

midlength of antennal scale, propodus 0.78–0.86 (average 0.81) times as long as carpus; ischium with broad laminar expansion. Second pereopods (Figs. 1, 2l) subequal, extending beyond antennal scale by length of fingers and sometimes slightly more than distal part of propodus, 16–19 (frequently 17 or 18) carpal articles; fingers 0.60–0.75 (average 0.67) times as long as palm. Third pereopod (Figs. 1, 3a, b) extending beyond antennal scale by length of dactylus and slightly more than distal one-fourth of propodus; dactylus 0.20–0.24 (average 0.22) times as long as propodus, armed with 5–7 (frequently 6) ventral spinules on proximal two-thirds in addition to subapical spinule; propodus with numerous scattered tufts of setae (becoming more dense distally) and spinules on lateral and ventral margins; carpus armed with 2 or 3 lateral spines, with numerous short setae and scattered spinules on dorsal surface; merus armed with 5–10 (frequently 7 or 8) lateral and 5–7 (frequently 6 or 7) ventral spines, with several short setae along dorsal margin; ischium with ventral spine. Fourth pereopod (Figs. 1, 3c, d) similar to 3rd, extending beyond distal margin of antennal scale by length of dactylus; dactylus 0.18–0.21 (average 0.20) times as long as propodus, armed normally with 5 or 6 (frequently 6) spinules on proximal two-thirds in addition to subapical spinule; propodus with numerous scattered tufts of setae (becoming more dense distally) and spinules on lateral and ventral margins; carpus armed with 2 or 3 lateral spines, many short setae and scattered spinules on dorsal margin (slightly less setulose than 3rd); merus armed with 6–8 (frequently 7) lateral and 5–7 (frequently 6) ventral spines, with some short setae on dorsal margin; ischium with ventral spine. Fifth pereopod (Figs. 1, 3e, f) reaching as far as distal margin of antennal scale; dactylus 0.13–0.19 (average 0.16) times as long as propodus, armed with 6–8 (frequently 6)

ventral spinules on proximal two-thirds in addition to subapical spinule; propodus with numerous scattered tufts of setae (becoming more dense distally) and spinules on lateral and ventral margins; carpus armed with 2 or 3 lateral spines, with short setae and spinules on dorsal margin (less setulose than 4th); merus armed with 6–9 (frequently 7) lateral and 0–7 ventral spines, with some short setae on dorsal margin.

Epipods on first 4 pereopods and branchial arrangement as in genus (cf. Boschi, 1973; Komai, 1994).

Endopod of 1st pleopod in transitional male bilobed, distomesial lobule long and narrow (Fig. 3g). In females, endopod abruptly narrowing distally (Fig. 3i). Appendix masculina in transitional males as long as or slightly shorter than appendix interna, distal bristles reduced (Fig. 3h). In females, appendix masculina considerably reduced in size, half length of appendix interna, armed with several setae distally (Fig. 3i). Third pleopod with exopod about half length of carapace.

Egg.—Non-eyed eggs oval, 3.6–3.8 x 2.6–2.7 mm.

Colour.—Carapace mottled with large light red patches and abdomen with transverse light red stripes basically at posterior part of each somite. Appendages generally light red (based on frozen specimens).

Etymology.—The Latin "*spinosior*" refers to a greater number of telson spines compared with the closest relative *P. miyakei*.

Distribution.—The definite sample site is unknown, but the specimens examined in this study were captured by a deep sea otter trawl operated at depths around 400 m in the waters between the Etorofu (Iturup) and Urup Islands (Urup or Etorofu Strait) in the Kuril Islands. *Pandalopsis spinosior* co-occurs with a bighead thornyhead, *Sebastolobus macrochir* (Günter). The Japanese trawling vessels operate in that region, target-

