexapus granosus*, the family thus now contains 12 genera and 19 species (Table 1).

Paeduma Rathbun, 1897

Paeduma orientalis (Rathbun, 1909)

Figs. 1A, 2

Thaumastoplax orientalis Rathbun, 1909: 113; Rathbun, 1910: 346, pl. 2 fig. 1, text-fig. 33; Tesch, 1918: 239; Sakai, 1934: 316, text-fig. 24; Sakai, 1935: 193, text-fig. 100; Sakai, 1939: 579, pl. 102 fig. 3; Sakai, 1976: 555, text-fig. 300a, b; Takeda, 1982: 200, fig. 593; Dai *et al.*, 1986: 389, pl. 56(6), Fig. 205(3-4); Dai and Yang, 1991: 419, pl. 56(6), Fig. 205(3-4).

Paeduma orientalis—Manning and Holthuis, 1981: 174.

Material Examined.—1 female (10.8 by 8.3 mm) (NKIMT 84,11,21,01), port at Kwushan, Kaohsiung City.

Remarks.—The genus *Paeduma* is represented by only three species, viz. *P. orientalis*, *P. chuenensis*, and *P. cylindraceus* (see Manning and Holthuis, 1981). The former two species were transferred from the genus *Thaumastoplax* Miers, 1881, whereas the latter species was referred from *Amorphopus* (see Manning and Holthuis, 1981). *Paeduma orientalis* is a new record for Taiwan. This species was originally described from the Gulf of Thailand, but it has also been reported from Guangdong (China) and Kii Peninsula, Nagasaki (Japan) (Rathbun, 1909; Sakai, 1976; Dai *et al.*, 1986). The specimen in this study was collected by an inshore trawler near Kaohsiung Harbor without any other information. Sakai (1976) noted that this species is found commensal in tube-dwelling annelids on shallow mud bottoms.

Latohexapus, new genus

Type Species.—*Latohexapus granosus*, new species, by present designation.

Diagnosis.—Carapace much broader than long; regions distinct, granulated, separated by deep grooves; eyes movable; anterolateral margin arcuate; pterygostomial region granular;

Table 1. List of genera and species (original genus cited in square parenthesis).

