

**Description of a new species of hydrothermal crab, *Xenograpsus testudinatus* (Crustacea: Decapoda: Brachyura: Grapsidae) from Taiwan**

N. K. Ng<sup>1</sup>, Jung-Fu Huang<sup>2</sup> and Ping-Ho Ho<sup>3</sup>

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黃彥姬 黃榮富 何平合 記產於海洋熱泉的臺灣新種螃蟹，烏龜怪方蟹（甲殼綱：十足目：短尾類：方蟹科） 國立臺灣博物館專題論著第10輯：191-199, March 2000

**摘 要**

本文描述產於臺灣的淺海熱泉的一新種方蟹科怪方蟹屬 (*Xenograpsus* Takeda and Kurata, 1977)的螃蟹。本新種蟹，烏龜怪方蟹 *Xenograpsus testudinatus* 的頭胸甲、螯腳、步行腳、腹部、雌蟹第一對腹肢及雌蟹生殖孔的形狀均不同於 *X. novaeinsularis* Takeda and Kurata, 1977。

**關鍵詞：**方蟹科、怪方蟹屬、新種、熱泉、臺灣。

**Abstract**

A new species of grapsid crab of the genus *Xenograpsus* Takeda and Kurata, 1977, is described from shallow water thermal vents in Taiwan. The new species differs from *X. novaeinsularis* Takeda and Kurata, 1977, in the form of the carapace, chelae, ambulatory legs, abdomen, male first gonopod and vulva.

**Key words:** Grapsidae, *Xenograpsus*, new species, hydrothermal vents, Taiwan.

**Introduction**

Takeda and Kurata (1977) described an unusual new genus and new species of varunine crab, *Xenograpsus novaeinsularis*, from Nishinoshima Island in the Ogasawara Islands, from an

area with steep cliffs and violent waves; shortly after the island was first formed in 1973 (Kido and Koike, 1975; Nakamura and Koike, 1975; Takeda and Kurata, 1977). Sixteen years later, this species was rediscovered in the Akusekijima Island, Tokara Islands, in the south of Kyushu,

<sup>1</sup>Department of Biological Sciences, National University of Singapore, Lower Kent Ridge Road, Singapore 117543, Republic of Singapore.

<sup>2</sup>Department of Aquaculture, National Kaohsiung Institute of Marine Technology, Kaohsiung, Taiwan 811, R.O.C.

<sup>3</sup>Taiwan Endemic Species Research Institute, 1 Ming-Shen Road, Chichi, Nantou County, Taiwan 522, R.O.C.

as well as Kita-Iwo-jima Island, Iwo Islands, to the south of the Ogasawara Islands (Takeda et al., 1993). It was subsequently reported from the sediment of Esmeralda Bank, an active submarine volcano in the Mariana Arc (Türkay and Sakai, 1995). All specimens have been collected from thermal environments.

Recently, a *Xenograpsus* species was collected from the edges of a shallow water thermal vent near an island in I-lan County on the eastern part of Taiwan. While similar to *X. novaeinsularis*, the Taiwanese specimens differed in several important characters viz. carapace, cheliped, ambulatory leg, abdomen and male gonopod characters, which indicate that it should be referred to a new species.

All measurements provided are of carapace widths and lengths respectively. The abbreviations G1 and G2 are used for the male first and second pleopods respectively. Specimens examined are deposited in National Science Museum

(NSMT), Tokyo, Japan; Taiwan Museum (TMCD), Taipei, Taiwan; National Taiwan Ocean University (NTOU), Keelung; Taipei, Taiwan; Institute of Zoology, Academia Sinica (ASIZ), Nankang, Taipei, Taiwan; Forschungsinstitut Senckenberg (SMF), Frankfurt A. M., Germany; Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research, National University of Singapore; and U.S. National Museum of Natural History (USNM), Smithsonian Institution, Washington D. C.

