PROCEEDINGS OF THE BIOLOGICAL SOCIETY OF WASHINGTON
113(1):48–53. 2000.

On the male of *Scutumara enodis* Ng & Nakasone, 1993 (Crustacea: Decapoda: Brachyura: Grapsidae)

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Abstract.—The male of the unusual grapsid, *Scutumara enodis* Ng & Nakasone, is described for the first time, and the species is compared with its congeners, *S. laniger* (Tesch) and *S. miyakei* (Nakamura & Takeda). The male characters of *S. enodis,* the type species of the genus, provide further evidence to support the establishment of *Scutumara* Ng & Nakasone, for these three species. The male abdomen and male first gonopods of *S. enodis* are, however, distinctly different from those of *S. laniger* and *S. miyakei.*

A male specimen of the coral reef grapsid crab, *Scutumara enodis* Ng & Nakasone, 1993, was recently collected by the second author in Ishigaki Island, Yaeyama Group, the Ryukyus. This species was originally described from only a single subadult female. This study describes the male specimen of this species, and gives information on the male abdomen and male first pleopod (G1). Our observations provide additional evidence in support of the establishment of the genus *Scutumara* Ng & Nakasone, 1993.

Measurements are given in mm in the order: carapace width by length. Specimens used here are deposited in the Zoological Reference Collection (ZRC), Department of Biological Sciences, National University of Singapore; Natural History Museum & Institute (CBM), Chiba, Japan; and National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM).

Family Grapsidae MacLeay, 1838
Subfamily Varuninae Alcock, 1900

Scutumara enodis Ng & Nakasone, 1993
(Figs. 1, 2)

Scutumara enodis Ng & Nakasone, 1993: 1, figs. 1–2.

Material examined.—Holotype, female (5.8 × 5.9 mm) (ZRC.1993.1), under littoral coral sand, Kunri-Hama Beach, Sesoko Island, Okinawa, Ryukyus, Japan, coll. P.K.L. Ng & Y. Nakasone, Apr 1992. Others—1 male (4.9 × 5.1 mm) (CBM-ZC 3604), beach near Fukido-gawa river-mouth, Ishigaki Island, Yaeyama group, Japan, coll. T. Komai, 24 Mar 1997.

Description of male.—Carapace slightly longer than broad; dorsal surface smooth, glabrous, without setae; regions not defined, strongly convex transversely and longitudinally, gastric region most convex (Fig. 1A). Frontal margin slightly convex, entire; lateral lobes not visible dorsally, slightly deflexed downwards; lateral edges apparently confluent with supraorbital margin from dorsal view, but not confluent from frontal view; inner edges of smooth, entire supraorbital margins strongly deflexed downwards, much more than outer edges of front, forming slight crimp at junction between frontal and supraorbital margins. Infraorbital margin not distinctly cristate, slightly raised; not granulated or striated. Anterolateral margin slightly arcuate, subcristate, very faintly trilobed, lobes separated by very broad, shallow clefts; external orbital lobe most distinct, very broad; second, third lobes more like weak undulations. Posterolateral margins not sharply demarcated from anterolateral margin, appearing almost straight, distinctly converging. Orbits small, eyes completely filling orbit, corneae well developed. Pterygostomial, suborbital, branchial regions smooth. Orbital hiatus completely filled by large basal anntennal segment; flagellum completely enclosed within orbit. Antennules folding obliquely, fossae very large; basal segment large, subtriangular in shape, broader than long. Posterior margin of epistome weakly sinuous, with 3 distinct ridges (1 median, 2 lateral); ridges separated from each other by narrow gap. Endostomial region with 3 well developed longitudinal palatal ridges (1 median, 2 lateral); lateral palatal ridges joining inner edges of lateral ridges of posterior epistomial margin.

Third maxilliped with foliaceous merus, broader than long; anterolateral angle strongly produced, auriculiform; distal margin distinctly bilobed, outer lobe larger, its base with small median cleft. Ischium longer than broad, sulcus not discernible. Small, distinct rhomboidal gape formed between inner margins of meri and ischia of third maxillipeds when closed. Exopod with obtuse, blunt inner subdistal angle, flagellum longer than width of merus (Fig. 1B).

