

Validity of *Palapedia truncatifrons* (Sakai, 1974) (Crustacea, Decapoda, Brachyura, Xanthidae)

Junji Okuno¹ and Masatsune Takeda²

¹ Coastal Branch of Natural History Museum and Institute, Chiba,
123 Yoshio, Katsuura, Chiba, 299–5242 Japan
e-mail: okuno@chiba-muse.or.jp

² Department of Zoology, National Science Museum, Tokyo,
3–23–1 Hyakunin-cho, Shinjuku-ku, Tokyo, 169–0079 Japan
e-mail: takeda@kahaku.go.jp

Abstract *Kraussia truncatifrons* Sakai, 1974, put into a junior synonym of *Palapedia bongensis* (Serène, 1972), is considered as a valid species in the genus *Palapedia* Ng, 1993 on account of the proportional difference of the carapace, and the armature on the chela and ambulatory legs. Taxonomic distinctions between *P. truncatifrons* and another congeneric species, *P. rastroipes* (Müller, 1887), are also discussed. The color variants of *P. truncatifrons* are provided on the basis of the additional specimens from the Boso Peninsula and Izu Peninsula, Pacific coast of central Japan.

Key words: Decapoda, Brachyura, *Palapedia truncatifrons*, validity, color variants.

Introduction

During the faunal survey of the decapod crustaceans along the coast of the Boso Peninsula, Pacific coast of Honshu, Japan, conducted by the Coastal Branch of Natural History Museum and Institute, Chiba, several crabs referred to *Kraussia truncatifrons* Sakai, 1974, have been collected from sublittoral zone at Katsuura and Kamogawa, east coast of the peninsula. Furthermore, in 2004, some additional specimens were collected at the Izu Oceanic Park, east coast of the Izu Peninsula, during the sampling for the “Study on Environmental Changes in Sagami Sea and Adjacent Coastal Area with Serial Comparison of Fauna and Flora”, under the project of the National Science Museum, Tokyo.

Kraussia truncatifrons originally described from the Kii Peninsula, Pacific coast of Honshu, Japan, is at present considered by Ng (1993) as a junior synonym of *K. bongensis* Serène, 1972 described on the basis of the six specimens from the Sulu Archipelago, Philippines, which has been transferred to the new genus *Palapedia* Ng, 1993. The detailed examination of the specimens

at hand from Japanese warm-temperate waters, including the topotypic material from the southern coast of Kii Peninsula, reveals that *K. truncatifrons* is rightly congeneric with, but specifically distinct from *Palapedia bongensis*, on account of the broader carapace, the absence of the prominent tubercles on dorsal surface of the dactyli of chelipeds, and the stronger armature of the dorsal surfaces of the dactyli of ambulatory legs. In this paper, therefore, *Palapedia truncatifrons* is resurrected as a species distinct from *P. bongensis*. The supplemental description to discriminate *P. truncatifrons* from the congeneric species is given in the following lines.

In the field, it was readily noted that there were remarkable color variations from uniform brick red to yellowish gray, sometimes with many rounded spots of good size. Two additional color variants are reproduced in this paper.

The maximum carapace length and width are abbreviated as CL and CW, respectively. The specimens examined are deposited in the Coastal Branch of Natural History Museum and Institute, Chiba (CMNH), the Kitakyushu Museum of Natural History and Human History, Kitakyushu

(KMNH), the National Science Museum, Tokyo (NSMT), the Natural History Museum and Institute, Chiba (CBM), the Western Australian Museum, Perth (WAM), and the Zoological Reference Collection, the Ruffles Museum of Biodiversity Research, National University of Singapore (ZRC).

For comparative purpose, we examined the following specimens of *Palapedia*:

Palapedia bongensis (Serène, 1972). About 9 miles & 130° from Bongae Light, Tawitawi Bay, Sulu Archipelago, Philippines, 29 February 1964, coll. B. R. Wilson on “Pele”, 1♂ (CW 17.6 mm, CL 15.8 mm), WAM C10698 (former WAM 263-70B) (paratype of *Kraussia bongensis* Serène, 1972).

Palapedia rastripes (Müller, 1887). aUgelpelú Reef, aUgelpelú Island, Palau, 5 May 1939, coll. S. Miyake, 3♂♂ (CW 9.7 mm, CL 8.1 mm; CW 10.6 mm, CL 9.0 mm; CW 13.6 mm, CL 11.4 mm), 1♀ (CW 16.3 mm, CL 13.9 mm), KMNH [former ZLKU (Zoological Laboratory, Department of Agriculture, Kyushu University) 1161–1164].

