

Neotype Designation of *Crangon affinis* (Decapoda, Caridea, Crangonidae)

Ken-Ichi Hayashi and Jung Nyun Kim

National Fisheries University, Nagata-honmachi, Shimonoseki 759-6595, Japan

(Received January 22, 1998)

In spite of its ecological and commercial significance, the taxonomy of the *Crangon affinis* complex has been much confused and requires a thorough revision. The specimens from Japanese waters which were previously referred to *C. affinis* or other closely related taxa have been reexamined. The type material of *C. affinis* is no longer extant, and a specimen from Yokosuka, Japan, referred to *C. vulgaris* by Bate (1888), has been selected as a neotype of *C. affinis*. It has been shown that *C. consobrinus* De Man is a junior subjective synonym of *C. affinis*. As a first step for a revision of *Crangon* in Far Eastern seas, the neotype is described in detail with figures.

Key words: neotype, *Crangon affinis*, Crangonidae, Caridea, Decapoda, taxonomy

Shrimps of the genus *Crangon* Fabricius, which is characterized by having one median gastric spine, an arthrobranch of the third maxilliped, and a ventral spine on the merus of the first pereopod, are commonly found on a sandy mud bottom in the littoral and sublittoral zones of the Far Eastern seas.^{1–4)} They play an important role in the food chain of coastal soft bottom communities and some species have considerable commercial value.^{1–7)} Recently, they have received particular attention as a predator of settling and newly-settled flat fishes.^{8,9),*1,*2} However, the taxonomic status of Far Eastern species assigned to this genus is so confused that Holthuis¹⁰⁾ suggested a complete revision of *C. affinis* De Haan¹¹⁾ and its species complex of the nine nominal taxa which have been placed in the synonymy of *C. affinis*. In order to resolve this taxonomic problem the status of *C. affinis* must first be established.

Materials and Methods

The carapace length (CL) of specimens was measured from the posterior margin of the orbit to the mid-dorsal posterior margin of the carapace; the rostrum length was measured from the tip of the rostrum to the posterior margin of the orbit; the antennal scale length was measured along the lateral margin from the tip of the distolateral spine to the posterior end of the lateral margin; and in the first pereopod the longest palm length and the broadest palm width were measured. The drawings were made with the aid of a WILD stereomicroscope with a drawing tube.

Specimens examined in this study are deposited in the institutions indicated by the following abbreviations: NHM=the Natural History Museum, London, RMNH=Nationaal Natuurhistorisch Museum, Leiden, USNM=National Museum of Natural History, Smithsonian Institution, Washington, D.C. The following abbreviations are also used in the text: coll.=collected, det.=determined, fms=fathoms, juv.=juvenile, ovig.=ovigerous,

and sta.=station.

Results

Crangon affinis De Haan, 1849

(Figs. 1, 2)

Restricted Synonymy

Crangon affinis De Haan, 1849: 183 (type locality: Japan);¹¹⁾ Bate, 1888: 484, pl. 86, figs. 1–3;¹²⁾ Ortmann, 1890: 531.¹³⁾

Crangon vulgaris—Bate, 1888: 484.¹²⁾ Not *Crangon vulgaris* Fabricius, 1798 (= *Crangon crangon* Linnaeus, 1758).^{10,14)}

Crangon crangon affinis—Ortmann, 1895: 180 (in part; no new locality);¹⁵⁾ Doflein, 1900: 325 (in part; no new locality).¹⁶⁾

?*Crangon crangon affinis*—Doflein, 1902: 642.¹⁷⁾

Crangon propinquus—Rathbun, 1902: 42.¹⁸⁾ Not *Crangon propinquus* Stimpson, 1860.

