

## The sesarmid genus *Neosarmatium* (Decapoda: Brachyura): new distribution records and a new species from Sulawesi

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**Abstract.**—The sesarmid genus *Neosarmatium* Serène & Soh, 1970 comprises 12 Indo-West Pacific species, some of them ranging in distribution from South Africa to the South Pacific. New distribution records are provided for six species, viz. *N. fourmanoiri* Serène, 1973, *N. laeve* (A. Milne Edwards, 1869), *N. meinerti* (de Man, 1887), *N. rotundifrons* (A. Milne Edwards, 1869), *N. indicum* (A. Milne Edwards, 1868), and *N. trispinosum* Davie, 1994. *Chiromantes tangi* (Rathbun, 1931) is transferred to *Neosarmatium* based on its morphological similarity to *N. laeve*. A new species, *N. daviei* sp. nov. is described based on material from Sulawesi, and a revised key for the 14 currently recognized species of *Neosarmatium* is presented.

### Introduction

The brachyuran family Sesarmidae Dana, 1851 was recently considered a distinct family and rearranged by Schubart *et al.* (2000, 2002), with the genera *Chasmagnathus*, *Cyclograpsus*, *Helice s. l.*, *Helograpsus*, *Metaplox*, and *Paragrapsus* being transferred to the family Varunidae H. Milne Edwards, 1853, where they would form part of the recently resurrected subfamily Cyclograpsinae H. Milne Edwards, 1853 (see Karasawa and Kato, 2001). After these changes, the Sesarmidae currently consists of 27 genera, 12 of which were established by Serène & Soh in 1970 to subdivide the very large and

morphologically diverse group of Indo-West Pacific *Sesarma s. l.*. Initially, there was strong reluctance to adopt most of Serène & Soh's new genera (*e.g.* Hartnoll, 1975; Holthuis, 1977; Manning & Holthuis, 1981; Vannini & Valmori, 1981), since some of them appeared to be based on few and morphologically questionable characters and therefore did not seem to represent monophyletic taxa. Other taxonomists took Serène & Soh's (1970) work as a basis and started to revise some of the sesarmid genera (*e.g.* Davie, 1992, 1994; Ng *et al.*, 1994; Ng & Davie, 1995). This involves several re-definitions and revised arrangements, but will hopefully result in establishing natural groupings and reach an increased acceptance of these sesarmid genera.

The genus *Neosarmatium* Serène and Soh, 1970 (type species *Sesarma smithi* H. Milne Edwards, 1853, by original designation) was revised by Davie (1994) and on the basis of the present study, contains 14 recognised species, viz. *N. daviei* sp. nov., *N. fourmanoiri* Serène, 1973, *N. indicum* (A. Milne Edwards, 1868), *N. inerme* (de Man, 1887), *N. integrum* (A. Milne Edwards, 1873), *N. laeve* (A. Milne Edwards, 1869), *N. malabaricum* (Henderson, 1893), *N. meinerti* (de Man, 1887), *N. punctatum* (A. Milne Edwards, 1873), *N. rotundifrons* (A. Milne Edwards, 1869), *N. smithi* (H. Milne Edwards, 1853), *N. spinicarpus* Davie, 1994, *N. tangi* (Rathbun, 1931) and *N. trispinosum* Davie, 1994. *Sarmatium biroi* Nobili,

1905, is a junior subjective synonym of *N. integrum*; *Sesarma* (*Sesarma*) *aequifrons* Rathbun, 1914, and *Neosarmatium ambonensis* Serène and Moosa, 1971, are synonyms of *N. laeve*; and *Sarmatium fryatti* Tesch, 1917, is a synonym of *N. rotundifrons* (see Davie, 1994) (for complete synonymy citations, see Davie, 1994). *Chiromantes tangi* (Rathbun, 1931) is here transferred to *Neosarmatium* and included for an up to date key of the genus.

Ng *et al.* (1997) reported five species of *Neosarmatium* from Taiwan, *viz.* *N. fourmanoiri*, *N. indicum*, *N. meinerti*, *N. punctatum*, and *N. rotundifrons*, thereby adding new distribution records to the review of Davie (1994). In recent years, we have compiled several new records from other localities and these have been included in the present paper. In addition, we summarize findings on colour variation in *N. meinerti*. Finally, a new species, *N. daviei*, is described from Sulawesi, Indonesia. The species appears to be closest to *N. punctatum* and *N. indicum*, but differs markedly in several carapace, cheliped and gonopod characters.