| Family Hexapodidae Miers, 1886 |
|---|
| <i>Hexapinus</i> Manning and Holthuis, 1981 = <i>Hexapinus</i> Manning and Holthuis, 1981 (type species <i>Hexapus latipes</i> De Haan, 1835, by original designation; gender masculine) |
| <i>Hexapinus buchanani</i> (Monod, 1956) [<i>Hexapus</i>] |
| <i>Hexapinus granuliferus</i> (Campbell and Stephenson, 1970) [<i>Hexapus</i>] |
| <i>Hexapinus latipes</i> (De Haan, 1835) [<i>Hexapus</i>] |
| <i>Hexaplax</i> Doflein, 1904 = <i>Hexaplax</i> Doflein, 1904 (type species <i>Hexaplax megalops</i> Doflein, 1904, by monotypy; gender feminine) |
| <i>Hexaplax megalops</i> Doflein, 1904 |
| <i>Hexapus</i> De Haan, 1835 = <i>Hexapus</i> De Haan, 1835 (type species <i>Cancer sexpes</i> Fabricius, 1798, designation by International Commission of Zoological Nomenclature; gender masculine) |
| <i>Hexapus anfractus</i> (Rathbun, 1910) [<i>Lambdophallus</i>] |
| <i>Hexapus? edwardsi</i> Serène and Soh, 1976 |
| <i>Hexapus sexpes</i> (Fabricius, 1798) [<i>Cancer</i>] = <i>Alpheus sexpes</i> Weber, 1795 (nomen nudum) = <i>Hexapus estuarinus</i> Sankarankutty, 1975 |
| <i>Lambdophallus</i> Alcock, 1900 = <i>Lambdophallus</i> Alcock, 1900 (type species <i>Lambdophallus sexpes</i> Alcock, 1900, by monotypy; gender masculine) |
| <i>Lambdophallus sexpes</i> Alcock, 1900 |
| <i>Latohexapus</i> , new genus = <i>Latohexapus</i> , new genus (type species <i>Latohexapus granosus</i> , new species, by original designation; gender masculine) |
| <i>Latohexapus granosus</i> , new species |
| <i>Paeduma</i> Rathbun, 1897 = <i>Amorphopus</i> Bell, 1859 (type species <i>Amorphopus cylindraceus</i> Bell, 1859, by monotypy; gender masculine; preoccupied name) = <i>Paeduma</i> Rathbun, 1897 (replacement name for <i>Amorphopus</i> Bell, 1859; gender feminine) |
| <i>Paeduma cylindraceus</i> (Bell, 1859) [<i>Amorphopus</i>] |
| <i>Paeduma chuenensis</i> (Rathbun, 1909) [<i>Thaumastoplax</i>] |
| <i>Paeduma orientalis</i> (Rathbun, 1909) [<i>Thaumastoplax</i>] |
| <i>Parahexapus</i> Balss, 1922 = <i>Parahexapus</i> Balss, 1922 (type species <i>Parahexapus africanus</i> Balss, 1922, by monotypy; gender masculine) |
| <i>Parahexapus africanus</i> Balss, 1922 |
| <i>Pseudohexapus</i> Monod, 1956 = <i>Pseudohexapus</i> Monod, 1956 (type species <i>Hexapus (Pseudohexapus) platydactylus</i> Monod, 1956, by monotypy; gender masculine) |
| <i>Pseudohexapus platydactylus</i> Monod, 1956 |
| <i>Spiroplax</i> Manning and Holthuis, 1981 = <i>Spiroplax</i> Manning and Holthuis, 1981 (type species <i>Thaumastoplax spiralis</i> Barnard, 1950, by original designation; gender feminine) |
| <i>Spiroplax spiralis</i> (Barnard, 1950) [<i>Thaumastoplax</i>] |
| <i>Stevea</i> Manning and Holthuis, 1981 = <i>Stevea</i> Manning and Holthuis, 1981 (type species <i>Hexapus williamsi</i> Glassell, 1938, by original designation; gender feminine) |
| <i>Stevea williamsi</i> (Glassell, 1938) [<i>Hexapus</i>] |
| <i>Thaumastoplax</i> Miers, 1881 = <i>Thaumastoplax</i> Miers, 1881 (type species <i>Thaumastoplax anomalipes</i> Miers, 1881, by monotypy; gender feminine) |
| <i>Thaumastoplax anomalipes</i> Miers, 1881 |
| <i>Tritoplax</i> Manning and Holthuis, 1981 = <i>Tritoplax</i> Manning and Holthuis, 1981 (type species <i>Hexapus stebbingi</i> Barnard, 1947, by original designation; gender feminine) |
| <i>Tritoplax stebbingi</i> (Barnard, 1947) [<i>Hexapus</i>] |
| <i>Tritoplax stephensi</i> (Serène and Soh, 1976) [<i>Hexapus</i>] |

