Deep-sea Fauna and Pollutants off Pacific Coast of Northern Japan, edited by T. Fujita, National Museum of Nature and Science Monographs, No. 39, pp. 495-580, 2009

Deep-sea Shrimps and Lobsters (Crustacea: Decapoda) from Northern Japan, Collected during the Project "Research on Deep-sea Fauna and Pollutants off Pacific Coast of Northern Japan"

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Abstract: A taxonomic report on deep-water dendrobranchiate and caridean shrimps and polychelid lobsters from northern Japan, mainly from northeastern Honshu (Aomori Prefecture to Ibaraki Prefecture), is presented. The collection consists of 64 species, belonging to 12 families. Two new species, *Metacrangon cornuta* sp. nov. (Caridea: Crangonidae) and *Lebbeus similior* sp. nov. (Caridea: Hippolytidae), are described and illustrated. Furthermore, the crangonid genus *Neocrangon* Zarenkov is rediagnosed and briefly reviewed. The validity of the hippolytid, *Spirontocaris brevidigitata* Kobjakova, is confirmed, and a brief review on this species is given. A detailed description accompanied with figures is presented for the little known hippolytid *Eualus townsendi* (Rathbun). Zoogeographically, the benthic fauna is divided into four major categories: those species having a widespread distribution in the northern part of the North Pacific, sometimes extending to the northwest coast of North America (16 species); those restricted to cold waters in East Asia (15 species); those restricted to temperate waters in East Asia, including Japanese Archipelago endemics (six species); and those widely distributed in the tropical Indo-West Pacific (12 species). The meso- and bathypelagic fauna is composed of two major groups: species widely distributed in the tropics of the Indo-Pacific and/or Atlantic Ocean (15 species); and species distributed in cold waters of the North Pacific Ocean (four species).

Key words: Crustacea, Decapoda, Dendrobranchiata, Caridea, Polychelida, northeastern Honshu, Japan, new species, new records.

Introduction

The deep-water shrimps and lobsters of the Pacific coast off northeastern Japan are at present only known from rather a few studies, although the area constitutes a major fishery ground in our country. The first organized biological survey of the continental shelf of Japan, conducted by S. S. *Soyo-maru* of the Imperial Fishery Experimental Station of Tokyo, during 1923-1930, included the northeastern part of Honshu. A collection of decapod crustaceans made by this survey was reported by Yokoya (1933), in which eight species were recorded from northeastern Honshu. Toriyama (1986) listed nine species of penaeoidean and caridean shrimps collected during a survey of the unexploited fisheries resourses on the continental slopes off northeastern Honshu in 1977-1979, organized by the Fisheries Agency of the Japanese Government. Other published works containing collections from the area include Yokoya (1939), Aizawa (1974), Miyake (1982), Baba (1986), Hayashi (1986), Kikuchi and Nemoto (1991), Komai (1991, 1993, 1994a, 1999), Komai and Takeda (1989), Komai and Amaoka (1992), Komai *et al.* (1992), Kim *et al.* (2000), and Komai and Kim (2004). A checklist of species that have been recorded from off northeastern Honshu from Aomori Prefecture to Fukushima Prefecture is given in Table 1.

Since 2005, in cooperation with the Fisheries Research Agency (FRA), the National Museum and Nature and Science, Tokyo, has been carrying out a series of trawl surveys along the coast of northeastern Honshu, extending from Aomori Prefecture to Ibaraki Prefecture, with the purpose of

Table 1. Checklist of deep-water species of penaeoidean and caridean shrimps and polychelid lobsters known from off north-eastern Honshu, Japan. *: species not represented in the present collection.

Taxa	Source
Infraorder Penaeidea	
Family Aristeidae	
Aristaeomorpha foliacea (Risso, 1827)	Toriyama (1986); Komai (1993); this study
Aristeopsis edwardsiana (Johnson, 1867)*	Komai (1993, as *Plesiopenaeus edwardsianus*)
Aristeus mabahissae Ramadan, 1938	Komai (1993); this study
Aristeus pallidicauda Komai, 1993*	Komai (1993)
Aristeus virilis Bate, 1881*	Toriyama (1986); Komai (1993)
Family Benthesicymidae	
Bentheogennema borealis (Rathbun, 1902)	Aizawa (1974); this study
Benthesicymus crenatus Bate, 1881	Kim *et al.* (2000)
Benthesicymus investigatoris Alcock and Anderson, 1899	Toriyama (1986; as *B. altus*); Kikuchi and Nemoto (1991); this study
Gennadas incertus (Balss, 1927)	Aizawa (1974); this study
Gennadas propinquus (Rathbun, 1906)	Aizawa (1974); this study
Gennadas parvus Bate, 1881	Aizawa (1974); this study
Family Penaeidae	
Funchalia taaningi Burkenroad, 1940	this study
Penaeopsis eduardoi Pérez-Farfante, 1976	this study
Family Solenoceridae	
Hymenopenaeus aequalis (Bate, 1888)	this study
Family Sergestidae	
Eusergestes similis (Hansen, 1903)	this study
Neosergestes orientalis (Hansen, 1919)	this study
Parasergestes armatus (Krøyer, 1855)	this study
Sergia japonica (Bate, 1881)	this study
Sergia prehensilis (Bate, 1881)	this study
Sergia regalis (Gordon, 1939)	this study
Sergia talismani (Barnard, 1947)	this study
Infraorder Caridea	
Family Crangonidae	
Argis hozawai (Yokoya, 1939)	Yokoya (1939); Komai and Amaoka (1992); this study
Argis lar (Owen, 1839)	Miyake (1982); this study
Crangon dalli Rathbun, 1902	Hayashi and Kim (1999); this study
Metacrangon nipponensis (Yokoya, 1933)	Yokoya (1933); this study
Metacraogon trigonorostris (Yokoya, 1933)	Yokoya (1933); this study
Metacrangon sp.	this study
Neocrangon abyssorum (Rathbun, 1902)	Kim et al. (2000); this study
Neocrangon communis (Rathbun, 1899)	Yokoya (1933); Miyake (1982); this study
Neocrangon sagamiensis (Balss, 1913)	Yokoya (1933); this study
Paracrangon echinata Dana, 1852	Yokoya (1933); Komai and Kim (2004); this study
Sclerocrangon boreas (Phipps, 1774)	this study
Sclerocrangon unidentata Komai and Takeda, 1989	Komai and Takeda (1989); this study
Sclerocrangon zenkevitchii Birshtein and Vinogradov, 1953	Kim *et al.* (2000); this study
Family Hippolytidae	
Birulia kishinouyei (Yokoya, 1930)	this study
Birulia sachalinensis (Brashnikov, 1903)	this study
Eualus biungius (Rathbun, 1902)	Komai (2008); this study
Eualus kuratai Miyake and Hayashi, 1967	this study
Eualus middendorffi Brashnikov, 1907	this study
Eualus spathulirostris (Yokoya, 1933)	Yokoya (1933); this study
Eualus townsendi (Rathbun, 1902)	this study
Heptacarpus maxillipes (Rathbun, 1902)	Komai (1993); this study
Heptacarpus moseri (Rathbun, 1902)	this study
Lebbeus compressus Holthuis, 1947	Yokoya (1933); Miyake (1982); this study
Lebbeus groenlandicus (Fabricius, 1775)*	Toriyama (1986)
Lebbeus similior sp. nov.	this study

Table 1. (Continued)

Taxa	Source
Spirontocaris brevidigitata Kobjakova, 1935	this study
Spirontocaris prionota (Stimpson, 1864)	this study
Family Nematocarcinidae	
Nematocarcinus tenuipes Bate, 1888	this study
Family Oplophoridae	
Acanthephyra eximia Smith, 1884	this study
Acanthephyra quadrispinosa Kemp, 1939	Aizawa (1974); this study
Hymenodora frontalis Rathbun, 1902	Aizawa (1974); this study
Notostomus japonicus Bate, 1888	Toriyama (1986); this study
Oplophorus spinosus (Brullé, 1839)	Aizawa (1974); this study
Systellapsis paucispinosa Crosnier, 1987	Toriyama (1986); Hayashi (2007); this study
Family Pandalidae	
Pandalopsis coccinata Urita, 1941	Toriyama (1986); Komai (1994); this study
Pandalopsis rubra Komai, 1994	Komai (2008); this study
Pandalus eous Makarov, 1938	Komai (1999); this study
Pandalus gracilis Stimpson, 1860	Komai (1999)
Pandalus hypsinotus Brandt, 1851	Komai (1999); this study
Pandalus nipponensis Yokoya, 1933*	Toriyama (1986); Komai (1999)
Pandalus teraoi Kubo, 1937	Komai (1999); this study
Plesionika semilaevis Bate, 1888	this study
Family Pasiphaeidae	
Leptochela sydniensis Dakin and Colefax, 1940	this study
Parapasiphae sulcatifrons Smith, 1884	this study
Pasiphaea amplidens Bate, 1888	this study
Pasiphaea sinensis Hayashi and Miyake, 1971	this study
Pasiphaea cf. *tarda* Krøyer, 1845	Hayashi (1986); this study
Infraorder Polychelida	
Family Polychelidae	
Polycheles helleri Bate, 1878	Baba (1986; as *Stereomastis nana*); this study

understanding the faunal component and distribution of organisms in the bathyal zone down to 1500 m. The present paper is a report on the dendrobranchiate and caridean shrimps and polychelid lobsters collected between 2005 and 2007 using R/V *Wakataka-maru* of the FRA. Material collected during the KT-07-29 cruise of R/V *Tansei-maru* of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) to northeastern Honshu and eastern Hokkaido and further cruises in 2006 and 2007 of R/V *Soyo-maru* (FRA) is also included to supplement the collections made by the *Wakataka-maru*, as these collections contain samples from lower bathyal to abyssal zones to 5000 m. Sixty-four species are recorded here, of which two are new to science. The crangonid genus *Neocrangon* Zarenkov, 1965 is briefly reviewed, as three of the five known species are available for study. A comparative dianosis is given for *N. sagamiensis* in order to make possible to compare with the closely allied *N. resima* (Rathbun, 1902). A detailed description and illustrations are given for the rare hippolytid *Eualus townsendi* (Rathbun, 1902) for the benefit of regional interests and for supplement detailed morphology. A brief review, including a full description, is given for the hippolytid, *Spirontocaris bregidigitata* Kobjakova, 1935, as the taxonomy of the taxon is rather complicated. The oplophorid *Systellapsis paucispinosa* Crosnier, 1987 is raised to full species status.

Materials and Methods

The primary purpose of this paper is to present taxonomic accounts of species occurring in northeastern Honshu, but supplemental material from off eastern Hokkaido made by R/V *Tansei-*

maru during KT-07-29 cruise is also included. For some species, supplemental material from various sources was also examined, when necessary. The material used in this paper is deposited in the National Museum of Nature and Science, Tokyo (NSMT), the Natural History Museum and Institute, Chiba (CBM), and the National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM). Each species account includes the original reference to the species and synonym(s), and those to relevant regional records and major works providing detailed morphological information. Detailed collection data of specimens collected during the 2005–2007 cruises of R/V *Wakataka-maru* are listed in Table 2, a map of the stations can be found in Fig. 1. In the material examined section of each species, only the station number(s) are provided for the material collected by the R/V *Wakataka-maru*. Each number is composed of a prefix WA, a number indicating the year, a capital letter corresponding to the general location, and the depth. Postorbital carapace length (cl) is used as a standard measurement. Within each suborder or infraorder, families, genera and species are arranged in alphabetical order. When possible, size of specimens is summarized for each species. For dendrobranchiates, maximum size is given for each sex; for carideans, maximum size is given for each sex, and size range of ovigerous females, are given. Abbreviations used in the text are: juv., juvenile(s); ovig., ovigerous female(s); stn, station.

For comparative purposes, the following material was examined.

Crangon affinis (De Haan, 1844): TRV *Toyoshio-maru*, 2000-10 cruise, stn 15, Suo-nada, Seto Inland Sea, 33˚43.0´N, 131˚15.0´E, 18 m, 14 July 2000, sledge, coll. S. Ohtsuka, 1 female (cl 11.2 mm), CBM-ZC 5664.

Crangon alaskensis Lockington, 1877: Pitum Bay, northern Sakhalin, Far Eastern Russia, subtidal, 22 July 1995, beach seine, coll. M. Yabe, 1 ovigerous female (cl 14.5 mm), CBM-ZC 4567.

Crangon amurensis Brashnikov, 1907: Slednaya Bay, Prymorie, Far Eastern Russia, 42˚38.6´N, 131˚12.4´E, subtidal, 27 August 1994, beach seine, coll. M. Yabe, 2 females (cl 12.6, 13.2 mm), CBM-ZC 5234.

Crangon casiope De Man, 1906: Shirahama, Ohtsuchi Bay, Iwate Prefecture, 2 m, 15 May 1995, coll. I. Takeuchi, 1 ovigerous female (cl 11.5 mm), CBM-ZC 5242.

Crangon crangon (Linnaeus, 1758): Orwell estuary, Sussex, U.K., 51˚59.043´N, 01˚16.004´E, subtidal, 13 June 2006, coll. S. De Grave and C. Asheley, 3 ovigerous females (cl 10.8–12.0 mm), CBM-ZC 9559.

Crangon hakodatei Rathbun, 1902: Kamiiso, Hakodate Bay, southern Hokkaido, Japan, 5–10 m, 22 March 1991, dredge, 1 ovigerous female (cl 11.2 mm), CBM-ZC 338.

Crangon nigromaculata Lockington, 1877: off Los Angeles, California, U.S.A., 6 m, 8 June 1994, trawl, coll. M. Miya, 1 ovigerous female (cl 10.5 mm), CBM-ZC 485.

Crangon propinquus Stimpson, 1860: Olga Bay, Prymorie, Far Eastern Russia, 1 m, 18 August 1994, beach seine, coll. M. Yabe, 2 ovigerous females (cl 12.9, 14.6 mm), CBM-ZC 2442.

Crangon uritai Hayashi and Kim, 1999: Yoshio Beach, Katsuura, Boso Peninsula, subtidal, 29 June 1995, beach seine, coll. E. Nishi, 1 ovigerous female (cl 10.2 mm).

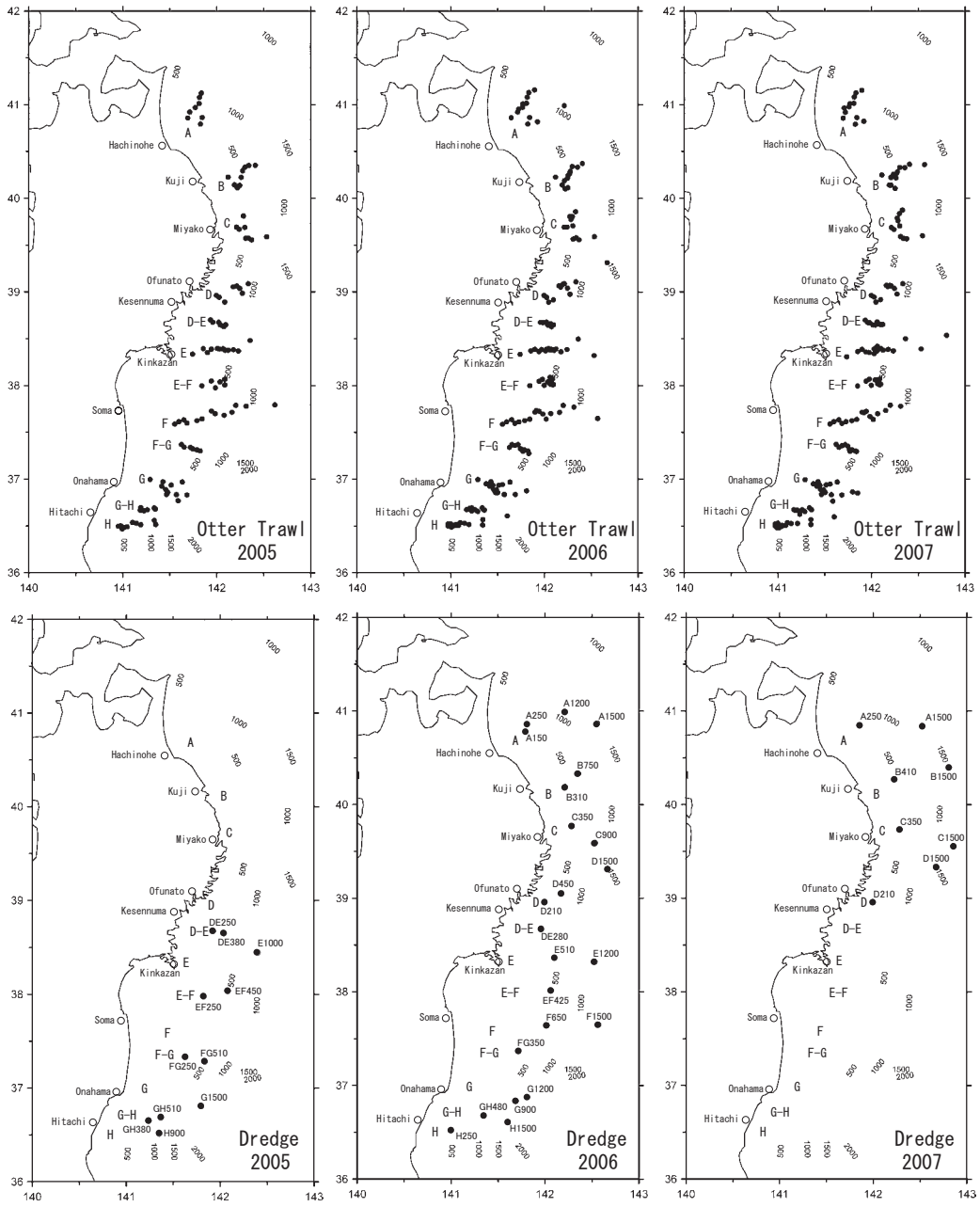

Fig. 1. Map showing stations of trawlings of R/V *Wakataka-maru* in 2005–2007.

Table 2. Sampling data of R/V *Wakataka-maru* cruise in 2005–2007. Only stations, where specimens treated in this study were collected, are listed. Abbreviations: BT, bottom temprature; D, dredge; O, otter trawl. Letters for general localities: A, northeast of Hachinohe, Aomori Prefecture; B, east of Kuji, Iwate Prefecture; C, east of Miyako, Iwate Prefecture; D, east of Ohfunato, Iwate Prefecture; DE, southeast of Kesennuma, Miyagi Prefecture; E, east of Kinkazan, Miyagi Prefecture; EF, southeast of Kinkazan; F, off Sohma, Fukushima Prefecture; FG, off Haramachi, Fukushima Prefecture; G, east of Onahama, Fukushima Prefecture; GH, east of Hitachi, Ibaraki Prefecture; H, southeast of Hitachi.