Chelipeds small, subequal, outer, inner surfaces smooth, glabrous; merus, carpus without spines or teeth; inner distal angle of carpus with broad, low, rounded lobe. Outer surface of chela with low but distinct ventral ridge running from near proximal part of palm to almost tip of pollex (Fig. 1C); inner surface without setae at base of fingers. Fingers distinctly longer than palm; cutting edge of both fingers with numerous denticles, ending in recurved, sharp tips; no gape discernible when fingers closed.

Ambulatory legs with second pair longest (Fig. 1D). All segments smooth, without spines or setae. Dorsal and ventral margins of merus sub-cristate, dorsal margin with blunt subdistal tooth. Dactylus tapering to slender, acute tip (Fig. 1E).

Male abdomen triangular (Fig. 1F); lateral margins sparsely setose; first abdominal segment weakly arched, with very weak transverse ridge; second segment narrow, short; third segment broad, slightly swollen laterally but medially depressed with proximal margin broader than distal margin, lateral margins rounded; fourth segment broader but shorter than fifth segment; fifth segment with proximal and distal margins straight, lateral margins slightly concave; sixth segment quadrate, lateral margins trapezoidal, weakly convex, proximal margin slightly concave, convex medially. Telson sub-triangular, lateral margins weakly concave, distal margin rounded.

Lateral margins of first 2 thoracic sternites finely granulated; suture between sternites 2 and 3 slightly convex towards abdomen; lateral margins of sternites 3 and 4 sinuous, with deep, broad notch demarcating edge of suture; median groove between sternites 5 and 6 narrow; space between sternites 8 very narrow throughout length (Fig. 2A).

Penis located at base of eighth sternite (Fig. 2A). G1 relatively slender, weakly curving outwards, reaching to anterior margin of fifth sternite (Fig. 2B); terminal lobe elongate, apparently 2-articulated, dorsally curved; genital opening lateral to base of terminal lobe; subterminal lobe chitinous, rounded, narrower than terminal lobe, densely setose (Figs. C–E). G2 short, small.

Distribution.—Southern Japan (Okinawa south to Ishigaki Islands, Ryukyus).

Remarks.—Ng & Nakasone (1993) established *Scutumara* and transferred two species previously placed in *Pseudograpsus, S. laniger* (Tesch, 1918), and *S. miyakei* (Nakamura & Takeda, 1972), to this new genus. Although the type specimen of *S. enodis* was represented only by a subadult female, Ng & Nakasone (1993) argued that on the basis of differences on the carapace and ambulatory legs, *S. enodis, S. laniger* and *S. miyakei* are distinct enough to war-

