

On Two New Records of Varunid Crabs (Crustacea: Brachyura: Varunidae) from Southern Taiwan

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(Received November 15, 2005; Accepted December 20, 2005)

Abstract. Two new records of the Varunidae, *Ptychognathus altimanus* (Rathbun, 1914) and *Utica gracilipes* White, 1847, are reported from southern Taiwan. The present study lists the diagnostic morphological features of *P. altimanus* and *U. gracilipes*, and provides a detailed comparison of the juveniles between *P. altimanus* and the superficially similar *Varuna litterata*.

Key words: Brachyura, new records, *Ptychognathus altimanus*, Taiwan, *Utica gracilipes*, Varunidae.

INTRODUCTION

The brachyuran fauna of Taiwan has been revealed to be composed of more than 600 species, of which 27 species belong to the Varunidae (e.g., Ng *et al.*, 2001, 2004; Ng and Liu, 2003; Schubart *et al.*, 2003; Ho *et al.*, 2004; Chen *et al.*, 2005; Shy, 2005). Recently we obtained two new record species of varunid crabs, *Ptychognathus altimanus* (Rathbun, 1914) and *Utica gracilipes* White, 1847, from southern Taiwan. *P. altimanus* is sometimes collected with small individuals of *Varuna litterata* (Fabricius, 1798) near the upper limit of brackish waters, but the juveniles of these species are too similar to distinguish from each other. In the present study, we list the diagnostic morphological features of *P. altimanus* and *U. gracilipes*, and provide a detailed comparison of the juveniles between *P. altimanus* and superficially similar *V. litterata*.

MATERIALS AND METHODS

Specimens are deposited in the National Museum of Natural Science, Taichung, Taiwan (NMNS) and the Ryukyu University Museum, Fujukan, Okinawa, Japan (RUMF). The

abbreviations CL, CW, and G1 are used for carapace length, carapace width, and male first gonopod, respectively. Specimens were measured using a stereomicroscope (Nikon SMZ-10) provided with an eyepiece micrometer or using a digital slide-caliper (Mitsutoyo CD-20PM) to the nearest 0.1 mm.

For the comparison between *P. altimanus* and *V. litterata*, the following characters were used: a) the exopod width to ischium width ratio of the third maxilliped (measured from the middle of the inner margin of the ischium outwards horizontally; Fig. 1B); b) the growth of the male's G1 (represented by the relative position of the distal end against the thoracic sternites); and c) the growth of the female's abdominal segments (the maximum widths of the third and fifth abdominal segments).

TAXONOMY

Family Varunidae

Genus *Ptychognathus* Stimpson, 1858

Ptychognathus altimanus (Rathbun, 1914)

(Figs. 1A-F, 3A-D)

Varuna altimana Rathbun, 1914: 70.

Ptychognathus altimanus- Tesch, 1918: 88, Pl. 4,

Fig. 5; Serène and Moosa, 1971: 7, Pl. 3, Figs.

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A, B; Minei, 1972: 49, Figs. 1, 2; Nakasone, 1977: 62; Miyake, 1983: 237; Shokita, 1989: Table 1, Fig. 2; Shokita, 1990: Table 3; Nomoto *et al.*, 1999: 5, Pl. 1, Fig. 1; Kishino and Wada, 2001: 59; Marumura and Kosaka, 2003: 64; Kishino *et al.*, 2001: 127; Naruse, 2005: 223.

Material examined: Two males, CL 9.0, 11.6 mm, NMNS5008-001, Hengchun, Pingtung County (Co.), coll. H.-L. Hsu, H.-T. Shih, and T. Naruse, 28 June 2005; 2 males, CL 12.1, 15.6 mm, NMNS5008-002, Hengchun, Pingtung Co., coll. H.-L. Hsu, H.-T. Shih, and T. Naruse, 29 June 2005.

Compared material. *Ptychognathus altimanus* from the Ryukyu Is.: 3 males, CL 4.2~16.3 mm, 1 juvenile, CL 3.9 mm, RUMF-ZC-243, Oura R., Okinawa I., coll. T. Naruse, 8 Dec. 2004; 2 males, CL 10.6, 19.5 mm, 1 female, CL 14.7 mm, 1 juvenile, CL 4.7 mm, RUMF-ZC-244, Fukido R., Ishigaki I., coll. T. Naruse, 20 Dec. 2004; 3 females, CL 7.2~13.4 mm, 1 juvenile, CL 3.9 mm, RUMF-ZC-245, Tsuru R., Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004; 2 males, CL 9.8, 15.0 mm, 1 female, CL 7.5 mm, RUMF-ZC-246, Fukido R., Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004; 1 male, CL 9.3 mm, 1 ovigerous female, CL 13.5 mm, RUMF-ZC-247, Tsuru R., Ishigaki I., coll. T. Naruse, 10 Jan. 2005.

Varuna litterata from southern Taiwan: 1 male, CL 7.4 mm, NMNS5008-003, Linbian, Pingtung Co., coll. H.-L. Hsu, H.-T. Shih, and T. Naruse, 29 June 2005.

Varuna litterata from the Ryukyu I.: 1 male, CL 11.8 mm, RUMF-ZC-248, Fukari R., Iriomote I., coll. T. Naruse, 21 Mar. 2001; 1 male, CL 37.7 mm, RUMF-ZC-249, Geruma I., coll. T. Naruse, 2 Oct. 2001; 1 male, CL 7.6 mm, 4 females, CL 7.4~19.2 mm, 10 juveniles, CL 4.9~6.8 mm, RUMF-ZC-250, Fukido R., Ishigaki I., coll. T. Naruse, 20 Dec. 2004; 1 male, CL 10.3 mm, 2 females, CL 5.8, 6.9 mm, RUMF-ZC-251, Tsuru R., Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004; 1 female, CL 6.0 mm, 2 juveniles, CL 5.5, 6.0 mm, RUMF-ZC-252, Fukido R., Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004; 1 male, CL 9.6 mm, RUMF-ZC-253, Motonagura, Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004; 1 male, CL 11.5 mm, RUMF-ZC-254, Utura R., Iriomote I., coll. T. Naruse and T. Nagai, 23 Dec. 2004; 1 female, CL 14.8 mm, RUMF-ZC-255, Inoda-ihdah, Ishigaki I., coll. H. Nakai, 18 Jan. 2005.