Measurements provided are of the carapace widths and lengths respectively. The type specimen of the new species is deposited in the Museum Zoologicum Bogoriense (MZB), Cibinong, Java, Indonesia. In addition, we report on specimens that represent new records and which are catalogued in the Zoological Reference Collection (ZRC) of the Raffles Museum, Department of Biological Sciences, National University of Singapore; U.S. National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C.; and the Senckenberg Museum (SMF), Frankfurt a. M., Germany.

#### Taxonomy

##### *Neosarmatium fourmanoiri* Serène, 1973

Material examined.—1 male (40.9 by 34.6 mm) (SMF 25170), Fiji: Viti Levu, Suva, mangrove, coll. R. Diesel, 30 November 1997; 1 male (37.3 by 30.6 mm) (ZRC 2001.712), 1 female (33.3 by 27.3 mm) (ZRC 2001.713), 2 males (38.3 by 31.7, 22.3 by 18.3 mm), 1 female (33.4 by 27.2 mm) (ZRC 2001.711), Guam: Merizo, mangrove, coll. P. K. L. Ng, 4 August 2001; 3 males (32.8 by 26.9, 37.7 by 31.0, 42.2 by 34.3 mm), 2 females (30.0 by 24.3, 35.9 by 28.6 mm) (ZRC 2002.180), Guam: Apra Harbour, mangrove, coll. P. K. L. Ng & C. H. Wang, 18 April 2000.

Remarks.—*N. fourmanoiri* has been reported from New Caledonia, Australia, New Guinea to Sulawesi and Taiwan (Davie, 1994; Ng *et al.*, 1997). Its presence in Fiji and Guam further extends its range into the Pacific.

##### *Neosarmatium indicum* (A. Milne Edwards, 1868)

Material examined.—1 male (24.5 by 20.2 mm), 1 female (14.7 by 14.7 mm) (ZRC 2002.200), Philippines: Cebu: Matutinao, Kawasan Falls, stream bank, coll. H.-C. Liu, 4 December 2001.

Remarks.—*N. indicum* has been reported reliably from Sulawesi, Peninsular Malaysia, northern Borneo, Sumatra, Hong Kong and Taiwan (Davie, 1994; Ng *et al.*, 1997). Its presence in the Philippines is thus not surprising. The habitat of the present specimens agrees with what was known about the ecology of the species (see Ng *et al.*, 1997).

##### *Neosarmatium laeve* (A. Milne Edwards, 1869)

Material examined.—1 male (14.8 by 12.2 mm) (ZRC 2002.167), Philippines: Cebu: Matutinao, Kawasan Falls, coll. H.-C. Liu, 4 December 2001; 1 male (12.0 by 10.0 mm) (ZRC 2002.197), Philippines: Cebu: Matutinao, Kawasan Falls, stream bank, coll. H.-C. Liu, 25 November 2001.

Remarks.—This rarely reported species has previously been recorded from the Philippines (Busuanga Island) as a new species, *Sesarma* (*Sesarma*) *aequifrons* Rathbun, 1914, but Davie (1994) showed that it was a junior synonym of *Sesarma laeve*. *Neosarmatium ambonensis* Serène & Moosa, 1971, from Ambon (Indonesia) is another junior synonym. This is probably the smallest species of *Neosarmatium* known and has been reported from eastern Indonesia, Philippines, Solomon Islands and Seychelles (Davie, 1994: 52).

***Neosarmatium meinerti***

(de Man, 1887)

Material examined.—1 female (27.2 by 23.3 mm) (ZRC 2000.1898), Thailand: Phuket, Ao Tang Khen mangrove, coll. C. D. Schubart, 22 August 1999; 1 male (32.8 by 28.9 mm) (ZRC 2001.1083), same locality as above, coll. D. Yeo & Y. Cai, 22 February 2001; 1 male (31.7 by 25.6 mm) (ZRC 2001.715), 1 female (31.7 by 25.1 mm) (ZRC 2001.716), 1 female (36.2 by 29.9 mm) (ZRC 2001.714), Guam: Merizo, mangrove, coll. P. K. L. Ng, 28 July 2001; 4 males (25.9 by 20.5, 31.6 by 26.1, 42.4 by 35.2, 42.8 by 34.8 mm) (ZRC 2002.170), Guam: Apra Harbour, mangrove, coll. P. K. L. Ng & C. H. Wang, 18 April 2000.