Crangon consobrinus De Man, 1906: 401 (type locality: Inland Sea of Japan);¹⁹⁾ 1907: 405, pl. 31, figs. 16–19 (no new locality).²⁰⁾

Material Examined

HMS *Challenger*, sta. 233, Bay of Kobé, Japan, 34°39'N, 135°14'E, 8 fms; 17 May 1875; 8 ovig. ♀ (CL 10.0–11.0 mm); det. C. S. Bate;¹²⁾ NHM 1888.22. HMS *Challenger*, sta. 233a, off Japan (Seto Inland Sea), 34°38'N, 135°1'E, 50 fms; 19 May 1875; 4 ovig. ♀ (CL 9.9–10.9 mm); det. C. S. Bate;¹²⁾ NHM 1888.22. HMS *Challenger*, sta. 233b, off Japan (Seto Inland Sea), 34°18'N, 133°35'E, 15 fms; 26 May 1875; 3 ovig. ♀ (CL 10.0–11.0 mm), 1 ♂ (CL 7.3 mm); det. C. S. Bate;¹²⁾ NHM 1888.22. Inland Sea of Japan; 1 ovig. ♀ (CL 9.9 mm); holotype of *C. consobrinus* De Man, 1906;¹⁹⁾ NHM 1907.4.27.13. Aomori, Japan; summer 1900; coll. D. S.

*1 S. Mori: Abst. Metg. Japan. Soc. Fisheries Sci., September, 1997, p. 171 (in Japanese).

*2 T. Minami: Abst. Metg. Japan. Soc. Fisheries Sci., September, 1997, p. 173 (in Japanese).

Jordan and J. O. Snyder; 3 ♀ (CL 11.6–12.6 mm); referred to *C. propinquus*,²¹⁾ det. M. J. Rathbun;¹⁸⁾ USNM 26335. Yokoska [Yokosuka], Japan, 5–20 fms; coll. HMS Challenger, 2 ovig. ♀ (CL 8.3, 9.1 mm), 1 juv. (CL 5.0 mm); referred to *C. vulgaris*,²²⁾ det. C. S. Bate;¹²⁾ NHM 1888.22.

Comparative Material

Crangon crangon: definite locality unknown; 3 ovig. ♀ (CL 12.1–15.1 mm); previously considered as syntypes of *C. affinis*; RMNH.

Diagnosis

Integument pubescent. Rostrum moderately long (0.20–0.24 times as long as carapace), usually reaching tip of eyes. Fourth abdominal somite with trace of mid-dorsal carina on posterior half, fifth somite with low but distinct mid-dorsal carina, sixth somite flattened or somewhat grooved dorsally and grooved ventrally. Telson with shallow median groove. Antennal scale 0.85–0.96 times as long as carapace. Third maxilliped with tuft of five spines on distoventral surface of antepenultimate segment. Palm of first pereopod 3.5–3.8 times as long as broad. Carpus of third pereopod 1.9–2.6 times as long as distal two segments combined. Fourth and fifth pereopods more robust than second and third pereopod, dactylus 1.0–1.3 times as long as carpus in fourth pereopod, 0.9–1.1 times in fifth pereopod. Thoracic sternite with acute median spine between coxae of second pereopods in ovigerous females.

Neotype Designation

The types of *Crangon affinis* De Haan are no longer extant. Therefore the ovigerous female originally identified by Bate¹²⁾ as *Crangon vulgaris* (CL 8.3 mm; NHM 1888.22) is designated the neotype of *C. affinis*.

Description of Neotype

Body depressed. Integument not particularly firm and pubescent.

Rostrum (Fig. 1a, b) about 0.2 times as long as carapace, reaching tip of eyes, somewhat descending and acute at tip. Carapace (Fig. 1a, b) with median gastric spine arising from anterior one-fifth; hepatic spine supported by short carina; moderate antennal, strong branchiostegal and weak pterygostomial spines; lateral margin of rostrum extending posteriorly over orbital fissure as ridge beyond mid-length of carapace.

First to third abdominal somites rounded dorsally. Dorsal surface faintly carinate in posterior half of fourth somite and apparently carinate over entire length of fifth somite. Sixth somite flattened dorsally and grooved ventrally, with short preanal spine. Telson slender and gradually tapering, faintly grooved dorsally.

Eye (Fig. 1a, b) moderately large; cornea well developed; dorsal tubercle small.