### Taxonomy

#### Family Grapsidae Macleay, 1838

#### Subfamily Varuninae Alcock, 1900

#### *Xenograpsus testudinatus*, new species

(Figs. 1-3)

#### Material examined.

Holotype --- 1 male (19.8 x 18.0 mm) (TMCD), Gengxin Fish Port, Peikuan, 15 m de-



Fig. 1. *Xenograpsus testudinatus*, new species, holotype male (19.8 x 18.0 mm) (TMCD).

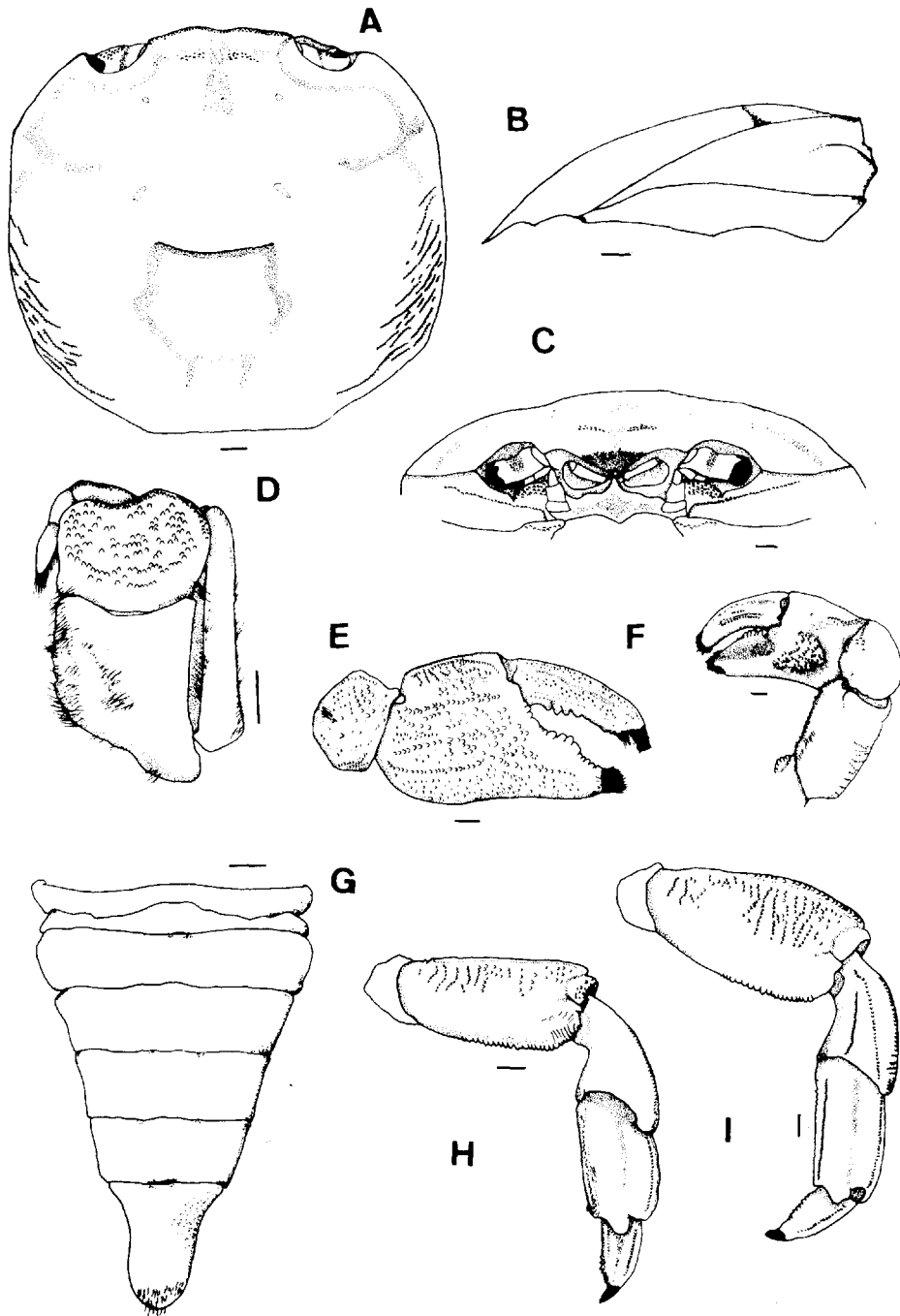


Fig. 2. *Xenograpsus testudinatus*, new species, holotype male (19.8 x 18.0 mm) (TMCD). A) carapace; B) side view of carapace; C) frontal view; D) third maxilliped; E) dorsal view of chelae; F) ventral view of chelae; G) male abdomen; H) right fourth ambulatory leg; I) right third ambulatory leg. Scale: A-I= 1.0 mm.