Remarks.—Davie (1994: 57) has already noted that this species occurs in two different colour morphs: the 'orange form', with a red-orange chelar palm and the fingers fading to yellow distally, and the 'yellow form', with evenly dirty pale yellow chelae. Both colour morphs are known to occur sympatrically in Australia (Davie, 1994). All the specimens of this species we have examined from East Asia and Guam correspond to the yellow form (see Ng *et al.*, 1997: Fig. 3b, 4b). In the Indian Ocean, *N. meinerti* has chelae with two-thirds of the proximal part red, the yellow part being prominently smaller, as

is evident from the recent specimens from western Thailand, and photographs we examined of this species from Kenya. It is therefore possible, that this widely distributed species consists of more than one genetically distinct population. No other morphological characters, however, could be found to separate these forms.

***Neosarmatium rotundifrons***

(A. Milne Edwards, 1869)

Material examined.—1 female (32.9 by 25.7 mm) (ZRC 2002.196), Philippines: Cebu: Matutinao, Kawasan Falls, stream bank, coll. H.-C. Liu, 3 December 2001.

Remarks.—The taxonomy of this wide-ranging species has been discussed in detail by Davie (1994) and Ng *et al.* (1997). *Sarmatium fryatti* Tesch, 1917, is regarded as a junior synonym (Davie, 1994). This species has been recorded from Samoa, Nias, Java, Moluccas, Taiwan (see Davie, 1994; Ng *et al.*, 1997), and now Philippines.

***Neosarmatium trispinosum***

Davie, 1994

Material examined.—1 male (31.5 by 27.5 mm), 1 female (26.7 by 24.5 mm) (ZRC 2002.178), Guam: Apra Harbour, Sasa Bay, mangrove, coll. J. Starmer & R. B. Tibbatts, 29 May 1997.

Remarks.—The species was previously known from New Guinea, eastern Australia, New Caledonia, Vanuatu, and Fiji (Davie, 1994), and its presence in Guam extends its range northward into the Pacific.

***Neosarmatium tangi*** (Rathbun, 1931)

comb. nov.

*Sesarma* (*Holometopus*) *tangi* Rathbun 1931: 93, pl. 15; Serène 1968: 107; Dai *et al.* 1986: 489, Fig. 274(3-4), Pl. 68(8); Dai and Yang 1991: 535, Fig. 274(3-4), Pl. 68(8).

*Chiromantes tangi*—Ng and Liu 1999: 230, Figs. 1-4.

Material examined.—Holotype male (16.0 by 12.3 mm) (USNM 61875), China: Guantao, near Foochow, Fukien, coll. Tang through S. F. Light, July 1923.

Remarks.—*Chiromantes tangi* (Rathbun, 1931), although superficially resembling some members of the genus *Chiromantes*, has a much higher and trapezoidal carapace, the inner and outer surfaces of the chela are smooth, without ridges or granules, and the dactylar fingers have a distinct row of a few well developed granules on the dorsal margin. With these morphological characters, *C. tangi* is actually much closer to members of the genus *Neosarmatium* Serène & Soh, 1970 to which it is herewith transferred. In general body form, *C. tangi* is perhaps closest to *N. laeve* (A. Milne Edwards, 1869), although it can immediately be distinguished by its entire lateral carapace margin, more trapezoidal carapace and relatively higher major chela. The absence of a lateral carapace tooth in any case is not a major character, and in another species of *Neosarmatium*, *N. integrum* (A. Milne Edwards, 1873), this tooth is sometimes absent with the margin appearing entire (see Davie, 1994). In the form of the thoracic sternum, male abdomen and first gonopods, there are no major generic differences between *C. tangi* and the other described *Neosarmatium* species (see also Ng *et al.*, 1997).

***Neosarmatium daviei* sp. nov.**

(Figs. 1–3)

Material examined.—Holotype, male (24.5 by 19.1 mm) (MZB 1482, ex. ZRC 2000.1750), Bitung, Sulawesi, Indonesia, coll. C. D. Schubart, 31 January 2000.

Diagnosis.—Carapace transversely rectangular, distinctly vaulted, width to length ratio *ca.* 1.28; regions well defined, surface gently punctate. External orbital tooth distinct, truncate; anterolateral margin with 3 teeth, first 2 low but distinct,

last barely discernible. Outer surface of chelae punctate, not granular; dorsal margin of dactylus with 3 distinct tubercles, each with chitinous tip. Ambulatory carpi and propodi with dense mat of short setae on dorsal surfaces. Abdomen relatively elongate; telson shorter than abdominal segment 6; G1 almost straight, distal part straight.