First antenna (Fig. 1a, b) depressed, with peduncle reaching slightly beyond midlength of antennal scale. Proximal segment longer than distal two segments combined. Stylocerite falling slightly short of anterior margin of proximal segment; lateral margin curved mesially, with shallow lateral sulcus. Distal two segments subequal in length. Outer flagellum reaching blade of antennal scale; inner flagel-

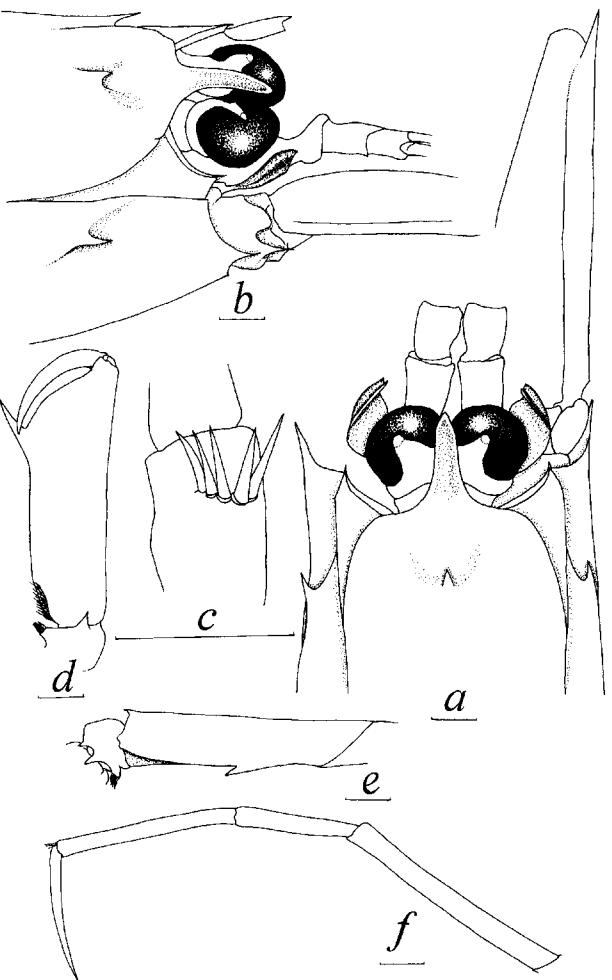


Fig. 1. *Crangon affinis* De Haan, 1849.

Neotype, ovigerous female (CL 8.3 mm) from Yokoska, Japan. a, anterior part of carapace and cephalic appendages, distal part of antennular peduncle not figured and setae omitted, dorsal; b, same, dorso-lateral; c, subterminal spines of antepenultimate segment of right third maxilliped, ventral; d, chela of left first pereopod, flexor; e, carpus and merus of first pereopod, flexor; f, left fourth pereopod, lateral. Scale 1 mm.

lum longer than outer flagellum. Antennal scale (Fig. 1a, b) as long as carapace; lateral margin nearly straight; distolateral spine slightly curved outward, exceeding rounded blade.

Third maxilliped reaching blade of antennal scale, with well developed exopod; ultimate segment slightly longer than penultimate segment; antepenultimate segment with tuft of five spines on ventral margin near distal end (Fig. 1c).

First pereopod (Fig. 1d, e) subchelate, almost reaching blade of antennal scale; palm (Fig. 1d) moderately slender, about 3.6 times as long as broad, cutting edge moderately oblique; movable finger not overreaching base of fixed finger when closed; carpus (Fig. 1d, e) short, with two laterodistal spines; merus (Fig. 1e) with strong spine at mid-length of ventromesial margin and weak spine on dorsodistal margin. Fourth pereopod (Fig. 1f) reaching end of third maxilliped; dactylus moderately curved, 0.8 times as long as propodus; propodus 1.3 times as long as carpus.