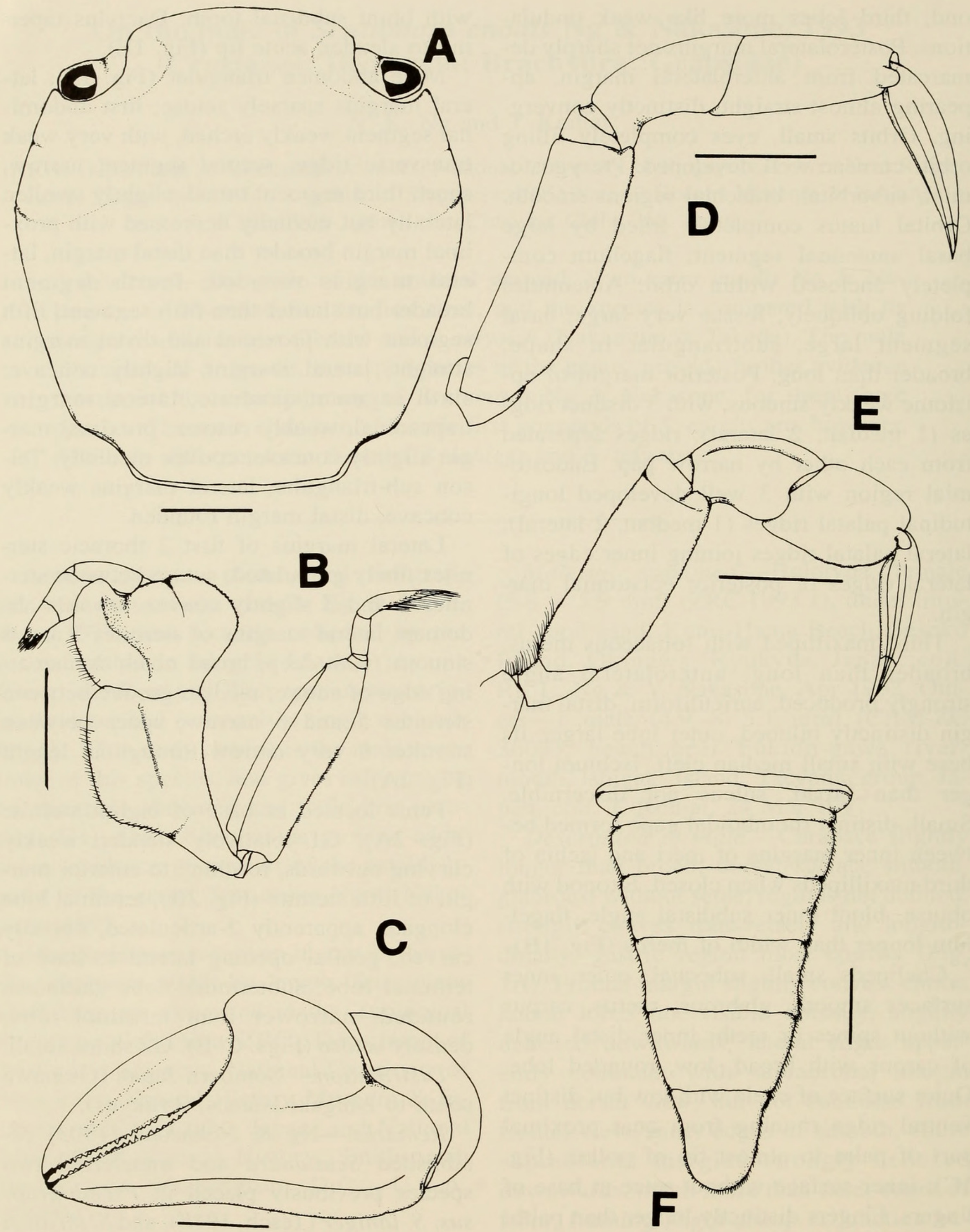

Fig. 1. *Scutumara enodis* Ng & Nakasone, 1993 (male, 4.9 by 5.1 mm, CBM-ZC 3604). A, carapace; B, third maxilliped; C, dorsal view of left chela; D, second ambulatory leg; E, fourth ambulatory leg; F, abdomen. Scales: A, C = 1.0 mm; B, E, F = 0.5 mm.