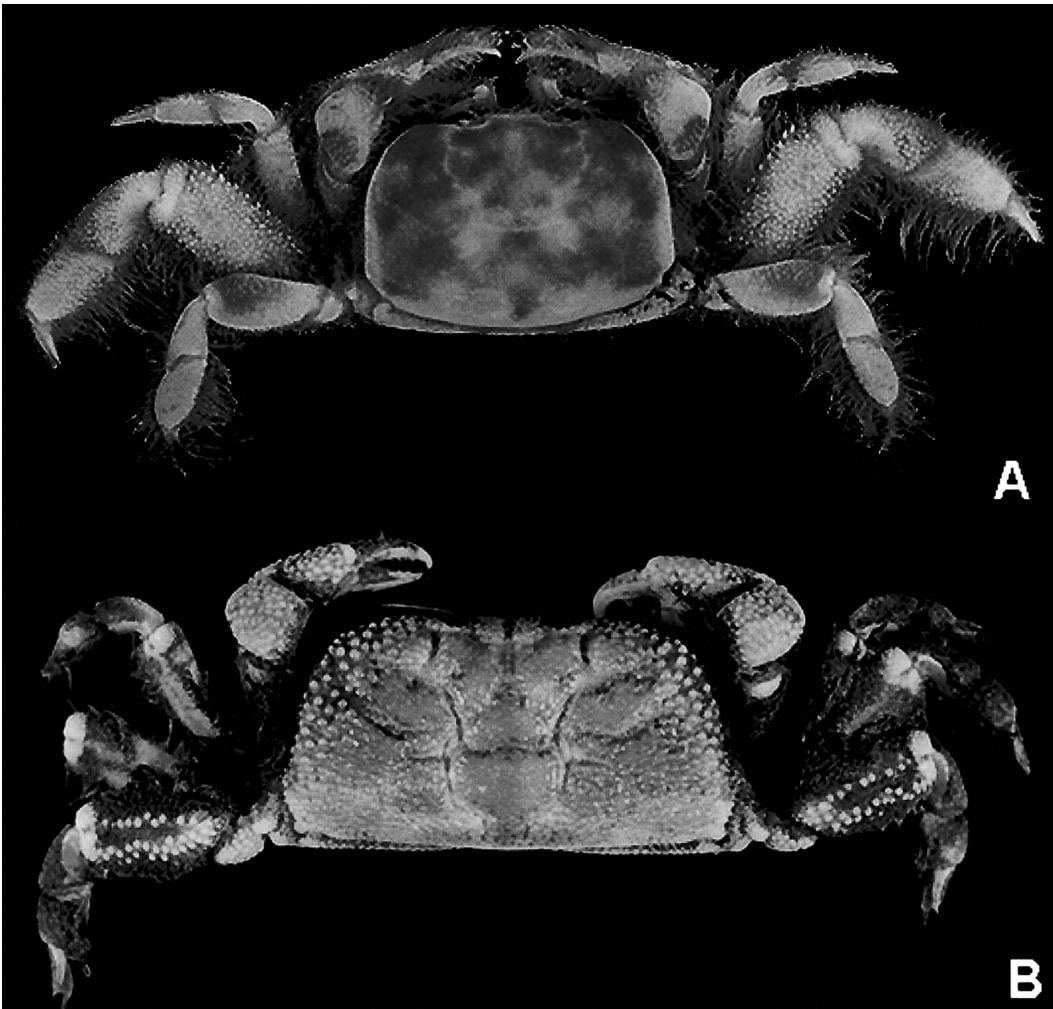


Fig. 1. A, *Paeduma orientalis*, female, 10.8 by 8.3 mm (NKIMT 84,11,21,01); B, *Latohexapus granosus*, new genus, new species, paratype male, 12.7 by 6.6 mm (NKIMT 88,2,25,01).

ischium of the third maxilliped expanded distally, longer than merus, exopod with well-developed flagellum; chelipeds asymmetrical, with prominent teeth at base of fingers; surface of ambulatory legs granular, dactylus upcurved; male thoracic sternum very broad; surface prominently granular; thoracic sternites 1 and 2 fused, separated from sternite 3 by distinct transverse ridge; deep transverse groove separating thoracic sternites 3 and 4, extending from edge of abdominal cavity to base of cheliped; male abdomen with segments 3–5 fused; segment 6 appearing hexagonal, with median part prominently expanded into triangular projection; telson subpentagonal; G1 very slender, directed anterolaterally, distal one-quarter not concealed under abdomen.

Etymology.—The name is derived from the Latin for broad, in combination with the name *Hexapus*. The gender is masculine.