Description.—Carapace transversely rectangular, distinctly vaulted, much broader than long, width to length ratio *ca.* 1.28; regions well defined; entire surface gently punctate, more prominently on anterior and lateral surfaces, some of punctae deeper, set with very short black setae; surface adjacent to antero- and posterolateral margins lined with strong, oblique striae; antero-median surface with deep Y-shaped groove; H-shaped gastro-cardiac groove deep; postfrontal cristae well developed, rounded, separated into 4 lobes by distinct short grooves. Front deflexed downwards, margin faintly bilobed from dorsal view, each lobe broadly truncate, separated by very broad, shallow median concavity. Supraorbital margin sinuous, entire. External orbital tooth truncate, well developed, outer margin twice as long as inner margin, straight along anterior half before curving sharply to join rest of margin, separated from first anterolateral tooth by deep V-shaped cleft; first anterolateral tooth broadly triangular, outer margin convex, separated from second tooth by shallow indentation; last tooth very low, broadly subtruncate, separated from posterolateral margin by gentle broad concavity. Posterolateral margin slightly concave, gently converging towards distinctly concave posterior carapace margin (Figs. 1A–B). Ischium of third maxilliped with shallow submedian sulcus; merus subovate, with distinct median ridge extending to anteroexternal angle of ischium; exopod slender, reaching to midpoint to outer margin of merus, flagellum long. Antennal and antennular