Stn. no.	Gear	Date	Position (net in)	Position (net out)	Depths (m)	BT (˚C)
WA05-DE250D	D	19 November 2005	38˚40.6´N, 141˚55.3´E	38˚40.2´N, 141˚55.2´E	249–249	-
WA05-DE380D	D	19 November 2005	38˚39.1´N, 142˚02.2´E	38˚38.6´N, 142˚02.1´E	375–373	-
WA05-DE410	O	20 November 2005	38˚39.3´N, 142˚03.4´E	38˚40.9´N, 142˚03.5´E	407–404	3.3
WA05-E410	O	25 October 2005	38˚23.7´N, 142˚02.6´E	38˚22.1´N, 142˚03.3´E	407–409	3.3
WA05-E425	O	25 October 2005	38˚24.1´N, 142˚03.0´E	38˚00.2´N, 142˚02.6´E	424–425	3.9
WA05-E450	O	25 October 2005	38˚23.6´N, 142˚04.0´E	38˚25.2´N, 142˚03.7´E	448–452	3.9
WA05-E480	O	25 October 2005	38˚22.6´N, 142˚05.3´E	38˚20.9´N, 142˚06.0´E	482–483	3.9
WA05-E510	O	25 October 2005	38˚22.5´N, 142˚06.3´E	38˚23.6´N, 142˚05.8´E	514–505	3.8
WA05-E550	O	26 October 2005	38˚22.6´N, 142˚07.3´E	38˚23.6´N, 142˚07.5´E	545–561	3.9
WA05-E650	O	26 October 2005	38˚23.0´N, 142˚10.7´E	38˚21.8´N, 142˚10.6´E	658–657	3.6
WA05-E900	O	26 October 2005	38˚28.9´N, 142˚21.4´E	38˚29.7´N, 142˚21.6´E	900–904	3.1
WA05-E1000D	D	26 October 2005	38˚26.7´N, 142˚23.8´E	38˚26.4´N, 142˚23.7´E	1005–1004	-
WA05-EF250D	D	17 November 2005	37˚58.7´N, 141˚49.3´E	37˚59.0´N, 141˚49.4´E	259–253	-
WA05-F350	O	4 November 2005	37˚37.5´N, 141˚47.3´E	37˚39.2´N, 141˚47.4´E	355–351	3.9
WA05-F380	O	4 November 2005	37˚38.6´N, 141˚50.6´E	37˚40.3´N, 141˚50.7´E	387–379	3.5
WA05-F410	O	4 November 2005	37˚43.1´N, 141˚53.9´E	37˚44.8´N, 141˚53.5´E	411–411	4.0
WA05-F425	O	27 October 2005	37˚44.3´N, 141˚54.8´E	37˚42.5´N, 141˚55.0´E	424–424	4.1
WA05-F450	O	27 October 2005	37˚43.6´N, 141˚56.6´E	37˚45.3´N, 141˚56.4´E	449–449	4.2
WA05-F510	O	27 October 2005	37˚39.4´N, 142˚01.2´E	37˚38.2´N, 142˚01.1´E	508–506	4.3
WA05-F550	O	27 October 2005	37˚41.0´N, 142˚04.7´E	37˚42.0´N, 142˚04.0´E	551–546	4.2
WA05-F750	O	28 October 2005	37˚47.4´N, 142˚12.2´E	37˚48.4´N, 142˚11.8´E	749–744	3.5
WA05-F900	O	28 October 2005	37˚46.7´N, 142˚18.8´E	37˚45.7´N, 142˚19.1´E	900–904	3.3
WA05-F1200	O	28 October 2005	37˚47.6´N, 142˚37.1´E	37˚47.4´N, 142˚37.2´E	1196–1196	2.7
WA05-FG350	O	14 November 2005	37˚20.3´N, 141˚43.2´E	37˚22.0´N, 141˚43.1´E	352–346	5.2
WA05-FG380	O	15 November 2005	37˚19.5´N, 141˚44.6´E	37˚21.1´N, 141˚44.8´E	383–383	4.3
WA05-G150	O	29 October 2005	36˚59.8´N, 141˚17.4´E	37˚01.3´N, 141˚17.8´E	151–150	11.1
WA05-G210	O	29 October 2005	36˚58.3´N, 141˚25.6´E	36˚57.0´N, 141˚24.8´E	211–210	8.0
WA05-G350	O	3 November 2005	36˚56.3´N, 141˚30.9´E	36˚58.0´N, 141˚31.5´E	373–356	4.0
WA05-G410	O	3 November 2005	36˚56.8´N, 141˚33.3´E	36˚58.1´N, 141˚34.4´E	411–411	4.0
WA05-G425	O	9 November 2005	36˚53.2´N, 141˚29.2´E	36˚52.1´N, 141˚27.7´E	427–418	4.0
WA05-G450	O	9 November 2005	36˚51.6´N, 141˚28.7´E	36˚52.8´N, 141˚30.0´E	454–448	4.0
WA05-G480	O	3 November 2005	36˚50.2´N, 141˚27.9´E	36˚51.3´N, 141˚29.2´E	481–484	4.2
WA05-G510	O	9 November 2005	36˚51.6´N, 141˚30.3´E	36˚52.4´N, 141˚31.4´E	507–509	4.0
WA05-G650	O	9 November 2005	36˚50.2´N, 141˚34.2´E	36˚50.9´N, 141˚35.2´E	644–650	3.7
WA05-G750	O	10 November 2005	36˚46.2´N, 141˚35.4´E	36˚45.6´N, 141˚34.8´E	750–750	3.4
WA05-G900D	O	10 November 2005	36˚49.9´N, 141˚41.0´E	36˚49.3´N, 141˚40.5´E	901–901	3.2
WA05-GH425	O	13 November 2005	36˚39.5´N, 141˚17.3´E	36˚40.9´N, 141˚18.3´E	425–422	4.0
WA05-GH480	O	13 November 2005	36˚40.8´N, 141˚20.8´E	36˚42.3´N, 141˚21.6´E	482–479	4.1
WA05-H150	O	30 October 2005	36˚29.9´N, 140˚57.0´E	36˚31.3´N, 140˚58.1´E	154–156	10.9
WA05-H210	O	30 October 2005	36˚30.1´N, 140˚58.4´E	36˚31.5´N, 140˚59.3´E	213–204	7.1
WA05-H650	O	2 November 2005	36˚30.8´N, 141˚11.5´E	36˚31.6´N, 141˚12.6´E	661–647	3.7
WA05-H750	O	2 November 2005	36˚33.6´N, 141˚20.1´E	36˚34.1´N, 141˚21.2´E	748–758	3.5
WA05-H900	O	2 November 2005	36˚30.9´N, 141˚21.0´E	36˚30.4´N, 141˚20.3´E	900–899	3.2
WA06-A150	O	9 October 2006	40˚47.6´ N, 141˚49.4´E	40˚46.9´N, 141˚51.1´E	155–149	13.7
WA06-A150D	D	9 October 2006	40˚46.5´N, 141˚51.9´E	40˚46.5´N, 141˚52.2´E	146–147	-
WA06-A210	O	9 October 2006	40˚51.6´N, 141˚38.8´E	40˚51.5´N, 141˚41.0´E	214–211	11.2
WA06-A250D	D	10 October 2006	40˚51.4´N, 141˚50.9´E	40˚51.3´N, 141˚51.1´E	267–266	-
WA06-A510	O	10 October 2006	41˚00.5´N, 141˚46.2´E	41˚00.0´N, 141˚46.9´E	511–510	3.0
WA06-B150	O	14 October 2006	40˚13.6´N, 142˚07.1´E	40˚15.1´N, 142˚06.6´E	153–151	13.7

Table 2. (Continued)

Stn. no.	Gear	Date	Position (net in)	Position (net out)	Depths (m)	BT (˚C)
WA06-B310D	D	14 October 2006	40˚09.9´N, 142˚13.2´E	40˚10.0´N, 142˚13.2´E	305–305	-
WA06-B450	O	13 October 2006	40˚14.9´N, 142˚15.3´E	40˚13.3´N, 142˚16.1´E	461–475	2.8
WA06-B650	O	13 October 2006	40˚20.4´N, 142˚17.8´E	40˚19.4´N, 142˚18.4´E	644–654	3.3
WA06-C310	O	16 October 2006	39˚48.3´N, 142˚16.3´E	39˚46.9´N, 142˚16.2´E	303–298	3.0
WA06-C550	O	5 October 2006	39˚33.8´N, 142˚18.5´E	39˚35.0´N, 142˚18.5´E	ND–558.0	3.5
WA06-D210D	D	19 October 2006	38˚56.4´N, 141˚59.3´E	38˚56.2´N, 141˚59.2´E	213–214	-
WA06-D450D	D	17 October 2006	39˚02.4´N, 142˚10.5´E	39˚02.7´N, 142˚10.6´E	460–460	-
WA06-DE280	O	23 November 2006	38˚40.5´N, 141˚57.4´E	38˚42.2´N, 141˚58.0´E	282–283	3.4
WA06-DE350	O	23 November 2006	38˚40.7´N, 142˚01.3´E	38˚38.8´N, 142˚00.9´E	347–345	3.2
WA06-DE480	O	23 November 2006	38˚38.9´N, 142˚05.7´E	38˚39.8´N, 142˚05.9´E	476–476	3.4
WA06-E150	O	5 November 2006	38˚20.0´N, 141˚44.5´E	38˚18.2´N, 141˚44.1´E	154–151	13.0
WA06-E210	O	5 November 2006	38˚22.2´N, 141˚51.3´E	38˚24.0´N, 141˚51.6´E	209–212	9.1
WA06-E250	O	5 November 2006	38˚23.3´N, 141˚53.9´E	38˚21.6´N, 141˚54.1´E	242–244	-
WA06-E280	O	4 November 2006	38˚21.8´N, 141˚56.4´E	38˚23.6´N, 141˚56.6´E	275–275	4.2
WA06-E310	O	4 November 2006	38˚23.2´N, 141˚58.2´E	38˚21.5´N, 141˚58.4´E	305–309	3.6
WA06-E350	O	4 November 2006	38˚22.2´N, 142˚00.7´E	38˚24.0´N, 142˚00.3´E	349–350	3.5
WA06-E380	O	4 November 2006	38˚23.4´N, 142˚01.6´E	38˚21.9´N, 142˚02.3´E	377–382	3.3
WA06-E410	O	3 November 2006	38˚23.7´N, 142˚02.6´E	38˚22.1´N, 142˚03.3´E	406–409	3.3
WA06-E425	O	4 November 2006	38˚24.2´N, 142˚03.0´E	38˚24.9´N, 142˚02.7´E	423–423	3.4
WA06-E450	O	3 November 2006	38˚23.5´N, 142˚04.0´E	38˚25.2´N, 142˚03.6´E	448–451	3.6
WA06-E480	O	3 November 2006	38˚22.7´N, 142˚05.2´E	38˚21.2´N, 142˚05.9´E	480–484	3.4
WA06-E510	O	3 November 2006	38˚22.6´N, 142˚06.3´E	38˚23.9´N, 142˚05.7´E	514–506	3.4
WA06-E510D	D	3 November 2006	38˚23.8´N, 142˚05.6´E	38˚24.1´N, 142˚05.4´E	503–498	-
WA06-E550	O	3 November 2006	38˚23.4´N, 142˚07.3´E	38˚22.3´N, 142˚07.3´E	553–545	3.4
WA06-E650	O	2 November 2006	38˚21.7´N, 142˚10.6´E	38˚22.9´N, 142˚10.7´E	656–660	9.6
WA06-E750	O	2 November 2006	38˚23.1´N, 142˚14.5´E	38˚22.4´N, 142˚14.1´E	758–756	3.2
WA06-E900	O	2 November 2006	38˚29.8´N, 142˚21.6´E	38˚29.1´N, 142˚21.5´E	905–908	2.8
WA06-E1200	O	2 November 2006	38˚23.4´N, 142˚31.8´E	38˚23.8´N, 142˚31.9´E	1202–1206	-
WA06-E1200D	D	2 November 2006	38˚19.3´N, 142˚31.7´E	38˚19.4´N, 142˚31.7´E	1214–1213	-
WA06-EF380	O	22 November 2006	38˚02.3´N, 142˚02.1´E	38˚04.0´N, 142˚02.5´E	378–373	4.1
WA06-EF425D	D	21 November 2006	38˚03.3´N, 142˚04.0´E	38˚03.1´N, 142˚04.1´E	420–424	-
WA06-F150	O	29 October 2006	37˚35.3´N, 141˚33.2´E	37˚36.7´N, 141˚33.9´E	150–165	13.7
WA06-F210	O	29 October 2006	37˚36.9´N, 141˚35.9´E	37˚38.2´N, 141˚36.1´E	213–213	6.5
WA06-F250	O	29 October 2006	37˚38.1´N, 141˚39.1´E	37˚36.4´N, 141˚38.8´E	257–256	5.7
WA06-F280	O	29 October 2006	37˚35.7´N, 141˚41.0´E	37˚37.5´N, 141˚40.9´E	277–284	4.9
WA06-F350	O	30 October 2006	37˚37.6´N, 141˚47.3´E	37˚39.2´N, 141˚47.4´E	353–350	3.9
WA06-F380	O	30 October 2006	37˚38.5´N, 141˚50.5´E	37˚40.1´N, 141˚50.6´E	386–379	3.8
WA06-F410	O	30 October 2006	37˚43.0´N, 141˚53.9´E	37˚44.6´N, 141˚53.6´E	411–411	3.3
WA06-F425	O	30 October 2006	37˚44.0´N, 141˚54.8´E	37˚42.3´N, 141˚55.1´E	425–424	3.4
WA06-F450	O	30 October 2006	37˚43.6´N, 141˚56.6´E	37˚45.2´N, 141˚56.4´E	450–450	3.4
WA06-F480	O	31 October 2006	37˚41.7´N, 141˚59.0´E	37˚39.9´N, 141˚59.0´E	483–478	3.6
WA06-F510	O	31 October 2006	37˚38.6´N, 142˚01.1´E	37˚39.8´N, 142˚01.4´E	503–511	3.8
WA06-F550	O	31 October 2006	37˚42.1´N, 142˚04.1´E	37˚40.9´N, 142˚04.7´E	546–551	3.7
WA06-F650	O	31 October 2006	37˚42.9´N, 142˚09.7´E	37˚44.0´N, 142˚09.1´E	654–651	3.7
WA06-F650D	D	31 October 2006	37˚44.9´N, 142˚08.5´E	37˚45.2´N, 142˚08.4´E	647–641	-
WA06-F750	O	1 November 2006	37˚47.3´N, 142˚12.2´E	37˚48.1´N, 142˚12.0´E	749–747	3.4
WA06-F900	O	1 November 2006	37˚46.2´N, 142˚18.9´E	37˚45.7´N, 142˚19.1´E	904–909	3.0
WA06-F1500	O	1 Nobember 2006	37˚36.3´N, 142˚33.6´E	37˚36.0´N, 142˚33.5´E	1515–1513	-
WA06-F1500D	D	1 November 2006	37˚34.6´N, 142˚33.5´E	37˚35.0´N, 142˚33.5´E	1511–1508	-
WA06-F1500D	D	1 November 2006	37˚38.9´N, 142˚34.1´E	37˚39.4´N, 142˚34.3´E	1466–1471	-
WA06-FG410	O	10 November 2006	37˚18.8´N, 141˚45.8´E	37˚17.1´N, 141˚45.5´E	410–410	4.2
WA06-FG450	O	10 November 2006	37˚18.8´N, 141˚47.2´E	37˚20.5´N, 141˚47.5´E	449–444	4.0
WA06-FG480	O	10 November 2006	37˚18.2´N, 141˚49.5´E	37˚16.5´N, 141˚48.8´E	480–477	3.8
WA06-G150	O	26 October 2006	36˚59.8´N, 141˚17.4´E	37˚01.4´N, 141˚17.9´E	151–150	12.3
WA06-G210	O	26 October 2006	36˚57.0´N, 141˚22.7´E	36˚58.4´N, 141˚23.8´E	210–208	8.9

Table 2. (Continued)

Stn. no.	Gear	Date	Position (net in)	Position (net out)	Depths (m)	BT (˚C)
WA06-G250	O	26 October 2006	36˚58.4´N, 141˚25.7´E	36˚57.0´N, 141˚24.8´E	251–252	6.9
WA06-G280	O	26 October 2006	36˚55.5´N, 141˚24.9´E	36˚54.0´N, 141˚24.2´E	276–279	5.3
WA06-G310	O	26 October 2006	36˚56.2´N, 141˚26.9´E	36˚54.8´N, 141˚26.5´E	301–315	4.8
WA06-G350	O	27 October 2006	36˚56.2´N, 141˚30.8´E	36˚57.9´N, 141˚31.5´E	373–355	5.0
WA06-G380	O	27 October 2006	36˚53.4´N, 141˚27.4´E	36˚54.5´N, 141˚28.9´E	384–377	4.7
WA06-G410	O	27 October 2006	36˚56.6´N, 141˚ 3.2´E	36˚58.1´N, 141˚34.4´E	414–411	4.7
WA06-G425	O	27 October 2006	36˚53.2´N, 141˚29.2´E	36˚52.1´N, 141˚27.6´E	428–420	5.0
WA06-G450	O	27 October 2006	36˚51.5´N, 141˚28.6´E	36˚52.7´N, 141˚30.0´E	454–454	4.6
WA06-G480	O	28 October 2006	36˚51.2´N, 141˚29.2´E	36˚50.0´N, 141˚27.7´E	481–483	4.5
WA06-G510	O	28 October 2006	36˚51.4´N, 141˚30.1´E	36˚52.1´N, 141˚31.2´E	508–508	4.4
WA06-G550	O	28 October 2006	36˚58.1´N, 141˚38.0´E	36˚59.2´N, 141˚38.8´E	558–554	4.2
WA06-G650	O	28 October 2006	36˚50.2´N, 141˚34.3´E	36˚50.9´N, 141˚35.2´E	648–648	3.8
WA06-G750	O	15 November 2006	36˚46.3´N, 141˚35.5´E	36˚46.4´N, 141˚35.7´E	753–754	3.6
WA06-G900	O	11 November 2006	36˚50.2´N, 141˚41.3´E	36˚49.4´N, 141˚40.7´E	907–910	3.2
WA06-G1200	O	11 November 2006	36˚51.8´N, 141˚48.0´E	36˚51.3´N, 141˚47.6´E	1207–1200	-
WA06-G1200D	D	11 November 2006	36˚52.6´N, 141˚48.6´E	36˚52.3´N, 141˚48.2´E	1201–1182	-
WA06-H250	O	12 November 2006	36˚31.4´N, 140˚59.9´E	36˚29.8´N, 140˚58.8´E	243–246	8.5
WA06-H1500	O	15 November 2006	36˚36.1´N, 141˚36.1´E	36˚35.9´N, 141˚36.1´E	1478–1475	-
WA06-H1500D	D	15 November 2006	36˚36.5´N, 141˚36.2´E	36˚36.7´N, 141˚36.1´E	1470–1450	-
WA07-A210	O	7 October 2007	40˚51.4´N, 141˚41.8´E	40˚51.7´N, 141˚39.8´E	207–215	7.2
WA07-A250	O	6 October 2007	40˚51.8´N, 141˚50.6´E	40˚50.5´N, 141˚51.9´E	273–258	5.4
WA07-A310	O	6 October 2007	40˚49.4´N, 141˚55.0´E	40˚50.6´N, 141˚53.5´E	306–309	3.6
WA07-A350	O	7 October 2007	40˚55.3´N, 141˚43.2´E	40˚55.2´N, 141˚44.7´E	360–359	-
WA07-A410	O	9 October 2007	40˚57.9´N, 141˚42.5´E	40˚57.5´N, 141˚43.3´E	412–415	3.4
WA07-A450	O	9 October 2007	40˚58.7´N, 141˚45.6´E	40˚58.3´N, 141˚46.1´E	471–468	3.4
WA07-A510	O	9 October 2007	41˚00.6´N, 141˚46.1´E	41˚00.4´N, 141˚46.4´E	510–512	3.3
WA07-A550	O	9 October 2007	41˚00.9´N, 141˚48.7´E	41˚00.6´N, 141˚49.0´E	550–551	3.3
WA07-A650	O	10 October 2007	41˚04.9´N, 141˚48.9´E	41˚04.5´N, 141˚49.2´E	662–661	3.3
WA07-A750	O	10 October 2007	41˚07.6´N, 141˚50.0´E	41˚07.4´N, 141˚50.1´E	748–747	3.1
WA07-A900	O	10 October 2007	41˚09.3´N, 141˚53.8´E	41˚09.0´N, 141˚53.8´E	882–881	2.9
WA07-A1500D	D	11 October 2007	40˚50.5´N, 142˚31.5´E	40˚50.2´N, 142˚31.1´E	1402–1377	-
WA07-B150	O	14 October 2007	40˚15.0´N, 142˚06.6´E	40˚13.3´N, 142˚07.4´E	153–156	9.8
WA07-B210	O	13 October 2007	40˚08.6´N, 142˚11.4´E	40˚10.1´N, 142˚11.1´E	208–214	5.7
WA07-B250	O	13 October 2007	40˚08.5´N, 142˚12.4´E	40˚06.8´N, 142˚13.2´E	249–258	4.3
WA07-B310	O	13 October 2007	40˚13.4´N, 142˚12.4´E	40˚11.7´N, 142˚12.8´E	309–307	3.5
WA07-B350	O	13 October 2007	40˚06.4´N, 142˚15.1´E	40˚08.2´N, 142˚14.6´E	350–352	3.4
WA07-B410	O	13 October 2007	40˚15.4´N, 142˚14.1´E	40˚13.7´N, 142˚14.6´E	420–412	3.4
WA07-B410D	D	13 October 2007	40˚16.9´N, 142˚13.5´E	40˚17.1´N, 142˚13.5´E	416–416	-
WA07-B450	O	12 October 2007	40˚13.2´N, 142˚15.7´E	40˚14.7´N, 142˚15.4´E	454–459	3.5
WA07-B510	O	12 October 2007	40˚16.0´N, 142˚16.0´E	40˚17.3´N, 142˚15.6´E	510–509	3.4
WA07-B550	O	12 October 2007	40˚16.9´N, 142˚16.6´E	40˚18.0´N, 142˚16.5´E	544–555	3.4
WA07-B650	O	11 October 2007	40˚19.8´N, 142˚18.0´E	40˚20.6´N, 142˚17.7´E	644–640	3.3
WA07-B750	O	11 October 2007	40˚19.7´N, 142˚21.3´E	40˚20.1´N, 142˚20.9´E	759–749	3.3
WA07-B900	O	11 October 2007	40˚21.8´N, 142˚24.3´E	40˚21.5´N, 142˚24.4´E	898–900	3.1
WA07-B1200T	O	12 October 2007	40˚21.6´N, 142˚33.9´E	40˚21.8´N, 142˚33.8´E	1208–1200	-
WA07-B1500D	D	12 October 2007	40˚23.9´N, 142˚48.5´E	40˚23.9´N, 142˚48.2´E	1511–1514	-
WA07-C210	O	15 October 2007	39˚41.3´N, 142˚12.6´E	39˚43.1´N, 142˚12.9´E	211–208	7.7
WA07-C250	O	15 October 2007	39˚40.0´N, 142˚14.3´E	39˚41.7´N, 142˚14.5´E	254–252	5.6
WA07-C310	O	14 October 2007	39˚47.3´N, 142˚16.4´E	39˚45.6´N, 142˚16.0´E	318–294	3.9
WA07-C350	O	15 October 2007	39˚45.7´N, 142˚16.9´E	39˚47.4´N, 142˚17.0´E	358–358	3.9
WA07-C350D	D	15 October 2007	39˚44.2´N, 142˚16.9´E	39˚44.4´N, 142˚16.9´E	355–354	-
WA07-C410	O	14 October 2007	39˚50.3´N, 142˚17.9´E	39˚48.5´N, 142˚17.9´E	409–415	3.7
WA07-C450	O	17 October 2007	39˚42.3´N, 142˚18.0´E	39˚40.6´N, 142˚17.7´E	467–458	3.7
WA07-C510	O	14 October 2007	39˚52.5´N, 142˚19.8´E	39˚51.2´N, 142˚20.0´E	511–521	3.5
WA07-C550	O	16 October 2007	39˚35.5´N, 142˚18.6´E	39˚34.2´N, 142˚18.5´E	552–559	3.6

Table 2. (Continued)