Remarks.—*Latohexapus* is most similar in general appearance to *Hexapus* and *Hexapinus*, but differs markedly from members of both genera in having the carapace regions very well demarcated and separated by deep grooves; and a proportionately much broader thoracic sternum, with a prominent transverse groove between sternites 3 and 4 which extends from the end of the abdominal cavity to the anterior edge of the coxal base of the chelipeds. The anterior part of the very elongate G1, which extends well beyond the abdominal cavity, fits into the proximal part of this groove. In

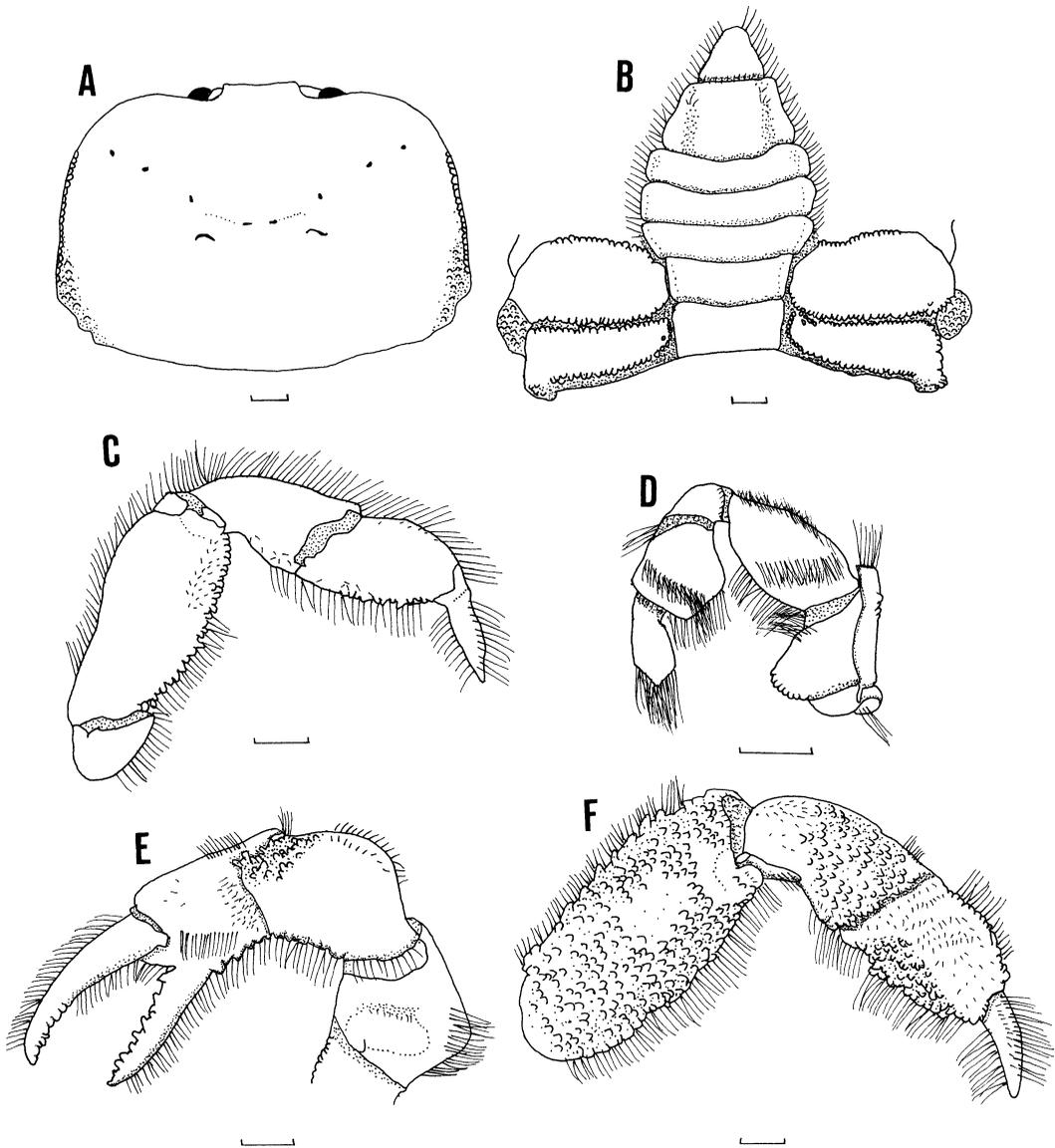


Fig. 2. *Paeduma orientalis*, female, 10.8 by 8.3 mm (NKIMT 84,11,21,01). A, dorsal view of carapace; B, abdomen; C, dorsal view of right third ambulatory leg; D, third maxilliped; E, right cheliped; F, right second ambulatory leg. Scales = 1.0 mm.