Diagnosis: Carapace (Figs. 1A, 3A, C) quadrate, dorsal surface flat, uneven, regions well defined; frontal margin almost straight, width about 1/2 fronto-orbital width; supraorbital margins sinuous, inner angle with distinct slit. Anterolateral margin (Fig. 1A) with 2 teeth behind external orbital angle; external orbital angle somewhat directed inwards, former tooth larger than latter, separated from latter by V-shaped notch, tip of former placed slightly closer to latter tooth than to angle; posterolateral region sloping outwards, separated from horizontal metabranchial region by an oblique ridge of tiny granules, reaching posterior of latter anterolateral tooth, distance between tip of latter tooth and outer end of granulated line almost identical with outer length of former anterolateral tooth.

Third maxilliped (Fig. 1B) with thick exopod, wider than ischium; merus with auriculate anterior outer angle, carpus attached to middle of anterior margin of merus.

Chelipeds (Fig. 1C) symmetrical in both male and female, male chelae much longer and higher; carpus with thin long spine on inner angle; large male manus high, thick proximal part of dorsal surface thinly raised, keel-like; fingers flat, lined with triangular teeth, immovable finger with a very low ridge toward manus, movable finger curved inwards.

Ambulatory legs rather flat, especially propodi and dactyli of 3rd and 4th legs, posterior margins of propodi and dactyli fringed with fine plumose setae, anterior margin of meri with an acute subdistal tooth.

Female sternal knob placed close to anterior margin of sternite V.

G1 (Fig. 1D, E) stout, width constant over distal 3/4, slightly curving dorsally.

Variation: Exopod of 3rd maxilliped wider in males than in females, its exopod width to ischium width ratio varying between 0.60 and 1.38 in males and 0.68 and 0.93 in females (Fig. 2). Exopod width of *P. altimanus* showing strong positive allometric growth against ischium width, males with a higher positive index (α) than females (Table 1).

Larger males with proportionally larger chelae (Figs. 1C, 3A-D). The movable finger strongly incurved over distal 1/3. Largest tooth of immovable finger located halfway along cutting edge, distal part of largest tooth concave. Consequently large males with wide gape on distal part when fingers closed.

