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Description of male *Tritodynamia serratipes* Anker & Ng, 2014 (Crustacea: Decapoda: Brachyura: Macrophthalmidae) from Singapore

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Abstract. *Tritodynamia serratipes* Anker & Ng, 2014 (Brachyura: Macrophthalmidae) was described from a single female specimen from Singapore and, consequently, its male diagnostic characters are unknown. Recently, an unregistered male specimen from Siglap, Singapore, identified as *Tritodynamia* sp. was discovered in the reference collection of the Natural History Museum, London. It was observed from this specimen that the pereiopod 3 leg character is not a suitable distinguishing character for the species as it is associated with sexual dimorphism. The species can, however, still be distinguished from congeners by the proportionately longer dactylus of the third maxilliped, the chela in both sexes being proportionately longer, the proximal third of the cutting edge of the pollex of the chela having two or three large teeth, the prominently serrated ventral margin of the propodus of pereiopod 3, the male telson that is relatively less sunken into the distal margin of somite 6, and the male first gonopod having the terminal chitinous process proportionately shorter and broader at the base.

Key words. *Tritodynamia serratipes* male characters, variation in proportions, sexual dimorphism, Southeast Asia

INTRODUCTION

Tritodynamia Ortmann, 1894, (Brachyura: Macrophthalmidae) comprises 11 species reported from temperate and subtropical East Asia, Southeast Asia, and eastern India (Ng et al., 2008; Rahayu & Ng, 2021). These small and rarely recorded crabs are distinct in possessing a relatively broad and transversely ovate or hexagonal carapace, with a prominent granulated ridge on the lateral part. Males are known for all but two species, *T. japonica* Ortmann, 1894, and *T. serratipes* Anker & Ng, 2014. Consequently, the discovery of male specimens of either of these two species and the description of their diagnostic pleons and first gonopods would help in their identification (see Rahayu & Ng, 2021).

The description of *Tritodynamia serratipes* by Anker & Ng (2014) from southern Singapore was based on one adult female. The purpose of this current study is to report on an adult male from Singapore Island collected almost 90 years ago by Michael Tweedie that was deposited uncatalogued in the reference collection of the Natural History Museum, London.

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MATERIAL AND METHODS

Specimens are deposited in the Zoological Reference Collection (ZRC), Lee Kong Chian Natural History Museum, National University of Singapore; and the Natural History Museum (NHM), London, United Kingdom.

The terminology follows Anker & Ng (2014) and Rahayu & Ng (2021). Measurements (in mm) are of the maximum carapace width and carapace length. The following abbreviations are used: G1, male first gonopod; G2, male second gonopod; P2–P5, pereopods 2–5 (first to fourth ambulatory legs), respectively.

TAXONOMY

Superfamily Ocypodoidea Rafinesque, 1815

Family Macrophthalmidae Dana, 1851

Genus *Tritodynamia* Ortmann, 1894

Tritodynamia serratipes Anker & Ng, 2014
(Figs. 1, 2)

Tritodynamia serratipes Anker & Ng, 2014: 370, figs. 1–3; Rahayu & Ng, 2021: 1188, 1197.

Material examined. Holotype: female (8.2 × 4.5 mm) (ZRC 2014.0229), Straits of Singapore, off Marina East, 1°17′199″–1°17′185″N 103°53′830″–103°53′575″E, Singapore, 6.3–6.5 m, soft mud, rectangular dredge, R.V. *Galaxea*, coll. C.K. Chim et al., 26 March 2014. Other: 1 male (9.5 × 4.9 mm)