Stn. no.	Gear	Date	Position (net in)	Position (net out)	Depths (m)	BT (˚C)
WA07-C650	O	16 October 2007	39˚34.3´N, 142˚20.3´E	39˚35.5´N, 142˚20.3´E	659–644	3.4
WA07-C750	O	16 October 2007	39˚34.1´N, 142˚22.5´E	39˚33.5´N, 142˚22.3´E	748–749	3.4
WA07-C900	O	16 October 2007	39˚36.1´N, 142˚32.7´E	39˚35.9´N, 142˚32.5´E	900–893	3.1
WA07-D210	O	18 October 2007	38˚57.8´N, 141˚59.9´E	38˚59.2´N, 142˚00.6´E	212–214	8.8
WA07-D250	O	18 October 2007	38˚56.8´N, 142˚01.6´E	38˚55.1´N, 142˚01.0´E	253–254	6.7
WA07-D310	O	18 October 2007	38˚53.5´N, 142˚02.8´E	38˚55.0´N, 142˚03.3´E	303–307	4.6
WA07-D350	O	18 October 2007	38˚55.1´N, 142˚05.7´E	38˚53.5´N, 142˚05.2´E	354–351	5.0
WA07-D410	O	17 October 2007	39˚04.2´N, 142˚09.5´E	39˚06.0´N, 142˚09.8´E	406–406	4.1
WA07-D450	O	17 October 2007	39˚03.4´N, 142˚10.4´E	39˚01.5´N, 142˚10.5´E	448–463	3.7
WA07-D510	O	17 October 2007	39˚04.2´N, 142˚11.8´E	39˚05.3´N, 142˚12.0´E	505–513	3.6
WA07-D550	O	5 October 2007	39˚03.7´N, 142˚12.8´E	39˚04.9´N, 142˚12.7´E	556–545	3.6
WA07-D650	O	5 October 2007	39˚02.3´N, 142˚14.7´E	39˚03.3´N, 142˚14.9´E	640–661	3.6
WA07-D750	O	5 October 2007	38˚58.7´N, 142˚16.4´E	38˚59.5´N, 142˚16.6´E	754–751	3.4
WA07-D900	O	5 October 2007	39˚05.3´N, 142˚20.0´E	39˚06.0´N, 142˚20.1´E	898–905	3.2
WA07-D1500D	D	17 October 2007	39˚20.2´N, 142˚40.1´E	39˚20.5´N, 142˚40.3´E	1505–1489	-
WA07-E510	O	25 October 2007	38˚23.8´N, 142˚05.8´E	38˚22.7´N, 142˚06.1´E	506–506	4.0
WA07-E900	O	26 October 2007	38˚30.0´N, 142˚21.7´E	38˚29.5´N, 142˚21.5´E	900–896	3.0
WA07-E1200T	O	26 October 2007	38˚23.5´N, 142˚31.8´E	38˚24.1´N, 142˚31.8´E	1198–1204	-
WA07-E1500T	O	26 October 2007	38˚32.2´N, 142˚48.0´E	38˚34.7´N, 142˚48.0´E	1499–1502	-
WA07-F410	O	30 October 2007	37˚42.9´N, 141˚53.9´E	37˚44.6´N, 141˚53.6´E	412–411	3.8
WA07-F480	O	4 November 2007	37˚40.2´N, 141˚59.0´E	37˚41.7´N, 141˚59.0´E	480–485	3.9
WA07-FG450	O	20 November 2007	37˚18.9´N, 141˚47.2´E	37˚20.0´N, 141˚47.4´E	453–449	4.2
WA07-G250	O	3 November 2007	36˚58.4´N, 141˚25.7´E	36˚56.9´N, 141˚24.8´E	249–252	8.9
WA07-G310	O	2 November 2007	36˚56.1´N, 141˚26.9´E	36˚54.4´N, 141˚26.4´E	303–315	4.9
WA07-G350	O	3 November 2007	36˚56.3´N, 141˚30.9´E	36˚57.5´N, 141˚31.3´E	371–358	4.4
WA07-G750	O	12 November 2007	36˚46.0´N, 141˚35.2´E	36˚45.6´N, 141˚34.7´E	757–752	3.8
WA07-G1200T	O	31 October 2007	36˚51.8´N, 141˚47.9´E	36˚51.4´N, 141˚47.6´E	1202–1202	-
WA07-G1500T	O	31 October 2007	36˚51.1´N, 141˚51.1´E	36˚51.4´N, 141˚51.6´E	1514–1513	-
WA07-H750	O	1 November 2007	36˚34.1´N, 141˚21.2´E	36˚33.7´N, 141˚20.3´E	756–747	3.7

Taxonomic Account

Suborder Dendrobranchiata
Superfamily Penaeoidea
Family Aristeidae
Genus ***Aristaeomorpha*** Wood-Mason, 1891
Aristaeomorpha foliacea (Risso, 1827)
[Japanese name: Tsunonaga-chihiro-ebi]
(Fig. 18A)

Penaeus foliaceus Risso, 1827: 69, pl. 2, fig. 6.
Aristeus rostridentatus Bate, 1881: 189; 1888: 317, pl. 51.
Aristaeomorpha mediterranea Adensamer, 1898: 627.
Aristaeomorpha rostridentata – Parisi, 1919: 59, figs. 1–2.
Aristeus japonicus Yokoya, 1933: 3, fig. 1.
Aristaeomorpha foliacea – Crosnier, 1978: 54, figs. 23–24; Miyake, 1982: 1, pl. 1, fig. 1; Hayashi, 1983: 281, figs. 53, 54a–e, 56a–f; 1986b: 51, 236, fig. 11; 1992c: 22, figs. 8, 14, 15; Komai, 1993: 21.

Material examined. R/V *Wakataka-maru*, WA05-G410, 1♀ (cl 51.4 mm), NSMT-Cr 16904; WA06-E380, 1♀ (cl ca. 40.0 mm), NSMT-Cr 17443; WA07-B410, 1♂ (cl 40.8 mm), NSMT-Cr 19113.

Color. Generally wine red; rostral margins transparent; scattered dark red spots on ventral surface of thoracic and abdominal sternites; cornea of eye dark brown (Fig. 18A).

Distribution. Widely distributed in tropical and temperate waters of the world oceans; 60–1300 m (Crosnier, 1978; Hayashi, 1992c). In Japan, occurring in the Pacific side, ranging from Iwate Prefecture to Kyushu, and East China Sea (Hayashi, 1992c; Komai, 1993).

Genus ***Aristeus*** Duvernoy, 1840
Aristeus mabahissae Ramadan, 1938
[Japanese name: Hakumei-chihiro-ebi]
(Fig. 18B)

Aristeus mabahissae Ramadan, 1938: 43, figs. 2b, 3b, 4a–e; Crosnier, 1978: 65, figs. 25c–f, 26c–f; Hayashi, 1983: 190, figs.49, 50a–c, 52a–b; 1986b: 53, 227, fig. 12; 1992c: 18, figs. 9, 11, 13a–b; Komai, 1991: 60; 1993: 22.

Material examined. R/V *Wakataka-maru*, WA06-G550, 1♂ (cl 26.2 mm), NSMT-Cr 17442; WA07-B410, 2♀♀ (cl 33.0, 35.0 mm), NSMT-Cr 19110; WA07-C550, 1♀ (cl 34.2 mm), NSMT-Cr 19111; WA07-D650, 1♀ (cl 34.0 mm), NSMT-Cr 19112.

Color. Body and appendages entirely rose-red; cornea darkly pigmented; second maxilliped dark red; photophores on pereopods dark red spots (Fig. 18B).

Distribution. Widely distributed in the Indo-West Pacific; 366–1097 m (Crosnier, 1978; Hayashi, 1992c). In Japan, recorded from off eastern Hokkaido, northeastern Honshu, and East China Sea (Komai, 1991, 1993; Hayashi, 1992c).

Family Benthesicymidae
Genus ***Bentheogennema*** Burkenroad, 1936
Bentheogennema borealis (Bate, 1881)
[Japanese name: Shinkai-ebi]
(Fig. 18C)

Gennadas borealis Rathbun, 1902: 887; 1904: 147, figs. 88–89; Kobjakova, 1937: 141, fig. 9; Vinogradov, 1950: 191, pl. 4, fig. 11.

Gennadas calmanni Kemp, 1909: 724, pl. 74, figs. 5–11.

Bentheogennema borealis – Aizawa, 1974: 19, fig. 10; Butler, 1980: 41, unnumbered fig.; Hayashi, 1984: 214, figs. 69, 70a–b, 71a–b; 1992c: 60, figs. 30, 31a–b, 32a–b; Komai, 1991: 56, fig. 1.

Material examined. R/V *Wakataka-maru*, WA06-E650, 1♀ (damaged), NSMT-Cr 16908; same data, 3♀♀ (cl 15.0–16.0 mm), NSMT-Cr 16911; WA05-E1000D, 1♀ (cl 12.0 mm), NSMT-Cr 16915; WA05-F750, 1♂ (damaged), 1♀ (damaged), NSMT-Cr 16913; WA05-H650, 4♀♀ (cl 15.4–17.8 mm), NSMT-Cr 16909; WA06-E510, 1♀, NSMT-Cr 17427; WA06-E550, 1♂, 1♀, NSMT-Cr 17439; WA06-E650, 2♀♀ (cl 16.3, 17.0 mm), NSMT-Cr 17435; WA06-E750, 1♀ (cl 16.6 mm), NSMT-Cr 17432; WA06-E900, 2♀♀, NSMT-Cr 17437; WA06-E1200, 2♀♀, NSMT-Cr 17434; WA06-E1200D, 1♂, NSMT-Cr 17440; WA06-EF425D, 1 juv., NSMT-Cr 17436; WA06-F550, 2♂♂, NSMT-Cr 17425; WA06-F650, 1♂, 1♀, NSMT-Cr 17429; WA06-F750, 1♂, 2♀♀, NSMT-Cr 17428; WA06-F900, 1♂, 2♀♀, NSMT-Cr 17433; WA-06-F1500, 2♀♀, NSMT-Cr 17438; WA06-F1500D, 1♀, NSMT-Cr 17431; WA-06-G550, 1♀, NSMT-Cr 17430; WA06-G650, 3♂♂ (cl 13.3–14.0 mm), 5♀♀ (cl 15.7–16.8 mm), NSMT-Cr 17426; WA07-A410, 1 specimen, NSMT-Cr 19089; WA07-A450, 1♂, 2♀♀, NSMT-Cr 19090; WA07-A510, 2♂♂, 1♀, NSMT-Cr 19091; WA07-A550, 1♂, 1♀, NSMT-Cr 19092; WA07-A650, 2♂♂, NSMT-Cr 19093; WA07-A750, 3♀♀, NSMT-Cr 19094; WA07-A900, 3♀♀, NSMT-Cr 19095; WA07-B550, 1♂, 1♀,

NSMT-Cr 19096; WA07-B650, 1♂ (cl 13.6 mm), 2♀♀ (cl 9.0, 15.3 mm), NSMT-Cr 19097; WA07-B750, 1♂, 1♀, NSMT-Cr 19098; WA07-B900, 2♀♀ (cl 16.0, 17.8 mm), NSMT-Cr 19099; WA07-B1200, 1♀, NSMT-Cr 19100; WA07-C450, 1♀ (cl 18.7 mm), NSMT-Cr 19101; WA07-C510, 1♀ (cl 16.0 mm), NSMT-Cr 19102; WA07-C650, 2♂♂, NSMT-Cr 19103; WA07-C750, 2♀♀ (cl 17.0, 17.0 mm), NSMT-Cr 19104; WA07-C900, 2♀♀, 1 juv., NSMT-Cr 19105; WA07-D650, 2♀♀, NSMT-Cr 19106; WA07-D750, 2♀♀, NSMT-Cr 19107; WA07-E1500, 8♀♀, NSMT-Cr 19108; WA07-G1200, 1♂ (cl 14.0 mm), 8♀♀ (cl 15.5–17.4 mm), NSMT-Cr 19109.

R/V *Soyo-maru*, stn SO06-M1-B, off Miyako, Iwate Prefecture, 39˚40.4´N, 143˚43.5´E, bottom depth 3000 m, 16 July 2006, benthos net, 1♂ (cl 13.6 mm), NSMT-Cr 19554; stn SO06-M4-B, off Miyake, 39˚35.2´N, 144˚02.4´E, bottom depth 4951 m, 17 July 2006, benthos net, 1♂ (cl 15.0 mm), NSMT-Cr 19555; stn SO07-K1, off Kinkazan, Miyagi Prefecture, 38˚35.4´N, 143˚04.5´E to 38˚34.0´N, 143˚06.9´E, bottom depth 2043–2183 m, 6 August 2007, benthos net, 1♂ (cl 13.3 mm), NSMT-Cr 19556; stn SO07-O3, 36˚57.1´N, 142˚39.9´E to 36˚52.4´N, 142˚35.7´E, off Onahama, Fukushima Prefecture, bottom depth 4075–4128 m, 8 August 2007, 1♂ (cl 11.7 mm), NSMT-Cr 19557.

R/V *Tansei-maru*, KT07-29, stn E1, off Erimo-misaki, eastern Hokkaido, 41˚43.0´N, 143˚56.7´E to 41˚44.5´N, 143˚56.5´E, bottom depths 1031–1008 m, 7 November 2007, beam trawl, 1♂ (damaged), NSMT-Cr 19399; stn H2, off Hachinohe, Aomori Prefecture, 40˚00.0´N, 143˚31.4´E to 41˚00.8´N, 143˚30.2´E, bottom depths 2055–2032 m, 8 November 2007, beam trawl, 1♀ (cl 10.7 mm), NSMT-Cr 19400; stn K1, off Kushiro, eastern Hokkaido, 42˚35.0´N, 144˚48.0´E to 42˚34.7´N, 144˚49.9´E, bottom depths 1028–1075 m, 7 November 2007, beam trawl, 1♂ (cl 13.2 mm), NSMT-Cr 19401; stn K2, off Kushiro, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, bottom depths 1535–1543 m, 2 November 2007, beam trawl, 1♂ (cl 14.0 mm), NSMT-Cr 19402; stn K3, off Kushiro, 42˚27.6´N, 144˚57.4´E to 42˚27.6´N, 144˚59.4´E, bottom depth 2037–2025 m, 7 November 2007, beam trawl, 1♂ (cl 12.0 mm), 3♀♀ (12.5–15.0 mm), NSMT-Cr 19403; stn M1, off Miyako, Iwate Prefecture, 39˚17.9´N, 142˚28.4´E to 39˚16.8´N, 142˚27.4´E, bottom depths 1039–1041 m, 6 November 2007, beam trawl, 1♂ (cl 14.0 mm), 1♀ (cl 16.2 mm), NSMT-Cr 19404; stn M3-1, 39˚20.0´N, 142˚51.0´E to 39˚21.8´N, 142˚51.9´E, bottom depths 1728–1719 m, 5 November 2007, beam trawl, 1♂ (damaged), 1♀ (cl 16.6 mm), NSMT-Cr 19405; stn M3-2, off Miyako, Iwate Prefecture, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, bottom depths 1737–1709 m, 6 November 2007, beam trawl, 1♂, NSMT-Cr 19406; stn M3-3, off Miyako, 39˚20.1´N, 142˚51.2´E to 39˚19.2´N, 142˚49.1´E, bottom depths 1733–1695 m, beam trawl, 1♀ (cl 14.1 mm), NSMT-Cr 19407.

Color. Entirely crimson-red; cornea of eye brown, with reflecting pigments; second and third maxillipeds maroon-red (Fig. 18C).

Size. Largest male cl 14.0 mm; largest female cl 18.7 mm.

Distribution. North Pacific; meso- and bathypelagic, 200–1500 m (Butler, 1980; Hayashi, 1992c). In Japanese waters, occurring in the Pacific coast from Hokkaido to Ohsumi Islands (Aizawa, 1974; Hayashi, 1984, 1992c; Komai *et al.*, 1999).

Genus ***Benthesicymus*** Bate, 1881

Benthesicymus crenatus Bate, 1881

[Japanese name: Shin'en-soko-chihiro-ebi]

Benthesicymus crenatus Bate, 1881: 190; 1888: 329, pls. 54–55; Crosnier, 1985: 851, figs. 6d–e, 7d–e, 8f–g; Kikuchi and Nemoto, 1991: 67, figs. 2–3; Kim *et al.*, 2000: 7, figs. 2f–g, 8c.

Material examined. R/V *Soyo-maru*, stn SO06-M4-B, off Miyako, Iwate Prefecture,

39˚35.2´N, 144˚02.4´E, 4951 m, 17 July 2006, benthos net, 1♂ (cl 31.7 mm), 1♀ (cl 25.7 mm), NSMT-Cr 17634.

Distribution. Northwestern to central Pacific; 3530–6350 m (Pérez-Farfante and Kensley, 1997; Kikuchi and Nemoto, 1991; Kim *et al*., 2000). In Japanese waters, previously only known from off southwestern Honshu.

Benthesicymus investigatoris Alcock and Anderson, 1899
[Japanese name: Marusoko-chihiro-ebi]
(Fig. 18D)

Benthesicymus investigatoris Alcock and Anderson, 1899a: 282; 1899b: pl. 41, fig. 2; Crosnier, 1978: 21, figs. 7c–d, 8c–d, 9–10; Hayashi, 1983: 440, fig. 61a–e; 1986: 55, 238, fig. 14; 1992c: 40, fig. 22; Kikuchi and Nemoto, 1991: 88, figs. 16–17.

Material examined. R/V *Wakataka-maru*, WA05-G900, 1♂ (cl 17.2 mm), NSMT-Cr 16914; WA05-H900, 1♀ (cl 14.2 mm), NSMT-Cr 16985; WA06-G1200D, 1♀ (cl 18.3 mm), NSMT-Cr; WA06-F1500, 1♂ (cl 15.2 mm), NSMT-Cr 17441; WA07-B650, 1 young ♂ (cl 12.0 mm), NSMT-Cr 19114; WA07-G1200, 2♂♂ (cl 15.2, 20.0 mm), 12♀♀ (cl ca 15.5–23.0 mm), NSMT-Cr 19115.

Color. Body and appendages generally scarlet-red, gastric region of carapace darker; cornea of eye brown, with reflecting pigment (Fig. 18D).

Size. Largest male 20.0 mm; largest female cl 23.0 mm.

Distribution. Widely distributed in the Indo-Pacific, East coast of Africa to Sala-y-Gómez Ridge, Japan to Kermadec Islands; 600–1650 m (Crosnier, 1978; Kikuchi and Nemoto, 1991; Hayashi, 1992c). In Japan, previously known from off Iwate Prefecture to Tosa Bay (Hayashi, 1983; 1992c; Kikuchi and Nemoto, 1991).

Genus ***Gennadas*** Bate, 1888

Gennadas incertus (Balss, 1927)
[Japanese name: Subesube-tsuno-chiro-ebi-modoki]

Amalopenaeus incertus Balss, 1927: 265, figs. 24–29.
Amalopenaeus Gardineri Balss, 1927: 267, fig. 31.
Gennadas incertus – Kensley, 1971b: 12, 14, figs. 4i, 5i; Aizawa, 1974: 23, 44, figs. 15, 19; Crosnier, 1978: 37, figs. 15b, 19a; Hayashi, 1984: 141, figs. 65a–c, 66e, 68c, i–j; 1992: 52, figs. 26, 27e, 29c, k–l.

Material examined. R/V *Wakataka-maru*, WA07-D510, 1♀ (cl 16.6 mm), NSMT-Cr 19117.

Distribution. Indo-Pacific; meso- and bathypelagic (Pérez-Farfante and Kensley, 1997). In Japanese waters, known from the Pacific coast from off northeastern Honshu to Ryukyu Islands (Aizawa, 1974; Hanamura, 1979; Hayashi, 1984, 1992c; Komai *et al.*, 1999).

Gennadas parvus Bate, 1881
[Japanese name: Subesube-chihiro-ebi]

Gennadas parvus Bate, 1881: 192 (in part); 1888: 340, pl. 59 (in part); Kemp, 1909: 721, pl. 73, figs. 1–6, pl. 75, fig. 1; Aizawa, 1974: 23, 44, figs. 16, 30; Crosnier, 1978: 37, figs. 16a, 19b; Hayashi, 1984: 142, figs. 66f–g, 67c, 68d; 1992c: 53, figs. 27f, 28c, 29d; Komai *et al.*, 1999: 133.

Material examined. R/V *Wakataka-maru*, WA07-D1500D, 1 young ♀ (cl 6.4 mm), NSMT-Cr 19118.

R/V *Tansei-maru*, KT 07-29, stn E3, off Erimo-misaki, 41˚39.1´N, 144˚07.5´E to 41˚37.2´N,

144˚07.6´E, bottom depths 1997–2043 m, 7 November 2007, beam trawl, 1♂ (cl 6.0 mm), NSMT-Cr 19414.

Distribution. Indo-West Pacific; meso- and bathypelagic; 200–1000 m (Pérez-Farfante and Kensley, 1997). In Japanese waters, occurring in the Pacific coast from Hokkaido to Ryukyu Islands (Aizawa, 1974; Hanamura, 1979; Hayashi, 1984, 1992c; Komai *et al.*, 1992, 1999).

Gennadas propinquus Rathbun, 1906
[Japanese name: Chihiro-ebi-modoki]

Gennadas propinquus Rathbun, 1906: 907, fig. 61; Kensley, 1971b: 167, fig. 9; Crosnier, 1978: 38, figs. 16b, 18d, e; Hanamura, 1983: 59, fig. 5; Hayashi, 1984: 142, fig. 63, 64a–c, 66h, 67d, 68k–l; 1992c: figs. 24–25, 27h, 28d, 29m–n; Komai *et al.*, 1999: 134.
Gennadas clavicarpus De Man, 1907: 144.
Gennadas alcocki Kemp, 1910: 174, pl. 13, fig. 8.
Gennadas scutatus indicus Kemp, 1913: 62.

Material examined. R/V *Wakataka-maru*, WA07-A310, 1♀ (cl 6.3 mm), NSMT-Cr 19116.

Distribution. Indo-Pacific; meso- and bathypelagic, 100–1200 m (Pérez-Farfante and Kensley, 1997). In Japanese waters, occurring in the Pacific coast off Hokkaido to Ryukyu Islands (Hanamura, 1979; Hayashi, 1984, 1992c; Komai *et al.*, 1999).

Family Penaeidae
Genus ***Funchalia*** Johnson, 1868
Funchalia taaningi Burkenroad, 1940
[Japanese name: Uki-ebi]
(Fig. 18E)

Funchalia taaningi Burkenroad, 1940: 36; Grippa, 1976: 9; Hayashi, 1983: 34, figs. 45, 46a–c; 1986b: 57, 239, fig. 16; 1992c: 76, figs. 36, 38; Crosnier, 1985: 871, fig. 14d–e.

Material examined. R/V *Wakataka-maru*, WA06-F510, 1 young ♂ (cl 12.4 mm), NSMT-Cr 17445.

Color. Body generally transparent, tint of salmon pink on carapace and posterior margin of each abdominal somite, and tip of uropods; pereopods and uropods pale salmon pink (Fig. 18E).

Distribution. Widely distributed in the Indian Ocean and western to central Pacific Ocean; meso- and bathypelagic (Pérez-Farfante and Kensley, 1997). In Japanese waters, recorded from Kyushu-Palau Ridge and Torishima Island (Hayashi, 1992c).

Remarks. The present specimen from northeastern Honshu is considered to be a young male, because of the symmetrical petasma, the non-modified third maxilliped and the short dactyli of the fourth and fifth pereopods. *Funchalia taaningi* is very similar to *F. villosa* (Bouvier, 1905), but the two species are distinguishable by the morphology of the petasma (male) and of the thelycum (female) (Crosnier, 1985). The present specimen is still immature and therefore, the identification is considered as provisional.