Taxonomic Account

Palapedia truncatifrons (Sakai, 1974)

[Japanese name: Futaba-goishigani]

(Figs. 1, 2)

Kraussia truncatifrons Sakai, 1974a: 90, 99; Sakai, 1974b: 13; Sakai, 1976: 308, 186, fig. 172 b, pl. 101, fig. 4 in color; Takeda, 1978: 77 (list); Miyake, 1983: 73, 214 (list), pl. 25, fig. 1 in color; Iishiba *et al.*, 1983: 34, pl. 6, fig. 1; Nagai, 1989: 120 (list); Yokota, 1992: 8, unnumbered fig. in color.

Kraussia truncatifrons [sic]: Tanaka, 1978: 5.

Palapedia bongensis: Ng, 1993: 153 (in part); Minemizu, 2000: 252, unnumbered fig. in color. Not *Palapedia bongensis* (Serène, 1972).

Material examined. Japan. Honshu. Boso Peninsula. Ubara-jima Islet, off Ubara, Katsuura, with SCUBA, 22 August 1998, coll. H. Tachikawa, 1♀ (CW 19.3 mm, CL 15.6 mm), CMNH-ZC 01765; Ashika-ne, off Isomura, Kamogawa, 26 m, with SCUBA, 26 November

2000, coll. J. Okuno, 1♂ (CW 19.8 mm, CL 14.9 mm), CMNH ZC 00494, 1♀ (CW 16.3 mm, CL 12.5 mm), NSMT-Cr S197; Hatto-ne, Isomura, Kamogawa, 12–15 m, with SCUBA, 20 August 1999, coll. H. Tachikawa, 1♀ (CW 18.8 mm, CL 15.6 mm), CMNH-ZC 00147; same locality, 15 m, with SCUBA, 26 November 2000, coll. J. Okuno and A. Murata, 2♂♂ (CW 20.1 mm, CL 16.2 mm; CW 19.1 mm, CL 16.4 mm), CMNH-ZC 00497; same locality, 14 m, with SCUBA, 29 June 2001, coll. J. Okuno, 1♂ (CW 14.6 mm, CL 11.8 mm), 1♀ (CW 17.8 mm, CL 14.6 mm), ZRC; same locality, 15 m, with SCUBA, 1 October 2003, coll. H. Tachikawa, J. Okuno and K. Yanagi, 1♀ (CW 15.8 mm, CL 12.9 mm), CMNH-ZC 01911, 1♀ (CW 18.0 mm, CL 14.4 mm), CMNH-ZC 01912.

Izu Peninsula. Izu Oceanic Park, Ito, with SCUBA, April 1993, coll. M. Yokota, 2♂♂ (CW 23.0 mm, CL 18.8 mm; CW 19.0 mm, CL 15.7 mm), 3♀♀ (CW 15.3 mm, CL 12.6 mm; CW 18.5 mm, CL 14.7 mm; CW 20.5 mm, CL 16.6 mm), NSMT-Cr 11340–11344; same locality, 20 m, with SCUBA, 5 October 2004, coll. J. Okuno and M. Yokota, 1♀ (CW 8.2 mm, CL 6.8 mm), NSMT-Cr S198; same locality, 15 m, with SCUBA, 6 October, 2004, coll. J. Okuno and M. Yokota, 1♂ (CW 23.4 mm, CL 18.9 mm), NSMT-Cr S199; same locality, 25 m, with SCUBA, 6 October, 2004, coll. J. Okuno and M. Yokota, 1♂ (CW 20.1 mm, CL 16.3 mm), NSMT-Cr S200.

Kii Peninsula. Shionomisaki, Kushimoto, 10 m, coll. S. Sugiyama, 1♂ (CW 18.4 mm, CL 15.4 mm), CBM-ZC 4233.

Izu Islands. Izu-ohshima Island. Akino-hama, 20 m, 12 July 2005, coll. J. Okuno and H. Arima, 1♂ (CW 24.6 mm, CL 20.1 mm), CMNH-ZC 01919.