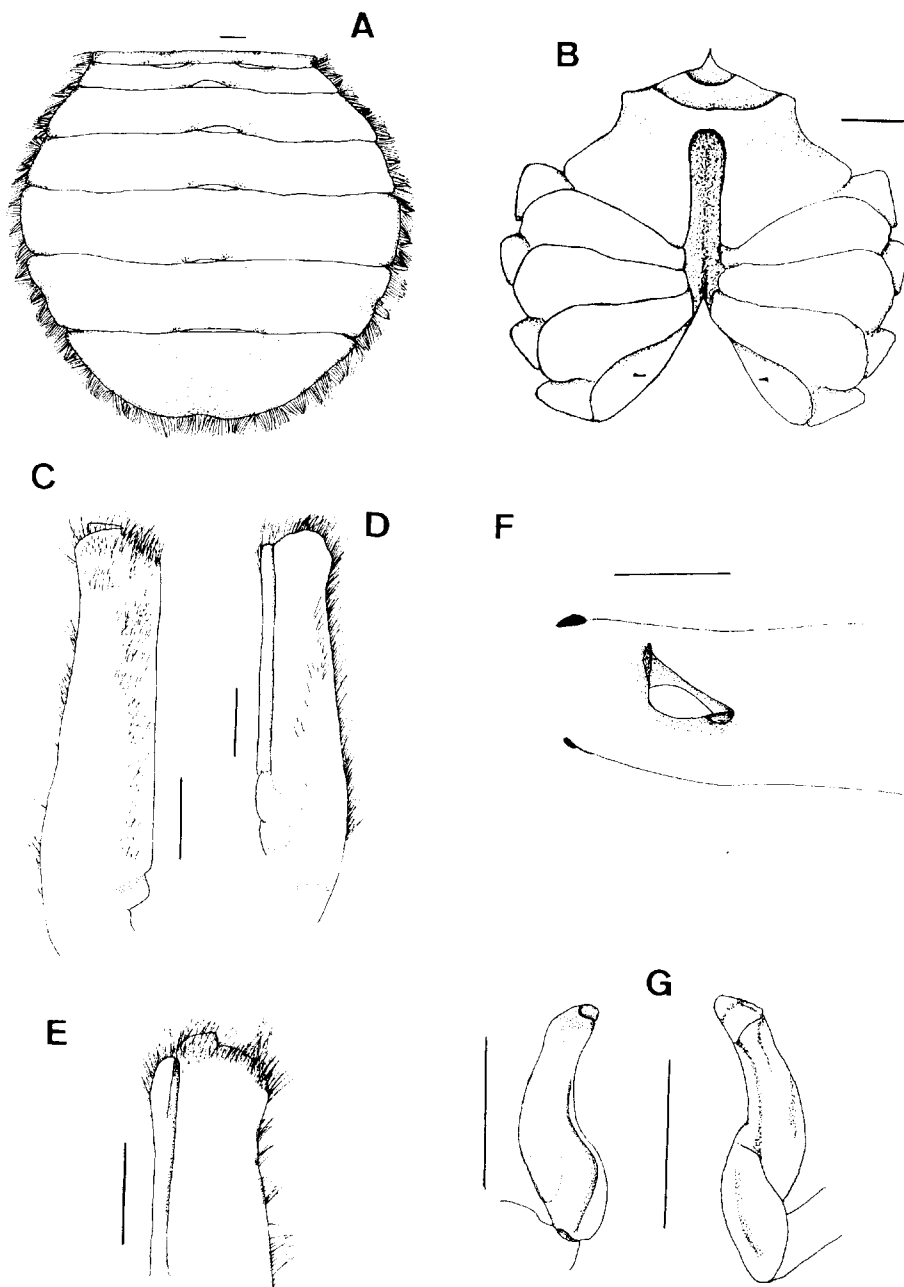


Fig. 3. *Xenograpsus testudinatus*, new species, holotype male (19.8 x 18.0 mm) (TMCD); female (19.9 x 17.9 mm) (ZRC). A) female abdomen; B) male sternum; C) ventral view of G1; D) dorsal view of G1; E) tip of G1; F) vulva; G) different view of G2. Scale: A-G= 1.0 mm.