Genus ***Penaeopsis*** Bate, 1881
Penaeopsis eduardoi Peréz-Farfante, 1977
[Japanese name: Benigara-ebi]
(Fig. 18F)

Parapenaeus rectacutus – De Man, 1911: 82, fig. 26; Kubo, 1949: 322 (in part), figs. 23A–B, 118A.

Penaeopsis eduardoi Pérez-Farfante, 1977: 172, figs. 1–4; Miyake, 1982: 14, pl. 5, fig. 6; Hayashi, 1982: 438, figs. 37, 38a–c; 1986b: 69, 245, fig. 29; 1992c: 118, figs. 63–64.

Material examined. R/V *Wakataka-maru*, WA06-E250, 1♂ (cl 20.0 mm), NSMT-Cr 17444.

Color. Body and appendages generally red, with darker patches on abdomen; cornea of eye grey-brown (Fig. 18F).

Distribution. Widely distributed in the Indo-West Pacific; 200–400 m (Pérez-Farfante and Kensley, 1997; Hayashi, 1992c). In Japanese waters, known from the Pacific coast southward from Suruga Bay (Hayashi, 1992c). Now newly recorded from northeastern Honshu.

Family Solenoceridae

Genus ***Hymenopenaeus*** Smith, 1882

Hymenopenaeus aequalis (Bate, 1888)

[Japanese name: Hime-kudahige-ebi]

Haliporus aequalis Bate, 1888: 286, pl. 41, fig. 1.

Hymenopenaeus aequalis – Kubo, 1949: 219, figs. 8A', 20R, 27O, P, 66M, N, 71H, 72D, J, 80I, 92D–I; Miyake, 1982: 5, pl. 2, fig. 2; Hayashi, 1985: 21, figs. 81–83; 1986b: 45, 233, fig. 4; 1992c: 180, figs. 97–99.

Material examined. R/V *Wakataka-maru*, WA06-G450, 1♂ (cl 14.6 mm), NSMT-Cr 17446.

Distribution. Eastern part of Indian Ocean to western and central Pacific; 200–1367 m (Crosnier, 1984). In Japanese waters, previously known from Suruga Bay to East China Sea (Hayashi, 1992c).

Superfamily Sergestoidea

Family Sergestidae

Genus ***Eusergestes*** Judkins and Kensley, 2008

Eusergestes similis (Hansen, 1903)

[Japanese name: Kitano-sakura-ebi]

(Fig. 18H)

Sergestes similis Hansen, 1903: 60, pl. 11, fig. 6a–d; Schmitt, 1921: 19, fig. 8, pl. 12, fig. 7; Milne, 1968: 22, figs. 1–4; Butler, 1980, 47, unnumbered fig.; Hayashi, 1986a: 287, figs. 112g, 113f, m, 114k; 1992c: 242, figs. 125h, 126g, o, 127m; Komai, 1991: 61.

Eusergestes similis – Judkins and Kensley, 2008: 76.

Material examined. R/V *Wakataka-maru*, WA05-DE380D, 1♀, NSMT-Cr 16924; WA05-E450, 2♂♂, 9♀♀, NSMT-Cr 16918; WA05-E480, 2♂♂, 8♀♀, NSMT-Cr 16920; same data, 300 specimens (not sexed), NSMT-Cr 16961; WA05-E550, 1♂, 3♀♀, NSMT-Cr 16929; WA05-F380, 2♀♀, NSMT-Cr 16927; WA05-F425, 1♀, NSMT-Cr 16926; same data, 3♂♂, 2♀♀, NSMT-Cr 16928; WA05-F450, 9♂♂, 11♀♀, NSMT-Cr 16919; same data, 1♂, NSMT-Cr 16921; same data, 1♂, NSMT-Cr 16922; WA05-G510, 1♀, NSMT-Cr 16925; WA06-DE350, 2♀♀, NSMT-Cr 17399; WA06-E350, 2♀♀, NSMT-Cr 17395; WA06-E380, 3♀♀, NSMT-Cr 17392; WA06-E410, 2♀♀, NSMT-Cr 17378; WA06-E425, 1♀, NSMT-Cr 17420; WA06-E450, 2♀♀, NSMT-Cr 17380; WA06-E480, 2♀♀, NSMT-Cr 17385; WA06-E510, 2♀♀, NSMT-Cr 17375; WA06-E550, 1♂, 1♀, NSMT-Cr 17377; WA06-E650, 2♀♀ (cl 13.0, 16.2 mm), NSMT-Cr 17394; WA06-E750, 2♀♀, NSMT-Cr 17393; WA06-E900, 2♀♀, NSMT-Cr 17398; WA06-E1200, 4♀♀ (cl 13.3–16.1 mm), NSMT-Cr 17391; WA06-EF425D, 1♂, NSMT-Cr 17280; WA06-EF510, 1♀, NSMT-Cr 17557; WA06-F380, 4♀♀ (cl 14.4–16.0 mm), NSMT-Cr 17372; WA06-F410, 5♀♀ (cl 13.5–16.0 mm), NSMT-Cr 17371; WA06-F425, 5♀♀, NSMT-Cr 17373; WA06-F450, 1♀, NSMT-Cr 17389; WA06-F480, 2♀♀, NSMT-Cr 17388; WA06-F510, 1♂, 1♀, NSMT-Cr 17374; WA06-F550, 1♀,

NSMT-Cr 17383; WA06-F650, 3♂♂, NSMT-Cr 17381; WA06-F900, 1♂, 2♀♀, NSMT-Cr 17396; same data, 1♀, NSMT-Cr 17419; WA06-G350, 2♀♀, NSMT-Cr 17379; same data, 1♀, NSMT-Cr 17424; WA06-G380, 6♀♀, NSMT-Cr 17386; WA06-G425, 1♂, NSMT-Cr 17376; same data, 5♀♀, NSMMT-Cr 17390; WA06-G450, 1♀, NSMT-Cr 17387; WA06-G480, 1♂, 2♀♀, NSMT-Cr 17384; WA06-G510, 1♂, NSMT-Cr 17422; WA06-G550, 3♂♂, 2♀♀, NSMT-Cr 17382; WA06-FG450, 1♂, 3♀♀, NSMT-Cr 17397; WA07-A250, 1♂ (cl 11.3 mm), 2♀♀(cl 14.3, 14.4 mm), NSMT-Cr 19020; WA07-A310, 1♂ (cl 11.5 mm), 1♀ (cl 14.0 mm), NSMT-Cr 19021; WA07-A350, 1♀ (cl 14.3 mm), NSMT-Cr 19022; WA07-A410, 1♂ (cl 11.2 mm), 3♀♀ (cl 13.1–15.3 mm), NSMT-Cr 19023; WA07-A450, 1♂ (cl 10.4 mm), NSMT-Cr 19024; WA07-A510, 1♂ (cl 10.3 mm), 3♀♀ (cl 13.0–15.0 mm), NSMT-Cr 19025; WA07-A550, 1♂ (cl 10.6 mm), 3♀♀ (cl 9.0–13.6 mm), NSMT-Cr 19026; WA07-A650, 2♀♀ (cl 12.9 mm, 1 damaged), NSMT-Cr 19027; WA07-A750, 2♂♂ (cl 8.5, 9.7 mm), 3♀♀ (cl 12.5–16.0 mm), NSMT-Cr 19028; WA07-A900, 2♀♀ (cl 14.1, 16.0 mm), NSMT-Cr 19029; WA07-A1500D, 1♂ (cl 11.2 mm), NSMT-Cr 19030; WA07-B310, 1♀ (cl 11.2 mm), NSMT-Cr 19031; WA07-B350, 1♀ (cl 14.5 mm), NSMT-Cr 19032; WA07-B410, 3♀♀, NSMT-Cr 19033; WA07-B450, 2♀, NSMT-Cr 19034; WA07-B510, 3♂♂, NSMT-Cr 19035; WA07-B650, 1♀, NSMT-Cr 19036; WA07-B750, 1♂, 2♀♀, NSMT-Cr 19037; WA07-B900, 1♂, 2♀♀, NSMT-Cr 19038; WA07-B1200, 3♀♀, NSMT-Cr 19039; WA07-B1500D, 1♂, NSMT-Cr 19040; WA07-C250, 3♀, NSMT-Cr 19041; WA07-C310, 2♂♂, 1♀, NSMT-Cr 19042; WA07-C350, 1♀ (cl 14.5 mm), NSMT-Cr 19043; WA07-C410, 2♀♀ (cl 15.2, 15.3 mm), NSMT-Cr 19044; WA07-C450, 3♀♀ (cl 13.0–15.1 mm), NSMT-Cr 19045; WA07-C510, 1♂ (cl 12.4 mm), 2♀♀ (cl 14.9, 15.1 mm), NSMT-Cr 19046; WA07-C550, 2♂♂, 1♀, NSMT-Cr 19047; WA07-C650, 2♂♂ (cl 12.0, 12.4 mm), 1♀ (cl 15.3 mm), NSMT-Cr 19048; WA07-C750, 2♀♀ (cl 13.7, 15.2 mm), NSMT-Cr 19049; WA07-C900, 2♀♀, NSMT-Cr 19050; WA07-D410, 1♀, NSMT-Cr 19051; WA07-D450, 2♀♀, NSMT-Cr 19052; WA07-D510, 2♀♀, NSMT-Cr 19053; WA07-D550, 1♂, 1♀, NSMT-Cr 19054; WA07-D650, 2♂♂, 1♀, NSMT-Cr 19055; WA07-D750, 1♂, 2♀♀, NSMT-Cr 19056; WA07-E510, 6♂♂, 10♀♀, NSMT-Cr 19057.

R/V *Tansei-maru*, KT07-29, stn K2, off Kushiro, eastern Hokkaido, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 7 November 2007, beam trawl, 1♂ (cl 9.3 mm), NSMT-Cr 19408.

Color. Cephalothorax generally red; organ of Pesta showing as opaque spot; abdomen and pleopods with numerous scattered red chromatophores; antennae and thoracic appendages reddish, second maxilliped darker (Fig. 18H).

Size. Largest male cl 12.4 mm; largest female cl 16.0 mm.

Distribution. North Pacific, east coast of Honshu Island, Japan to southwestern Bering Sea, Gulf of Alaska to Gulf of California, southeastern Atlantic off Chile, southeastern Atlantic off West Africa; meso- and bathypelagic (Milne, 1968; Butler. 1980). In Japan, occurring in waters off Pacific coast of Hokkaido to Honshu (Hayashi, 1986a; 1992c; Komai, 1991). This species is abundant in northeastern Honshu.

Remarks. The genus *Eusergestes* was established by Judkins and Kensley (2008) for two species previously assigned to *Sergestes* s. l., *S. arcticus* Krøyer, 1855 (type species) and *S. similis*.

Genus ***Neosergestes*** Judkins and Kensley, 2008

Neosergestes orientalis (Hansen, 1919)

[Japanese name: Kebuka-kasumi-ebi]

Sergestes orientalis Hansen, 1919: 22, pl. 2, fig. 2; Judkins, 1978: 23, figs. 16a–e, k–l, 17–18, 21a; Hayashi, 1986a: 284, figs. 111a, 112c, 113b, I, 114b, g; 1992c: 238, figs. 124a, 125d, 126c, k, 127c, i.

Sergestes (*Sergestes*) *orientalis* – Kensley, 1971a: 238, fig. 12.

Neosergestes orientalis – Judkins and Kensley, 2008: 76.

Material examined. R/V *Wakataka-maru*, WA06-F650D, 1♂ (cl 6.7 mm), NSMT-Cr 17423.

R/V *Tansei-maru*, KT07-29, stn M3-2, off Miyako, Iwate Prefecture, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, bottom depths 1737–1709 m, 6 November 2007, beam trawl, 1♀ (cl 6.4 mm), NSMT-Cr 19409.

Distribution. Southeast Atlantic Ocean, Red Sea, Indo-Pacific Ocean; meso- and bathypelagic (Pérez-Farfante and Kensley, 1997). In Japanese waters, occurring in off Honshu to Ryukyu Islands (Hanamura, 1979; Hayashi, 1986a, 1992c).

Remarks. Judkins and Kensley (2008) established *Neosergestes* for eight species previously assigned to the *Sergestes edwardsii* Krøyer, 1855 species group, among them *N. orientalis*.

Genus ***Parasergestes*** Judkins and Kensley, 2008

Parasergestes armatus (Krøyer, 1855)

[Japanese name: Togari-kasumi-ebi]

(Fig. 18G)

Sergestes armatus Krøyer, 1855: 10; Hansen, 1922: 174, pl. 10, figs. 6a–k; Hayashi, 1986a: 283, figs. 111d, 112a, 113a, g, 114e; 1992c; figs. 124d, 125a, 126a, h, 127f.
Sergestes (*Sergestes*) *armatus* – Kensley, 1971a: 232, fig. 8.
Parasergestes armatus – Judkins and Kensley, 2008: 77.

Material examined. R/V *Wakataka-maru*, WA06-F510, 1♀ (cl 11.1 mm), NSMT-Cr 17417; WA06-F1500, 1♂ (cl 10.8 mm), NSMT-Cr 17416; WA07-B350, 1♂ (cl 11.7 mm), NSMT-Cr 19087.

Color. Cephalothorax ruby red or purplish red, with scattered red spots; organ of Pesta showing as white spot inside of carapace; rostrum colorless; abdomen transparent, with numerous red spots on first to third somites; cornea darkly pigmented; antennae transparent, antennal scale with row of red spots on lateral margin; thoracic and abdominal appendages transparent, colorless (Fig. 18G).

Distribution. Mediterranean, Atlantic, Indian and western Pacific oceans; meso- and bathypelagic (Pérez-Farfante and Kensley, 1997). In Japanese waters, occurring in the Pacific coast off Honshu to Ryukyu Islands (Hayashi, 1986a, 1992c; Komai *et al.*, 1999).

Remarks. Judkins and Kensley (2008) formally divided *Sergestes* sensu lato in six genera, including five new genera. This taxon was assigned to the new genus *Parasergestes* as a type species.

Genus ***Sergia*** Stimpson, 1860

Sergia japonica (Bate, 1881)

[Japanese name: Yamato-sakura-ebi]

Sergestes japonicus Bate, 1881: 194; 1888: 387, pl. 70, figs. 1–2.
Sergestes mollis Smith, 1884: 419; 1886: 93, pl. 20, figs. 3–5.
Sergestes profundus Bate, 1888: 428 (in part).
Sergia japonica – Hayashi, 1986a: 457, figs. 117f, 118e, i; 1992c: 253, figs. 130f, m, 131e, j; Vereshchaka, 2000: 91, figs. 8–11, pl. 4A.

Material examined. R/V *Wakataka-maru,* WA07-B900, 1♀ (cl ca. 17.7 mm), NSMT-Cr 19085.

R/V *Soyo-maru*, 2007 cruise, stn K1, off Kinkazan, Miyagi Prefecture, 38˚35.4´N, 143˚04.5´E to 38˚34.0´N, 143˚06.9´E, bottom depth 2043–2183 m, benthos net, 6 August 2007, 1♂ (damaged),

NSMT-Cr 19581.

Distribution. It is suggested that this species is widely distributed in the tropics of the world oceans, but literature records are discontinuous, lacking records from the western Indian Ocean and the central Pacific; bathypelagic (Vereshchaka, 2000). In Japanese waters, recorded from off southwestern coast, Suruga Bay and Ryukyu Islands (Bate, 1888; Hayashi, 1986a, 1992c; Komai *et al.*, 1999). The present specimen represents the first record of the species from northeastern Honshu.

Sergia prehensilis (Bate, 1881)
[Japanese name: Beni-sakura-ebi]
(Fig. 19A)

Sergestes prehensilis Bate, 1881: 193; 1888: 385, pl. 71.
Sergestes gloriosus Stebbing, 1905: 84, pls. 22–23.
Sergestes fujiyamaensis Nakazawa, 1932: 32.
Sergestes (*Sergia*) *prehensilis* – Kensley, 1971a: 253, fig. 20; Sakai and Nakano, 1985: 26.
Sergia prehensilis – Hayashi, 1987: 44, figs. 116d, 119b, 120b, 121b; 1992: 256, figs. 129d, 132b, h, 133b, h, 134b; Vereshchaka, 2000: 160, figs. 2C, 59–61.

Material examined. R/V *Wakataka-maru*, WA05-E480, 1♂ (cl 15.3 mm), 2♀♀ (cl 13.6, 15.0 mm), NSMT-Cr 16923; WA06-E350, 3♂♂ (cl 10.5–15.0 mm), 5♀♀ (cl 9.3–11.6 mm), NSMT-Cr 17400; WA06-E380, 1♀, NSMT-Cr 17407; same data, 1♀, NSMT-Cr 17409; WA06-E410, 1♂ (cl 12.8 mm), NSMT-Cr 17410; WA06-E425, 1♂, NSMT-Cr 17412; WA06-E450, 1♀, NSMT-Cr 17411; WA06-E480, 1♂, NSMT-Cr; WA06-F1500, 1♀, NSMT-Cr 17406; WA06-F1500D-1, 1♀, NSMT-Cr 17418; WA06-F1500D-2, 1♀, NSMT-Cr 17408; WA06-F480, 1 specimen, NSMT-Cr 17405; WA06-F510, 1♂, 2♀♀, NSMT-Cr 17413; WA06-F650, 1♀, NSMT-Cr 17401; WA06-F900, 2♂♂, 5♀♀, NSMT-Cr 17402; WA06-H1500D, 1♂, NSMT-Cr 17404; WA07-A510, 1♀, NSMT-Cr 19058; WA07-A550, 3♀♀, NSMT-Cr 19059; WA07-B350, 1 young ♂, 1♀, NSMT-Cr 19060; WA07-B410, 4♂♂ (cl 11.2–14.3 mm), 10♀♀ (cl 10.0–15.5 mm), NSMT-Cr 19061; WA07-B450, 5♂♂ (cl 12.3–14.9 mm), 7♀♀ (cl 10.0–12.0 mm), NSMT-Cr 19062; WA07-B510, 3♂♂, 2♀♀, NSMT-Cr 19063; WA07-B550, 1♂, 1♀, NSMT-Cr 19064; WA07-B650, 1♂, NSMT-Cr 19065; WA07-B900, 1♀, NSMT-Cr 19066; WA07-C350, 1♀, NSMT-Cr 19067; WA07-C450, 3♂♂ (cl 12.5–14.3 mm), 7♀♀ (cl 11.7–15.4 mm), NSMT-Cr 19068; WA07-C510, 4♂♂, 2♀♀, NSMT-Cr 19069; WA07-C750, 1♀, NSMT-Cr 19070; WA07-C900, 1♂, 4♀♀, NSMT-Cr 19071; WA07-D450, 1♀, NSMT-Cr 19072; WA07-D510, 6♀♀, NSMT-Cr 19073; WA07-D550, 1♀, NSMT-Cr 19074; WA07-D650, 1♂, 2 juv., NSMT-Cr 19075; WA07-D750, 3♂♂ (cl 11.3–14.6 mm), 1♀ (cl 13.6 mm), NSMT-Cr 19076; WA07-E510, 3♂♂, 8♀♀, NSMT-Cr 19077.

R/V *Soyo-maru*, SO07-K2, off Kinkazan, Miyagi Prefecture, 38˚34.7´N, 143˚32.9´E to 38˚30.6´N, 143˚35.6´E, bottom depth 2968–3308 m, 1♀ (cl 10.0 mm), NSMT-Cr 19558; stn SO07-O3, off Onahama, Fukushima Prefecture, 36˚57.1´N, 142˚39.9´E to 36˚52.4´N, 142˚35.7E, bottom depth 4075–4128 m, 8 August 2007, benthos net, 1 juvenile, NSMT-Cr 19559.

R/V *Tansei-maru*, KT07-29, stn M2, off Miyako, Iwate Prefecture, 39˚16.2´N, 142˚41.1´E to 39˚18.6´N, 142˚43.7´E, bottom depths 1528–1603 m, 5 November 2007, beam trawl, 1♂ (cl 11.0 mm), 1 juv., NSMT-Cr 19370; stn M3-2, off Miyako, Iwate Prefecture, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, bottom depths 1737–1709 m, 6 November 2007, beam trawl, 3♀♀ (cl 6.6–10.0 mm), NSMT-Cr 19371; stn M3-3, off Miyako, 39˚20.1´N, 142˚51.2´E to 39˚19.2´N, 142˚49.1´E, bottom depths 1733–1695 m, beam trawl, 1♂ (cl 15.2 mm), 1♀ (cl 8.2 mm), NSMT-Cr 19372.

Color. Body and appendages generally red; rostrum and uropods pale; cornea dark brown

(Fig. 19A).

Distribution. Indo-West Pacific, South Africa to Japan; meso- and bathypelagic (Vereshchka, 2000).

Sergia regalis (Gordon, 1939)
[Japanese name: Beni-toge-sakura-ebi]
(Fig. 19B)

Sergestes regalis Gordon, 1939: 498, figs. 1–4.
Sergestes creber Burkenroad, 1940: 44.
Sergestes (*Sergia*) *creber* – Kensley, 1971a: 247, fig. 16.
Sergestes (*Sergia*) *regalis* – Kensley, 1971a: 256, fig. 21.
Sergia crebra – Hanamura, 1979: 167.
Sergia regalis – Vereshchaka, 1994: 86, figs. 8, 16–18, 26; 2000: 149, figs. 52A–D, 53A–C, 54, pl. 2A; Komai *et al.*, 1999: 136, fig. 1.

Material examined. R/V *Wakataka-maru*, WA06-F550, 1♂ (cl 17.4 mm), NSMT-Cr 17414; WA06-F650, 1♂ (cl 18.1 mm), 2♀♀ (cl 20.2, 24.0 mm), NSMT-Cr 17415; WA07-A510, 1♂ (cl 14.0 mm), 1♀ (cl 17.2 mm), NSMT-Cr 19078; WA07-B450, 1♂ (cl 17.0 mm), NSMT-Cr 19079; WA07-B510, 2♀♀ (cl 22.6, 24.4 mm), NSMT-Cr 19080; WA07-B550, 1♀ (cl 20.0 mm), NSMT-Cr 19081; WA07-C650, 1♀ (cl 23.3 mm), NSMT-Cr 19082; WA07-D550, 1♂ (cl 17.7 mm), 1♀ (cl 25.0 mm), NSMT-Cr 19083; WA07-D650, 2♀♀ (cl 20.0, 22.4 mm), NSMT-Cr 19084.