Supplemental description. Carapace slightly broader than long, maximum width 1.2–1.3 longer than maximum length; dorsal surface nearly smooth, frontal and lateral regions feebly granulose; frontal margin bilobed, with distinct median notch (Fig. 1A). Infraorbital angle armed

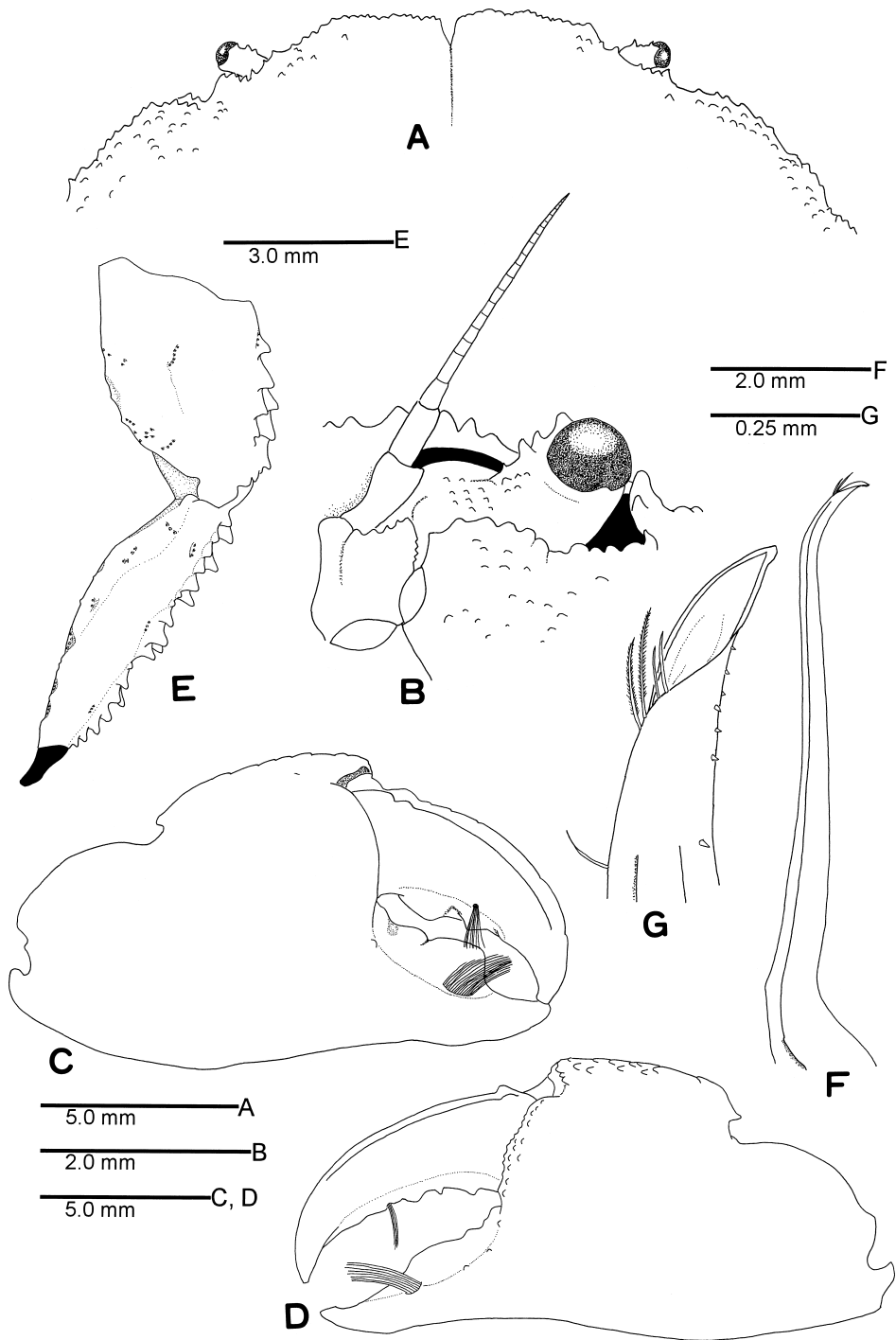


Fig. 1. *Palapedia truncatifrons* (Sakai), male (CW 23.4×CL 18.9 mm, NSMT-Cr S199). A, frontal region of carapace, dorsal view; B, orbital region, ventral view; C, major right chela, external view; D, minor left chela, external view; E, propodus and dactylus of right first ambulatory leg, external view; F, left first pleopod, ventral view; G, same, apical part, ventral view. A, B, E, setae omitted; C, D, pigmentation on fingers omitted.

with blunt tubercles (Fig. 1B).