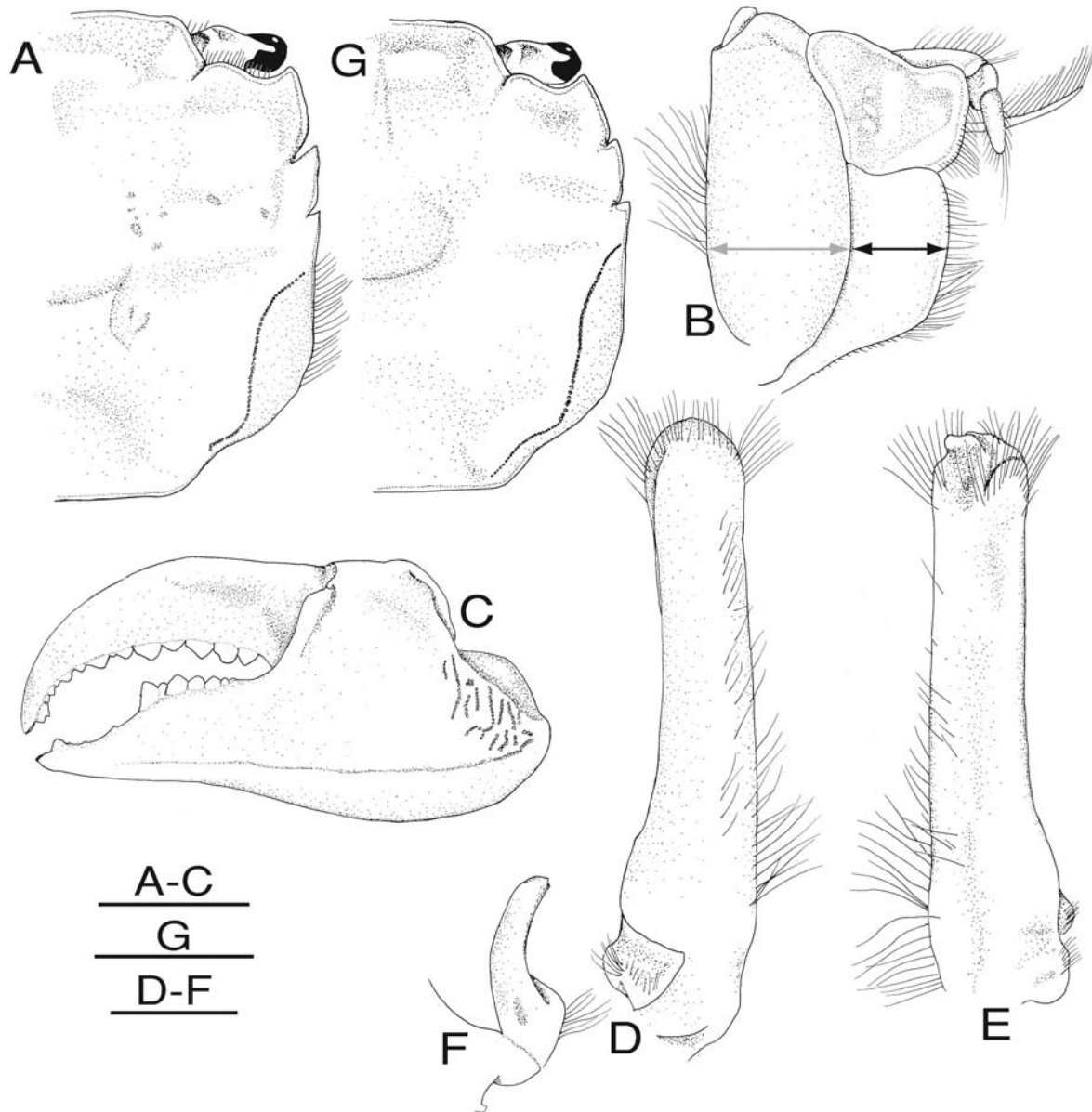


Fig. 1. *Ptychognathus altimanus* (Rathbun, 1914) and *Varuna litterata* (Fabricius, 1798). A-F. *P. altimanus*; G. *V. litterata*. A. G. carapace, dorsal view; B. third maxilliped; C. chela; D. G1, ventral view, left; E. G1, dorsal view, left; F. G2. A. B. D-F. NMNS5008-002, male, CL 15.6 mm; C. RUMF-ZC-243, male, CL 16.3 mm; G. RUMF-ZC-255, female, CL 14.8 mm. Scales, A-C. G, 5 mm; D-F. 1 mm. Black and empty arrows indicate measurements of the third maxilliped's ischium and the exopod width, respectively.

Table 1. Allometric growth of the exopod width of the third maxilliped against the ischium width of *Ptychognathus altimanus* and *Varuna litterata*. α is the allometric index of the exopod against the ischium width.

Species		n	α
<i>P. altimanus</i>	male	10	1.55
	female	6	1.38
	juvenile	3	1.44
<i>V. litterata</i>	male	7	1.25
	female	8	1.04

Coloration: Coloration of *P. altimanus* variable. Small individuals dark to slightly purple; manus lilac with white spots (Fig. 3A, B). Dorsal surfaces of carapace and ambulatory legs of large individuals dark khaki, while manus orange (Fig. 3C, D).

Habitat: *Ptychognathus altimanus* was collected from underwater vegetation along the riverbank or in the riverbed of upper basins with brackish waters; the substratum was pebbly-muddy.

Distribution: Widely distributed in the Western Pacific: Nias and Ambon, Indonesia; Point

Jamelo, Luzon, the Philippines (type locality, Rathbun, 1914); Pingtung Co., Taiwan; Iriomote I., Ishigaki I., Okinawa I., Amami-oshima I., and Yaku I., the Ryukyu Is.; Kinokawa R., Wakayama Pref., main islands of Japan (Tesch 1918; Serène and Moosa, 1971; Minei, 1972; Nakasone, 1977; Nomoto *et al.*, 1999; Kishino and Wada, 2001; Kishino *et al.*, 2001; Naruse, 2005; this study).

Remarks: Rathbun (1914) described *Varuna altimana* in detail and transferred 5 *Ptychognathus* species to *Varuna*, with the emphasis on the characters of the carapace and the chelipedal carpus. Tesch (1918), however, regarded these species as *Ptychognathus*, as they share the wide exopod of the third maxilliped with other *Ptychognathus* species (see Alcock, 1900). Tesch's (1918) concept of *Ptychognathus* has been accepted up to the present time.

Medium-sized individuals of *P. altimanus* (CL < ~11 mm) are extremely similar to *Varuna litterata* (Fabricius, 1798) collected from brackish waters of Linbian, Pingtung Co. (NMNS5008-003) and the Ryukyu Islands. Small individuals of *P. altimanus* are barely distinguishable from *V. litterata* by the position of the outer end of the granulated ridge of the metabranchial region (the distance between the outer end of the granulated ridge and the tip of the latter anterolateral tooth being almost identical to the length of the outer margin of the former anterolateral tooth (Fig. 1A; Rathbun, 1914) vs. the distance being half the length of the former tooth (Fig. 1G)). The relative exopod width of the third maxilliped is wider than that of *V. litterata*, especially in large individuals; the allometric index of the exopod width against the ischium width is much higher in *P. altimanus* (male, $\alpha = 1.55$; female, $\alpha = 1.38$) than in *V. litterata* (male, $\alpha = 1.25$; female, $\alpha = 1.04$) (Fig. 2; Table 1). Furthermore, *P. altimanus* and *V. litterata* show differences in the sexual characters associated with maturation. In males, the tip of the G1 (*in situ*) reaches thoracic sternite V in individuals with a CL of > 8.3 mm. Instead, G1s of similar-sized males of *Varuna litterata*. (CL 7.4~11.8 mm) just reach thoracic sternite VII or VI (Fig. 4, left). In females, the width of the fifth abdominal segment is almost equal to that of the third abdominal segment in an individual with a CL of 13.4 mm (RUMF-ZC-245). On the other hand, the fifth segment width of *V. litterata* is narrower than that of the third one even in an individual with a CL of 19.2 mm (RUMF-ZC-250) (Fig. 4, right). These indicate that *P. altimanus*

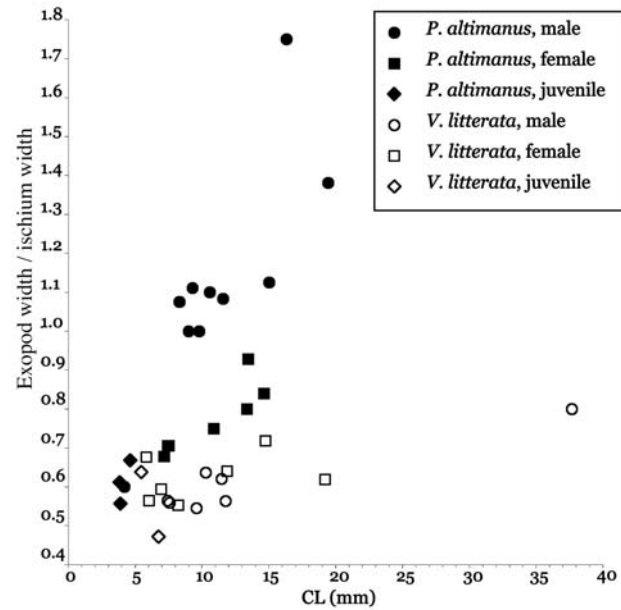


Fig. 2. Exopod to ischium width ratio of the third maxilliped of *Ptychognathus altimanus* (Rathbun, 1914) and *Varuna litterata* (Fabricius, 1798). Horizontal and vertical axes indicate the CL and the exopod/ischium ratio, respectively.

matures at a smaller size than *V. litterata*; these differences also help distinguish these two species. The key diagnostic characters of *P. altimanus* and *V. litterata* are listed in Table 2.