Color. Body and appendages dark red, gastric region and second maxilliped darker; cornea dark brown (Fig. 19B).

Distribution. Widely distributed in the tropics of the world oceans; meso- and bathypelagic (Vereshchaka, 2000). In Japanese waters, recorded from Suruga Bay, Kyushu-Palau Ridge, and northern Ryukyu Islands (Hayashi, 1986a; 1992c; Komai *et al.*, 1999).

Remarks. Vereshchaka (1994) synonymized *Sergia crebra* (Burkenroad, 1940) with *Sergia regalis* (Gordon, 1939). Later, Vereshchaka (2000) supported the synonymy of the two taxa after examination of extensive material from various localities in the world oceans, but he still recognized two morphs corresponding to these taxa because of the differences in the shape of the rostrum and the structure of the petasma. We found that the rostrum is constantly acuminate in the present series.

Sergia talismani (Barnard, 1946)
[Japanese name: Toge-hige-sakura-ebi]

Sergestes splendens Hansen, 1920: 480; 1922: 121, pl. 7, fig. 2. Not *Sergestes splendens* Sund, 1920.
Sergestes talismani Barnard, 1946: 384.
Sergia talismani – Hayashi, 1987: 46, figs. 115, 119d, h, 120d, h, 121e, i; 1992c: 258, figs. 128, 132e, j, 133e, j, 134e, j; Vereshchaka, 2000: 188, figs. 80–82, pls. 2B, 5C.

Material examined. R/V *Wakataka-maru*, WA06-G350, 1♂ (cl 11.1 mm), NSMT-Cr 17403.

Distribution. Widely distributed in tropics of the Atlantic, Indian and western Pacific; meso- and bathypelagic (Vereshchaka, 2000). In Japanese waters, recorded from Tosa Bay and off Kyushu (Hayashi, 1987, 1992c; Komai *et al.*, 1999). The present specimen extends the horizontal range of the species to northeastern Honshu.

Remarks. The present specimen agrees well with the published descriptions of *Sergia talismani* by Hansen (1922; as *Sergestes splendens*), Hayashi (1987, 1992c) and Vereshchaka (2000), particularly in the fewer number of photophores (four photophores without lenses in the present specimen) on the antennal scale and the structure of the petasma. Hayashi (1987) mentioned the

possibility that *Sergia nipponensis* (Nakazawa, 1932) might be a senior synonym of *Sergia talismani*.

Suborder Pleocyemata
Infraorder Caridea
Family Crangonidae
Genus ***Argis*** Krøyer, 1842
Argis hozawai (Yokoya, 1939)
[Japanese name: Hime-kurozako-ebi]
(Fig. 19C)

Nectocrangon hozawai Yokoya, 1939: 276, fig. 9; Kim, 1977: 31, figs. 135, 138, pls. 32, 54, figs. 66a–b.
Nectocrangon lar kobjakovi Vinogradov, 1950: 221 (key).
Argis hozawai – Komai and Amaoka, 1992: 25, figs. 1–5; Komai, 1994b: 93, fig. 2E, H–I.

Material examined. R/V *Wakataka-maru*, WA06-A210, 1♂ (cl 9.1 mm), 4♀♀ (cl 13.2–17.9 mm), 1 ovig. (cl 15.9 mm), NSMT-Cr 17327; WA06-B150, 1♀ (cl 17.0 mm), NSMT-Cr 17329; WA06-E210, 2 ovig. (cl 19.0, 19.8 mm), NSMT-Cr 17328; WA06-F210, 2♀♀ (cl 19.3, 20.0 mm), 3 ovig. (cl 18.8–21.2 mm), NSMT-Cr 17330; WA06-G210, 1 ovig. (cl 16.5 mm), NSMT-Cr 17326; WA07-A210, 1 ♀ (cl 18.7 mm), 1 ovig. (cl 18.4 mm), NSMT-Cr 19119; WA07-A250, 1♂ (cl 8.5 mm), 2♀♀ (cl 17.3, 18.7 mm), NSMT-Cr 19120; WA07-A310, 3♀♀ (cl 13.2–19.4 mm), 1 ovig. (cl 17.1 mm), NSMT-Cr 19121; WA07-B150, 1♀ (cl 16.4 mm), 1 ovig. (cl 14.6 mm), NSMT-Cr 19122; WA07-B210, 1♀ (cl 18.4 mm), 1 ovig. (cl 18.0 mm), 1 juv, (cl 6.6 mm), NSMT-Cr 19123; WA07-B250, 2♀♀ (cl 11.0, 21.3 mm), 1 ovig. (cl 19.2 mm), NSMT-Cr 19124; WA07-B310, 2♀♀ (cl 12.0, 13.1 mm), 2 ovig. (cl 15.0, 15.1 mm), NSMT-Cr 19125; WA07-B350, 1♀ (cl 16.7 mm), 3 ovig. (cl 15.0–16.5 mm), NSMT-Cr 19126; WA07-C210, 2♀♀ (cl 16.4, 20.0 mm), 1 ovig. (cl 16.4 mm), NSMT-Cr 19127; WA07-C250, 2♀♀ (cl 19.0, 19.4 mm), 1 ovig. (cl 17.0 mm), NSMT-Cr 19128; WA07-C310, 1♀ (cl 20.6 mm), 1 ovig. (cl 19.0 mm), NSMT-Cr 19129; WA07-C510, 1♀ (cl 17.0 mm), NSMT-Cr 19130; WA07-D210, 1 juv. (cl 5.6 mm), NSMT-Cr 19131.

Color. Background mottled light buff, yellow ocher, or amber over most of body, occasionally with tint of white or milky white on gastric region of carapace; abdomen with brown diagonal bands crossing third to first somites and fourth somite, and occasionally with white blotches on pleura; cornea grey; antennal scale pale buff; third maxilliped and pereopods yellowish or reddish, distal part of ultimate segment of third maxilliped and dactyli of fourth and fifth pereopods transparent; uropods with broad, rather obscure, reddish brown band (Fig. 19C).

Size. Largest female cl 19.4 mm, ovigerous females cl 14.6–19.2 mm.

Distribution. Restricted to East Asian waters, including Sea of Okhotsk, Sea of Japan southward to Korea, Hokkaido to off Onahama, Fukushima Prefecture; 10–310 m (Komai and Amaoka, 1992; this study).

Remarks. This species was redescribed in detail by Komai and Amaoka (1992). The authors placed *Nectocrangon lar kobjakovi* Vinogradov, 1950 in the synonymy of *Argis hozawai*.

Argis lar (Owen, 1839)
[Japanese name: Kurozako-ebi]
(Fig. 19D)

Crangon lar Owen, 1839: 88, pl. 28, fig. 1.
Nectocrangon lar – Rathbun, 1904: 137, figs. 74–75.
Nectocrangon lar lar – Vinogradov, 1950: 221, pl. 21, fig. 90.

Argis lar – Miyake, 1982: 68, pl. 23, fig. 3; Komai, 1991: 79, fig. 7; Komai, 1994b: fig. 2A–D, F–G.

Material examined. R/V *Wakataka-maru*, WA07-A350, 1 ovig. (cl 19.3 mm), NSMT-Cr 19132; same data, 2♀♀ (21.0, 24.3 mm), NSMT-Cr 19136; WA07-B310, 1♀ (cl 24.2 mm), NSMT-Cr 19137; WA07-B350, 1♀ (cl 20.4 mm), NSMT-Cr 19138; WA07-C250, 1♀ (cl 14.3 mm), NSMT-Cr 19133; WA07-C310, 1 ovig. (cl 17.8 mm), NSMT-Cr 19134; WA07-C350, 1♀ (cl 20.1 mm), 2 ovig. (cl 16.1, 17.0 mm), NSMT-Cr 19135; WA07-D310, 1♀ (cl 28.4 mm), NSMT-Cr 19139.

Color. Generally similar to preceding species; abdomen occasionally with tint of reddish brown on pleura (Fig. 19D).

Size. Largest female cl 20.4 mm, ovigerous females cl 16.1–19.3 mm.

Distribution. Northern North Pacific, including Sea of Japan, northern Japan, Sea of Okhotsk, Bering Sea, Chukchi Sea; 10–350 m (Butler, 1980; this study). In Japanese waters, occurring in waters around Hokkaido, Sea of Japan southward to Shimane Prefecture, Pacific side southward to Miyagi Prefecture (Kim, 2000; this study).

Remarks. Five non-ovigerous specimens (WA07-A350, 2 females; WA07-B350, 1 female; WA07-D310, 1 female; WA07-B310, 1 female) are provisionally referred to *Argis lar*, because they differ from the typical form in having more conspicuous middorsal carina on the first to fifth abdominal somites. In this regard, the specimens are rather similar to *Argis hozawai*, but the absence of the postrostral tubercle and the large size differentiate those specimens from *A. hozawai*. In order to satisfactorily determine the taxonomic status of these intermediate specimens, a molecular analysis is strongly recommended.

Genus ***Crangon*** Fabricius, 1798

Crangon dalli Rathbun, 1902

[Japanese name: Mizo-ebijyako]

(Fig. 19E)

Crangon dalli Rathbun, 1902a: 889; 1904: 119, fig. 60; Igarashi, 1969: 9, pl. 10, fig. 27, pl. 17, fig. 54; Butler, 1980: 99, unnumbered fig.; Hayashi and Kim, 1999: 73; Sokolov, 2001: 118, figs. 17–18.

Material examined. R/V *Wakataka-maru*, WA05-G210, 3♀♀ (cl 14.7–15.4 mm), NSMT-Cr 16883; WA06-A150, 3 juv., NSMT-Cr 17310; WA06-A150D, 1 juv., NSMT-Cr 17311; WA06-A250D, 1♂ (cl 9.4 mm), 2♀♀ (cl 10.9, 12.5 mm), NSMT-Cr 17314; WA06-D210D, 3♂♂ (cl 12.0–12.8 mm), 1 juv., NSMT-Cr 17313; WA06-E150, 1♀ (cl 14.1 mm), NSMT-Cr 17315; WA06-E210, 3♀♀ (cl 13.0–17.6 mm), NSMT-Cr 17320; WA06-E250, 1♂ (cl 12.7 mm), 1♀ (cl 17.7 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 17317; WA06-E280, 1♀ (cl 13.4 mm), 2 ovig. (cl 16.0, 16.1 mm), NSMT-Cr 17318; WA06-F210, 1♂ (cl 12.2 mm), 3♀♀ (cl 15.0–17.0 mm), 3 juv. (cl 8.4–9.5 mm), NSMT-Cr 17319; WA06-F250, 4♂♂ (cl 7.6–12.6 mm), 3♀♀ (cl 11.4–16.0 mm), NSMT-Cr 17321; WA06-F280, 2♀♀ (cl 15.4, 16.0 mm), 1 ovig. (cl 16.2 mm), NSMT-Cr 17323; WA06-G250, 3♂♂ (cl 12.1–12.3 mm), 7♀♀ (cl 14.2–15.6 mm), 1 ovig. (cl 16.1 mm), NSMT-Cr 17322; WA07-A210, 1♂ (cl 13.4 mm), 1♀ (cl 14.8 mm), NSMT-Cr 19195; WA07-A250, 2♂♂ (cl 10.9, 11.8 mm), 2♀♀ (cl 13.4, 15.1 mm), NSMT-Cr 19196; WA07-A310, 4♀♀ (cl 11.0–17.0 mm), NSMT-Cr 19197; WA07-A350, 3♀♀ (cl 13.1–17.4 mm), NSMT-Cr 19198; WA07-A410, 1♀ (cl 12.2 mm), NSMT-Cr 19199; WA07-B150, 3♀♀ (cl 8.4–14.1 mm), NSMT-Cr 19200; WA07-B210, 2♂♂ (10.7, 11.8 mm), 3♀♀ (cl 11.6–15.8 mm), NSMT-Cr 19201; WA07-B250, 3♀♀ (cl 13.6–17.0 mm), NSMT-Cr 19202; WA07-B310, 4♀♀ (cl 11.9–16.2 mm), NSMT-Cr 19203; WA07-B350, 3♀♀ (cl 12.1–13.2 mm), NSMT-Cr 19204; WA07-C210, 1♂ (cl 14.0 mm), 2♀♀ (cl 13.1, 17.8 mm), NSMT-Cr 19205; WA07-C250, 3♀♀ (cl 12.8–18.3 mm), NSMT-Cr 19206; WA07-C350, 2♀♀ (cl 13.1, 15.5 mm),

NSMT-Cr 19208; WA07-C410, 2♀♀ (cl 17.4, 17.6 mm), NSMT-Cr 19209; WA07-D210, 2♂ (cl 11.5, 11.6 mm), 2♀♀ (cl 12.0, 16.5 mm), NSMT-Cr 19210; WA07-D250, 1 ovig. (cl 15.5 mm), NSMT-Cr 19211.

Color. Brownish grey background over entire body, with numerous scattered translucent spots; telson and uropod darker; cornea gray; antennae and thoracic appendages also brownish gray, antennal flagellum banded with brownish gray and shorter white (Fig. 19E).

Size. Largest male cl 14.0 mm, largest female cl 18.3 mm, ovigerous females cl 15.0–16.2 mm.

Distribution. North Pacific, Puget Sound to Sea of Japan; Bering Sea; Chukchi Sea; subtidal to 630 m (Butler, 1980; Hayashi and Kim, 1999). In Japanese waters, occurring in Hokkaido, northeastern Honshu southward to Fukushima Prefecture, and Sea of Japan (Kim and Hayashi, 1999).

Genus ***Metacrangon*** Zarenkov, 1965

Remarks. A taxonomic review of the genus is still in progress. In this study, four species have been recognized from northeastern Japan, of which one species is described as new. Two previously described species, *M. nipponensis* (Yokoya, 1933) and *M. trigonorostris* (Yokoya, 1933), will be fully redescribed in a separate paper. The fourth species remains unidentified, although it is morphologically similar to *M. ochotensis* (Kobjakova, 1955), which is represented only by the holotype from the South Kurile Islands (Komai, 1997b).

Metacrangon cornuta sp. nov.

[New Japanese name: Tsunodashi-toge-ebijyako]

(Figs. 2–4, 19G)

Material examined. Holotype: ♂ (cl 5.4 mm), R/V *Tansei-maru*, KT07-29, stn K2, off Kushiro, eastern Hokkaido, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 7 November 2007, beam trawl, NSMT-Cr 19425.

Description. Body (Fig. 2) moderately robust. Rostrum (Fig. 3A–B) elongate triangular in

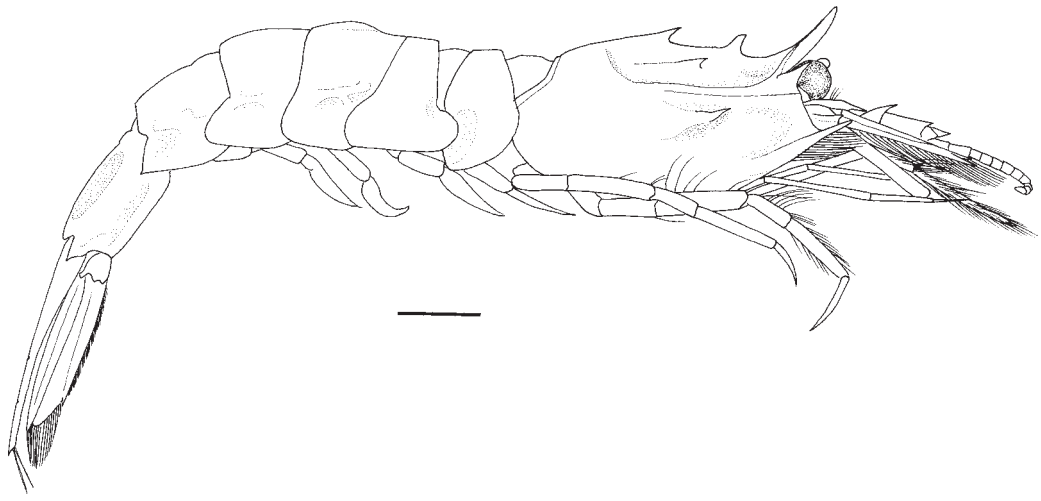

Fig. 2. *Metacrangon cornuta* sp. nov., holotype, male (cl 5.4 mm), NSMT-Cr 19425, habitus in lateral view. Scale bar: 2 mm.

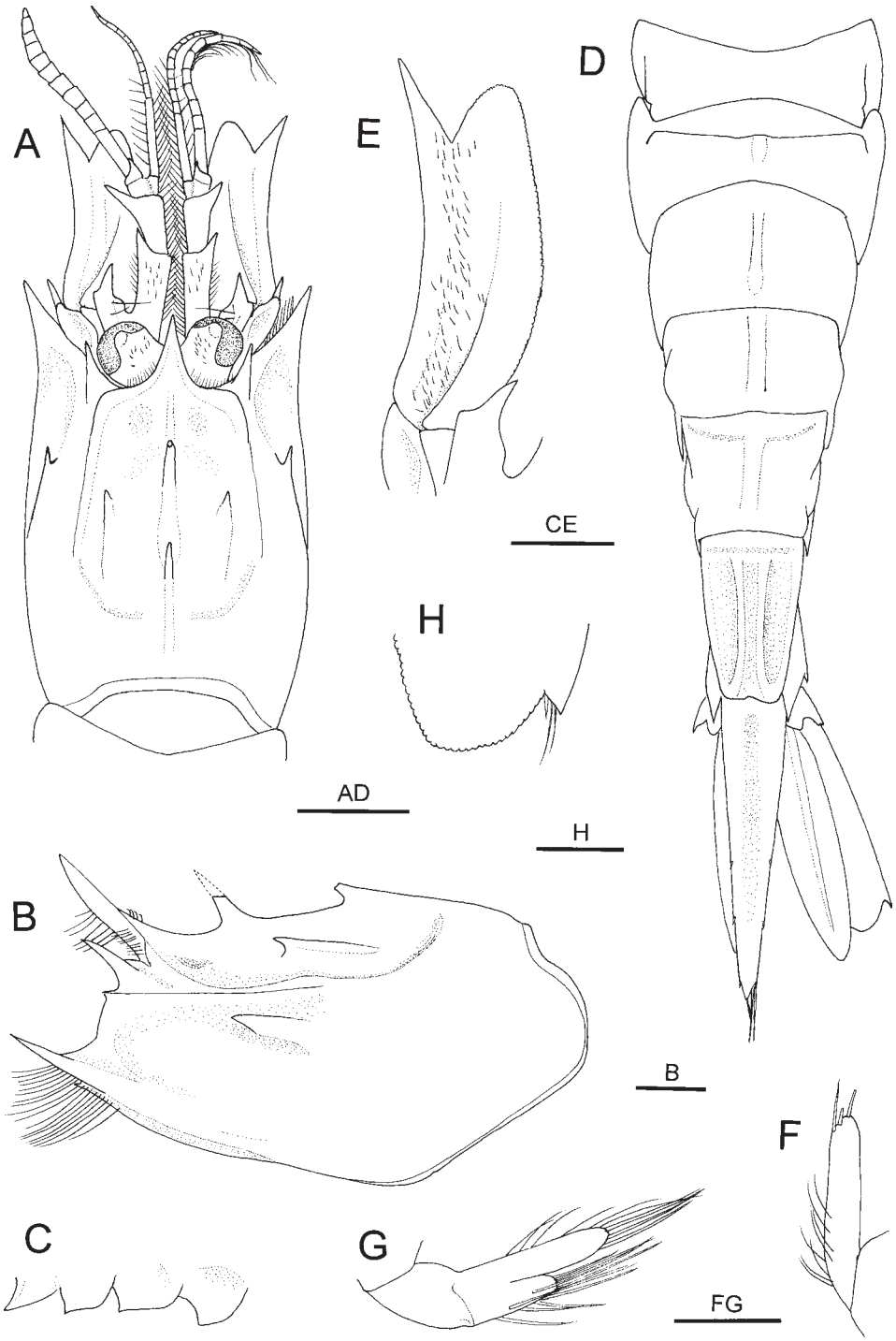

Fig. 3. *Metacrangon cornuta* sp. nov., holotype, male (cl 5.4 mm), NSMT-Cr 19425. A, carapace and cephalic appendages, dorsal view; B, carapace, lateral view; C, median keel of thoracic sternum, ventrolateral view; D, abdomen, dorsal view (setae omitted); E, left antennal scale and part of stylocerite, dorsal view; F, endopod of left first pleopod, ventral view; G, endopod and appendix masculina of left second pleopod, ventral view; H, posterior margin of exopod of left uropod, ventral view. Scale bars: 2 mm for A, D; 1 mm for B–C, E; 0.5 mm for F–H.

dorsal view, strongly ascending (angle against horizontal plane of carapace about 70˚), reaching level of distal corneal margins, 0.33 times as long as carapace; tip acuminate; dorsal surface flattened, lateral margin confluent with orbital margin; ventral surface bluntly carinate. Carapace (Fig. 3A–B) slightly longer than wide postorbitally; 2 middorsal teeth present, anterior (epigastric) tooth obliquely erect (angle against horizontal plane about 70˚), arising at 0.20 of carapace length, posterior tooth distinctly smaller than anterior tooth, arising at 0.55 of carapace length; middorsal carina except for 2 teeth blunt; submedian tooth moderately small, weakly buttressed, lower than dorsal midline in lateral view; postorbital ridges distinct, slightly diverging posteriorly; hepatic tooth moderately small; antennal tooth relatively large, sharp, ascending (angle against horizontal plane about 50˚); branchiostegal tooth relatively strong, directed somewhat upward in lateral view and anterolaterally in dorsal view, not curved, reaching beyond level of rostral apex, anteriorly, reaching distal margin of antennal basicerite; branchiostegal ridge extending to level of epigastric tooth; pterygostomial tooth tiny.

Thoracic sternite with distinct transverse ridge on fourth somite; fifth to eighth somites each with laterally compressed teeth, consisting of median keel, all acutely or subacutely pointed (Fig. 3C).