Chelipeds subequal in length, but dissimilar in general form; major cheliped (Fig. 1C) stouter than the minor, external surface of palm smooth, dactylus and fixed finger robust, cutting border of fixed finger armed with distinct, semiquadrate denticle, with tuft of dense setae on distal third of length, dactylus moderately arched, dorsal surface with two rows of carinae, cutting border with two low, triangular denticles, and with tuft of a few setae on proximal two fifths; minor cheliped (Fig. 1D) with almost smooth palm, but armed with low, small tubercles distolaterally, with low squamae on dorsal surface, dactylus and fixed finger more elongate than those of major chela, cutting border of fixed finger armed with low denticle, with tuft of dense setae on proximal two fifths, dactylus moderately arched, dorsal surface with two rows of carinae, cutting

border armed with some acute proximal teeth, with tuft of a few setae on distal third of length.

Ambulatory legs stout; dactyli (Fig. 1E) blade-like, armed dorsally with rows of prominent tubercles and ventromesial row of dense setae.

Male first pleopod (Fig. 1F) slender, almost straight, distally sinuous outwards, apical margin very feebly spatulate (Fig. 1G).

Color in life. Although the life-coloration of the chelipeds and ambulatory legs is constant as generally reddish and pale pinkish with pale mottles on the fourth leg, the color in life of the carapace can individually vary. The typical color pattern of *Palapedia truncatifrons* is shown in Figs. 2A, B, and two unusual color patterns of carapace are additionally recognized as follows:

Additional color pattern 1 (Fig. 2C). Single male from the Izu Oceanic Park (NSMT-Cr S200). Ground color of carapace right white,

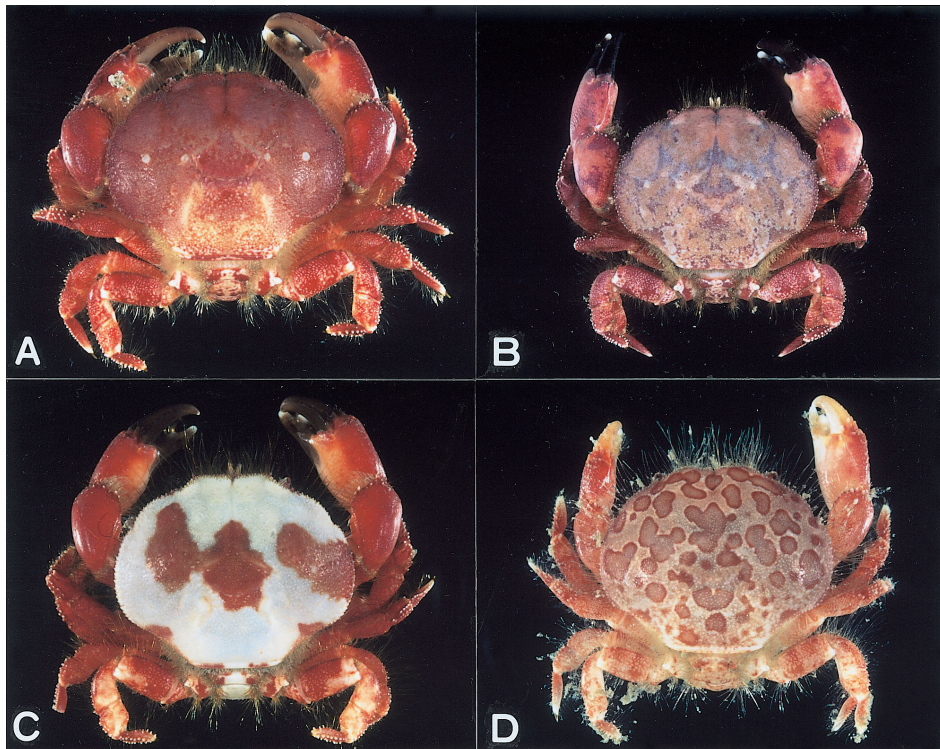


Fig. 2. Color variants of *Palapedia truncatifrons* (Sakai). A, male from Izu Oceanic Park (CW 23.4×CL 18.9 mm, NSMT-Cr S199); B, male from Izu-ohshima Island (24.6×20.1 mm, CMNH-ZC 01919); C, male from Izu Oceanic Park (20.1×16.3 mm, NSMT-Cr S200); D, female from Kamogawa (15.8×12.9 mm, CMNH-ZC 01911).

with three deep red irregular patches; one on midpoint of carapace (metagastric to cardiac regions), others on each branchial region. Median patch continued with left side one.

Additional color pattern 2 (Fig. 2D). Single female from Kamogawa (CMNH-ZC 01911). Ground color of carapace pinkish, with several brownish red irregular blotches bordered with deep red lines.