Genus *Utica* White, 1847

Utica gracilipes White, 1847

(Figs. 5, 6)

Utica gracilipes White, 1847a: 43 (nom. nud.); White, 1847b: 86; White, 1847c: 207; Adams and White, 1849: 53, Pl. 13, Fig. 6; H. Milne Edwards, 1853: 177, Pl. 7, Fig. 4; Kingsley, 1880: 206; Ortmann, 1894: 713; Tesch, 1918: 96; Balss, 1934: 234, Fig. 12; Estampador, 1937: 539; Minei, 1972: 50, Figs. 3-5; Holthuis, 1978: 19; Nagai and Nomura, 1988: 38; Shokita, 1990: 310, Table 3; Kishino and Wada, 2001: 59, Fig. 1; Kishino *et al.*, 2001: 127; Shokita *et al.*, 2003: 101; Marumura and Kosaka, 2003: 64; Naruse, 2005: 211.

Pseudograpsus barbatus Schmeltz, 1874: 75.

Utica nausithoe de Man, 1895: 113; de Man, 1898: 702, Pl. 28, Fig. 24; Rathbun, 1910: 308, Pl. 2, Figs. 2, 3; Tesch, 1918: 96.

Material examined: One male, CL 16.0 mm, NMNS5008-004, Hengchun, Pingtung Co., coll. H.-L. Hsu, H.-T. Shih, and T. Naruse, 28 June 2005.

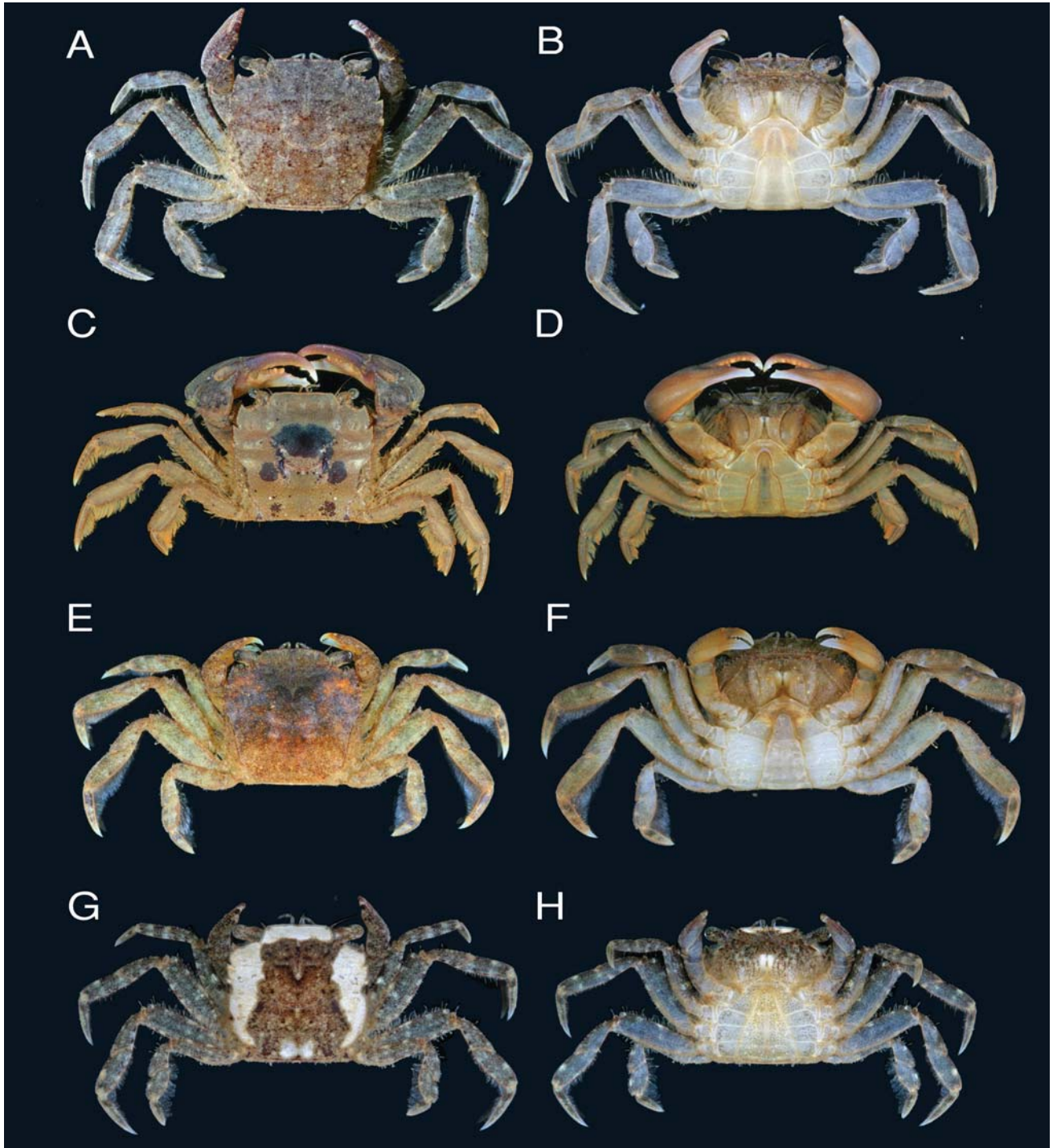


Fig. 3. Coloration of *Ptychognathus altimanus* (Rathbun, 1914) and *Varuna litterata*. A. B. *P. altimanus* from southern Taiwan (NMNS5008-001, male, CL 11.6 mm); C. D. *P. altimanus* from Okinawa I., the Ryukyus (RUMF-ZC-243, male, CL 16.3 mm); E. F. *V. litterata*. from Ishigaki I., the Ryukyus (RUMF-ZC-251, male, CL 10.3 mm); G. H. *V. litterata*. from Ishigaki I., the Ryukyus (RUMF-ZC-250, female, CL 7.4 mm).