Abdomen (Figs. 2, 3D) slightly sculptured; first somite with trace of middorsal carina, second somite with low, obsolete middorsal carina; third to fifth somites each with low, but clearly delimited middorsal carinae, none reaching posterior margin of somite; third to fifth somites each with obsolete lateral ridges. Pleuron of first somite with blunt posteroventral angle, those of second to fourth somites rounded marginally; fifth pleuron shallowly depressed on lateral surface, with posteroventral tooth. Sixth somite with clearly delimited submedian carinae, reaching nearly to posterodorsal margin; lateral carina distinct; pleuron shallowly depressed; posterolateral projection terminating in sharp tooth. Telson 1.80 times longer than sixth somite, gradually tapering posteriorly to sharply pointed apex, armed with 2 pairs of dorsolateral spinules (anterior pair arising at 0.54 length) and 1 pair of spinule and 2 pairs of long spiniform setae flanking apex; dorsal surface sulcate medially.

Eye (Fig. 3A) stout, cornea as wide as eyestalk, corneal width about 0.20 of carapace length; eyestalk with prominent dorsal tubercle.

Antennular peduncle (Figs. 2, 3A) distinctly overreaching mid-length of antennal scale; first segment with dorsolateral distal angle produced in strong tooth; stylocerite falling short of distal margin of first segment, terminating in elongate, acute tooth, distomesial margin forming broadly convex lobe, lateral margin forming blunt but conspicuous angle; second segment with dorsolateral distal angle produced distolaterally in strong tooth; third segment short, with spiniform projection at base of outer flagellum. Outer flagellum overreaching distal margin of antennal scale by about 0.80 length, consisting of 11 articles in females; inner flagellum subequal in length to outer flagellum.

Antenna (Figs. 2, 3A) with basicerite bearing weakly produced, blunt dorsodistal lateral angle and elongate ventrolateral tooth. Antennal scale (Fig. 3A, E) 0.60 times as long as carapace, 2.85 times longer than wide, lateral margin concave, distolateral tooth strong, separated from lamella by deep V-shaped notch, overreaching relatively narrow, rounded lamella. Flagellum missing.

Third maxilliped (Fig. 4A) relatively slender; ultimate segment gradually tapering distally to pointed apex, 6.0 times longer than wide, mesial margin with some elongate spines obscured by dense stiff setae; penultimate segment 3.2 times longer than wide; antepenultimate segment sinuous in dorsal view, with 2 spinules on ventral surface subterminally; exopod well-developed; coxa with large lateral plate.

First pereopod (Fig. 4B) moderately stout, overreaching antennal scale by 0.2 length of palm; palm (Fig. 4C) longer than merus and ischium combined, 3.5 times longer than wide, not

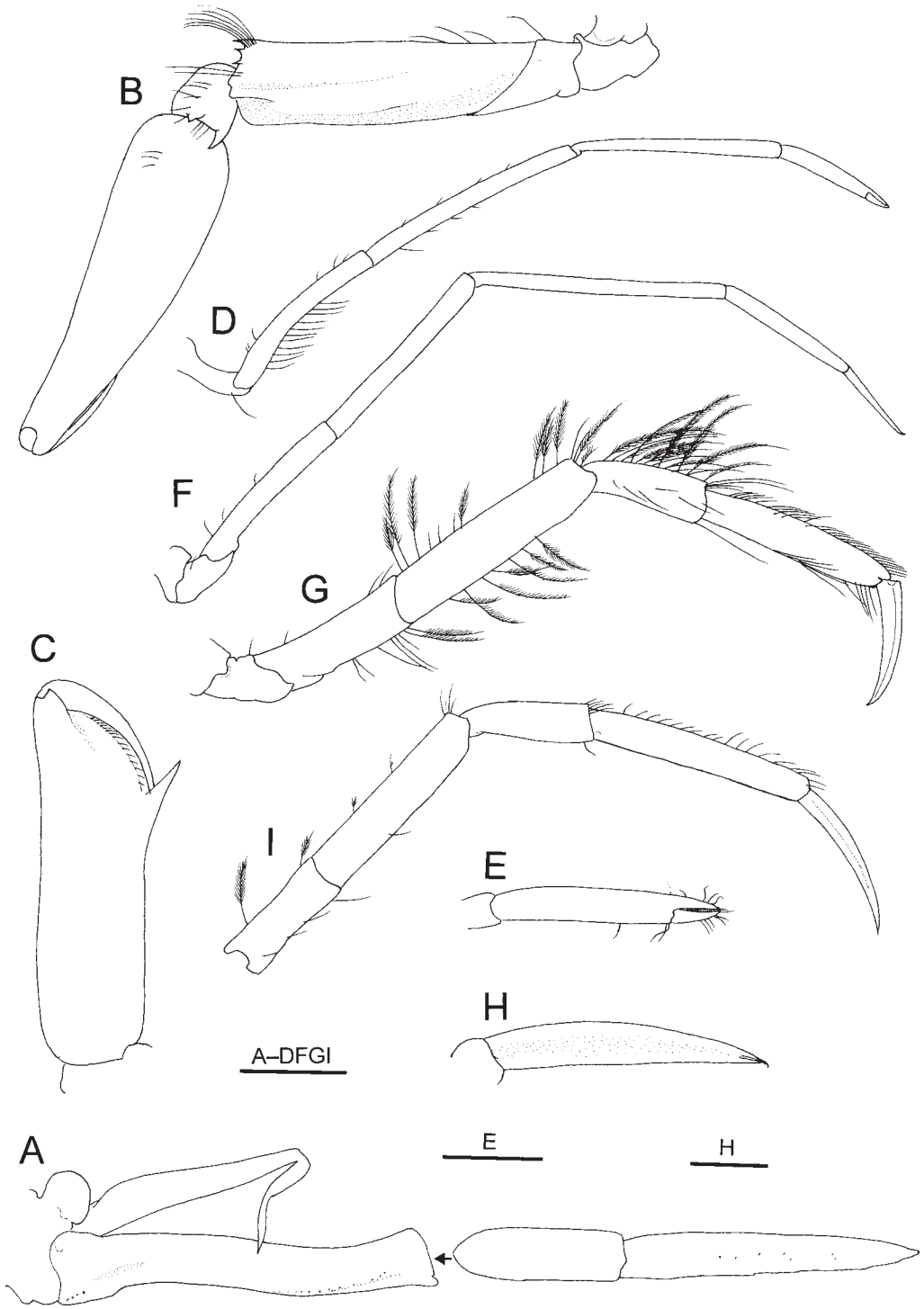

Fig. 4. *Metacrangon cornuta* sp. nov., holotype, male (cl 5.4 mm), NSMT-Cr 19425. A, left third maxilliped, dorsal view (setae omitted); B, left first pereopod, lateral view; C, same, subchela, dorsal view; D, right second pereopod, lateral view; E, same, chela, extensor view; F, right third pereopod, lateral view; G, right fourth pereopod, lateral view; H, same, dactylus, outer view; I, right fifth pereopod, lateral view. Scale bars: 1 mm for A–D, F–G, I; 0.5 mm for E, H.

particularly widened proximally or distally, lateral margin very slightly sinuous, mesial margin straight, cutting edge oblique; distomesial process (thumb) relatively slender; carpus with 2 sharp teeth on distolateral margin (ventrolateral tooth larger than lateral tooth); merus with relatively small dorsodistal tooth and 2 smaller teeth on distolateral margin, ventrolateral margin weakly delimited. Second pereopod (Fig. 4D) reaching base of distolateral tooth of antennal scale by tip of chela; dactylus 0.27 times as long as palm; both fingers each with minutely pectinated cutting edge; chela (Fig. 4E) 0.57 times as long as carpus; merus 1.24 times as long as ischium. Third pereopod (Fig. 4F) moderately slender, overreaching antennal scale by half length of dactylus; dactylus 0.60 times as long as propodus; propodus 0.57 times as long as carpus; merus slightly longer than ischium. Fourth pereopod (Fig. 4G) relatively slender; dactylus (Fig. 4H) slender, subspatulate with gently convex upper and straight lower margins, terminating in minute unguis flanked by distal projections; outer surface slightly concave; propodus 5.2 times longer than wide, with numerous stiff setae on dorsal and ventral margins; carpus 0.60 times as long as propodus, with long plumose setae on dorsal margin; merus 3.5 times longer than wide, with long plumose setae on dorsal and ventral margins. Fifth pereopod (Fig. 4I) more slender than fourth pereopod; dactylus subconical, slightly curved, 0.68 times as long as propodus; propodus 7.2 times longer than wide, with sparse short setae on dorsal margin, naked on ventral margin; carpus 0.57 times as long as propodus, devoid of setae on dorsal margin; merus 4.9 times longer than wide, with few short setae on dorsal and ventral margins.

Endopod of first pleopod (Fig. 3F) 0.30 length of exopod, not particularly tapering distally, rounded terminal margin with 3 spiniform setae. Endopod of second pleopod (Fig. 3G) 0.25 times as long as exopod, appendix masculina reaching mid-length of endopod, basally fused with endopod, bearing several long spiniform setae on terminal margin to mesial surface. Uropod distinctly shorter than telson; endopod moderately narrow, slightly longer than exopod; exopod with straight lateral margin terminating in small posterolateral tooth and with slender spinule just mesial to posterolateral tooth.

Color. Generally light reddish brown; cornea black (Fig. 19H).

Distribution. So far known only from off Kushiro, eastern Hokkaido; 1535–1543 m.

Remarks. This new taxon appears closest to *Metacrangon spinirostris* (Rathbun, 1902), presently known only from the Aleutian Islands at depths of 478–1125 m. Shared characters include: the rostrum is elongate, obliquely erect, and spiniform in the general shape; the epigastric tooth is also obliquely erect similarly to the rostrum; the dorsolateral distal angles of the first and second segments of the antennular peduncle are produced into strong, sharp teeth; the distolateral tooth of the antennal scale overreaches the lamella. (Rathbun, 1902, 1904). Comparison with the descriptions by Rathbun (1902, 1904) reveals some minor but apparently significant differences. The antennal and branchiostegal teeth of the carapace are less ascending in *M. cornuta* sp. nov. than in *M. spinirostris*, and the latter tooth exceeds beyond the tip of the rostrum in the new species, rather than just reaching that in *M. spinirostris*. The epigastric tooth on the carapace is about 0.80 length of the rostrum in *M. spinirostris*, but it is estimated to be about 0.50 length of the rostrum in the new species. The second abdominal somite is provided with a low, blunt middorsal carina in *M. cornuta*, whereas it is rounded in *M. spinirostris*.

Etymology. From the Latin *cornuta*, meaning a horn, alluding to the elongate, ascending rostrum. Used as a noun in apposition.

Metacrangon nipponensis (Yokoya, 1933)
[New Japanese name: Kitano-somewake-ebijyako]
(Fig. 19F)

Crangon nipponensis Yokoya, 1933: 38, text-fig. 19.
Metacrangon nipponensis – Zarenkov, 1965: 1764.

Material examined. R/V *Wakataka-maru*, WA05-G450, 1♀ (cl 9.2 mm), NSMT-Cr 16897; WA05-GH425, 2♀♀ (cl 8.5, 9.2 mm), NSMT-Cr 16895; WA05-GH480, 1♀ (cl 8.3 mm), 1 ovig. (cl 9.3 mm), NSMT-Cr 16900; WA06-E480, 1♀ (cl 8.0 mm), 1 ovig. (cl 9.0 mm), NSMT-Cr 17340; WA06-F425, 1♂ (cl 5.3 mm), 1♀ (cl 5.0 mm), 1 ovig. (cl 9.2 mm), NSMT-Cr; WA06-FG410, 1♂ (cl 6.6 mm), NSMT-Cr; WA06-FG450, 1♀ (cl 9.4 mm), NSMT-Cr 17334; WA06-G350, 1 ovig. (cl 9.1 mm), NSMT-Cr 17335; WA06-G450, 3♀♀ (cl 8.0–10.1 mm), 1 ovig. (cl 9.1 mm), NSMT-Cr 17337; WA06-G480, 1 ovig. (cl 10.0 mm), NSMT-Cr 17338; WA06-G510, 1♂ (cl 6.0 mm), NSMT-Cr 17339.

Color. Carapace, anterior section of first abdominal somite, and posterior half of second somite to sixth somite maroon red, posterior section of first abdominal somite and anterior part of second somite white with mottled maroon red blotch medially; telson and uropods paper; cornea brownish grey; antennal and pereopods also brown or maroon red (Fig. 19F).

Distribution. Known only from Kashima Sea off Fukushima to Ibraki Prefecture; 350–480 m (Yokoya, 1933; this study).

Remarks. The present material represents the second record of this rare species since the original description by Yokoya (1933). This species will be fully redescribed in a separate paper (Komai, in preparation).

Metacrangon trigonorostris (Yokoya, 1933)
[New Japanese name: Mitsukado-somewake-ebijyako]

Crangon trigonorostris Yokoya, 1933: 37, text-fig. 18.
Metacrangon trigonorostris – Zarenkov, 1965: 1764.
Argis trigonorostris – Burukovsky, 2003: 44, figs. 1–2.

Material examined. R/V *Wakataka-maru*, WA05-DE380D, 2♀♀ (cl 4.5, 4.6 mm), NSMT-Cr 16896; WA05-DE410, 1 ovig. (cl 12.1 mm), NSMT-Cr 16894; WA05-E425, 1♀ (cl 10.4 mm), NSMT-Cr 16893; WA06-E480, 2 ovig. (cl 9.8, 10.5 mm), NSMT-Cr; WA06-E900, 1 ovig. (cl 8.8 mm), NSMT-Cr 17343; WA06-F410, 2♀♀ (cl 9.4, 9.7 mm), NSMT-Cr 17341; WA06-F425, 3♀♀ (cl 9.3–9.7 mm), 1 ovig. (cl 10.6 mm), NSMT-Cr 17342; WA07-D650, 2 ovig. (cl 10.3, 10.6 mm), NSMT-Cr 19157; WA07-F410, 4♀♀ (cl 8.5–11.0 mm), NSMT-Cr 19158.

Distribution. Previously known only from two localities off northeastern Honshu, i.e., off Shioya-zaki, Fukushima Prefecture, 390 m (Yokoya, 1933), and off Kuji, Iwate Prefecture, 1005–1016 m (Burukovsky, 2003).

Remarks. *Metacrangon trigonorostris* was originally described on the basis of a single female collected from off Shioya-zaki, Fukushima Prefecture, at a depth of 390 m (Yokoya, 1933, as *Crangon*). Since the original description, Burukovsky (2003) reported the species based on specimens from off Kuji, Iwate Prefecture, at depths of 1005–1016 m. The latter author transferred the species to *Argis*, but the assignment is not justified because of the lack of synapomorphies of the latter genus, i.e., the specialized orbit and the strongly reduced rostrum (Christoffersen, 1988; Komai, 1997a). Furthermore, this species has dorsolateral carinae on the sixth abdominal somite, a possible synapomorphy of *Metacrangon* (Komai, unpublished data). It will be redescribed in

detail in a separate paper in preparation.

Metacrangon sp.
(Figs. 5, 19H)

Material examined. R/V *Wakataka-maru*, WA06-F1500D-1, 1♀ (cl 5.3 mm), NSMT-Cr 17350; WA06-F1500D-2, 1♂ (cl 5.5 mm), NSMT-Cr 17351.

Color. Carapace with tinge of maroon on anterodorsal part, posterior part of carapace, abdomen, antennae, and pereopods transparent; cornea opaque (Fig. 19H).

Remarks. The present specimens represent a species belonging to the *Metacrangon jacqueti* (A. Milne-Edwards, 1881) species group, characterized by the strong anterior middorsal (epigastric) tooth overhanging the rostrum and the first to third abdominal pleura each bearing ventral tooth or projection (Komai, 1997b). In the northwestern Pacific, two species of the group are known, i.e., *M. ochotensis* (Kobjakova, 1955) and *M. similis* Komai, 1997. *Metacrangon ochotensis* is represented only by the holotype collected from Ekaterina Strait between Kunashiri and Etorof Islands in the southern Kurile Islands, at a depth of 2850 m (Kobjakova, 1955; Komai, 1997b). *Metacrangon similis* is known from the Pacific coast of Japan from Chiba Prefecture to Tosa Bay, at depths of 450–1000 m. Following the key of Komai (1997b), the present specimens key out to *M. ochotensis*. However, they differ from the holotype of *M. ochotensis* in several respects as follows: the rostrum reaches the distal corneal margins in the present specimens (Fig. 5A–B), rather than falling short of the latter in the holotype; the branchiocardiac ridge on the carapace extends only to the level of the second middorsal tooth in the present specimens (Fig. 5A–B), but it overreaches it in the holotype of *M. ochotensis*; the middorsal and lateral carinae on the abdomen are less distinct in the present specimens than in the holotype (Fig. 5C–D); the antennular peduncles are more stout in the present specimens than in the holotype (Fig. 5B); the lateral margin of the antennal scale is less concave in the present specimens than in the holotype (Fig. 5E); the notch separating the distolateral tooth and distal lamella of the antennal scale is less deep in the present specimens than in the holotype (Fig. 5E). At present, it is difficult to fully assess if these differences are of specific significance or of individual variation because of the paucity of material, but in other congeneric species, most of these characters are rather stable (Komai, 1997b).

Genus ***Neocrangon*** Zarenkov, 1965

Crangon (*Neocrangon*) Zarenkov, 1965: 1762.
Neocrangon – Kuris and Curlton, 1977: 554; Christoffersen, 1988; Holthuis, 1993: 292.

Diagnosis. Carapace with 1 or 2 small epigastric teeth, but otherwise unarmed on dorsal midline; submedian teeth absent; hepatic tooth present; antennal tooth small; branchiostegal tooth relatively small, directed forward; pterygostomial tooth tiny; postorbital ridge low, blunt; orbital margin evenly concave, with small cleft. Abdomen slightly sculptured; first and second somites devoid of middorsal carina, third to fifth somites rounded or with low, blunt middorsal carina; sixth somite with distinct submedian carinae, pleuron not flared laterally. Eyes contiguous; cornea relatively large; dorsal tubercle of eyestalk absent. Antennular peduncle without deep fossa of statocyst opened on dorsal surface. Posterior lobe of scaphognathite rounded, but somewhat elongate, with very long setae on posterior and posteromesial margin. No arthrobranch present above base of third maxilliped. First pereopod unarmed on ventral margin of merus. Second pereopod chelate, flexed at articulation between merus and carpus, fingers of chela pectinated with minute spinules. Fourth and fifth pereopods slender, dactyli narrowly subspatulate, dactylar-propodal articulation

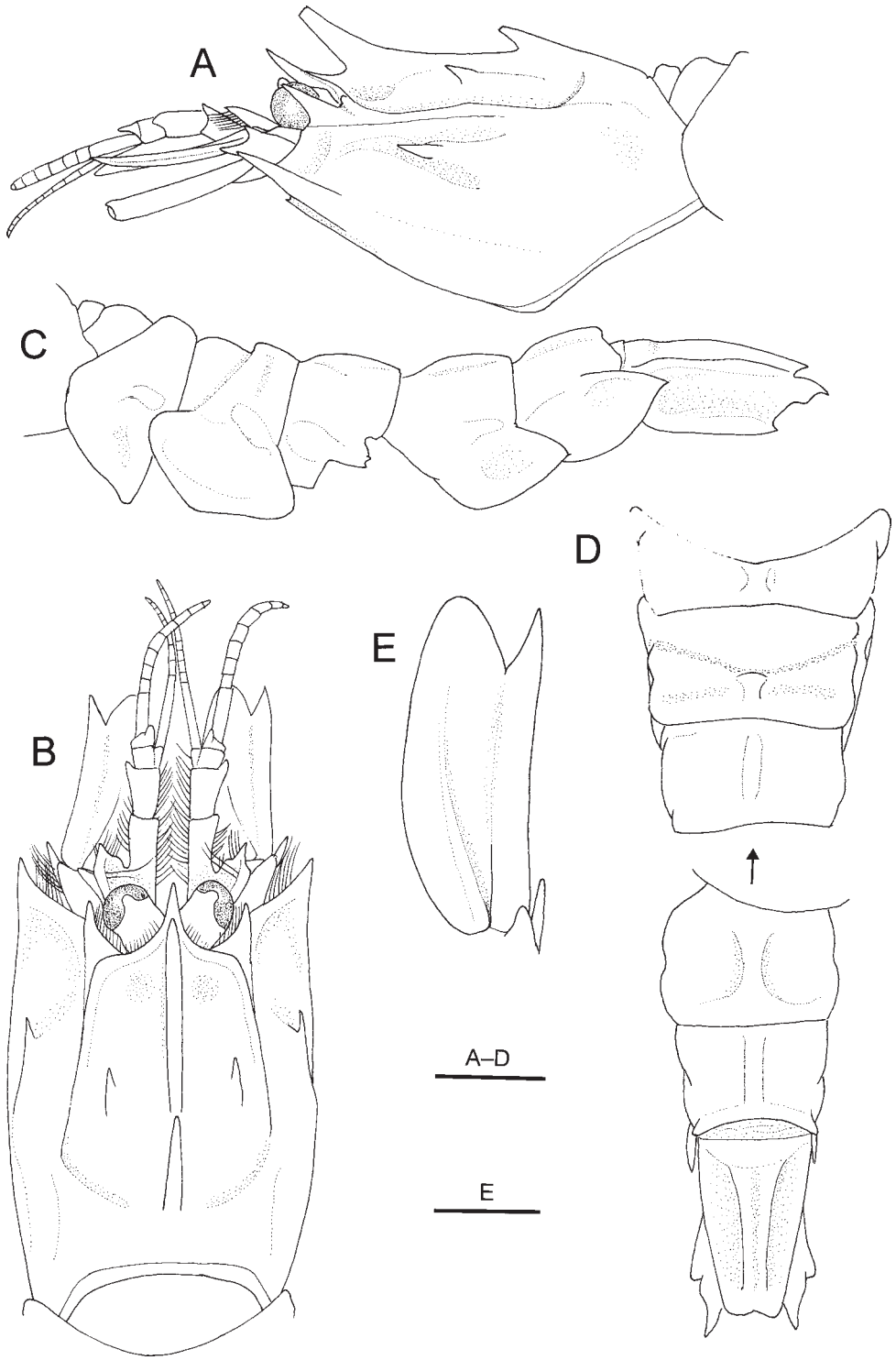

Fig. 5. *Metacrangon* sp., male (cl 5.5 mm), NSMT-Cr 17351. A, carapace and cephalic appendages, lateral view (setae partially omitted); B, same, lateral view (setae partially omitted); C, abdomen, lateral view (third somite damaged); D, same, dorsal view; right antennal scale, dorsal view (marginal setae omitted). Scale bars: 2 mm for A–D; 1 mm for E.