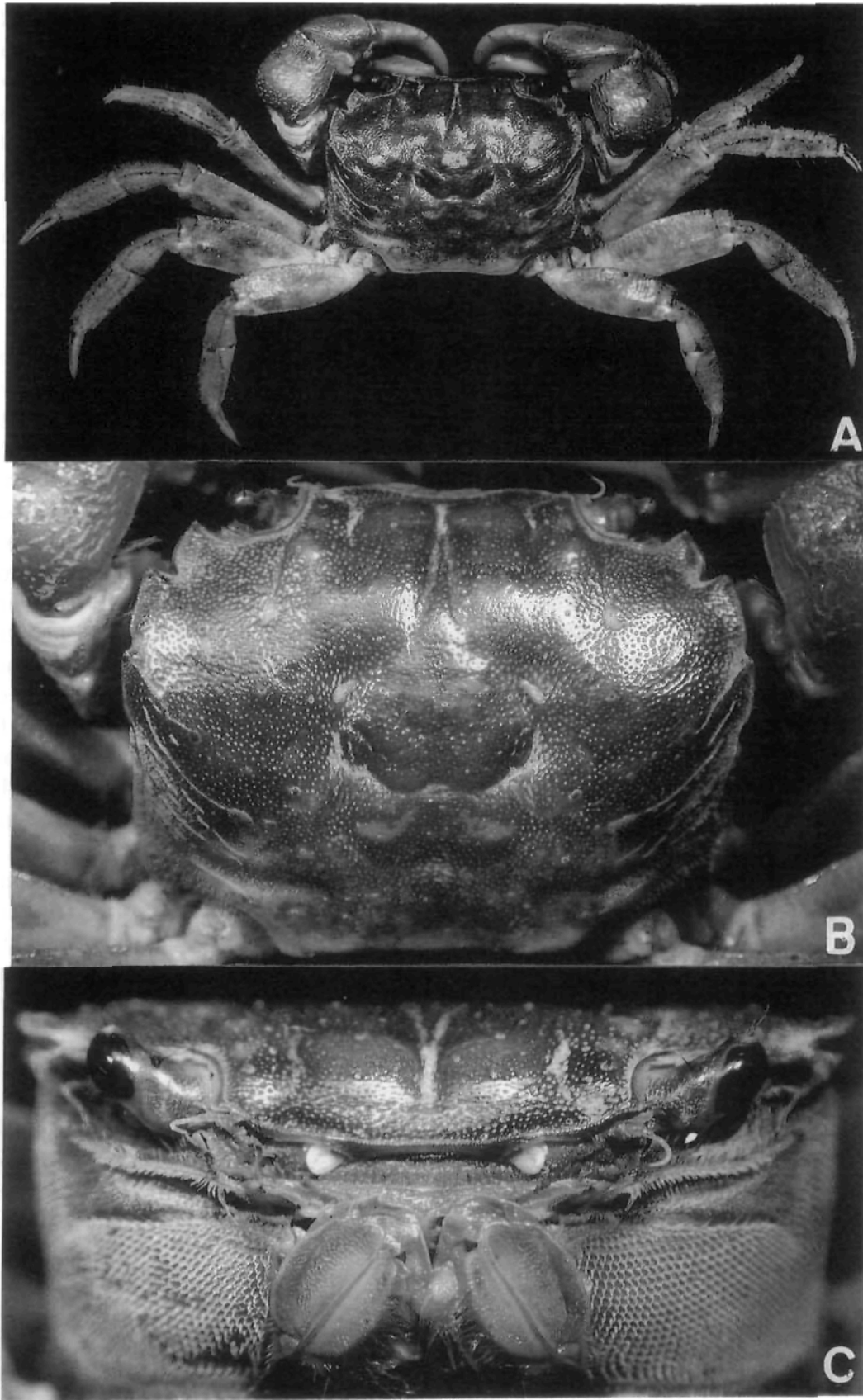


Fig. 1. *Neosarmatium daviei* sp. nov. Holotype male (24.5 by 19.1 mm) (MZB 1482). A, overall view; B, dorsal view of carapace; C, frontal view.

basal segments adjacent, not separated by septum. Eyes filling orbits, top of eye stalk with tuft of relatively long setae (Fig. 1C).

Chelipeds subequal; ventral surfaces of coxa, basis-ischium and merus with scattered very short black setae. Outer surface of larger chela prominently punctate and somewhat rugose; outer surface with low but discernible submedian ridge on proximal part, subdistal half of subdorsal surface with low ridge curving gently upwards towards distal edge at base of dactylus, lower part separated from rest of surface by shallow groove; inner surface gently granulose, with high ridge of large rounded granules curving towards and ending at base of pollex; dorsal margin of palm with several uneven ridges of low, rounded granules, continuous along proximal part and breaking up into several short ridges distally; ventral margin strongly convex. Fingers long, strongly curved, forming large gape when closed, tip prominently pectinated; dorsal margin of dactylus with 3 distinct tubercles on proximal half, each granule with chitinous tip, unarmed distally; cutting edge of dactylus with 2 prominent submedian teeth, 1 subdistal tooth and numerous denticles; cutting edge of pollex with 1 large submedian tooth and numerous denticles. Outer surface of carpus prominently rugose, outer margin with scattered very short, black setae; inner distal angle rounded, margins granulated. Inner margin of merus gently serrated (Figs 2A–C).

Ambulatory legs short, second and third pair longest; ventral surfaces of coxae, basis-ischium and meri with scattered very short black setae. Outer surfaces of meri, carpi, and propodi strongly rugose to gently rugose. Meri with dorsal margin gently serrated due to granules, subdistal angle present but not sharp or spiniform; dorso-distal surface with dense coat of very short dark setae which obscures surface. Carpi with 2 ridges on

outer surface, dorsal half with dense mat of very short dark setae. Propodi with dorsal two-thirds and distal surfaces covered with dense mat of very short dark setae; ventral margin with row of dense short black setae. Dactyli shorter than propodi, gently curved, outer surface with 2 rows of dense short black setae (Fig. 1A).

Sutures and margins of anterior thoracic sternites strongly setose; rest of surface with scattered very short black setae. Sternites 1 and 2 completely fused. Sternites 2 and 3 separated by suture. Sternites 3 and 4 fused, relatively broad, but separated by low ridge which is heavily setose. Abdominal cavity reaching beyond three-quarters length of sternite 4.

Abdomen and telson relatively elongate; telson shorter than segment 6, lateral margins gently convex, tip rounded. Segment 6 long, lateral margins distinctly convex. Segments 3–5 progressively more trapezoidal (Fig. 3A). First gonopods almost straight from ventral view, outer margin gently concave, inner margin gently convex or almost straight; distal part straight, pectinated (Figs. 3B–E).

Etymology.—The species is named after our colleague Peter Davie of the Queensland Museum, whose revisions of *Neosarmatium* and Indo-West Pacific Sesarmidae in general have contributed substantially to our knowledge of the corresponding fauna.