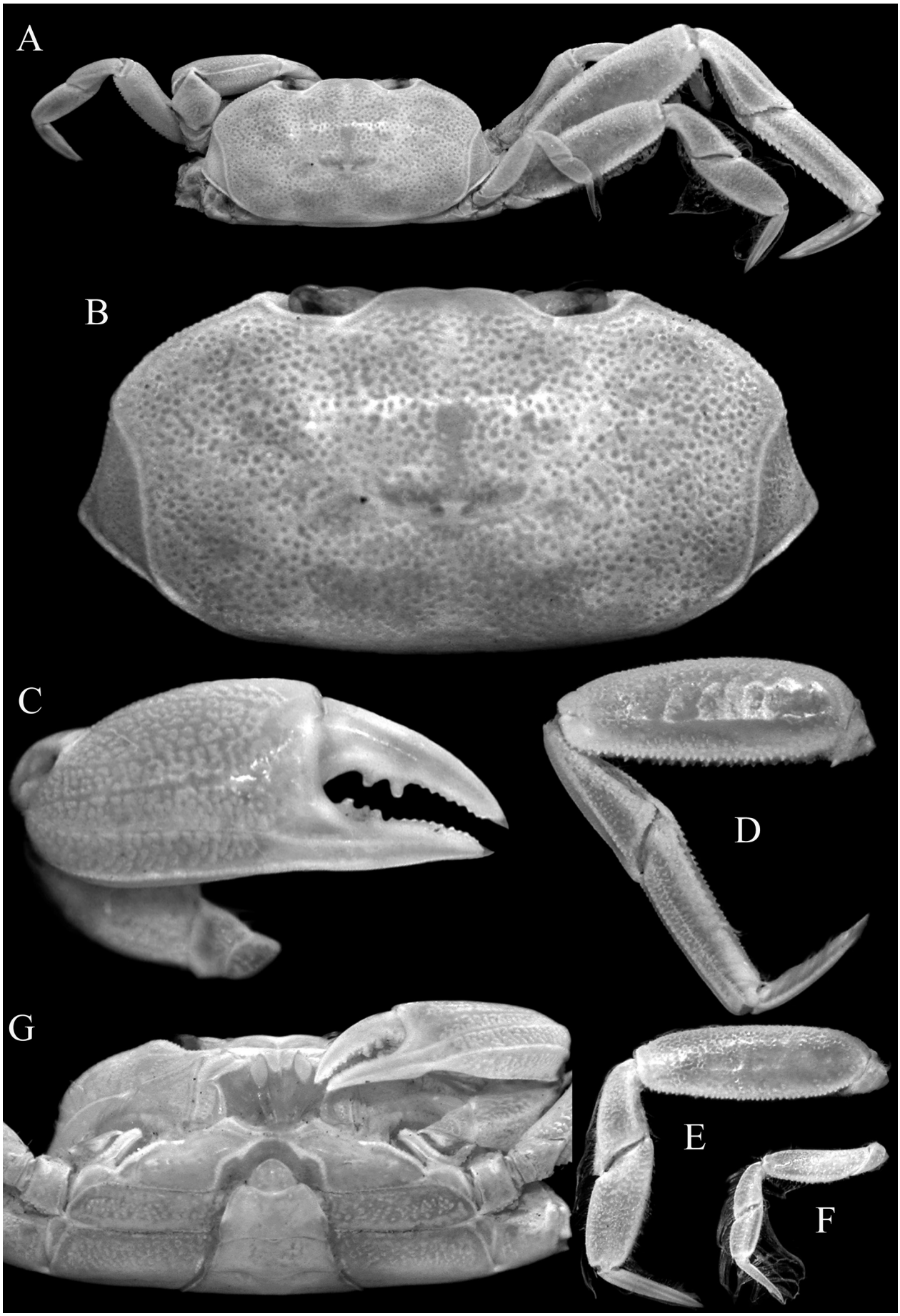

Fig. 1. *Tritodynamia serratipes* Anker & Ng, 2014, male (9.5 × 4.9 mm) (NHM 2022.154), Singapore. A, dorsal habitus; B, carapace, dorsal view; C, right chela, external view; D, left P3, dorsal view; E, left P4, dorsal view; F, left P5, dorsal view; G, cephalothorax showing thoracic sternum and pleon, ventral view.