pth in rocky reef, Ilan County, Taiwan, coll. P.-H. Ho, 3 Oct 1991.

Paratypes --- 1 male (21.7 × 20.1 mm) (TMCD), Gengxin Fish Port, Peikuan, 15 m depth in rocky reef, I-Lan County, Taiwan, coll. P.-H. Ho, 3 Oct 1991. --- 1 male (15.8 × 14.4 mm) (NTOU), Gengxin Fish Port, Peikuan, 15 m depth in rocky reef, Ilan County, Taiwan, coll. P.-H. Ho, 3 Oct 1991. --- 1 male (17.4 × 16.1 mm) (USNM), Gengxin Fish Port, Peikuan, 15 m depth in rocky reef, I-Lan County, Taiwan, coll. P.-H. Ho, 3 Oct 1991. --- 3 males, 4 females (ZRC), Kueishan (= Turtle Mountain) Island, Ilan County, Taiwan. --- 5 males, 7 females (ASIZ72116-2), 16 m depth, near thermal vent, coll. 18 Apr. 1999.

### Description

Carapace quadrate, slightly broader than long (length to width ratio 1.1), convex, glabrous (Fig. 2A). Epigastric cristae granulated, distinct; gastric cristae short. Regions not defined, cardiac regions barely traceable, surface behind frontal orbital border and hepatic region slightly depressed. Frontal margin one-third as broad as carapace, with distinct median cleft, margin uneven, with lobulations weak, posterolateral margins with oblique striae. Anterolateral margin entire, without incision behind external orbital angle (Fig. 2B), posterolateral margins subparallel. Supraorbital border with tiny granules, interrupted at inner one-third. Infraorbital border with larger granules, with deep incision at inner one-third; terminal lobe large, visible from above, tightly oppressed to antennal basal segment. Suborbital ridge with minute granules. Eyes well-developed, base broad, cornea small, pigmented; peduncle short, stout. Antennule folds transversely into broad fossa; antennal basal segments occupying entire orbital hiatus, flagellum two-thirds as long as diameter of orbit.

Endostomial ridge prominent granulated

(Fig. 2C). Posterior margin of epistome entire, margin granulated, without lobulation. Third maxillipeds broad, closing without gape, but not covering entire buccal cavity (Fig. 2D). Ischium longer than broad (length to width ratio 1.3). Merus slightly broader than long (length to width ratio 0.8). Outer angle of merus less strongly convex, produced; exopod narrow, reaching three-quarters height of merus, with well-developed flagellum.

Chelipeds short, stout, equal, similar to each other, covered with granules (Fig. 2E). Distal half of merus extends beyond carapace (when viewed dorsally), upper borders rounded (length to width ratio 1.8). Carpus unarmed, inner angle rounded. Outer surface of palm with thick granules in addition to longitudinal rows of granules. Inner surface with a strong protuberance near proximal end, such that palm tapers in upper view (length to width ratio 1.0) (Fig. 2F). Pollex long, curved, slightly bent, with weakly granulated longitudinal ridges. Cutting edges of fingers with sharp, conical teeth. Inner surfaces deeply excavated; distal part of cutting edges with pectinated margin, tuft of stiff setae present distally.