Remarks.—The general facies of *N. daviei* resembles *N. punctatum* and *N. indicum*, but it can immediately be distinguished from these two species by the dorsal margin of the chelipedal dactylus possessing three (vs. two) tubercles. In some specimens of *N. indicum* we have examined, one of the tubercles on one of the dactylus may be very low or even absent, but invariably, the other dactylus has the normal complement of two tubercles. Compared to *N. indicum*, *N. daviei* also has the first anterolateral tooth more prominently produced and deeply cut from the other teeth, the outer

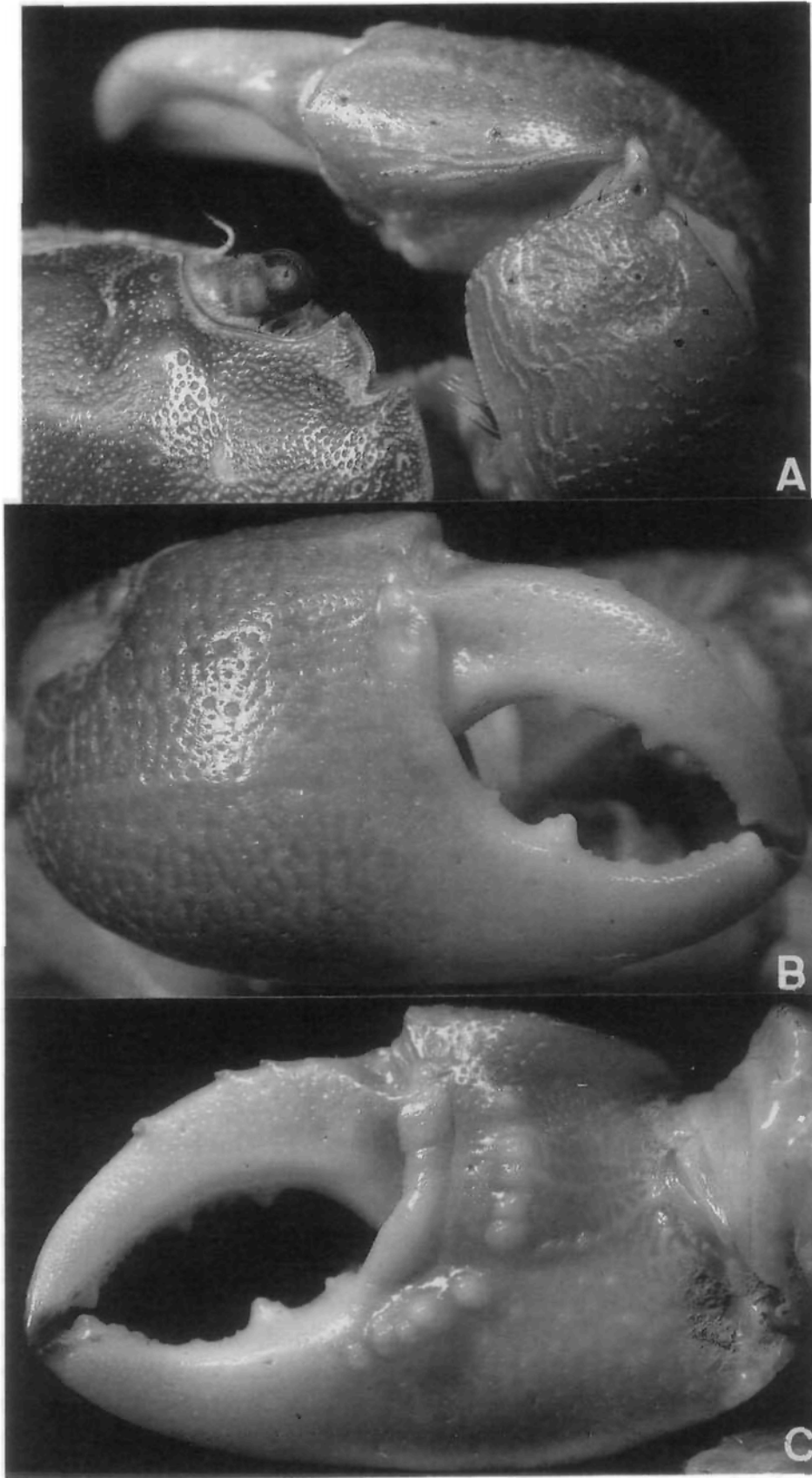


Fig. 2. *Neosarmatium daviei* sp. nov. Holotype male (24.5 by 19.1 mm) (MZB 1482). A, dorsal view of right cheliped; B, outer surface of right chela; C, inner surface of right chela.