Distribution. Type locality: Kii-nagashima, Kii Peninsula, Honshu, Japan (Sakai, 1974a). Endemic to the Pacific coast of Honshu, and the northern Izu Islands, Japan, ranging from the Boso Peninsula southward to the Kii Peninsula. It is highly probable that the individuals from the Ryukyu Islands are not identified with *P. truncatifrons*, but really referable to *P. bongensis* as reported by Ng (1993).

Discussion

While examining a collection of crabs from the northern Izu Islands, Takeda (1978) doubted the validity of *Kraussia truncatifrons* Sakai, 1974, due to the close similarity in the general formation of the carapace, especially the truncated and bilobed front, to *K. bongensis* Serène, 1972. Later, Ng (1993) established a new genus *Palapedia* to accommodate 13 Indo-Pacific species, 11 of which were previously referred to the genus *Kraussia* Dana, 1852, reducing *K. truncatifrons* to a junior synonym of *Palapedia bongensis*. As a result, the genus *Kraussia* is represented monotypically by *K. rugulosa* (Krauss, 1843). These two genera are distinguished basically by the following two characters: 1) The anterolateral margin of the carapace is armed with four sharp spines in *Kraussia*, but cut into four dentiform lobes, or merely uneven, without sharp spines, in *Palapedia*: 2) The tips of the fingers are deeply excavated to be distinctly spoon-shaped in *Kraussia*, but sharp or slightly flattened, never spoon-shaped, in *Palapedia*. Considering these characters, the transfer of *K. truncatifrons* from *Kraussia* to *Palapedia* by Ng (1993) is reasonable, but the reduction of *P. truncati-*

frons to a synonym of *P. bongensis* is to be withdrawn, as mentioned in the following lines.

Although Sakai (1974a) mentioned that the distal part of the male first pleopod of *Kraussia truncatifrons* is spatulate and a little broader than that of *K. integra* (De Haan, 1835), any illustration has not been provided not only in the original description (Sakai, 1974a) but also in the subsequent notes by the original author (Sakai, 1974b, 1976). Ng (1993) put *K. truncatifrons* based only on a single female from the Ryukyu Islands into a junior synonym of *P. bongensis* on account of the form of frontal margin of the carapace and the spatulate distal margin of the male first pleopod. In the male specimens at hand, the first pleopod is feebly spatulate along the distal margin (Fig. 1G), differing from that of *P. bongensis* figured by Serène (1972, fig. 19 as *Kraussia*), in which the first pleopod is wider with more rounded distal margin. As Serène (1972) suggested that the form of the male first pleopod shows the intraspecific variation, we compared the Japanese individuals with the largest paratype of *K. bongensis* directly. As mentioned by Serène (1972), the distal lobe of the pleopod in the paratype is feebly developed, resembling those of the Japanese individuals (Fig. 3D). However, we could find several morphological features to discriminate *P. truncatifrons* from *P. bongensis* by the direct comparison. The carapace of *P. truncatifrons* is broader than that of *P. bongensis*, viz., the proportional ratio between width and length ranges from 1.2 to 1.3 in *P. truncatifrons* against 1.1 in *P. bongensis*. In *P. truncatifrons*, the frontal region of the carapace is less produced than that of *P. bongensis* (Fig. 3A). While the dactylus of chela is long and moderately arched in *P. truncatifrons* (Figs. 1C, D), the dactylus is strongly incurved in *P. bongensis* (Fig. 3B). The chela of *P. truncatifrons* lacks the distinct tubercles on the dorsal surface of dactylus and the lateral surface of palm (Figs. 1C, D), whereas *P. bongensis* possesses the rows of the prominent tubercles on the dactylus and the squamiform tubercles on the distolateral region of palm (Fig. 3B). The denticulation of dactyli of the ambula-