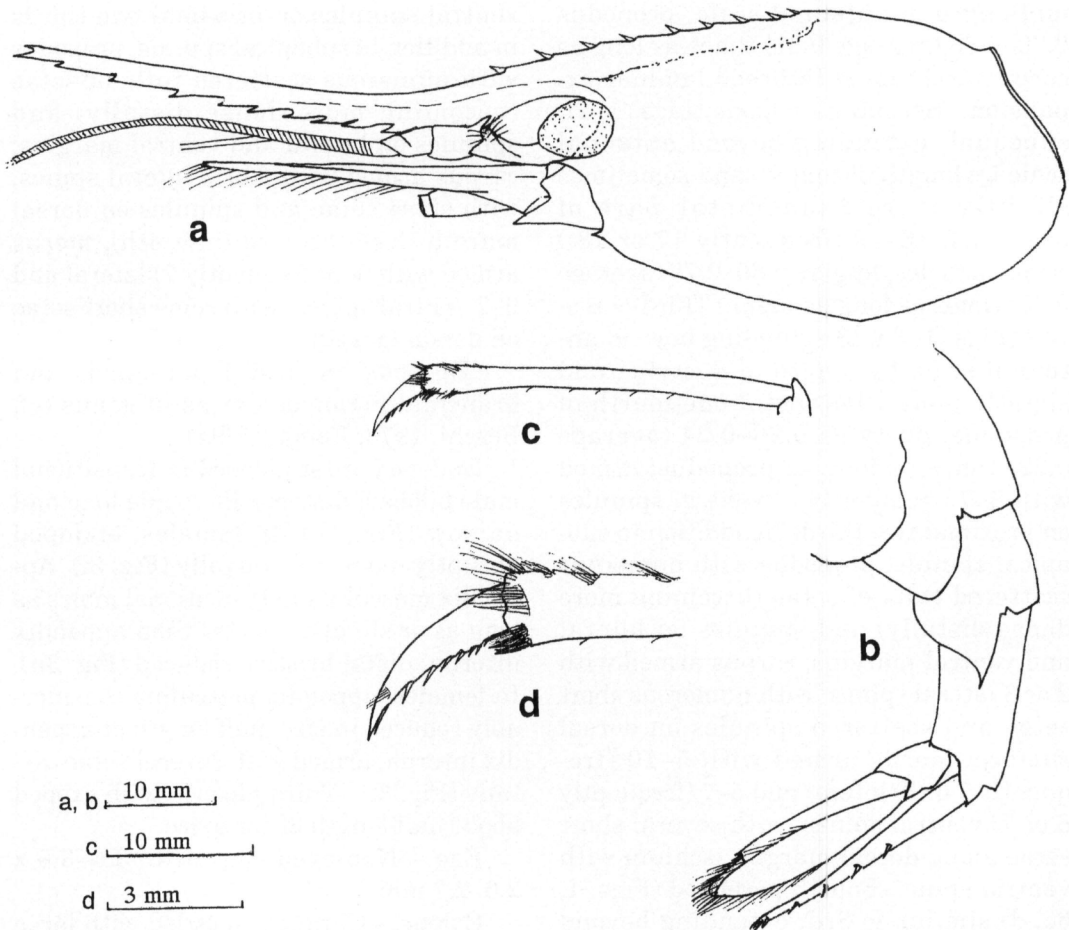


Fig. 4. *Pandalopsis miyakei* Hayashi, 1986, female from Tosa Bay, cl 37.0 mm (NSK Dec 00027): a, anterior part of body; b, posterior part of body; c, left dactylus and propodus of 5th pereopod; d, same, dactylus enlarged.

ing mainly this fish.

Remarks.—Komai (1994) suggested the identity of *Pandalopsis profunda* Zarenkov, 1971, to be an immature of *P. miyakei*, but confirmation demands future studies. Hence, the genus *Pandalopsis* contains 15 recognized species to date. The identification key provided by Komai (1994, 1997) is useful in the recognition of the species of *Pandalopsis* by the addition of *P. lucidirimicola* Jensen, 1998, a recently described species from the eastern Pacific.

Of the known species of *Pandalopsis*, the new species shows the closest affinity

to *P. miyakei* in having a combination of the following features: the carapace is naked; the rostrum is unarmed, at least in distal half of the dorsal margin, with usually six or more postorbital spines (one specimen of *P. spinosior* possesses five spines); the proximalmost spine of the ventral rostral series is subequal to the length of the second spine; the outer flagellum of the first antenna has a basal aesthetasc-bearing portion consistently shorter than the carapace; and the dactyli of the posterior three pereopods are armed with ventral spinules on almost its entire length.

Comparison with five specimens of *P. miyakei*, collected in Tosa Bay off the Pacific coast of south-west Japan (NSK Dec 00027; Fig. 4), revealed following differences. The anteriormost dorsal rostral spine (except the subapical group) is situated anterior to the distal margin of the antennular peduncle while it arises above the antennular peduncle in *P. miyakei*; the lateral carina of the rostrum is sharp, extending to near apex of the rostrum in *P. spinosior* rather than an obtusely rounded carina reaching at most the midlength in *P. miyakei*. The pleuron of the fourth abdominal somite of the new species normally possesses a posteroventral spine instead of usually having no spine in *P. miyakei*. The propodi of the posterior three pereopods are more heavily setose than in *P. miyakei*. The telson bears seven or eight dorsolateral spines rather than five spines on each margin, in addition to ordinary three terminal pairs in *P. miyakei*. The colour is also different, in that the entire body of *P. miyakei* is wine red or purplish (Hayashi, 1986; photo on p. 122) in contrast to light reddish in the new species.