Hexapus and *Hexapinus* species, the dorsal surface of the carapace has the regions only poorly demarcated, if at all, even though it may be gently granulated; and the thoracic sternum is proportionately much narrower. We have examined specimens of *Hexapus anfractus* and *H. sexpes* from China and Japan (in the ZRC, Copenhagen Museum, Denmark; and Oceanological Institute, Qingdao, China), and in *Hexapus* the sternal G1 groove is broader and shorter and reaches just to the base of the third

maxilliped; the G1, although long, is still relatively shorter than that in *Latohexapus*. In *Hexapinus*, the sternal G1 groove is not at all apparent, being present only as an irregular gap between the telson and abdominal cavity, and the G1 is even shorter, with the tip just protruding or only a short distance from the telson. In fact, the width of the thoracic sternum and length of the sternal G1 groove is reminiscent of the condition in *Lambdophallus* Alcock, 1900. In *Lambdophallus*, however, the sternal

G1 groove is near the posterior margin of sternite 4 and does not extend to the sternal edges; and the carapace does not have clearly defined regions. As such, it seems best to refer the present new species to a new genus.

The male abdominal locking mechanism of *Latohexapus* is interesting, as it is of the coapted type, with a special structure on thoracic sternite 5 engaging a depression on abdominal segment 6 (Guinot and Bouchard, 1998: 634). The mechanism holds the male abdomen to the sterno-abdominal cavity very tightly, and actually closely resembles that described for retroplumids by Guinot and Bouchard (1998: 651). The "button" is well developed, directly anteriorly, and fits tightly into a depression on the inner vertical face of the lateral expansion of male abdominal segment 6. As the male abdominal segment 6 is hexagonal in shape and the median part projects sideways, the inner vertical face where the depression lies is relatively more developed, and as such, the depression engages the "button" more efficiently, resulting in a tighter lock. Guinot and Bouchard (1998: Fig. 17) record females of *Hexapus* also having an abdominal locking mechanism, but this is not known for *Latohexapus* as the type species is only known on the basis of males. Thoracic sternite 8 of *Latohexapus* is just visible externally as a small and narrow triangular plate, as described and figured for *Hexapus* by Guinot (1979: 115, Figs. 32, 33E).

Latohexapus granosus, new species

Figs. 1B, 3, 4

Material Examined.—Holotype, male (16.3 by 8.2 mm) (ZRC 2002.001), port at Bertzuliau, Yulin County, coll. P.-Y. Hsu, 23 March 2000. Paratype, male (12.7 by 6.6 mm) (NKIMT 88,2,25,01), port at Bertzuliau, Yulin County, coll. P.-Y. Hsu, 25 February 1999.

Diagnosis.—Carapace about 1.9 times broader than long; dorsal surface distinctly granulated, separated by deep grooves; surface of ambulatory legs granular, merus of third leg with 2 subparallel rows of granules and enclosed groove; male abdomen with segments 3–5 completely fused; segment 6 appearing hexagonal, granular, with median part prominently expanded into triangular projection; telson subpentagonal; G1 very slender, distal one-quarter part not concealed under abdomen.