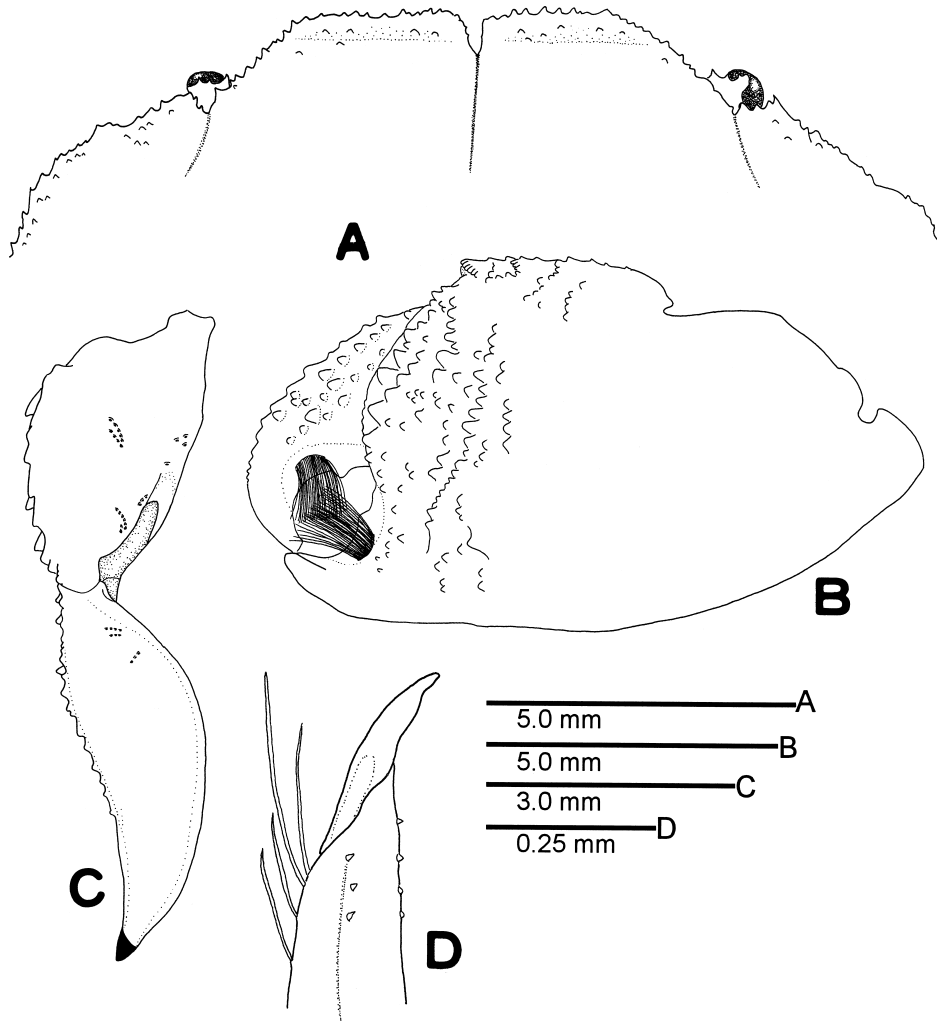


Fig. 3. *Palapedia bongensis* (Serène), male (CW 17.6×CL 15.8 mm, paratype of *Kraussia bongensis*, WAM C10698). A, frontal region of carapace, dorsal view; B, major left chela, external view; C, propodus and dactylus of left first ambulatory leg, external view; D, apical part of left first pleopod, ventral view. A, C, setae omitted; B, pigmentation on fingers omitted.

tory legs are more strongly developed in *P. truncatifrons* than in *P. bongensis*, and the ventral margins of dactyli are less expanded in *P. truncatifrons* than in *P. bongensis* (Figs. 1E, 3C). These characters peculiar to each species justify the specific validity of *P. truncatifrons* distinct from *P. bongensis*.

From initial comparison with literature, the bilobed frontal margin of the carapace, both fingers of chelipeds furnished with the tuft of dense setae, and the strongly denticulate dactyli of the

ambulatory legs suggest the strong relationship of *P. truncatifrons* with *P. rastroipes* (Müller, 1887), originally described from Sri Lanka, and later reported from some localities in the eastern Indian Ocean (Andamans by Alcock, 1900, as *K. integra*; Cocos Keeling by Tweedie, 1950, as *K. integra*) and also in the South and West Pacific (Rotuma by Borradaile, 1900; Gilbert, Palau, Caroline and New Guinea by Balss, 1938; Palau by Miyake, 1939, Takeda, 1972, and Takeda & Shimazaki, 1974; Enewetak Atoll by Garth *et al.*,

1987; Tahiti by Poupin, 1996). As the result of the direct comparison our specimens of *P. truncatifrons* with 3 males and 1 female of *P. rastripes* from Palau, reported by Takeda & Shimazaki (1974), these two species are differentiated by the following features: 1) the marginal tubercles on the carapace are minute in *P. truncatifrons* (Fig. 1A), but these tubercles are acute in *P. rastripes* (Fig. 4A); 2) the infraorbital margin of *P. truncatifrons* is armed with blunt tubercles (Fig. 1B) instead of the acute denticles in *P. rastripes* (Fig. 4B); 3) *P. truncatifrons* has two rows of the unarmed carinae on the dorsal surface of the moderately arched dactylus of cheliped (Figs. 1C, D), whereas in *P. rastripes*, the rows of the prominent tubercles are present at the dorsal sur-

face of the strongly incurved dactylus (Fig. 4C).