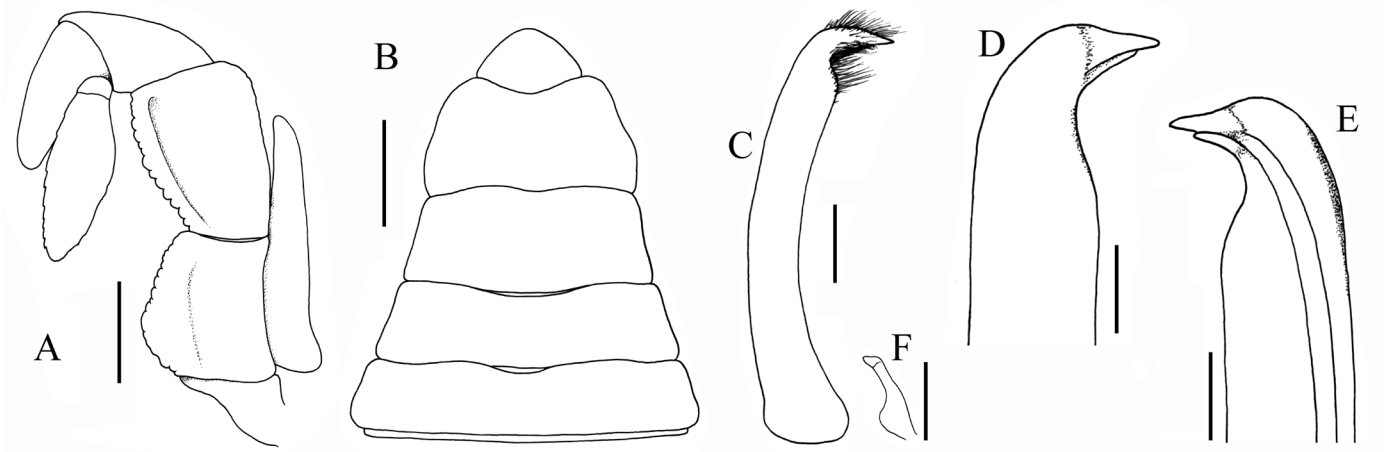

Fig. 2. *Tritodynamia serratipes* Anker & Ng, 2014, male (9.5 × 4.9 mm) (NHM 2022.154), Singapore. A, left third maxilliped (flagellum detached), external view; B, pleon, ventral view; C, left G1, ventral view; D, distal part of left G1 (setae denuded), ventral view; E, distal part of left G1 (setae denuded), dorsal view; F, left G2, ventral view. Scales: A, C, F = 0.5 mm; B = 1.0 mm; D, E = 0.25 mm.

(NHM 2022.154), littoral zone, Siglap, southern Singapore, coll. M.W.F. Tweedie, June 1933.