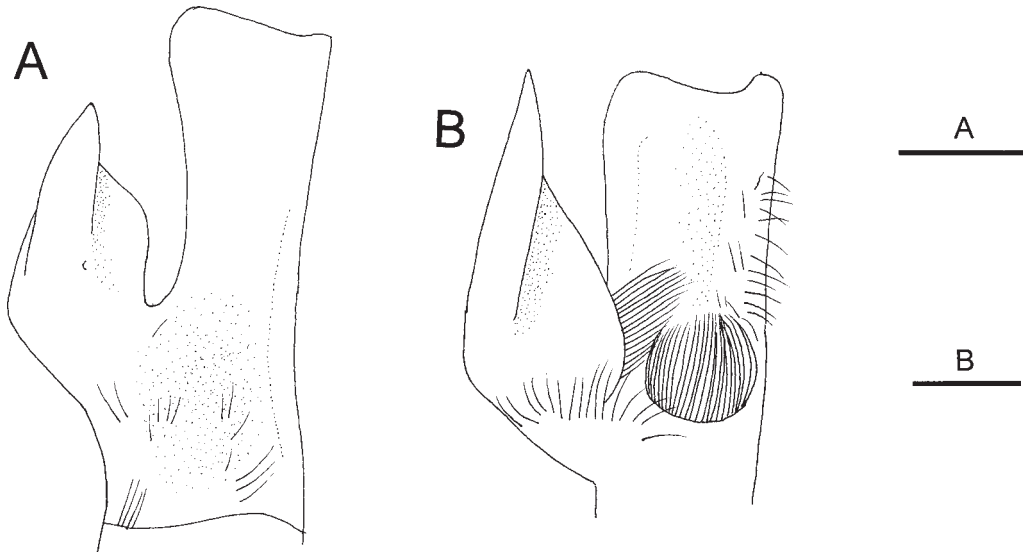

Fig. 6. Basal segment of antennular peduncle of two crangonid species, dorsal view. A, *Neocrangon communis* (Rathbun, 1899), female (cl 11.6 mm), off Hamanaka, eastern Hokkaido, 216 m, CBM-ZC 5484; B, *Crangon dalli* Rathbun, 1902, female (cl 13.6 mm), off Rokkasyo Village, Aomori Prefecture, CBM-ZC 1122. Scale bars: 1 mm.

not twisted. Pleopods devoid of appendices internae; appendix masculina of male second pleopod shorter than endopod, bearing spiniform setae.

Species included. *Neocrangon communis* (Rathbun, 1899) (type species); *N. abyssorum* (Rathbun, 1902); *N. resima* (Rathbun, 1902); *N. sagamiensis* (Balss, 1913); and *N. joloensis* (De Man, 1929).

Remarks. *Neocrangon* was originally established as a subgenus of *Crangon* by Zarenkov (1965) chiefly based on the differences in the number of epigastric teeth on the carapace and the lack of arthrobranch gill on the third maxilliped. Later Kuris and Curlton (1977) raised the taxon to a full genus, citing differences in the number of epigastric teeth on the carapace, the carination of the sixth abdominal somite and the shape of the rostrum. Christoffersen (1988) has shown that the loss of arthrobranch above the base of the third maxilliped links *Neocrangon* to the clade consisting of *Notocrangon* Coutière, 1900, *Mesocrangon* Zarenkov, 1965, *Metacrangon*, *Argis*, *Rhynocrangon* Zarenkov, 1965 and *Sclerocrangon*. However, the status of *Neocrangon* has been subject of disagreement. Several authors (e.g., Komai, 1991; Holthuis, 1993; Wicksten, 1996; Kim *et al.*, 2000) maintained the taxon as a full genus, but others recognized it as a subgenus of *Crangon* (e.g., Hayashi, 1986b) or did not accept the taxon (e.g., Butler, 1980; Sokolov, 2000). During this study, we have confirmed that there is no arthrobranch above the base of the third maxilliped in the three species treated herein, whereas there is a small arthrobranch above the base of the third maxilliped in *Crangon* (in addition to *C. dalli*, material of nine selected species in the CBM collection were examined, i.e., *C. affinis*, *C. alaskensis*, *C. amurensis*, *C. casiope*, *C, crangon* (type species of the genus), *C. hakodatei*, *C. nigromaculata*, *C. propinquus*, and *C. uritai*). The merus of the first pereopod bears a sharp tooth on the ventral surface arising at about the mid-length in all species assigned to *Crangon* (cf. Butler, 1980; Hayashi and Kim, 1999), which is absent in all species of *Neocrangon*. Furthermore, we have found that the three species of *Neocrangon* differ from the ten species of *Crangon* in the lack of a statocyst fossa opening on the dorsal surface of the first segment of the antennular peduncle (Fig. 6A), suggesting that this character is of generic significance. In the species of *Crangon*, the first segment of the antennular peduncle is provided with a

deep fossa obscured by numerous stiff setae arising from the posterior margin of the fossa (Fig. 6B). The presence of the statocyst fossa possibly represents a unique synapomorphy of *Crangon*, because the character is not known in other crangonid taxa (Komai, unpublished data). Characters cited by Kuris and Curlton (1977) in diagnosing *Neocrangon* are rather variable, and thus they are less reliable. Nevertheless, the carination of the sixth abdominal somite is also useful in distinguishing *Neocrangon* and *Crangon*, because among the known *Crangon* species, only *C. dalli* has two submedian carinae on the sixth somite. We concur that *Neocrangon* is a valid genus.

Originally, Zarenkov (1965) assigned the following nine *Crangon* species to *Neocrangon*, *Crangon abyssorum*, *C. geniculata* Yokoya, 1933, *C. resima*, *C. communis*, *C. joloensis*, *C. sagamiense*, *C. dalli*, *C. nigricauda* Stimpson, 1856, *C. zacae* Chace, 1937, *C. franciscorum* Stimpson, 1859, and *C. nigromaculata*. Kuris and Curlton (1977) confirmed that *C. dalli*, *C. nigricauda*, *C. franciscorum*, and *C. nigromaculata* should be assigned to *Crangon* s.s. *Crangon joloensis* is known only by the holotype from Jolo Islands in Indonesia and the original description by De Man (1929), although De Man (1929) clearly pointed the close affinity of his new species to *N. communis*. The generic status of De Man's (1929) taxon needs to be verified, because the gill formula remains unknown. The specific status of *Crangon geniculata* has been obscure. The senior author has attempted to locate the holotype, but it seems that it is no longer extant. No specimens agreeing to Yokoya's description have been encountered yet. Wicksten (1996) synonymized *Neocrangon zacae* with *N. resima*. At present, only five species are assigned to *Neocrangon*.

Key to Japanese species of *Neocrangon*

1. Rostrum flattened dorsoventrally, shallowly sulcate dorsally; lateral margin of antennal scale nearly straight; third and fourth abdominal somites with low, but clearly discernible middorsal carina ..... *N. communis*
– Rostrum not flattened dorsoventrally, not sulcate dorsally; lateral margin of antennal scale markedly concave; third and fourth abdominal somites without trance of middorsal carina 2
2. Posterior epigastric tooth arising at 0.25–0.30 of carapace length; rostrum nearly spiniform ..... *N. abyssorum*
– Posterior epigastric tooth arising at 0.40–0.50 of carapace length; rostrum strongly compressed laterally, with distinct ventral lobe occasionally expanded ..... *N. sagamiensis*

Neocrangon abyssorum (Rathbun, 1902)
[Japanese name: Chihiro-soko-ebijyako]
(Fig. 20A)

Crangon abyssorum Rathbun, 1902: 890; 1904: 125, fig. 66; Butler, 1980: 112, unnumbered fig.
Neocrangon abyssorum – Komai, 1991: 81, fig. 8; Kim *et al.*, 2000: 13, figs. 6–7, 8f.

Material examined. R/V *Wakataka-maru*, WA05-F900, 3♀♀ (cl 6.4–7.3 mm), NSMT-Cr 16901; WA06-E1200, 1♂ (cl 8.6 mm), 4♀♀ (cl 8.4–10.2 mm), NSMT-Cr 17346; WA06-E750, 1♂ (cl 8.6 mm), NSMT-Cr 17344; WA06-E900, 3♀♀ (cl 6.6–7.6 mm; largest specimen infected with rhizocephalan), NSMT-Cr 17345; WA06-F1500, 3♂♂ (cl 7.4–8.0 mm), 7♀♀ (cl 5.0–10.4 mm), 1 ovig. (cl 8.6 mm), NSMT-Cr 17348; WA06-F900, 3♂♂ (cl 6.0–6.7 mm), 4♀♀ (cl 5.2–7.4 mm), 1 ovig. (cl 8.1 mm), NSMT-Cr 17347; WA06-H1500D, 2♀♀ (cl 6.0, 6.4 mm), NSMT-Cr 17349; WA07-A1500D, 1♂ (cl 4.9 mm), NSMT-Cr 19189; WA07-B900, 3♀♀ (cl 5.4–9.0 mm), NSMT-Cr

19190; WA07-B1200, 2♂♂ (cl 7.0, 8.1 mm), 14♀♀ (cl 4.5–8.3 mm), 1 ovig. (cl 8.0 mm), NSMT-Cr 19191; WA07-C900, 1♂ (cl 6.4 mm), 5♀♀ (cl 5.5–8.4 mm), NSMT-Cr 19192; WA07-D1500D, 1 juv. (cl 3.0 mm), NSMT-Cr 19193; WA07-E1200, 3♂♂ (cl 8.7–10.0 mm), 10♀♀ (cl 7.5–11.0 mm), 1 ovig. (cl 8.8 mm), NSMT-Cr 19194.

R/V *Soyo-maru*, stn SO07-O2, off Onahama, Fukushima Prefecture, 36˚52.6´N, 142˚22.8´E to 36˚48.2´N, 142˚21.7´E, 2904–2991 m, 8 August 2007, 1♀ (damaged), NSMT-Cr 19586.

R/V *Tansei-maru*, KT07-29, stn E1, off Erimo-misaki, eastern Hokkaido, 41˚43.0´N, 143˚56.7´E to 41˚44.5´N, 143˚56.5´E, 1031–1008 m, 7 November 2007, beam trawl, 1♂ (cl 6.0 mm), NSMT-Cr 19377; stn E3, off Erimo-misaki, 41˚39.1´N, 144˚07.5´E to 41˚37.2´N, 144˚07.6´E, 1997–2043 m, 7 November 2007, beam trawl, 6♂♂ (cl 8.6–10.4 mm), 27♀♀ (cl 5.2–11.5 mm), 9 ovig. (cl 8.6–11.3 mm), 1 juv. (cl 3.0 mm), NSMT-Cr 19378; stn H2, off Hachinohe, Aomori Prefecture, 40˚00.0´N, 143˚31.4´E to 41˚00.8´N, 143˚30.2´E, 2055–2032 m, 8 November 2007, beam trawl, 5♂♂ (cl 7.2–9.5 mm), 7♀♀ (cl 6.2–9.6 mm), 2 ovig. (cl 8.0, 8.6 mm), 3 juv., NSMT-Cr 19379; stn K1, off Kushiro, eastern Hokkaido, 42˚35.0´N, 144˚48.0´E to 42˚34.7´N, 144˚49.9´E, 1028–1075 m, 7 November 2007, beam trawl, 6♂♂ (cl 5.6–9.0 mm), 7♀♀ (cl 4.8–8.3 mm), NSMT-Cr 19380; stn K2, off Kushiro, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 7 November 2007, beam trawl, 1♂ (cl 8.0 mm), 26♀♀ (cl 4.2–10.4 mm), 4 juv. (cl 3.4–3.8 mm), NSMT-Cr 19381; stn K3, off Kushiro, 42˚27.6´N, 144˚57.4´E to 42˚27.6´N, 144˚59.4´E, 2037–2025 m, 7 November 2007, beam trawl, 42♀♀ (cl 3.9–10.5 mm), 3 ovig. (cl 8.6–11.1 mm), 2 juv. (cl 3.1, 3.4 mm), NSMT-Cr 19382; stn M2, off Miyako, Iwate Prefecture, 39˚16.2´N, 142˚41.1´E to 39˚18.6´N, 142˚43.7´E, 1528–1603 m, 5 November 2007, beam trawl, 1♂ (cl 6.3 mm), 2♀♀ (cl 8.6, 8.6 mm), 1 juv. (cl 3.6 mm), NSMT-Cr 19383; stn M3-1, off Miyako, 39˚20.0´N, 142˚51.0´E to 39˚21.8´N, 142˚51.9´E, 1728–1719 m, 5 November 2007, beam trawl, 3♀♀ (cl 5.0–8.3 mm), 1 ovig. (cl 9.8 mm), NSMT-Cr 19384; stn M3-2, off Miyako, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, bottom depths 1737–1709 m, 6 November 2007, beam trawl, 2♂♂ (cl 9.0, 9.0 mm), 1♀ (cl 9.6 mm), 3 juv., NSMT-Cr 19385; stn M3-3, off Miyako, 39˚20.1´N, 142˚51.2´E to 39˚19.2´N, 142˚49.1´E, 1733–1695 m, 8 November 2007, 3♀♀ (cl 7.7–8.7 mm), 2 ovig. (cl 8.6, 10.3 mm), NSMT-Cr 19386.

Color. Body entirely khaki brown, paler on abdomen; eye brown, with reflecting pigment (Fig. 20A).

Size. Largest male cl 10.4 mm, largest female cl 11.5 mm, ovigerous females cl 8.0–11.3 mm.

Distribution. Bering Sea to Cortes Bank, Kurile Islands, northern Japan; 887–4000 m (Butler, 1980; Kim *et al*., 2000). In Japanese waters, known from off eastern Hokkaido to Iwate Prefecture (Komai, 1991; Kim *et al*., 2000).

Neocrangon communis (Rathbun, 1899)
[Japanese name: Futatoge-ebijyako]
(Fig. 20C)

Crangon communis Rathbun, 1899: 556; 1904: 123, fig. 64; Igarashi, 1969: 9, pl. 10, fig. 27, pl. 17, fig. 54; Butler, 1980: 110, unnumbered fig.; Miyake, 1982: 71, pl. 24, fig. 3; Sokolov, 2001: 115, figs. 13–16.
Sclerocrangon communis – Brashnikov, 1907: 88, fig. 8; Vinogradov, 1950: 219, pl. 19, fig. 82.
Crago communis – Schmitt, 1921: 95, fig. 63.
Neocrangon communis – Komai, 1991: 84, fig. 9.

Material examined. R/V *Wakataka-maru*, WA05-DE380D, 4 juv., NSMT-Cr 16899; WA05-E425, 1♀ (cl 10.3 mm), 3 ovig. (cl 11.2–11.7 mm), NSMT-Cr 16887; WA05-E450, 1♂ (cl 12.0 mm), 4 ovig. (cl 11.1–12.8 mm), NSMT-Cr 16885; WA05-E480, 1♂ (cl 11.6 mm), 5 ovig. (cl

9.8–14.0 mm), NSMT-Cr 16886; WA05-E480, 4♂♂ (cl 8.3–10.0 mm), 1♀ (cl 11.0 mm), 13 ovig. (cl 9.3–16.3 mm), NSMT-Cr 16903; WA05-E550, 1 ovig. (cl 11.6 mm), NSMT-Cr 16891; WA05-F410, 1 ovig. (cl 9.2 mm), NSMT-Cr 16898; WA05-F425, 2 ovig. (cl 11.9, 12.1 mm), NSMT-Cr 16890; WA05-F450, 1♀ (cl 11.4 mm), 3 ovig. (cl 10.1–11.5 mm), NSMT-Cr 16888; WA05-FG380, 2 ovig. (cl 10.0, 14.4 mm), NSMT-Cr 16889; WA06-A510, 3♂♂ (cl 8.1–10.2 mm), 1 ovig. (cl 9.6 mm), NSMT-Cr 17299; WA06-B450, 1 ovig. (cl 12.0 mm), NSMT-Cr 17306; WA06-B650, 2 ovig. (cl 11.0, 11.3 mm), NSMT-Cr 17298; WA06-C310, 1♂ (cl 8.6 mm), 1♀ (cl 8.4 mm), 1 ovig. (cl 7.6 mm), NSMT-Cr 17297; WA06-C550, 3 ovig. (cl 11.2–125 mm), NSMT-Cr 17312; WA06-D450D, 2 ovig. (cl 9.6, 13.1 mm), NSMT-Cr 17302; WA06-DE280, 6 ovig. (cl 12.7–13.9 mm), NSMT-Cr 17282; WA06-DE350, 5 ovig. (cl 13.0–14.6 mm), NSMT-Cr 17283; WA06-DE480, 4 ovig. (cl 13.3–14.9 mm), NSMT-Cr 17281; WA06-E280, 2♂♂ (cl 11.1, 13.4 mm), 1♀ (cl 12.0 mm), NSMT-Cr 17286; WA06-E310, 1♂ (cl 11.0 mm), 5 ovig. (cl 12.0–15.8 mm), NSMT-Cr 17284; WA06-E350, 2 ovig. (cl 10.5, 11.2 mm), NSMT-Cr 17301; WA06-E380, 2♀♀ (cl 11.2, 11.5 mm), 4 ovig. (cl 12.4–14.4 mm), NSMT-Cr 17288; WA06-E410, 2♂♂ (cl 8.0, 9.5 mm), 4 ovig. (cl 11.1–15.6 mm), NSMT-Cr 17296; WA06-E425, 2♂♂ (cl 9.5, 10.0 mm), 2 ovig. (cl 14.2, 16.6 mm), NSMT-Cr 17291; WA06-E450, 2♂♂ (cl 10.4, 12.0 mm), 2 ovig. (cl 11.0, 13.6 mm), NSMT-Cr 17309; WA06-E480, 3♂♂ (cl 9.6–12.4 mm), 2 ovig. (cl 13.7, 14.9 mm), NSMT-Cr 17285; WA06-E510D, 1♂ (cl 19.9 mm), 3 ovig. (cl 12.3–12.6 mm), NSMT-Cr 17290; WA06-E550, 1♂ (cl 11.6 mm), 4 ovig. (11.0–12.7 mm), NSMT-Cr 17289; WA06-EF380, 1 ovig. (cl 13.4 mm), NSMT-Cr 17307; WA06-EF425D, 2 juv., NSMT-Cr 17308; WA06-F350, 1♀ (cl 12.0 mm), 5 ovig. (cl 12.0–15.4 mm), NSMT-Cr 17293; WA06-F380, 1♂ (cl 10.4 mm), 3 ovig. (cl 11.0–13.2 mm), NSMT-Cr 17292; WA06-F410, 5 ovig. (cl 13.2–15.8 mm), NSMT-Cr 17294; WA06-F425, 4♂♂ (cl 9.0–10.1 mm), 6 ovig. (cl 11.7–13.2 mm), NSMT-Cr 17259; WA06-F450, 2♂♂ (cl 12.0, 12.5 mm), 5 ovig. (cl 10.0–14.0 mm), NSMT-Cr 17287; WA06-F480, 5 ovig. (cl 10.6–12.1 mm), NSMT-Cr 17304; WA06-F510, 2 ovig. (cl 10.0, 11.5 mm), NSMT-Cr 17305; WA06-G480, 1 ovig. (cl 9.6 mm), NSMT-Cr 17300; WA06-FG450, 1 ovig. (cl 11.6 mm), NSMT-Cr 17303; WA07-A350, 2 ovig. (cl 9.3, 10.5 mm), NSMT-Cr 19159; WA07-A410, 2♂♂ (cl 7.8, 9.5 mm), 2 ovig. (cl 11.3, 12.8 mm), NSMT-Cr 19160; WA07-A450, 2♂♂ (cl 7.8 mm, damaged), 4 ovig. (cl 11.0–14.7 mm), NSMT-Cr 19161; WA07-A510, 1♀ (cl 10.0 mm), 3 ovig. (cl 10.6–12.6 mm), NSMT-Cr 19162; WA07-A550, 1♂ (cl 8.0 mm), 3 ovig. (cl 9.3–12.5 mm), NSMT-Cr 19163; WA07-B350, 1 ovig. (cl 12.0 mm), NSMT-Cr 19164; WA07-B410, 1♂ (cl 10.4 mm), 1♀ (cl 10.0 mm), 2 ovig. (cl 10.5, 13.0 mm), NSMT-Cr 19165; WA07-B410D, 1 juv. (cl 3.3 mm), NSMT-Cr 19166; WA07-B450, 1♂ (cl 12.5 mm), 3 ovig. (cl 9.8–14.0 mm), NSMT-Cr 19167; WA07-B510, 4 ovig. (cl 9.2–14.0 mm), NSMT-Cr 19168; WA07-B550, 2♂♂ (cl 9.6, 10.0 mm), 2 ovig. (cl 12.0, 12.9 mm), NSMT-Cr 19169; WA07-B650, 4 ovig. (cl 10.7–14.1 mm), NSMT-Cr 19170; WA07-C350, 2♂♂ (cl 8.0, 10.6 mm), 1 ovig. (cl 13.7 mm), NSMT-Cr 19171; WA07-C350D, 2♀♀ (cl 7.4, 8.5 mm), 2 ovig. (cl 11,1, 14.3 mm), NSMT-Cr 19172; WA07-C410, 2 ovig. (cl 11.0, 12.7 mm), NSMT-Cr 19173; WA07-C450, 1♂ (cl 8.2 mm), 1♀ (cl 10.0 mm), 2 ovig. (cl 13.0, 13.3 mm), NSMT-Cr 19174; WA07-C510, 3 ovig. (cl 9.6–14.6 mm), NSMT-Cr 19175; WA07-C550, 3 ovig. (cl 10.0–12.0 mm), NSMT-Cr 19176; WA07-C650, 1♂ (cl 10.0 mm), 3 ovig. (cl 9.0–14.1 mm), NSMT-Cr 19177; WA07-C750, 2 ovig. (cl 10.9, 12.1 mm), NSMT-Cr 19178; WA07-D250, 1 ovig. (cl 12.5 mm), NSMT-Cr 19179; WA07-D310, 2♂♂ (cl 8.0, 11.4 mm), 4 ovig. (cl 10.6–16.0 mm), NSMT-Cr 19180; WA07-D350, 4 ovig. (cl 10.9–14.9 mm), NSMT-Cr 19181; WA07-D410, 1♂ (cl 10.0 mm), 4 ovig. (cl 9.4–14.6 mm), NSMT-Cr 19182; WA07-D450, 2 ovig. (cl 11.0, 14.0 mm), NSMT-Cr 19183; WA07-D510, 2 ovig. (cl 11.0, 14.2 mm), NSMT-Cr 19184; WA07-D550, 3 ovig. (cl 12.4–14.5 mm), NSMT-Cr 19185; WA07-D650, 2 ovig. (cl 10.1, 13.0 mm), NSMT-Cr 19186; WA07-E510, 2♂♂ (cl 11.0, 11.5 mm), 9 ovig. (cl 10.3–13.4 mm), NSMT-Cr 19187.