Acknowledgements

We sincerely thank Messrs. Kazuhiko Aihara of "Aquamarine Kamogawa", Hirohito Arima of "Global Sports Club", the late Hajime Masuda of the Izu Oceanic Park, and Masaomi Yokota of "Diving Service Go to the Sea" for their support in collecting the crab specimens by the first author. Our thanks go to Drs. Diana S. Jones and Melissa Hewitt of the Western Australian Museum, and also to Dr. Michitaka Shimomura of the Kitakyushu Museum of Natural History and Human History, for sending us the comparative material on loan. We are grateful to Dr. Tomoyu-

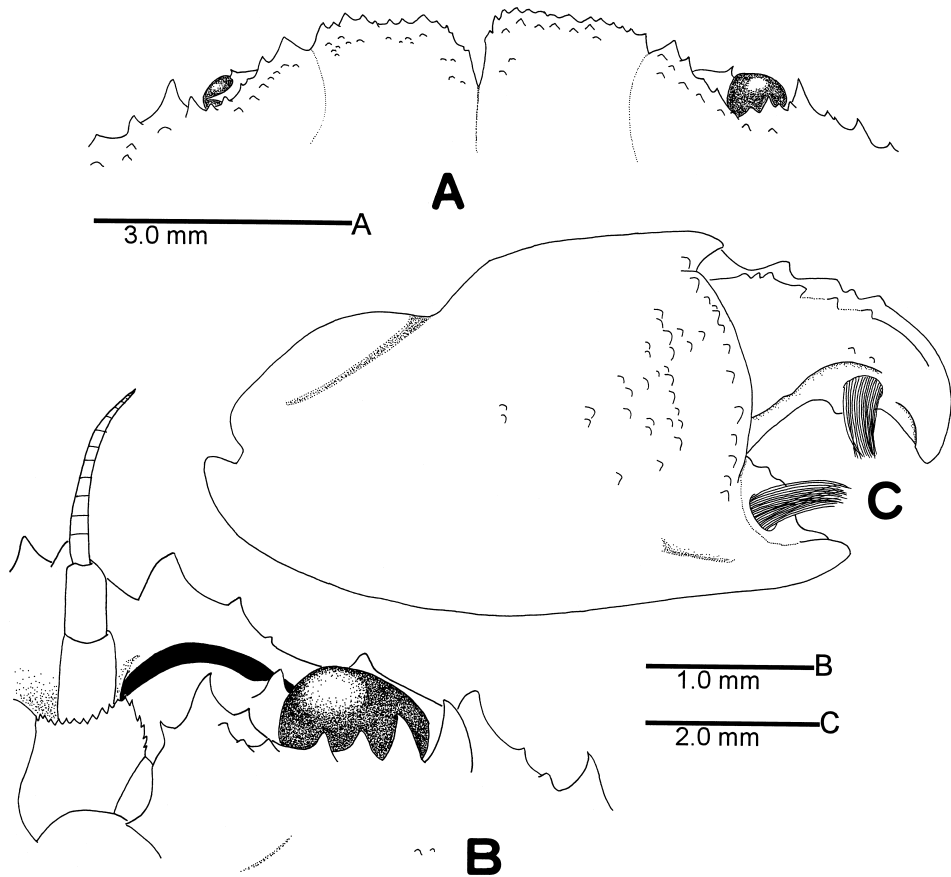


Fig. 4. *Palapedia rastripes* (Müller), male (13.4×11.4 mm, KMNH) (A, C), female (CW 16.3×CL 13.9 mm, KMNH) (B). A, frontal region of carapace, dorsal view; B, orbital region, ventral view; C, right chela, external view. A, B, setae omitted; C, pigmentation on fingers omitted.

ki Komai of the Natural History Museum and Institute, Chiba, for examination of the topotypic material of *P. truncatifrons*.