Diagnosis. (Modified from Anker & Ng, 2014) Carapace transversely elongated, male carapace width-to-length ratio 1.9 (female 1.8); front about 0.2 times CW, margin entire, cristate, about 0.4 times width between external orbital angles; anterolateral margin cristate. Mxp3 with ischium slightly shorter than merus; propodus with projecting, foliaceous, distodorsal lobe; dactylus elongate-elliptical, inserted at ventral submedian part of propodus, reaching far beyond propodus. P1 symmetrical; lower part of manus with 2 granulated cristae, lower crista of manus with prominent concavity on subventral inner face adjacent to pollex base; cutting edge of pollex with 3 prominent teeth in proximal third, proximal tooth subtriangular, distal tooth subquadrate; dactylus with 2 strong teeth in proximal half, subtriangular to subquadrate in form. P2 of both sexes with merus about 3.9 times as long as wide, with row of granules distally on anterodorsal surface, numerous granules on posterior surface, including rows of strong granules along posterodorsal, ventral margins. Male P3 elongated, length (from merus to dactylus) about 2.0 times carapace width (1.7 in female); ischium with granules on dorsal, ventral surfaces; posterior margin with strong projecting tooth; merus with anterior, posterior surfaces bearing numerous rounded, conical granules; posterodorsal, ventral margins lined with strong conical granules; male propodus about 1.5 times as long as dactylus (1.5 times in female), 3.9 times as long as wide (1.9 in female); rows of strong granules present on anterior, ventral margin, median part of dorsal surface; posterodorsal margin with uneven row of conical or slightly arched, adjacent teeth, 7–10 of them conspicuously strong. Male P4 merus stout, 3.1 times as long as wide (2.2 in female), anterior, posterior surfaces with numerous granules, especially on dorsal, ventral margins; propodus about 1.3 times as long as dactylus (same in female), about 2.5 times as long as wide (2.2 in female), surface without granules. P5 of both sexes with dactylus directed slightly dorsally. Thoracic sternites 1 and 2 fused, forming subtriangular structure, medially depressed, separated from third sternite by distinctly concave suture. Male pleon relatively broad, 6 free somites and telson; somite 6 wide with strongly convex lateral margins; telson partially sunken into distal margin of somite 6. G1 relatively slender, gently curved, distal part prominently bent at almost 90º angle, distalmost part chitinous, base relatively wide, tapering to form beak-like structure.

Remarks. The holotype female of *T. serratipes* was described and figured in great detail so there is no need to repeat the data here. The present male of *T. serratipes* differs from the holotype female in having the carapace relatively wider (width-to-length ratio 1.9 vs. 1.8) (Fig. 1B; cf. Anker & Ng, 2014: fig. 1A); the P3 propodus is distinctly longer in proportions (length-to-width ratio 3.9 vs. 1.9) (Fig. 1A, D; cf. Anker & Ng, 2014: fig. 1J); and the P4 merus is proportionately longer (length-to-width ratio 3.1 vs. 2.2) (Fig. 1E; cf. Anker & Ng, 2014: fig. 1L). Otherwise, most of the non-sexual characters, including the structures of the third maxilliped and chela (Figs. 1C, 2A), closely agree.

The species most similar in morphology to *T. serratipes* is *T. bengalensis* Trivedi, Mitra & Ng, 2021, described from a male from the eastern Indian Ocean. *Tritodynamia bengalensis* appears to be closest to *T. serratipes* in having the ventral margins of the P3 merus and propodus prominently serrated. Trivedi et al. (2021) noted that *T. serratipes* can be separated from *T. bengalensis* by the following morphological features: the dactylus of the third maxilliped is much longer than the propodus (Anker & Ng, 2014: fig. 1E) (vs. dactylus of the third maxilliped is relatively shorter, being only slightly longer than the propodus, in *T. bengalensis*; Trivedi et al., 2021: fig. 2C); there are two distinct teeth present in the proximal half of the cheliped pollex (Anker & Ng, 2014: figs. 1F, 3C) (vs. there is one strong and one low tooth at the base of pollex in *T. bengalensis*; Trivedi et al., 2021: fig. 2E); and the P3 propodus is proportionately shorter and strongly serrated, with 15 large teeth, along the ventral margin (Anker & Ng, 2014: figs. 1J, K, 3A) (vs. P3 propodus is proportionately longer and is relatively less strongly serrated with 18 small teeth on the ventral margin in *T. bengalensis*; Trivedi et al., 2021: fig. 3B). The present discovery of a male *T. serratipes* shows that the P3 leg character it is not a suitable distinguishing character as it