Compared material. *Utica gracilipes* from the Ryukyu Is.: 1 male, CL 26.6 mm, 1 female, CL 28.3 mm, RUMF-ZC-256, Tsuru R., Ishigaki I., coll. T. Naruse and T. Nagai, 21 Dec. 2004.

Diagnosis: Carapace (Fig. 5A, C, E) sub-hexagonal, dorsal surface flat, with embossed ridges covered by short black setae, reaching

greatest width on posterior epibranchial tooth. Frontal margin straight, slightly upturned, width slightly less than 1/2 greatest width of carapace; postfrontal crista absent, mesogastric region with a Y-shaped ridge, posterior end connected with a falcate ridge, each metabranchial and cardiac region with a transverse ridge, intestinal region

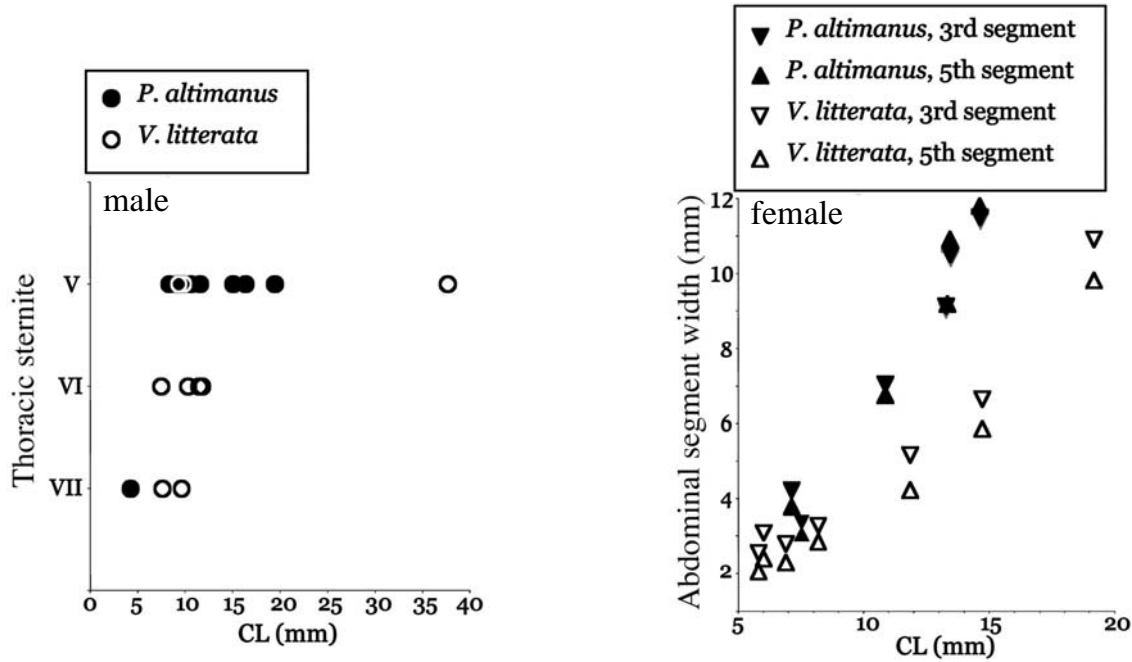


Fig. 4. Growth of relative length of male first gonopod and width of female abdominal third and fifth segments in *Ptychognathus altimanus* (Rathbun, 1914).

Table 2. Key diagnostic characters of *Ptychognathus altimanus* and *Varuna litterata*

Character	<i>P. altimanus</i>	<i>V. litterata</i>
Outer end of granulated ridge of metabranchial region	separated from the latter anterolateral tooth by the outer length of the former anterolateral tooth	separated from the latter anterolateral tooth by half the length of the former tooth
Width of exopod of third maxilliped	wide; larger individuals (especially males) have a wider exopod; width to ischium width 0.6~1.8 in males; 0.68~0.84 in females	narrow; width to ischium width 0.55~0.8 in males; 0.55~0.71 in females
Anterior margin of large male chelipedal merus	lined with long setae	saw-edged
Dorsal margin of large male chela	proximal part keel-like	rounded
Female sternal knob	placed closer to anterior margin of sternite V	placed in middle of sternite V
Body size	smaller; male G1 reaches thoracic sternite V in individuals with a CL > 8.3 mm; fifth abdominal segment equal to that of the third abdominal segment in an individual with a CL of 13.4 mm	larger; G1 of similar-sized males (CL 7.4~11.8 mm) just reaching thoracic sternite VII or VI; fifth abdominal segment remains narrower than that of third even in the individual with a CL of 19.2 mm