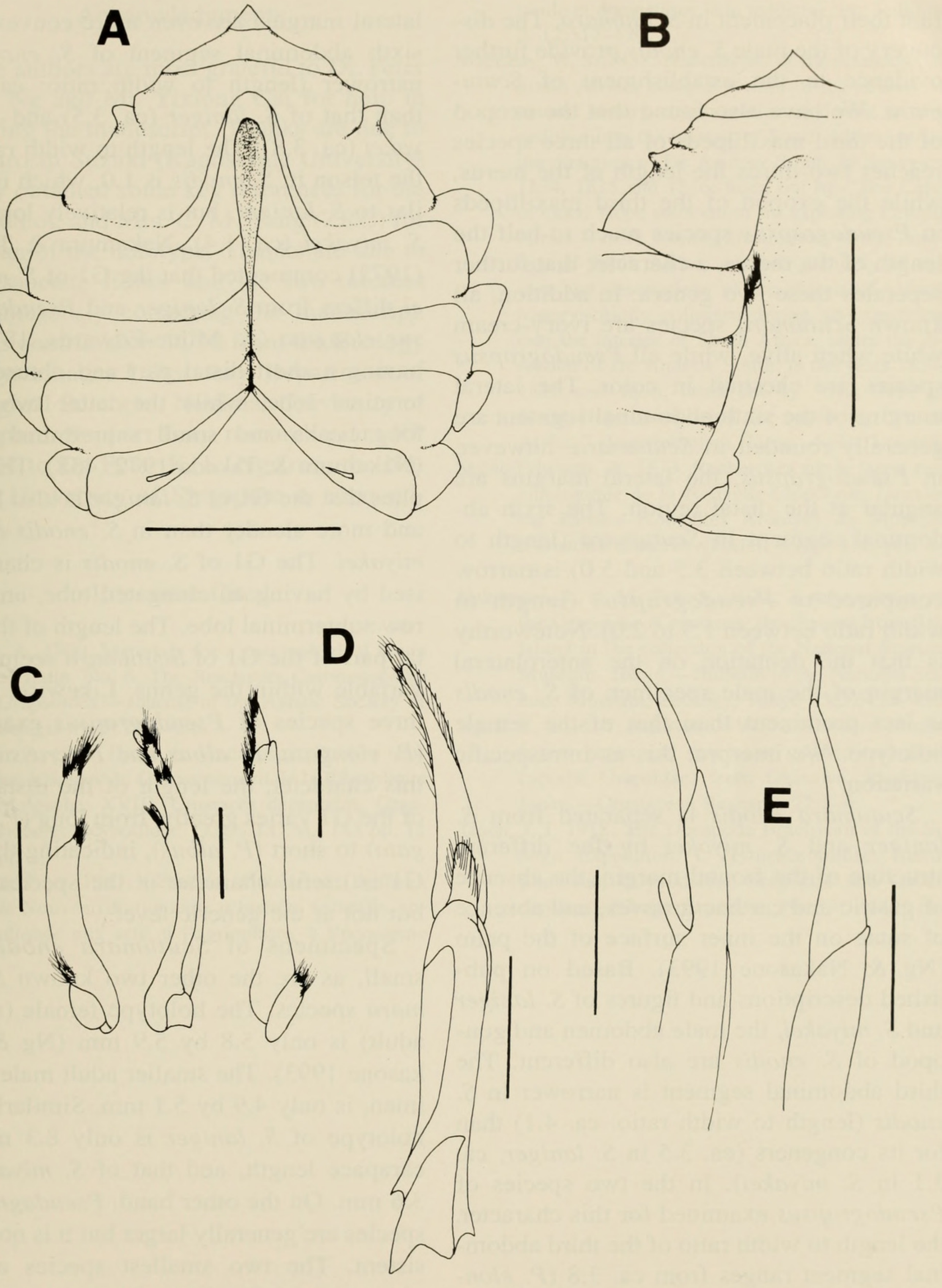

Fig. 2. *Scutumara enodis* Ng & Nakasone, 1993 (male, 4.9 by 5.1 mm, CMB-ZC 3604). A, sternum; B, natural position of male first gonopod; C, male first gonopod in different view; D, enlarge view of the G1; E, different views of the shaven enlarged distal region of G1. Scales: A, B = 1.0 mm, C = 0.5 mm, D, E = 0.25 mm.

rant their placement in *Scutumara.* The discovery of the male *S. enodis* provide further evidence to the establishment of *Scutumara.* We have also found that the exopod of the third maxillipeds of all three species reaches two-thirds the length of the merus, while the exopod of the third maxillipeds in *Pseudograpsus* species reach to half the length of the merus, a character that further seperates these two genera. In addition, all known *Scutumara* species are ivory-cream white when alive, while all *Pseudograpsus* species are chestnut in color. The lateral margins of the sixth abdominal segment are generally rounded in *Scutumara,* however, in *Pseudograpsus,* the lateral margins are angular at the distal region. The sixth abdominal segment in *Scutumara* (length to width ratio between 3.5 and 5.0) is narrow compared to *Pseudograpsus* (length to width ratio between 1.5 to 2.0). Noteworthy is that the dentation on the anterolateral margin of the male specimen of *S. enodis* is less prominent than that of the female holotype. We interpret this as intraspecific variation.