seems to be associated with sexual dimorphism. Although the morphology of the present male of *T. serratipes* (Fig. 1A, D) is similar to that of *T. bengalensis* (cf. Trivedi et al., 2021: fig. 3B), four additional characters can still separate the two taxa: the chela is proportionately longer in both sexes of *T. serratipes* (Fig. 1C; Anker & Ng, 2014: fig. 1F) (vs. the chela being proportionately shorter in *T. bengalensis*; Trivedi et al., 2021: fig. 2E); the proximal part of the pollex has two or three teeth on the cutting edge (Fig. 1C; Anker & Ng, 2014: fig. 1F) (vs. with only one tooth; Trivedi et al., 2021: fig. 2E); the male telson is less sunken into the distal margin of somite 6 (Figs. 1G, 2B) (vs. prominently sunken in into the distal margin of somite 6; Trivedi et al., 2021: fig. 2D); and the G1 has the terminal chitinous process proportionately broader at the base (Fig. 2C–E) (vs. the G1 has the terminal chitinous process basally narrower base in *T. bengalensis*; Trivedi et al., 2021: fig. 3E, F).

No author has discussed possible sexual dimorphism in *Tritodynamia* species. This is despite the fact that most authors use carapace proportions and leg proportions (especially those of P3) to separate species, and the several keys and tabular comparisons between species mainly use these characters (cf. Shen, 1932, 1935; Yang & Tang, 2005; Rahayu & Ng, 2021). Two species *T. fujianensis* Chen, 1979, *T. longipropoda* Dai, in Dai, Feng, Song & Chen, 1980, and *T. yeoi* Naruse & Ng, 2010, are known only from males (Chen, 1979; Dai et al., 1980; Naruse & Ng, 2010); while the types of *T. fani* Shen, 1932, are almost certainly juveniles. Shen (1932: 127) reported that he probably had five males and four females in his type series of the species but noted that the female pleons are still narrow like those of the male and he did not figure the first gonopod and pleon like he did with the other species. His figure of the dorsal habitus (Shen, 1932: text-fig. 73) and the small size reported (the largest male is only 7.5 × 5.0 mm) suggest that all the types of *T. fani* are immature.

For the other species, Shen (1932: 120 text fig. 69b, c) commented that the male chela of *T. rathbuni* was relatively larger compared to other congeners; as did Yang & Tang (2005: 782, fig. 1C, D) for *T. bidentata*. The figures of *T. dilatata* by Yang & Sun (1996: fig. 1B, C) showed that the male chela is likewise larger than the female chela. Dai et al. (1980: 138) recorded two males and two females of *T. hainanensis* Dai, in Dai, Feng, Song & Chen, 1980, but did not comment on any sexual dimorphism. In his overview of Chinese species, Shen (1935) did not comment on sexual dimorphism but his table of measurements (Shen, 1935: 24) is interesting. For *T. intermedia*, the male and female carapace width-to-length ratios are 1.5 and 1.8, respectively, i.e., the female carapaces are proportionately wider; while the P3 merus has the following length-to-width ratios: male 2.1, female 1.8; i.e., the males have longer legs. For *T. horvathi* Nobili, 1905, Shen (1935) reported male and female carapace width-to-length ratios as 1.4 and 1.5 respectively, i.e., females were only slightly wider; while the P3 merus length-to-width ratios were the same (2.0) for both sexes (Shen, 1935: 24). In *T. serratipes*, the male P3 and P4 meri (and propodi) are proportionately longer than in the female, like *T. intermedia*. Rahayu & Ng (2021) had one male and one female of *T. nontjii*, with carapace width-to-length ratios of 2.2 and 2.1, respectively; no ambulatory leg differences were recorded.

The prominently serrated P3 merus and propodus, and the relatively slender G1 with the strongly bent, sharp and elongate chitinous distal part are characters unique to *T. serratipes* and *T. bengalensis*. In all other congeners, the P3 merus and propodus are at most uneven or granular, never serrate; and the G1 is stout, with the distal part rounded, bilobed to varying degrees, sometimes gently curved, but never with a chitinous extension. Once all the members of the genus can be reviewed, it may be necessary to recognise a separate genus for these two species.

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