Thoracic sternite concave, with long median spine be-

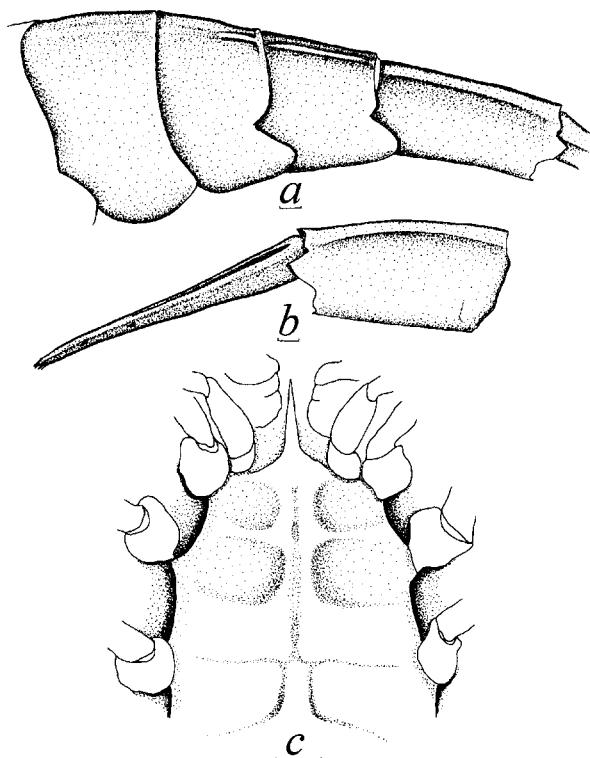


Fig. 2. *Crangon affinis* De Haan, 1849.

a, c, Holotype of *Crangon consobrinus* De Man, 1906, ovigerous female (CL 9.9 mm) from Inland Sea of Japan; *b*, ovigerous female (detached part) from Challenger St. 233a, Inland Sea of Japan; *a*, third to sixth abdominal somites, dorso-lateral; *b*, sixth abdominal somite and telson, dorso-lateral; *c*, thoracic sternum. Scale 1 mm.

tween coxae of second pereopods.

Discussion

Yamaguchi²³⁾ indicated that the type series of *C. affinis* is no longer extant. The three ovigerous females in the RMNH collection, which were previously considered to be the types of *C. affinis*, have been reexamined during the present study. According to Prof. L. B. Holthuis (RMNH, pers. comm.), these materials are no longer considered to be a part of the Siebold or Bürger Collections and are now proved to be European *C. crangon*. Although the original description of *C. affinis* is brief and insufficient,¹¹⁾ without mention about the abdominal features, the following characters can be detected: the third maxilliped overreaches the blade of the antennal scale; the fifth pereopod reaches the distal end of the first pereopod; the telson is slender with a median groove; the rostrum is slightly descending; the antennal scale is as long as the carapace and the lateral sides are parallel.

The present material, including the holotype of *C. consobrinus* De Man, is well consistent with the above features, except for the length of the third maxilliped. In comparison with the original description of *C. affinis*, De Man²⁰⁾ emphasized this point as well as the length of the antennal scale. However, these characters are rather variable and the features of De Man's and De Haan's types are within the range of the individual variation. The third maxilliped usually reaches to or sometimes beyond the blade of

the antennal scale (K. Hayashi and J. N. Kim: Natl. Fish. Univ., unpubl. data). *C. affinis* is one of the species bearing the longest thoracic appendages and the longest antennal scale among the Far Eastern species of the genus *Crangon*.

Due to the absence of the abdominal features in the original description,¹¹⁾ subsequent authors could not evaluate adequately the taxonomic importance of that feature in *C. affinis*. Brashnikov²⁴⁾ suggested that the abdomen of *C. affinis* did not differ in sculpture from that of *C. vulgaris*, i.e. it lacked any sculpture. On the other hand, Bate¹²⁾ pointed out the presence of the abdominal carinae in the account for his *C. affinis*. All the *Challenger* specimens referred to *C. vulgaris* or *C. affinis* by Bate,¹²⁾ the specimens identified to *C. propinquus* by Rathbun¹⁸⁾ and the holotype of *C. consobrinus*,^{19,20)} have a median carina on two abdominal somites; one obscurely present on the posterior half of the fourth somite and the other more distinct on the entire length of the fifth somite (Fig. 2a). These carinae are sometimes not easy to find, because they are usually concealed by the dense short setation. Furthermore, this species has a dorso-median groove on the telson (Fig. 2b). These abdominal features may be the most important and the best characteristics to separate *C. affinis* from other related species. A slender spine on the thoracic sternite in ovigerous females (Fig. 2c) is also specific for this species as mentioned by both Bate¹²⁾ and De Man.²⁰⁾