Ambulatory legs short, stout, with depressed granulated margins. Third pair longest, first and fourth pair subequal, shorter than others. All meri widening distally, covered with conical granules along margins, anterior margins slightly crested, lined with sparse short soft setae. Length to width ratio of last merus 2.1. Carpi crested on anterior margins, upper surface of first three carpi with two widely separated longitudinal rows of granulated linear ridges distally, posterior ridge with a fringe of silky, long setae along anterior ridge; on last carpus, ridges on upper surface indistinct; lower surfaces of first three carpi each with longitudinal granulated ridge. First propodus with two granulated ridges along anterior border, a longitudinal row of silky long setae

present throughout length of shallow median depression; second and third propodi similar to first, with additional ridge and a fringe of setae along posterior margin. Last propodus (Fig. 2H) without median row of setae but densely setose along both borders. Length to width ratio of last propodus 1.5. Dactylus sparsely setose, with two granulated ridges along both borders, dactylus of the last three legs with a longitudinal ridge on upper surface (Fig. 2I). Tips of all dactylus curved, heavily pectinated, length to width ratio of last dactylus 2.3.

Margins of first two thoracic sternites finely granulated. First to third thoracic sternites completely fused. Fourth sternite with deep, wide median groove, median groove of fifth and sixth sternites narrower than fourth. Seventh and eighth sternites without medial groove (Fig. 3B). Sternum structures of female similar to male, medial groove wider, shallower.

Male abdomen triangular (Fig. 2G), length to width ratio 1.4. First abdominal segment arched, with transverse ridge. Second segment narrow, short. Third segment broad, slightly swollen laterally with proximal margin broader than distal, lateral margin rounded. Fourth segment broader but shorter than fifth segment. Fifth segment quadrate. Sixth segment quadrate, lateral margins subparallel, distal margin concave medially, lateral distal angle broad, smoothly rounded. Telson triangular, widely elongated with rounded tip, length to width ratio 1.2. Female abdomen rounded, large covering most of sternum when mature (Fig. 3A). First three segments ridged, second shorter than third. Fourth, fifth segments similar in shape. Sixth narrower than fifth, proximal margin slightly convex medially, distal margin slightly concave medially, lateral margins slightly concave medially. Telson transversely triangular, distal margin medially concave (Fig. 3A). Anterior border of female ab-

dominal cavity densely covered with soft setae.

Male first pleopod stout (Fig. 3C-D) (length to width ratio 5.4), heavily calcified, bearing a subdistal outgrowth, distal pectinated marginal fringe covered with setae (Fig. 3E). G2 short with rounded tip (Fig. 3G). Vulva (Fig. 3F) on sixth sternite, bluntly triangular in shape.

### Habitat

Some of the type specimens of *X. testudinatus* were collected from trammel nets (for palinurid lobsters) set in relatively shallow waters just off the coast of Peikuan in northeastern Taiwan. *Xenograpsus testudinatus*, however, is very common around shallow water hydrothermal vents just off Kueishan Island, which is very close to Peikuan. Large numbers of this species (including juveniles) were observed around these vents, and it appears to be the only brachyuran crab present in this environment (videotape of habitat by M.-S. Jeng; fide P. K. L. Ng, pers comm.). This preference for thermal habitats agrees well with what has been reported for the allied *X. novaeinsularis*. The specimens obtained from off Peikuan are thus probably vagrants, with the normal habitat for the species being hydrothermal vents. The preferred niche of *Xenograpsus* is interesting as this is yet another extreme habitat favoured by a varunine. For example, Ng et al. (1996) treated a varunine genus (*Orcovita*) which is only known from anchialine habitats.

### Colour

Fresh specimens are reddish to greyish-brown in colour overall.

### Etymology

The species name "testudinatus" is derived from the Latin for like a turtle shell', alluding to the general appearance of the crab as well as its type locality (Kueishan Tao or Turtle Island).

## Remarks

Takeda and Kurata (1977) established *Xenograpsus* for one new species, *X. novaeinsularis*, on the basis of two males and a female collected under volcanic debris from Ogasawara Islands. This species has been found primarily in thermal environments (Takeda, 1982; Takeda et al., 1993; Türkay and Sakai, 1995). Most of the specimens of this species we have examined are relatively small (holotype male only  $7.4 \times 6.8$  mm in carapace size). The females, even the smallest, were ovigerous, suggesting high fecundity and early larval production (Türkay and Sakai, 1995).