Description.—Carapace subquadrate, about 1.9 times as broad as long (Figs. 1B, 3A). Regions very distinct, prominently granulated, separated

from each other by deep, smooth grooves; surface of branchial and intestinal regions densely covered with granules (Figs. 1B, 3A). Front deflexed, obscurely divided into 2 lobes, not projecting beyond edge of orbits (Fig. 4E). Orbits distinct, rounded; eyes small but cornea discernible, stalk slightly movable (Figs. 3A, 4E). Anterolateral margin arcuate, gently granular, not clearly demarcated from almost straight to gently convex posterolateral margin which is distinctly divergent backwards towards gently convex posterior carapace margin (Figs. 1B, 3A). Pterygostomial region covered with granules (Fig. 4E). Ischium of third maxilliped expanded distally, longer than merus, proximal portion granular; carpus gently granular; length of palp (carpus, propodus, dactylus) longer than length of merus and ischium; exopod relatively broad, basal part gently granular, flagellum well developed (Fig. 4G).

Chelipeds asymmetrical. Major cheliped with prominently gaping fingers when closed, with 2 stout teeth at base of inner margin (Fig. 4F); fingers distinctly shorter than manus; manus, carpus, and merus covered with numerous granules on outer surface; ventral margin of manus lined with setae; merus unarmed; carpus with inner distal angle not produced or sharp (Fig. 3A). Minor cheliped with fingers slightly gaping when closed, with prominent setae at base.

Three pairs of ambulatory legs, second leg longest, first shortest (Fig. 3A); surface of coxa prominently to gently granulated (Fig. 4B); outer surface of merus of third leg distinctly granulated, with 2 longitudinal, subparallel rows of uneven granules enclosing prominent longitudinal submedian groove (Figs. 3A, 4B); anterior and posterior margins of last four segments of ambulatory legs covered with dense setae, but not obscuring margins; dactylus gently upcurved, subspatuliform (Figs. 3A, 4B, C).

Male thoracic sternum very broad; surface prominently granular (Fig. 3B, C); sternites 1 and 2 fused, separated from other sternites by curved ridge (Fig. 3B); sternite 3 separated from sternite 4 only laterally, medially appearing fused (Fig. 3B); deep, wide transverse groove separating sternites 3 and 4, extending obliquely from edge of abdominal cavity a short distance to proximal margin of sternite 3 before abruptly bending to become subparallel to frontal margin, to base of cheliped (Figs. 3B, 4A). Sternite 8 just visible externally as small, narrow triangular plate next to abdomen.