The occurrence of a transitional phase in the appendix masculina implies that *Pandalopsis spinosior* is possibly a protandous hermaphroditic species as in other members of the genus (cf. Komai, 1994).

Acknowledgements

We would like to thank Mr. H. Odaira of Thoichi Reizo Co. for providing specimens for this study and associated facilities. We also appreciate to Dr T. Komai of the Natural History Museum and Institute, Chiba, for reading the manuscript and invaluable suggestions. Reviewers' comments helped to improve this paper.

Literature Cited

- Bate, C. S., 1888. Report on the Crustacea Macrura collected by the H. M. S. "Challenger" during the years 1873-76. Reports on the Scientific Results of the Voyage of H. M. S. "Challenger" during the Years 1873-76, 24: 1-942, 150 pls.
- Boschi, E. E., 1973. Aportes al conocimiento de tres especies de camarones de aguas profundas del Atlantico Sur (Crustacea, Caridea). *Physis*, (A), 32: 233-244.
- Butler, T. H., 1980. Shrimps of the Pacific coast of Canada. *Canadian Bulletin of Fisheries and Aquatic Sciences*, 202: 1-280.
- Hayashi, K., 1986. Penaeoidea and Caridea. In: Baba, K., Hayashi, K. & Toriyama, M., 1986. Decapod crustaceans from continental shelf and slope around Japan, 336 pp., Japan Fisheries Resource Conservation Association, Tokyo.
- Holthuis, L. B., 1980. FAO species catalogue. Vol. 1. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries. FAO Fisheries Synopsis, No. 125, 1: 1-271.
- Jensen, G. C., 1998. A new shrimp of the genus *Pandalopsis* (Decapoda: Caridea: Pandalidae) from the eastern Pacific, with notes on its natural history. *Species Diversity*, 3: 81-88.
- Kobjakova, Z., 1936. Übersicht der Dekapoden-Gattung *Pandalopsis* Bate. *Zoologischer Anzeiger*, 116: 185-194.
- Komai, T., 1994. Deep-sea shrimps of the genus *Pandalopsis* (Decapoda: Caridea: Pandalidae) from the Pacific coast of eastern Hokkaido, Japan, with the description of two new species. *Journal of Crustacean Biology*, 14: 538-559.
- , 1997. Redescription of a little known pandalid shrimp, *Pandalopsis lamelligera* (Brandt) (Crustacea: Decapoda: Caridea) based upon topotypic material from Shantar Islands, northern Okhotsk Sea. *Journal of the Natural History Museum and Institute, Chiba*, 4: 139-145.
- , & Amaoka, K., 1989. Records of some rare deep-sea decapod crustaceans from the Okhotsk coast of Hokkaido (Caridea and Anomura). *Bulletin of the Faculty of Fisheries, Hokkaido University*, 40: 278-291.
- Rathbun M. J., 1904. Decapod crustaceans of the northwest coast of North America. *Harriman Alaska Expedition*, 10: 1-210.
- Takeda, M. & Hatanaka, H., 1984. Records of decapod crustaceans from southwestern Atlantic collected by the Japanese fisheries trawlers. *Bulletin of the National Science Museum, series A (Zoology)*, 10: 7-24.

- Urita, T., 1941. On new shrimp of the genus *Pandalopsis* found in Hokkaido, Japan. *Zoological Magazine*, 53: 12–16. (In Japanese with English summary).
- Zarenkov, N. A., 1971. Contribution to the study of the species and of the geographic distribution of the marine shrimps belonging to the families Hippolytidae and Pandalidae (Crustacea Decapoda). *Complexnie Issledvaniia Prirodi Okeana, Moskovskogo Universiteta*, 2: 176–195. (In Russian).

Addresses: (YH) National Research Institute of Fisheries and Environment of Inland Sea, Ohno-cho, Hiroshima 739–0452, Japan; (HK) Hachinohe Station, Tohoku National Fisheries Research Institute, Samejima-cho, Hachinohe, Aomori 031–0841, Japan; (HS) Kuroshio Station, National Fisheries Research Institute of Fisheries Science, Sanbashi-dori, Kochi 780–0801, Japan.

E-mail: (YH) hanamura@nnf.affrc.go.jp