*Xenograpsus testudinatus* can easily be distinguished from *X. novaeinsularis* by the following characters, viz. a) absence of a epibranchial tubercle or tooth on the anterolateral margin of the carapace (Fig. 2A) (vs. presence of a distinct epibranchial tooth); b) the epigastric cristae is relatively more prominent (Fig. 2A, B, C); c) the dorsal surface of the carapace is more distinctly convex (2B,C); d) the margin of the merus of the third maxilliped is weakly convex (Fig. 2D) (vs. strongly convex); e) the merus of the cheliped is short, with the length to width ratio 1.8 (Fig. 2F) (vs. relatively longer merus with a length to width ratio of 2.2); f) the shorter and stouter ambulatory propodus, with a length to width ratio of 1.5 (Fig. 2H,I) (vs. length to width ratio 2.4); g) the shorter and stouter ambulatory dactylus, with a length to width ratio of 2.3 (Fig. 2H,I) (vs. length to width ratio 3.8); h) the lateral margins of all the ambulatory meri are subparallel (Figs. 1, 2H,I) (vs. more convergent); i) the distal margin of the male telson is broadly rounded (Fig. 2G) (vs. narrowly rounded); k) the G1 is proportionately shorter and stouter with a length to width ratio of 5.4, and is more strongly calcified (Fig. 3C, D) (vs. relatively longer and more slender G1, with the length to width ratio 6.0 and only

weakly calcified); and l) the different vulva form (Fig. 3F).

*Xenograpsus testudinatus* appears to be a generally larger species than *X. novaeinsularis*, with most of the specimens examined measuring more than 18 mm in carapace width. This is also apparent from the above-mentioned videotape of the crabs filmed in situ from Kueishan Island. In contrast, most of the specimens of *X. novaeinsularis* examined by us and reported thus far are relatively small (cf. Takeda and Kurata, 1977; Takeda et al., 1993; Türkay and Sakai, 1995). Fortunately, the largest specimens of *X. novaeinsularis* from Ogasawara measures 20.4 mm in carapace width (NSMT-Cr.6570) compares well with the type series of *X. testudinatus*, allowing good comparison to be made (see above). Examination of the good series of specimens of *X. novaeinsularis* on hand shows that larger specimens tend to have a more convex carapace dorsal surface, prominent epi-gastric cristae, more acute epibranchial teeth, third maxillipeds which do not completely cover the buccal cavity, a male telson which does not completely cover the medial grooves of the third and fourth thoracic sternites and the ambulatory legs are less setose to glabrous. None of these infra-specific variations, however, are substantial enough to account for the differences between *X. novaeinsularis* and *X. testudinatus* (see above).

In *X. testudinatus*, there is some variations associated with its size. In larger specimens, the dorsal carapace surface is generally more convex, the frontal margin is more strongly lobulated, and the cardiac and epi-gastric cristae are less distinct. There is also a tuft of soft setae at the tip of the male telson in large specimens (e.g. male, 26.2 x 23.6 mm, ASIZ72166-1), which is less dense in smaller specimens (e.g. male, 23.0 x 21.4 mm, ASIZ72166-1), and are totally absent in smaller specimens (e.g., male 15.8 x 14.4

mm, NTOU). The holotype has no setae at the end of the telson. None of these differences appear to be of specific significance.

### Comparative material

*Xenograpsus novaeinsularis* - Holotype male (7.3 x 6.4 mm) (NSMT-Cr.5427), Nishino-shima-shinto, Japan, coll. Y. Kurata, 25 Jul 1975. Others - 3 males (NSMT-Cr.6570), Tsukiura Wan, Nishino-shima-shinto, Nishi-no-shima, Japan, coll. Y. Kurata & K. Takenaga, 25 Oct 1979; 1 male (NSMT-Cr.12440), Sho-takara-jima, Ika- u Retto, coll. Y. Seyama, 2 May 1998; 11 males, 7 females (SMF-22945), North Esmeralda, North Mariana, North Pacific, coll. F. S. Sonne, 12 Jul 1990.

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