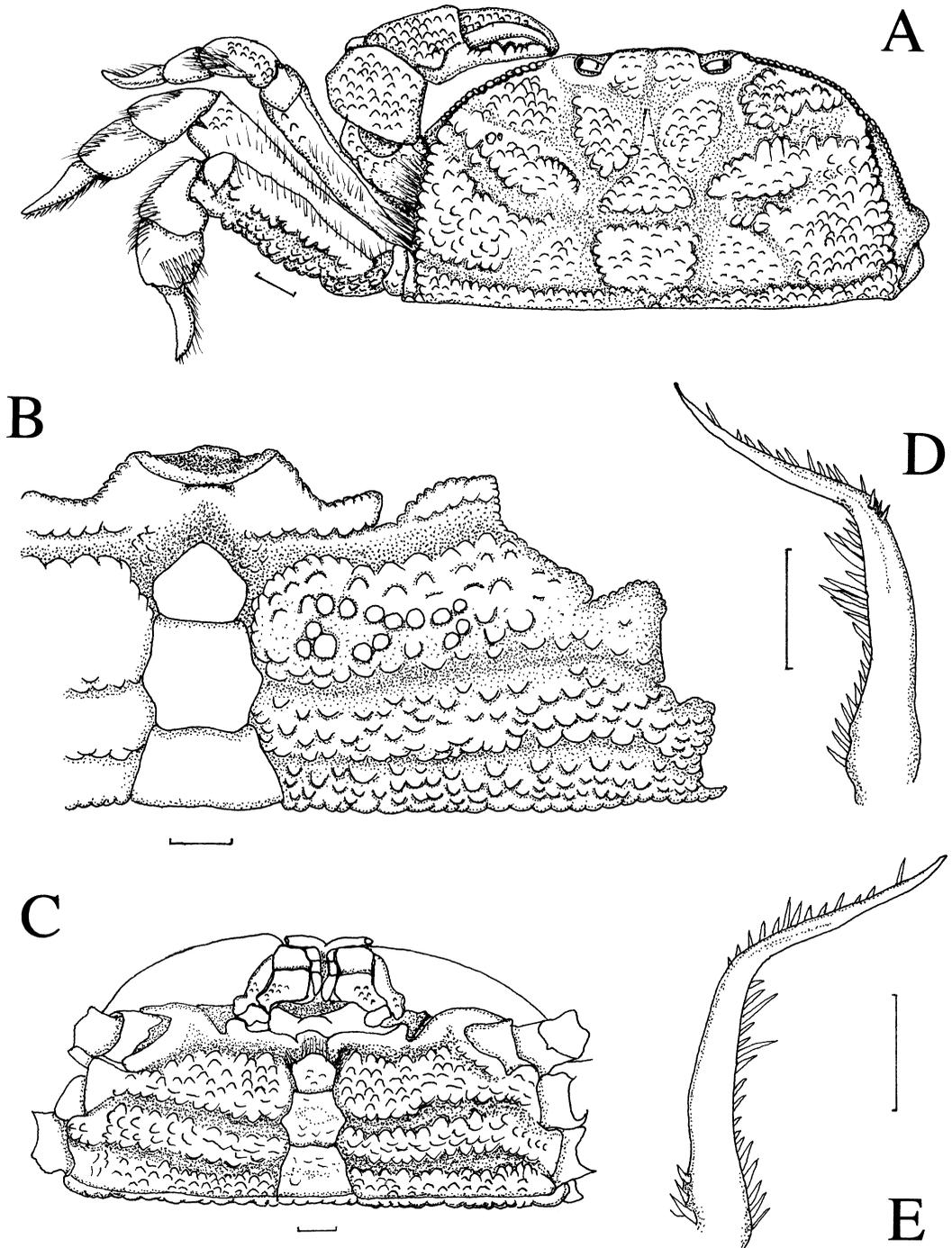


Fig. 3. *Latohexapus granosus*, new genus, new species. B, D, E, holotype male, 16.3 by 8.2 mm (ZRC); A, C, paratype male, 6.6 by 12.7 mm (NKIMT 88,2,25,01). A, overall view of carapace (right pereiopods not drawn); B, anterior thoracic sternum (right side and abdominal granulation not drawn); C, ventral surface of anterior part of carapace; D, E, left G1. Scales = 1.0 mm.