References

- Alcock, A., 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa, or Grapsoidea. *J. Asiat. Soc. Bengal*, (2), **69**: 280–456.
- Balss, H., 1938. Die Dekapoda Brachyura von Dr Sixten Bocks Pazifik-Expedition 1917–1918. *Göteborg. K. Vet.-och Vit.-Samh. Hand.*, (B), **5** (7): 1–85, pls. 1, 2.
- Borradaile, L. A., 1900. On some crustaceans from the South Pacific. Part IV. The crabs. *Proc. Zool. Soc. London*, **1900**: 568–596, pls. 40–42.
- Garth, J. S., J. Haig & W. Knudsen, 1987. Crustacea Decapoda (Brachyura and Anomura) of Enewetak Atoll. In D. M. Devaney, E. S. Reese, B. L. Burch & P. Helfrich (eds.), *The Natural History of Enewetak Atoll. Vol. 2. Biogeography and Systematics*, pp. 235–261. U. S. Department of Energy, Office of Scientific and Technical Information, Oak Ridge, Tennessee.
- Minemizu, R., 2000. *Marine Decapod and Stomatopod Crustaceans Mainly from Japan*. 344 pp. Bun-ichi Sogo Shuppan, Tokyo. (In Japanese.)
- Miyake, S., 1939. Notes on Crustacea Brachyura collected by Professor Teiso Esaki's Micronesia Expedition 1937–1938 together with a check list of Micronesian Brachyura. *Rec. Oceanogr. Wks Japan*, **10**: 168–247, pls. 12–17.
- Miyake, S., 1983. *Japanese Crustacean Decapods and Stomatopods in color. II. Brachyura (crabs)*. 277 pp., 64 pls. Hoikusha, Osaka. (In Japanese.)
- Müller, F., 1887. Zur Crustaceenfauna von Trincomali. *Verh. Nat. Ges. Basel*, **3**: 470–485, pls. 4, 5.
- Nagai, S., 1989. Brachyuran fauna of Wakayama Prefecture II. *Nankiseibutsu*, **31**: 115–120. (In Japanese.)
- Ng, P. K. L., 1993. Kraussii/nae, a new subfamily for the genera *Kraussia* Dana, 1852, *Palapedia*, new genus, and *Garthasia*, new genus (Crustacea: Decapoda: Brachyura: Xanthidae), with descriptions of two new species from Singapore and the Philippines. *Raffles Bull. Zool.*, **41**: 133–157.
- Ishiba, E., M. Furuta, T. Kataoka, T. Nakano, M. Sekido, M. Saba, S.-I. Tanaka, Y. Tomida, Y. Yamamoto, N. Yamashita & T. Yamashita (Research Group on Brachyura), 1983. Brachyuran fauna of Ise Bay, and the northern and the middle parts of Kumano-nada. *Bull. Mie Pref. Mus., (Nat. Sci.)*, (5): 1–78. (In Japanese with English summary.)
- Poupin, J., 1996. Crustacea Decapoda of French Polynesia (Astacidea, Palinuridea, Anomura, Brachyura). *Atoll Res. Bull.*, (442): 1–114.
- Sakai, T., 1974a. Notes from the carcinological fauna of Japan (V). *Res. Crust.*, (6): 86–102, 1 frontispiece. (In English and Japanese.)
- Sakai, T., 1974b. On some systematically interesting crabs from Japan. *Proc. Jap. Soc. Syst. Zool.*, (10): 10–14. (In Japanese with English abstract and summary.)
- Sakai, T., 1976. *Crabs of Japan and the Adjacent Seas*. 773 pp. (English), 461 pp. (Japanese), 251 pls. Kodansha, Tokyo.
- Serène, R., 1972. Observations of the Indo-pacific species of *Kraussia* Dana 1852 (Decapoda: Brachyura). *J. Roy. Soc. W. Aust.*, **55**: 41–62.
- Takeda, M., 1971 (1972). New and rare crabs from the Palau Islands. *Micronesica*, **7**: 185–213.
- Takeda, M., 1978. Biogeographical notes on the crabs obtained by dredging at the sea around Nii-jima and Oshima, Izu Islands. *Mem. Natn. Sci. Mus.*, (11): 73–80. (In Japanese with English summary.)
- Takeda, M. & S. Shimazaki, 1974. Studies on the Crustacea Brachyura of the Palau Islands. II. Atelecyclidae, Portunidae, Goneplacidae, Pinnotheridae and Palicidae. *Bull. Lib. Arts & Sci. Cour., Nihon Univ. Sch. Med.*, (2): 41–79, pls. 1–4.
- Tanaka, S., 1978. Mie-ken san kani rui sou-mokuroku, sono 5 [Checklist of brachyurans from Mie Prefecture, part 5]. *Mieseibutsu*, (27): 3–9. (In Japanese.)
- Tweedie, M. W. F., 1950. The fauna of the Cocos-Keeling Islands, Brachyura and Stomatopoda. *Bull. Raffles Mus.*, (22): 105–148, pls. 16, 17.
- Yokota, M., 1992. Crab & shrimp watching. *Kraussia truncatifrons*. *Izu Ocean. Park Div. News*, **3** (10): 8. (In Japanese.)