Scutumara enodis is separated from *S. laniger* and *S. miyakei* by the different structure of the frontal margin, the absence of gastric and cardiac grooves, and absence of setae on the inner surface of the palm (Ng & Nakasone 1993). Based on published descriptions and figures of *S. laniger* and *S. miyakei,* the male abdomen and gonopod of *S. enodis* are also different. The third abdominal segment is narrower in *S. enodis* (length to width ratio: ca. 4.1) than for its congeners (ca. 3.5 in *S. laniger,* ca. 3.1 in *S. miyakei*). In the two species of *Pseudograpsus* examined for this character, the length to width ratio of the third abdominal segment ranges from ca. 3.8 (*P. elongata*) to ca. 4.0 (*P. albus*), which is narrower than *S. laniger* and *S. miyakei,* but only slightly broader than *S. enodis.* In *S. enodis,* the lateral margins of the sixth abdominal segment are weakly rounded, while in *S. laniger,* the posterior part of the lateral margins are distinctly convex; in *S. miyakei* the lateral margins are even more convex. The sixth abdominal segment of *S. enodis* is narrower (length to width ratio: ca. 5.0) than that of *S. laniger* (ca. 3.5) and *S. miyakei* (ca. 3.8). The length to width ratio of the telson in *S. enodis* is 1.0, which is similar to *S. laniger,* but is relatively longer in *S. miyakei* (ca. 1.4). Nakamura & Takeda (1972) commented that the G1 of *S. miyakei* differs from *S. laniger* and *Pseudograpsus elongata* (A. Milne-Edwards, 1873) in having a short distal part and obtuse subterminal lobe, while the latter two have long beaks and small subterminal lobes (Nakamura & Takeda 1972: 438). This implies that the G1 of *S. laniger* is also longer and more slender than in *S. enodis* and *S. miyakei.* The G1 of *S. enodis* is characterised by having an elongated tube, and narrow subterminal lobe. The length of the distal part of the G1 of *Scutumara* seem to be variable within the genus. Likewise, in the three species of *Pseudograpsus* examined (*P. elongata, P. albus* and *P. crassus*) for this character, the length of the distal part of the G1 varies greatly, from long (*P. elongata*) to short (*P. albus*), indicating that the G1 is useful character at the species level but not at the generic level.

Specimens of *Scutumara enodis* are small, as are the other two known *Scutumara* species. The holotype female (a subadult) is only 5.8 by 5.9 mm (Ng & Nakasone 1993). The smaller adult male specimen, is only 4.9 by 5.1 mm. Similarly, the holotype of *S. laniger* is only 8.3 mm in carapace length, and that of *S. miyakei* is 3.6 mm. On the other hand, *Pseudograpsus* species are generally larger but it is not consistent. The two smallest species are *P. elongata* and *P. albus*: *P. elongata* ranges from 8.8 by 7.8 mm (USNM 33411) to 9.7 by 8.6 mm (Crosnier 1965); and *P. albus* ranges from 8.2 by 7.3 mm (USNM 81732) to 9.5 by 8.6 mm (Crosnier 1965). *P. crassus* (42.6 by 36.3 mm) is a very large species (USNM 93152).

Acknowledgments

The authors are most grateful to Dr. Peter K. L. Ng and Mr. Yixiong Cai for help in checking the manuscript. Thanks are due to Dr. Hiroshi Suzuki (Kagoshima University) kindly obtained some key references for the first author, and Mrs. C. M. Yang (ZRC) for the loan of the holotype. Thanks are due to the Associate Editor and the two referees for laboriously correcting the manuscript. This is contribution 34/98 from the Ecology and Systematics Laboratory, Department of Biological Sciences, National University of Singapore. Support from research grant RP 950324 to Dr. Peter K. L. Ng from the National University of Singapore is acknowledged.

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