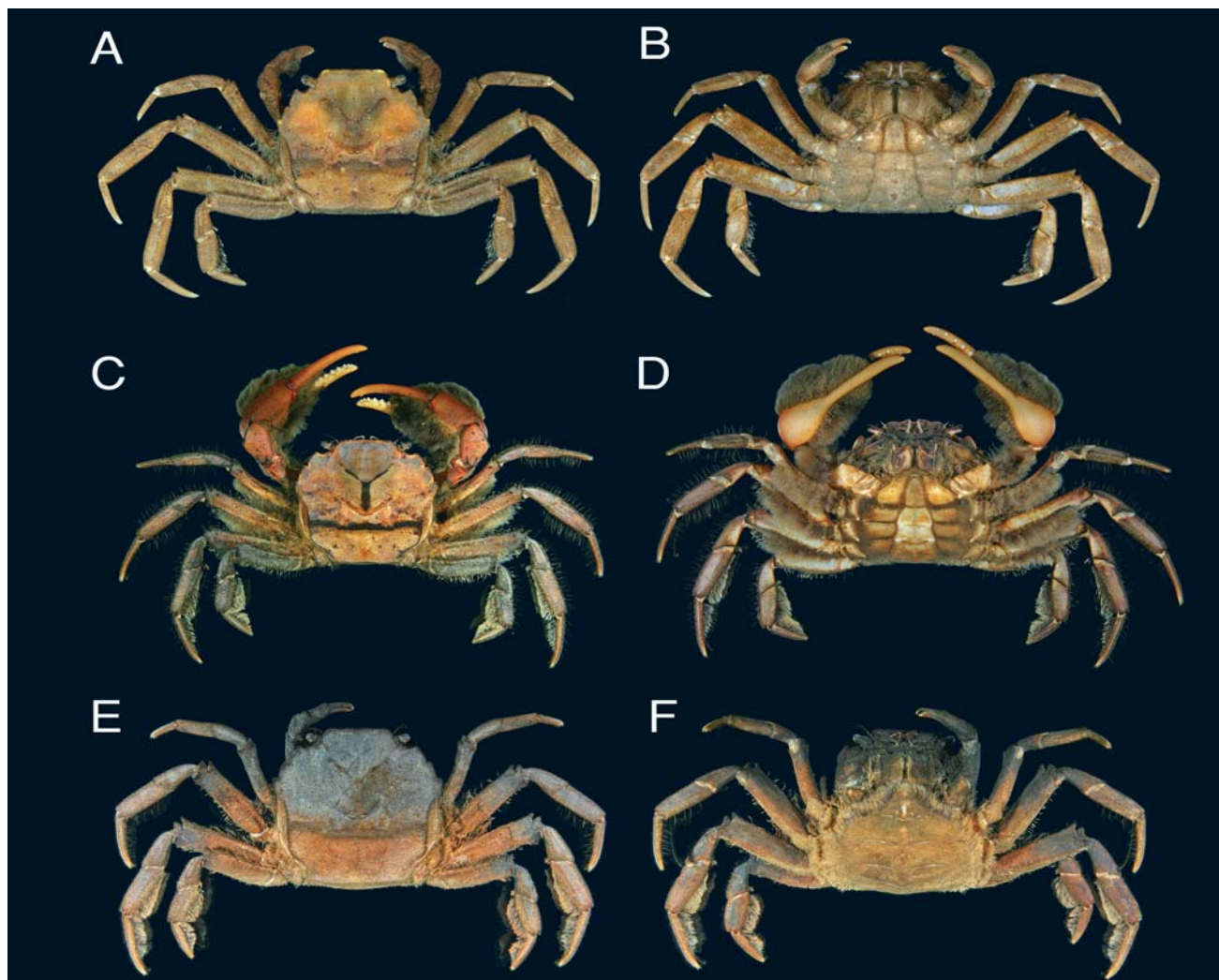


Fig. 5. *Utica gracilipes* White, 1847. A. B. *U. gracilipes* from southern Taiwan (NMNS5008-004, male, CL 16.0 mm); C-F. *U. gracilipes* from Ishigaki I., the Ryukyus (RUMF-ZC-256, C. D. male, CL 26.6 mm, E. F. female, CL 28.3 mm).

with a longitudinal ridge. Supraorbital margin sinuous, inner angle with a V-shaped notch. Anterolateral margin with 2 epibranchial teeth behind external orbital angle, angle and teeth similar in size, angle directed anteriorly inwards, tip of former tooth placed equidistance from angle and latter tooth; posterolateral region sloping outwards, separated from flat mesobranchial region by distinct cristate demarcation.

Third maxilliped (Fig. 5B, D, F) rectangular, median hiatus narrow; exopod width less than 1/2 width of ischium, with distinct flagellum; carpus attached to middle of anterior margin of merus.

Chelipeds (Fig. 5) symmetrical; male manus with tuft of soft hairs on outer and inner surfaces, without ridges; fingers straight, inner margins regularly and sparsely lined with low, rounded teeth; female cheliped feeble, merus to chela covered with short black setae.

Ambulatory legs slender, anterior 3 pairs of meri with a subdistal blunt tooth on anterior margin, dorsal surface patchily covered with short black setae, posterior margin fringed with dense plumose setae.

G1 (Fig. 6A, B) relatively slender, inner margin concave on proximal 1/3, inner margin distinctly bilobed for more than 1/2 its length, dorsal lobe well protruding from inner margin of ventral lobe in ventral view.

Variation: Large males with proportionally much longer and thicker chelae, on the other hand, chelae of large females very feeble.

Coloration: Dorsal surfaces of *Utica gracilipes* olive to brown (Fig. 5).

Habitat: *Utica gracilipes* was collected from under a stone of a riverbed in an upper estuarine basin.

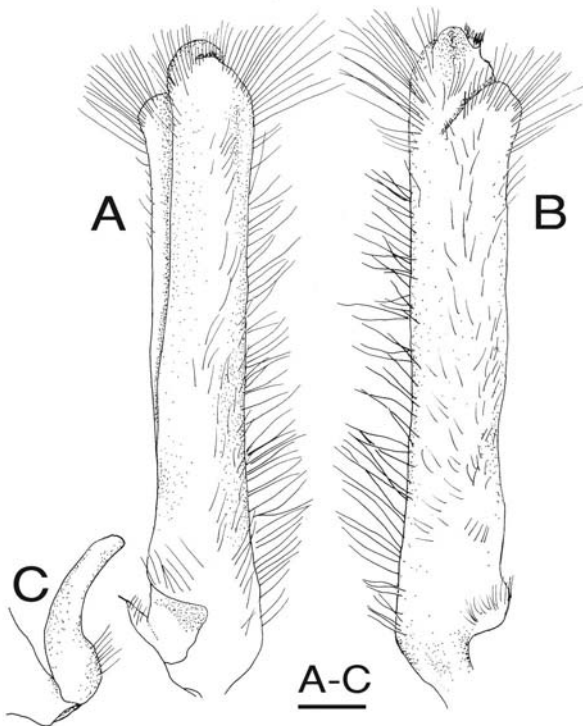


Fig. 6. *Utica gracilipes* White, 1847. A. G1, ventral view, left; B. G1, dorsal view, left; C. G2. RUMF-ZC-256, male, CL 26.6 mm. Scale, 1 mm.