Ortmann¹³⁾ compared a specimen of *C. affinis* from Maizuru, Japan, with *C. vulgaris*. De Man²⁰⁾ reexamined this Ortmann's specimen and synonymized it with *C. consobrinus*. Later Ortmann¹⁵⁾ relegated *C. affinis* under the subspecific status of *C. crangon* without comment. Although this material was not examined, Ortmann's¹³⁾ specimen is thought to be synonymous with *C. affinis*. Doflein's¹⁷⁾ report of *Crangon crangon affinis* from Nemuro, Hokkaido, needs to be verified, as there is no evidence to support the occurrence of the true *C. affinis* from eastern Hokkaido. Most modern references to *C. affinis* actually include more than one species, and to identify the actual species involved will require the examination of specimens as is the case for Doflein's¹⁷⁾ material mentioned above.

Confirmed Japanese localities of *C. affinis* by the present study now include Aomori,¹⁸⁾ Yokosuka, Tokyo Bay,¹²⁾ Seto Inland Sea,^{12,19,20)} and Maizuru, the Sea of Japan¹³⁾ at depths of sublittoral to about 100 meters.

Acknowledgments We wish to express our sincere gratitude to Dr. L. B. Holthuis (RMNH) for a loan and information about the specimens referred to the syntypes of *C. affinis* and for kind reviewing the manuscript, and also Drs. P. F. Clark (NHM) and P. J. F. Davie (Queensland Museum, Brisbane) for critical reading of the manuscript. We are also much indebted to Drs. R. B. Manning (USNM) for a loan of the important materials and A. L. Rybakov (Institute of Marine Biology, Vladivostok) for a translation of Russian reference. One of us (K.H.) would particularly like to thank Drs. L. B. Holthuis, C. H. J. M. Fransen (RMNH) and P. F. Clark for providing facilities to examine old Japanese specimens of this genus deposited at their museums. Part of this work was supported by a Grant from the Mikimoto Fund for Marine Ecology.

References

- 1) J. Yasuda: Ecological study of each species. Biological study of shrimp resources in Seto Inland Sea (II). *Bull. Naikai Reg. Fish.*