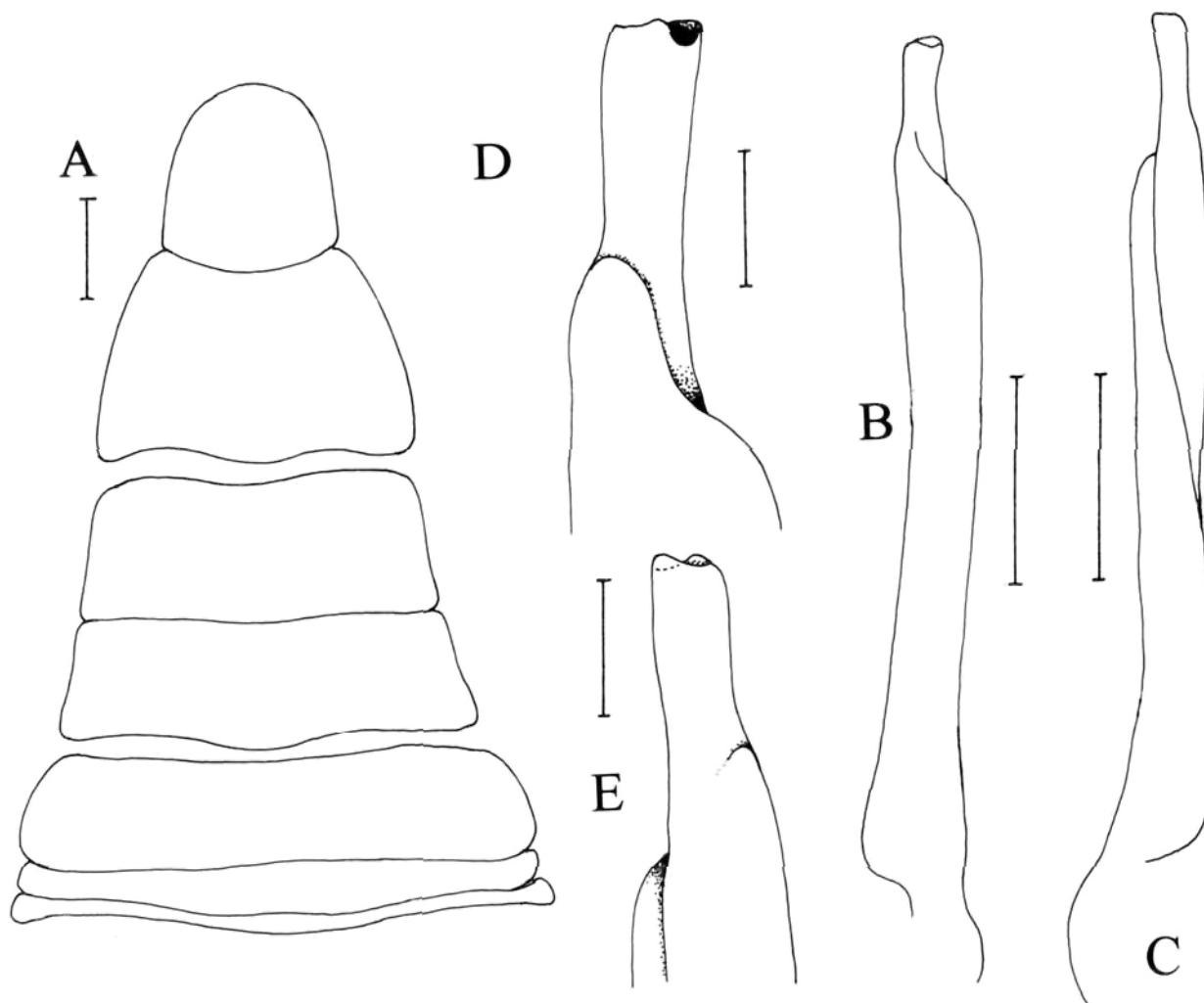


Fig. 3. *Neosarmatium daviei* sp. nov. Holotype male (24.5 by 19.1 mm) (MZB 1482). A, male abdomen; B, C, left first gonopods (B, dorsal view, C, ventral view, setae denuded); D, E, distal part of left first gonopods (D, dorsal view, E, ventral view, setae denuded). Scales: A, B, C = 2.0 mm; D, E = 0.5 mm.

surface of the chela more prominently punctate, a proportionately shorter male telson, and the distal part of the first gonopod is relatively shorter (see Davie, 1994; Ng *et al.*, 1997). In its broad carapace proportions, *N. daviei* is closer to *N. punctatum*, a poorly known species described from New Caledonia until Davie (1994) clarified its identity and Ng *et al.* (1997) reported this taxon from Taiwan and elaborated on its taxonomy. *Neosarmatium daviei*, however, can also immediately be distinguished by its better developed anterolateral teeth in which the second tooth is also discernible (vs.

absent) and the more punctate outer surface of the male chela (see Davie, 1994; Ng *et al.*, 1997).