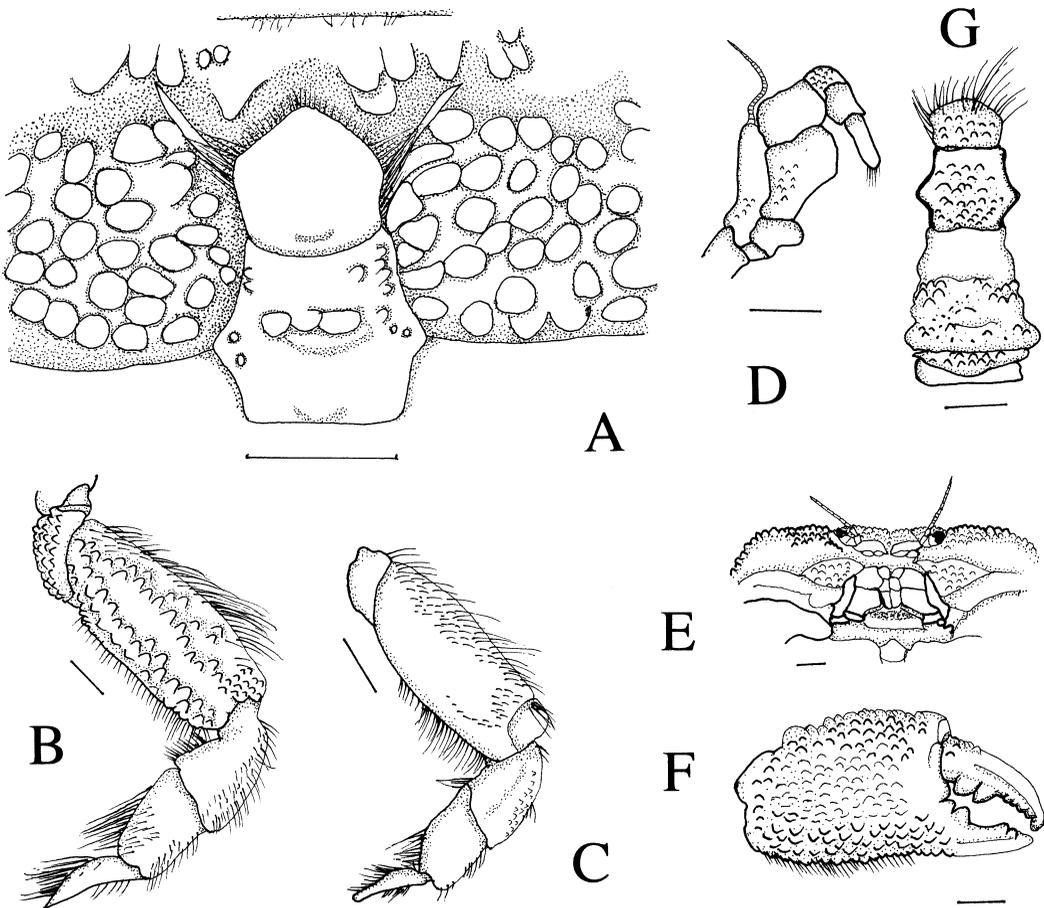


Fig. 4. *Latohexapus granosus*, new genus, new species. Paratype male, 6.6 by 12.7 mm (NKIMT 88,2,25,01). A, ventral surface of carapace showing abdomen and protruding distal parts of G1s; B, dorsal view of right third ambulatory leg; C, dorsal view of right second ambulatory leg; D, right third maxilliped; E, anterior view of carapace; F, right cheliped; G, abdomen. Scales = 1.0 mm.

Male abdomen fitting tightly into abdominal cavity except for edge of telson (Fig. 3B, C); segments 3–5 completely fused (Fig. 4G); sutures separating segments not distinct, almost undiscernible at parts, surfaces of segments 3 and 4 prominently granular; segment 2 granular, laterally shorter than segment 3; segment 1 same width as segment 2; segment 6 with surface granular, median part of lateral margin prominently expanded into triangular projection, segment appearing evenly hexagonal; telson granular, subpentagonal (Fig. 4G). Abdominal locking mechanism: thoracic sternal “button” in form of rounded, slightly anteriorly directed prominence on distal corner of thoracic sternite 5, at edge of sterno-abdominal cavity, adjacent to suture between sternites 4 and 5; side of distal half of abdominal segment

6 prominently expanded inwards (towards sterno-abdominal cavity), with inner surface distinctly hollowed, coapting tightly with sternal “button” when appressed.

G1 very slender, bent submedially, directed anterolaterally, with tip partially S-shaped, apex tapered, without long setae or spines (Fig. 3D, E); about a quarter part of G1 exposed, not concealed under abdomen, fitting into oblique part of groove between thoracic sternites 3 and 4 (Fig. 4A). G2 very short.

Etymology.—The species name is derived from the granular appearance of the carapace.

Remarks.—*Latohexapus granosus* can be separated from its closest relative, *Hexapus sexpes* (Fabricius, 1798) by having grooves separating

hepatic and branchial regions of the carapace, prominent granules distributed throughout these regions, asymmetrical chelipeds, and the outer surface of the ambulatory legs covered with two rows of subparallel granules.

The carapace of the fresh specimens had many parts colored a dull orange. This species was collected from relatively shallow waters (10–20 m) with sandy mud bottoms, which is often covered by oyster shells.

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