- Res. Lab.*, (9), 1–81 (1956) (in Japanese).
- 2) J. Yasuda: Species, distribution, movement and composition of shrimps. Study of rationalization of the shrimp fisheries in Seto-Inland Sea II. *Bull. Naikai Reg. Fish. Res. Lab.*, (10), 28–36 (1957) (in Japanese).
 - 3) Y. Hayashi: Relation between environmental factor and marine fauna (on the small trawl fishery in Osaka Bay, 1970). *Bull. Osaka Pref. Fish. Sta.*, (4), 42–75 (1974) (in Japanese).
 - 4) Y. Hayashi: Change of the catch composition on the beam shrimp-trawl (on the small trawl fishery in Osaka Bay, 1972). *Bull. Osaka Pref. Fish. Sta.*, (4), 76–92 (1974) (in Japanese).
 - 5) J. Y. Liu: Economic shrimps and prawns of northern China, Marine Biological Institute, Academy of Sciences, Beijing, 1955, i–iii, p. 73 (in Chinese).
 - 6) E. Harada: Seasonal changes in distribution and abundance of some decapod crustaceans. Ecology and biological production of Lake Naka-umi and adjacent regions, 5. *Spec. Publ. Seto Mar. Biol. Lab.*, (2)2, 75–103 (1968).
 - 7) S. Y. Hong and C. W. Oh: Ecology of sand shrimp, *Crangon affinis* in the Nakdong River Estuary, Korea. *Bull. Korean Fish. Soc.*, 22, 351–362 (1989) (in Korean with English abstract).
 - 8) T. Seikai, I. Kinoshita, and M. Tanaka: Predation by crangonid shrimp on juvenile Japanese flounder under laboratory conditions. *Nippon Suisan Gakkaishi*, 59, 321–326 (1993).
 - 9) Y. Yamashita, H. Yamada, K. D. Malloy, T. E. Targett, and Y. Tsuruta: Sand shrimp predation on settling and newly-settled stone flounder and its relationship to optimal nursery habitat selection in Sendai Bay, Japan, in “Survival strategies in early life stages of marine resources” (ed. by Y. Watanabe, Y. Yamashita, and Y. Oozeki), A. A. Balkema, Rotterdam, 1996, pp. 271–283.
 - 10) L. B. Holthuis: FAO species catalogue, vol. 1. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125) 1, i–xvii, 1–271 (1980).
 - 11) W. De Haan: Crustacea, in, “P. F. von Siebold, Fauna Japonica sive Descriptio Animalium, quae in Itinere per Japoniam, Jussu et Auspiciis Superiorum, qui Summum in India Batava Imperium Tenent, Suscepto, Annis 1823–1830 Collegit, Notis, Observationibus et Adumbrationibus Illustravit”, ix–xvi, i–xxxii, vii–xvii, pp. 1–243, pls. A–J, L–Q, 1–55, circ. tab. 2 (1833–1850).
 - 12) C. S. Bate: Report on the Crustacea Macrura dredged by H.M.S. *Challenger* during the years 1873–76. *Rep. Voy. Challenger, Zool.*, 24, 1–942 (1888).
 - 13) A. Ortmann: Die Unterordnung Natantia Boas. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berück-
sichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und z. Z. im Strassburger Museum aufbewahrten Formen. Theil. I. *Zool. Jahrb. Syst.*, 5, 437–542 (1890).
 - 14) K. Tiews: Synopsis of biological data on the common shrimp *Crangon crangon* (Linnaeus, 1758), in “Proceedings of the world science conference on the biology and culture of shrimps and prawns” (ed. by M. N. Mistakidis), *FAO Fish. Rep.*, (57) 4, 1970, pp. 1167–1224.
 - 15) A. Ortmann: A study of the systematic and geographic distribution of the decapod family Crangonidae Bate. *Proc. Acad. Nat. Sci. Philad.*, 47, 173–197 (1895).
 - 16) F. Doflein: Die dekapoden Krebse der arktischen Meere, in “Fauna Arctica. Eine Zusammenstellung der arktischen Tierarten, mit besonderer Berücksichtigung des Spitzbergen-Gebietes auf Grund der Ergebnisse der Deutschen Expedition in das Nördliche Eismeer im Jahre 1898” (ed. by F. Römer und F. Schaudinn), 1, 313–362 (1900).
 - 17) F. Doflein: Ostasiatische Dekapoden. *Abh. Bayer. Akad. Wiss.*, 21, 613–670 (1902).
 - 18) M. J. Rathbun: Japanese stalk-eyed crustaceans. *Proc. U.S. Nat. Mus.*, 26, 23–55 (1902).
 - 19) J. G. De Man: Diagnoses of five new species of decapod Crustacea and of the hitherto unknown male of *Spirontocaris rectirostris* (Stimp.) from the Inland Sea of Japan, as also of a new species of *Palaemon* from Darjeeling, Bengal. *Ann. Mag. Nat. Hist.*, (7) 17, 400–406 (1906).
 - 20) J. G. De Man: On a collection of Crustacea, Decapoda and Stomatopoda, chiefly from the Inland Sea of Japan; with descriptions of new species. *Trans. Linn. Soc. Lond.*, (2) 9, 387–454 (1907).
 - 21) W. Stimpson: Prodromus descriptionis animalium vertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, C. Ringgold et J. Rodgers Ducibus, observavit et descripsit. *Proc. Acad. Nat. Sci. Philad.*, 12, 22–47 (1860).
 - 22) J. C. Fabricius: Supplementum Entomologiae Systematicae, 1798, p. 572 (not seen).
 - 23) T. Yamaguchi: A list of species described in the Crustacea volume of Fauna Japonica as belonging to the Japanese fauna, in “Ph. F. von Siebold and natural history of Japan, Crustacea” (ed. by T. Yamaguchi), The Carcinological Society of Japan, Tokyo, 1993, pp. 571–596.
 - 24) V. Brashnikov: Matériaux pour servir à la connaissance de la faune des mers russes de l'est rassemblés par le shooner “Storoz” en 1899–1902. *Mem. Acade. Sci. Petersb.*, (8) 20, 1–185 (1907) (in Russian).