Distribution: Widely distributed in the Indo-West Pacific: Fiji; Sunda Is. (Atjeh, N. Sumatra; Simeulue I., off W. Sumatra; Buleleng I., Bali; Mburu, West Flores; West Sumba) and Talud Is., Indonesia; the islands of Negros and Mindanao, the Philippines; Pingtung Co., Taiwan; Iriomote I., Ishigaki I., and Yaku I., the Ryukyu Is. (Holthuis, 1978; Shokita, 1990; Kishino and Wada, 2001; this study).

Remarks: Seven species have been described for the genus *Utica* White, 1847 (*U. gracilipes* White, 1847; *U. glabra* A. Milne Edwards, 1873; *U. barbimana* A. Milne Edwards, 1873; *U. crassimana* Haswell, 1882; *U. setosipes* Haswell, 1882; *U. borneensis* de Man, 1895; and *U. nausithoe* de Man, 1895), of which *U. nausithoe* was considered a junior subjective synonym of *U. gracilipes* by Minei (1972) and Holthuis (1978). Holthuis (1977) doubted whether *U. glabra*, *U. barbimana*, *U. setosipes*, and *U. borneensis* are valid species, but he deferred a decision concerning their taxonomic significance.

Utica gracilipes can be easily recognized by its hexagonal and flat carapace with embossed ridges on the dorsal surface (Fig. 5). This is the first record of *U. gracilipes* from Taiwan, but it is not surprising since the present species is widely

distributed from Southeast Asia to the Ryukyu Islands.

ACKNOWLEDGEMENTS

Thanks are due to Mr. Jr-An Chen and Miss Zih-Ying Chen (Team of Video Broadcast, Taichung) for their help during fieldwork. The first author thanks Prof. Tin-Yam Chan and his students for help during a stay in Taiwan. This study was supported by the 21st Century COE Program of the University of the Ryukyus.

REFERENCES

- Adams, A. and A. White, 1849. Crustacea. In A. Adams (ed.), The zoology of the Voyage of H.M.S. Samarang: under the command of Captain Sir Edward Belcher, during the year 1843-1846. Reeve, Benham and Reeve, London, pp. 1-66, pls. 1-13.
- Alcock, A. 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa or Grapsoidea. J. Asiatic Soc. Bengal 67: 279-486.
- Balss, H. 1934. Die Krabben der Reise J. W. Harms' nach der Christmas-Insel und dem Malaiischen Archipel. Zool. Anz. 106: 225-237.
- Chen, W.-J., J.-H. Cheng, and J.-Y. Shy. 2005. On two new species of freshwater crabs (Crustacea: Decapoda: Brachyura: Potamidae) from southern Taiwan. Raffles Bull. Zool. 53: 103-110.
- Estampador, E.P. 1937. A check list of Philippine crustacean decapods. Philipp. J. Sci. 62: 465-559.
- Fabricius, J.C. 1798. Supplementum Entomologiae Systematicae. Proft et Storch, Hafniae (=Copenhagen). (not seen)
- Haswell, W.A. 1882. Catalogue of the Australian stalk- and sessile-eyed Crustacea. Australian Museum, Sydney.
- Ho, P.-H., P.K.L. Ng, T.-Y. Chan, and D.-A. Lee. 2004. New records of 31 species of brachyuran crabs from the joint Taiwan-France expeditions, "Taiwan 2000" and "Taiwan 2001", off deep waters in Taiwan. Crustaceana 77: 641-668.
- Holthuis, L.B. 1977. The Grapsidae, Gecarcinidae and Palicidae (Crustacea: Decapoda: Brachyura) of the Red Sea. Israel J. Zool. 26: 141-192.

- Holthuis, L.B. 1978. A collection of decapod Crustacea from Sumba, Lesser Sunda Islands, Indonesia. *Zool. Verhand. Leiden* 162: 1-55.
- Kingsley, J.S. 1880. Carcinological notes, No. IV. Synopsis of the Grapsidae. *Proc. Acad. Nat. Sci. Phil.* 1880: 187-224.
- Kishino, T. and K. Wada. 2001. Record of *Utica gracilipes* (Crustacea: Brachyura: Grapsidae) from Yakushima-Island, Kagoshima Prefecture, Japan. *Nankiseibutsu* 43: 59-60. (in Japanese)
- Kishino, T., A. Nomoto, S. Kimura, T. Yonezawa, and K. Wada. 2001. Brachyuran crab species recorded in the brackish waters of Amami-Oshima Island, Kagoshima Prefecture, Japan. *Nankiseibutsu* 43: 125-131. (in Japanese)
- Man, J.G. de. 1895. Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. Zweiter Theil. *Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere* 9: 75-218.
- Man, J.G. de. 1898. Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. Sechster (Schluss-) Theil. *Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere* 10: 677-708, pls. 28-38.
- Marumura, M. and A. Kosaka. 2003. Catalogue of the brachyuran and anomuran crabs donated by the late Mr. Seiji Nagai to the Wakayama Prefectural Museum of Natural History. Wakayama Prefectural Museum of Natural History, Wakayama. (in Japanese)
- Milne Edwards, A. 1873. Recherches sur la faune carcinologique de la Nouvelle-Calédonie. Deuxième Partie. Groupe des Cyclometopes. Portuniens. *Nouv. Arch. Mus. Hist. Nat.* 9: 155-332.
- Milne Edwards, H. 1853. Mémoire sur la famille des Ocypodiens, suite (1). *Ann. Sci. Nat., Zool.* (3)20: 163-228, pls. 6-11.
- Minei, H. 1972. Distribution and ecological notes of two Japanese grapsids (Decapoda, Crustacea). *Sci. Bull. Faculty Agric. Kyushu Univ.* 27: 49-53. (in Japanese)
- Miyake, S. 1983. Japanese crustacean decapods and stomatopods in color. Vol. II: Brachyura (Crabs). Hoikusha, Osaka. (in Japanese)
- Nakasone, Y. 1977. Crab zonation in the Yuhi River, Okinawa Island. *Jpn. J. Ecol.* 27: 61-70.
- Nagai, S. and K. Nomura, 1988. Okinawan marine organisms. No. 7, Crab. Shinsei Tosho, Okinawa. (in Japanese)
- Naruse, T. 2005. *Ptychognathus altimanus*. In Nature Conservation Division (Department of Cultural and Environmental Affairs, Okinawa Prefectural Government) (ed.), Threatened wildlife in Okinawa, 2nd ed. (Animals) - Red Data Okinawa. Nature Conservation Division, Department of Cultural and Environmental Affairs, Okinawa Prefectural Government, Okinawa, p. 223. (in Japanese)
- Ng, P.K.L. and H.-C. Liu. 2003. On a new species of tree-climbing crab of the genus *Labuanium* (Crustacea: Decapoda: Brachyura: Sesarmidae) from Taiwan. *Proc. Biol. Soc. Wash.* 116: 601-616.
- Ng, P.K.L., H.-C. Liu, and C.D. Schubart. 2004. *Geosesarma hendon*, a new species of terrestrial crab (Crustacea: Decapoda: Brachyura: Sesarmidae) from Taiwan and the Philippines. *Raffles Bull. Zool.* 52: 239-249.
- Ng, P.K.L., C.-H. Wang, P.-H. Ho, and H.-T. Shih. 2001. An annotated checklist of brachyuran crabs from Taiwan (Crustacea: Decapoda). *Natl. Taiwan Mus. Spec. Publ. Ser.* 11: 1-86.
- Nomoto, A., S. Yodo, S. Kimura, T. Kishino, M. Sakano, and K. Wada. 1999. Six rare brachyuran species of the family Grapsidae, recorded from the Kinokawa River Estuary, Wakayama Prefecture. *Nankiseibutsu* 41: 5-9. (in Japanese)
- Ortmann, A.E., 1894. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu Kiu Inseln gesammelten und zur Zeit im Strassburger Museum aufbewahrten Formen. VIII. Theil. Abtheilung: Brachyura (Brachyura genuina Boas) III. Unterabtheilung: Cancroidea, 2. Section: Cancrinea, 2. Gruppe: Catametopa. *Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere* 7: 683-772, p1. 23.
- Rathbun, M.J. 1910. Decapod crustaceans collected in Dutch East India and elsewhere by Mr. Thomas Barbour in 1906-1907. *Bull. Mus. Comp. Zool.* 52: 305-317, pls. 1-6.
- Rathbun, M.J. 1914. New species of crabs of the families Grapsidae and Ocypodidae.