Key to species of *Neosarmatium*

- 1 Anterolateral carapace margin not demarcated from posterolateral margin, lateral margin straight or almost so ..... 2
- Anterolateral carapace margin gently to prominently convex, always clearly demarcated from posterolateral margin ..... 3



- 2 Carapace rectangular, lateral carapace margins gently converging towards posterior; anterolateral carapace margin with one distinct anterolateral tooth ..... *N. laeve*
- Carapace trapezoidal, lateral carapace margins sharply converging towards posterior; anterolateral carapace margin entire ..... *N. tangi*
- 3 Anterolateral carapace margin entire or almost so; if tooth present, as low angular projection, separated from rest of margin by broad, deep notch; extraorbital breadth subequal to carapace length. .... *N. integrum*
- Anterolateral carapace margin with one or two teeth, second may be low ..... 4
- 4 Dorsal margin of dactylus of male chela with well developed, strong chitinous tubercles ..... 5
- Dorsal margin of dactylus of male chela without well developed, strong chitinous tubercles, or only with small chitinous spinules ..... 11
- 5 Dorsal margin of dactylus of male chela with 2 tubercles ..... 6
- Dorsal margin of dactylus of male chela with 3–5 tubercles ..... 8
- 6 Outer surface of adult male chela with a prominent protruding shelf at base of pollex below gape ..... *N. indicum*
- Outer surface of adult male chela normal, without any trace of protruding shelf at base of pollex below gape ..... 7
- 7 Carapace 1.15–1.25 times wider than long; distal tooth on upper surface of dactylus positioned medially; upper surface of male chela with distinct longitudinal ridge ..... *N. malabaricum*
- Carapace 1.25–1.35 times wider than long; distal tooth on upper surface of dactylus positioned about one-third distance from proximal edge; upper surface of male chela with low longitudinal ridge ..... *N. punctatum*
- 8 Dactylus of male chela with 3 distinct tubercles on dorsal margin ..... 9
- Dactylus of male chela with 4 or 5 distinct tubercles on dorsal margin ..... *N. rotundifrons*
- 9 Carapace distinctly vaulted and rectangular, *ca.* 1.28 times wider than long; dorsal surface of carapace almost smooth, setae present as very short tufts, hardly discernible ..... *N. daviei* sp. nov.
- Carapace squarish, less than 1.2 times wider than long; dorsal surface of carapace prominently setose, setae distinct ..... 10
- 10 Tubercles on dorsal margin of dactylus of male chela subtruncate, evenly spaced along proximal half ..... *N. smithi*
- Tubercles on dorsal margin of dactylus of male chela acute, positioned close together along proximal two-fifths ... *N. trispinosum*
- 11 Dorsal margin of dactylus of male chela smooth, unarmed ..... 12
- Dorsal margin of dactylus of male chela lined with sharp chitinous spinules ..... 13
- 12 Inner angle of chelipedal carpus unarmed; inner surface of palm with vertical row of granules behind gape forming ridge ..... *N. inerme*
- Inner angle of chelipedal carpus with acute granular projection; inner surface of palm with a patch of subventral granules behind gape but not extending vertically as ridge ... *N. spinicarpus*
- 13 Anterolateral carapace margin with gentle cleft marking second tooth

posterior to first epibranchial tooth; ventral margin of male chela evenly convex; dorsal margin of dactylus of male chela with evenly spaced spinules arranged in an approximate row, extending to about half to two-thirds length of dactylus; inner surface of male chela with strong transverse granular ridge ..... *N. meinerti*

- Anterolateral carapace margin entire posterior to first epibranchial tooth; ventral margin of male chela straight behind pollex; dorsal margin of dactylus of male chela with numerous scattered spinules extending almost to dactylar tip; inner surface of male chela with relatively low transverse granular ridge ..... *N. fourmanoiri*

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