- (Scientific results of the Philippine cruise of the fisheries steamer "Albatross." 1907-1910. No. 31). Proc. US Natl. Mus. 47: 69-85.
- Schmeltz, J.D.E. 1874. Museum Godeffroy Catalog V. Nebst einer Beilage enthaltend topographische und zoologische Notizen. L. Friedrichsen & Co., Hamburg. (not seen)
- Schubart, C.D., H.-C. Liu, and J.A. Cuesta. 2003. A new genus and species of tree-climbing crab (Crustacea: Brachyura: Sesarmidae) from Taiwan with notes on its ecology and larval morphology. Raffles Bull. Zool. 51: 49-59.
- Serène, R. and M.K. Moosa. 1971. New and few known species of Brachyura from Ambon. Mar. Res. Indonesia 11: 1-18, pls. 1-6.
- Shokita, S. 1989. Longitudinal distribution and abundance of inlandwater and its adjacent crustaceans in Okinawa Island, the Ryukyus. In Nature Conservation Bureau (Environment Agency) (ed.). Study of essential factors for preservation of wildlife in Nansei Islands. Nature Conservation Bureau (Environment Agency), Tokyo, pp. 483-499.
- Shokita, S. 1990. Inland-water decapods and their distribution in Iriomotejima Island of the Ryukyu Islands. In Nature Conservation Bureau (Environment Agency) (ed.). Study of essential factors for preservation of wildlife in Nansei Islands. Nature Conservation Bureau (Environment Agency), Tokyo, pp. 305-317.
- Shokita, S., Y. Fujita, T. Nagai, A. Ito, T. Kawahara, and H. Noho. 2003. Distribution and abundance of crustaceans in the mangrove swamp and upper reaches of the Nagura River, Ishigaki Island, Japan. In Research Institute for Subtropical Regions (ed.). Reports on the researches for mangrove forests and swamps, Okinawa, pp. 97-111. (in Japanese)
- Shy, J.-Y. 2005. A new species of freshwater crab of the genus *Geothelphusa* Stimpson, 1858 (Crustacea, Decapoda, Brachyura, Potamidae) from Taiwan. Raffles Bull. Zool. 53: 99-102.
- Stimpson, W. 1858. Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federate missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit. Pars V. Crustacea Ocypodoidea. Proc. Acad. Nat. Sci. Phil. 10: 93-110.
- Tesch, J.J. 1918. The Decapoda Brachyura of the Siboga Expedition, I. Hymenosomidae, Retroplumidae, Ocypodidae, Grapsidae and Gecarcinidae. Siboga-Expeditie 39(c): 1-148, pls. 1-6.
- White, A. 1847a. List of the specimens of Crustacea in the collection of the British Museum. British Museum, London.
- White, A. 1847b. Short descriptions of some new species of Crustacea in the collection of the British Museum. Proc. Zool. Soc. Lond. 1847: 84-86.
- White, A. 1847c. Short descriptions of some new species of Crustacea in the collection of the British Museum. Ann. Mag. Nat. Hist. (1) 20: 205-207.

南臺灣弓蟹類(甲殼類：短尾類：弓蟹科)之兩新記錄種

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報導兩種採自南臺灣弓蟹科之新記錄種，分別是 *Ptychognathus altimanus* (Rathbun, 1914) (高掌折顎蟹) 與 *Utica gracilipes* White, 1847 (細足扁平蟹)。本文列舉此兩種之重要形態特徵，並詳細比較 *P. altimanus* 與類似的 *Varuna litterata* (Fabricius, 1798) (字紋弓蟹) 其幼蟹之差異。

關鍵詞：弓蟹科，高掌折顎蟹，細足扁平蟹，短尾類，新記錄種，臺灣。