R/V *Tansei-maru*, KT07-29, stn H1, off Hachinohe, Aomori Prefecture, 40˚48.7´N, 142˚00.1´E

to 40˚47.4´N, 142˚00.5´E, 497–454 m, 500 m, 8 November 2007, beam trawl, 8 ovig. (cl 8.8–13.0 mm), NSMT-Cr 19389.

Supplemental material. R/V *Tanshu-maru*, 1990 cruise, stn DII-C, off Hamanaka, eastern Hokkaido, 42˚50.98´N, 145˚18.75´E, 216 m, 5 June 1990, otter trawl, 1 female (cl 11.6 mm), HUMZ-C 1081.

Comparative material. *Albatross*, stn 3081, off Siuslow River, Oregon, northwest coast of North America, 110 m, 1♂ (cl 9.4 mm), 9♀♀ (cl 8.2–13.4 mm), part of USNM 26428, transferred to CBM.

Color. Body generally mottled brown or greyish brown, brachial region of carapace and pleura of second to fourth abdominal somites with tinge of yellow or yellow-green; cornea greyish brown; antennal flagellum banded with brown and transparent (Fig. 20C).

Size. Largest male cl 12.5 mm, largest female cl 16.0 mm, ovigerous females cl 9.3–16.0 mm.

Distribution. North Pacific, San Diego to Sea of Japan; Bering Sea; Chukchi Sea; 16–1537 m (Butler, 1980). In Japanese waters, occurring in Hokkaido, northeastern Honshu, and Sea of Japan.

Remarks. *Neocrangon communis* is easily distinguished from *N. abyssorum* and *N. sagamiensis* by the dorsoventrally flattened rostrum with a sulcate dorsal surface, the possession of middorsal carina on the third and fourth abdominal somites, the presence of pubescent areas on the abdomen, and the proportionally smaller cornea.

Komai (1991) remarked that the Japanese specimens differed from the descriptions by Rathbun (1904) and Butler (1980) in the relatively large cornea of the eye and the proportionally longer antennal scale. During this study, 15 specimens (all ovigerous females, cl 9.2–14.6 mm) from the present northern Japan material were selected for comparison with 10 specimens (one male and nine females) from Oregon, northwest America. The maximum diameter of the cornea is 0.18–0.27 (0.22 on average) of the carapace length in Japanese specimens, and 0.15–0.21 (0.18 on average) in the American specimens. The antennal scale is 0.76–0.92 times (0.86 on average) as long as the carapace in the Japanese specimens, while 0.76–0.79 times (0.78 on average) in the American specimens. Nevertheless, these values partially overlap. In order to determine if the Japanese population really belongs to the same species as the American population, molecular comparison is strongly recommended. For the time being, we refer the Japanese specimens to *N. communis*.

Neocrangon sagamiensis (Balss, 1913)

[Japanese name: Soko-ebijyako]

(Figs. 7, 20B)

Crangon (*Crangon*) *sagamiensis* Balss, 1913: 237; 1914: 63, figs. 38–39.

? *Crangon abyssorum* – Yokoya, 1933: 34, text-fig. 14.

Crangon (*Neocrangon*) *sagamiensis* – Zarenkov, 1965: 1762; Fujino and Miyake, 1970: 268; Kim, 1977: 298, pl. 54, 62, text-fig. 130; Hayashi, 1986b: 141, 275, fig. 92.

Neocrangon sagamiensis – Komai, 1994b: 98.

Material examined. R/V *Wakataka-maru*, WA06-F150, 1♂ (cl 7.0 mm), NSMT-Cr 17316; WA06-F210, 1♂ (cl 7.4 mm), NSMT-Cr 17324; WA06-G150, 15♂♂ (cl 5.1–7.2 mm), 2♀♀ (cl 6.2, 7.2 mm), 7 ovig. (cl 5.5–7.2 mm), NSMT-Cr 17325.

Supplemental material. Suruga Bay off Toi, west coast of Izu Peninsula, 34˚52.058´N, 138˚42.632´E, 550 m, 21 March 2001, commercial trawler, coll. T. Komai, 3 ovig. (cl 9.2–12.2 mm), CBM-ZC 6246; off Shionomisaki, Kii Peninsula, 350 m, 21 January 1990, dredge, coll. S. Nagai, 1 ovig. (cl 8.7 mm), CBM-ZC 3034.

Diagnosis. Rostrum (Fig. 7A, C–D) strongly compressed laterally, narrowly triangular in dorsal view, usually overreaching distal corneal margins, ascending at 15–45˚ degree against horizontal plane; dorsal surface flat; ventral margin forming thin lamella, occasionally expanded in rounded lobe, with stiff setae. Carapace (Fig. 7A–B) longer than wide postorbitally; dorsal midline with posterior epigastric tooth arising at 0.40–0.50 of carapace length, small anterior epigastric tooth present or absent; postrostral median ridge low, broad; postorbital ridge low, broad; hepatic tooth arising slightly posterior to level of orbital margin; antennal tooth small, directed forward in dorsal view, slightly ascending in lateral view, with short longitudinal groove extending from inferior to base of antennal tooth; branchiostegal tooth directed forward in both dorsal and lateral view, slightly falling short of tip of rostrum. Abdomen (Fig. 7E) without obvious pubescence; anterior four somites rounded dorsally, fifth somite with weak middorsal carina; sixth somite with weak submedian carinae separated by shallow median sulcus; pleura of anterior three somites rounded, fourth pleuron with or without tiny posteroventral tooth, fifth with small posteroventral tooth; sixth somite more than 2.0 times longer than fifth somite. Telson (Fig. 7E) rounded dorsally, without median sulcus. Maximum diameter of cornea about 0.30 of carapace length (Fig. 7B). Antennal scale (Fig. 7B) about 0.90 times as long as carapace, lateral margin weakly concave, terminating in strong distolateral tooth distinctly overreaching obliquely truncate distal lamella. First pereopod (Fig. 7F) overreaching antennal scale; palm (Fig. 7G) 3.0–3.1 times longer than wide, with moderately oblique cutting edge; carpus with ventrolateral tooth; merus with moderately strong dorsodistal tooth, unarmed ventrally. Fourth and fifth pereopods each with slender dactyli subequal in length to propodi (Fig. 7H).

Color. Body and appendages generally brick red; cornea greyish brown (Fig. 20B).

Distribution. Known from the Pacific coast of Japan from off Miyako, Iwate Prefecture to East China Sea, southern Korea; 150–400m (Yokoya, 1933; Hayashi, 1986b).

Remarks. The rostrum of this species shows substantial variation in the shape of the ventral lobe, as figured (Fig. 7A, C–D). The development of the anterior epigastric tooth is also variable.

Neocrangon sagamiensis is morphologically very similar to *N. resima* from the northeastern Pacific, but no direct comparison has so far been made. Here we compare the present material with the published description of *N. resima* (cf. Rathbun, 1904; Chace, 1937, as *Crago zacae*; Wicksten, 1996). The dorsal surface of the rostrum is flat in *N. sagamiensis*, but it bears a pronounced sulcus in *N. resima*. The posterior epigastric tooth on the carapace arises at the 0.45–0.48 length of the carapace in *N. sagamiensis*, rather than 0.35 length in *N. resima*. The distal lamella of the antennal scale is obliquely truncate in *N. sagamiensis*, whereas it is rounded in *N. resima* (Chace, 1937). Furthermore, the anterior epigastric tooth is usually absent in *N. sagamiensis*, but it is always present in *N. resima*.

Kim *et al.* (2000) considered that the specimens referred to *Crangon abyssorum* by Yokoya (1933: 35, text-fig. 14) represent an undescribed species of *Neocrangon*. However, Kim (2000) finally concluded that Yokoya's specimens belonged to *N. sagamiensis*. We concur Kim's (2000) conclusion.

Genus ***Paracrangon*** Dana, 1852

Paracrangon echinata Dana, 1852

[Japanese name: Kajiwara-ebi]

(Fig. 20E)

Paracrangon echinatus Dana, 1852: 20; 1855: pl. 33, fig. 6.

Paracrangon echinata – Igarashi, 1969: 11, pl. 12, fig. 35, pl. 20, fig. 64a–b; Butler, 1980: 75, unnumbered fig.; Miyake, 1982: 67, pl. 23, fig. 2; Minemizu, 2000: 115, unnumbered figs.; Komai and Kim, 2004: 516, figs. 2–4.

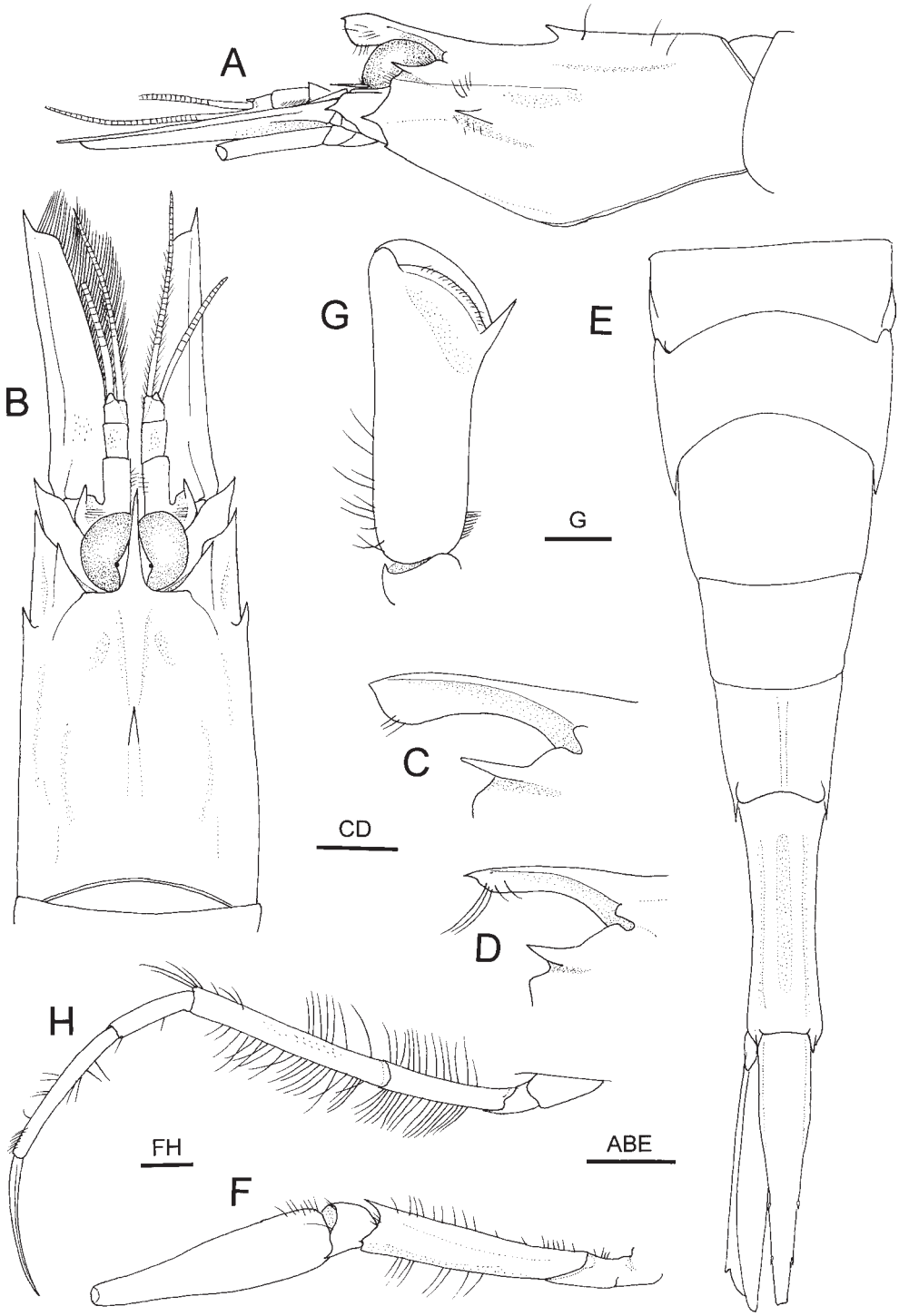

Fig. 7. *Neocrangon sagamiensis* (Balss, 1913). A–B, E–H, ovigerous female (cl 7.1 mm), WA06-G150, NSMT-Cr 17325; C, female (cl 7.5 mm), same lot; D, ovigerous female (cl 7.3 mm), same lot. A, carapace and cephalic appendages, lateral view; B, same, dorsal view; C–D, rostra, lateral view; E, abdomen, dorsal view; F, left first pereopod, lateral view; G, same, subchela, dorsal (extensor) view; H. left fourth pereopod, lateral view. Scale bars: 2 mm for A, B, E; 1 mm for C–D, F–H.

Material examined. R/V *Wakataka-maru*, WA06-A210, 2 ovig. (cl 14.8, 16.0 mm), NSMT-Cr 17331; WA06-B150, 2♂♂ (cl 9.2, 11.2 mm), 1 ovig. (cl 13.2 mm), NSMT-Cr 17332; WA06-F150, 1♂ (cl 11.2 mm), NSMT-Cr 17333; WA07-A210, 1♂ (cl 13.1 mm), 2 ovig. (cl 14.3, 16.0 mm), 1 juv. (cl 5.0 mm), NSMT-Cr 19152; WA07-B150, 2 ovig. (cl 16.6, 20.0 mm), NSMT-Cr 19153; WA07-B210, 2♂♂ (cl 8.4, 10.1 mm), NSMT-Cr 19154; WA07-C210, 1 ovig. (cl 17.5 mm), NSMT-Cr 19155.

Color. Body mottled brown, tip of rostrum transparent; cornea blueish grey; antennae and thoracic appendages also brown (Fig. 20E).

Size. Ovigerous females cl 13.2–20.0 mm, largest female 20.0 mm.

Distribution. North Pacific, Sea of Japan to La Jolla, California, subtidal to 210 m (Butler, 1980; Komai and Kim, 2004). In Japanese waters, occurring in Hokkaido, northeastern Honshu southward to Miyagi Prefecture, and Sea of Japan southward to Wakasa Bay.

Remarks. Komai and Kim (2004) reviewed *Paracrangon echinata* on the basis of extensive material mainly from East Asian waters. They showed that the species is restricted to cold waters. The record from Sagami Bay by Balss (1914) was referred to *Paracrangon okutanii* Ohé and Takeda, 1986.

Genus ***Sclerocrangon*** Sars, 1883

Sclerocrangon boreas (Phipps, 1774)

[Japanese name: Kita-zako-ebi]

(Fig. 20D)

Cancer boreas Phipps, 1774: 190, pl. 12, fig. 1.

Sclerocrangon boreas – Urita, 1942: 33, fig. 9; Igarashi, 1969: 10, pl. 10, fig. 29, pl. 18, fig. 58; Butler, 1980: 91, unnumbered fig.; Miyake, 1982: 71, pl. 24, fig. 2.

Sclerocrangon gasuyebi Yokoya, 1933: 41 (in part).

Material examined. R/V *Wakataka-maru*, WA07-A210, 1♀ (cl 26.6 mm), NSMT-Cr 19156.

Color. Body generally mottled brown, tinge of white on rostrum, dorsum of carapace, and abdomen; antennal scale whitish; pereopods brown (Fig. 20D). In this species, coloration and markings vary considerably (Butler, 1980; personal observation).

Distribution. North Pacific, Washington State to Sea of Japan, Bering Sea, Chukchi Sea, arctic Canada, arctic Europe, North Atlantic Ocean; subtidal to 366 m (Butler, 1980). In Japan, occurring in Hokkaido, Sea of Japan, northeastern Honshu southward to Iwate Prefecture (Miyake, 1982; Komai, unpublished data).

Sclerocrangon unidentata Komai and Takeda, 1989

[Japanese name: Toge-kijin-ebi]

Sclerocrangon unidentata Komai and Takeda, 1989: 77, figs. 1–5.

Material examined. R/V *Wakataka-maru*, WA05-G750, 1♂ (cl 25.5 mm), NSMT-Cr 16960; WA06-G750, 1♀ (cl 38.3 mm), NSMT-Cr 17352.

Distribution. Japanese endemic, known only from the Pacific coast of Honshu, from off Iwate Prefecture to Suruga Bay; 200–750 m (Komai and Takeda, 1989).

Sclerocrangon zenkevitchii Birshtein and Vinogradov, 1953
[New Japanese name: Meifuno-kijin-ebi]

Sclerocrangon zenkevitchii Birshtein and Vinogradov, 1953: 218, figs. 2–5; Kim *et al.*, 2000: 8, figs. 3–5, 8d–e.
Sclerocrangon zenkewichii (sic) – Zarenkov, 1993: 17.

Material examined. R/V *Soyo-maru*, stn SO07-K2, off Kinkazan, Miyagi Prefecture, 38˚34.7´N, 143˚32.9´E to 38˚30.6´N, 143˚35.6´E, 2968–3308 m, 6 August 2007, benthos net, 1♂ (cl 23.8 mm), NSMT-Cr 19560.

Distribution. Bering Sea to off northeastern Japan; 2995–4070 m (Birshtein and Vinogradov, 1953; Zarenkov, 1993; Kim *et al.*, 2000). Kim *et al.* (2000) reported material from off eastern Hokkaido and off Aomori Prefecture.

Family Hippolytidae
Genus ***Birulia*** Brashnikov, 1903
Birulia kishinouyei (Yokoya, 1930)
[Japanese name: Kishinoue-mo-ebi]
(Fig. 20G)

Paraspirontocaris kishinouyei Yokoya, 1930:
Birulia kishinouyei – Miyake, 1982: 53, pl. 18, fig. 5; Hayashi, 1992b: 341, fig. 231a–e; Cha *et al.*, 2001: 116–117, unnumbered figs.

Material examined. R/V *Wakataka-maru*, WA05-H150, 2♂♂ (cl 11.0, 12.4 mm), 1♀ (cl 16.0 mm), 1 ovig. (cl 11.2 mm), NSMT-Cr 16884; WA05-H210, 1 ovig. (cl 14.0 mm), NSMT-Cr 16892; WA06-E150, 1♂ (cl 10.8 mm), NSMT-Cr 17531; WA06-F150, 9♂♂ (cl 10.0–12.2 mm), 2♀♀ (cl 11.0, 13.4 mm), 10 ovig. (cl 11.1–16.0 mm), NSMT-Cr 17529; WA06-F210, 3♂♂ (cl 11.0–11.4 mm), NSMT-Cr 17530.

Color. Body generally light yellowish brown, with small red dots on carapace; distal part of rostrum yellowish; abdomen mottled with red; cornea grey; antennular and antennal basicerite pale pink with red dots; third maxilliped and pereopods yellow; corneous spines on ultimate segment of third maxilliped and of chelae of first pereopod, and dactylar accessory spinules of third to fifth pereopods dark brown (Fig. 20G).

Size. Largest male cl 12.4 mm; ovigerous females cl 11.1–16.0 mm.

Distribution. Restricted to East Asian waters, i.e., Japan and Korea; 18–200 m (Hayashi, 1986b; 1992b). In Japan, known from waters around Honshu and Kyushu (Hayashi, 1986b; 1992b).

Birulia sachalinensis Brashnikov, 1903
[Japanese name: Kita-mo-ebi-modoki]
(Fig. 20H)

Birulia sachalinensis Brashnikov, 1907: 172, fig. 26a–d; Urita, 1942: 28; Igarashi, 1969: 6, pl. 4, fig. 17; Hayashi, 1992b: 342, figs. 230, 231f–h.

Material examined. R/V *Wakataka-maru*, WA06-F150, 1 ovig. (cl 10.3 mm), NSMT-Cr 17532; WA07-A210, 1♀ (cl 20.2 mm), NSMT-Cr 19188.

Color. Body and appendages generally light yellowish brown, with scattered dots on carapace and abdomen; corneous spines on ultimate segment of third maxilliped and of chela of first pereopod, and dactylar accessory spinules of third to fifth pereopods dark brown (Fig. 20H).

Size. Ovigerous female cl 10.3 mm.

Distribution. Restricted to East Asian waters, i.e., Sakhalin, Sea of Japan and Hokkaido; 3–135 m (Hayashi, 1992b). The present specimen slightly extends the geographical range of this species to northeastern Honshu, and bathymetric range to 210 m.

Genus ***Eualus*** Thallwitz, 1891

Eualus biungius (Rathbun, 1902)

[Japanese name: Hasami-mo-ebi]

(Fig. 20F)

Spirontocaris biunguis Rathbun, 1902: 899; 1904: 97; Yokoya, 1933: 27, fig. 9A–C.

Eualus biungius – Miyake and Hayashi, 1967: 248, fig. 1a–b; Igarashi, 1969: 6, pl. 6, fig. 18, pl. 15, fig. 45; Hayashi, 1993: 243, figs. 242–243.

Material examined. R/V *Wakataka-maru*, WA05-E480, 1 ovig. (cl 17.0 mm), NSMT-Cr 16932; same data, 1♀ (cl 11.0 mm), 1 ovig. (cl 15.5 mm), NSMT-Cr 16944; WA05-E550, 1♀ (cl 10.5 mm), 2 ovig. (cl 13.4, 14.6 mm), NSMT-Cr 16945; WA05-E650, 1♂ (cl 12.6 mm), 3 ovig. (cl 14.4–16.2 mm), NSMT-Cr 16942; WA05-F510, 1 ovig. (cl 15.0 mm), NSMT-Cr 16941; WA05-F750, 2♂♂ (1 damaged, 10.1 mm), 1♀ (cl 10.5 mm), 7 ovig. (cl 11.5–16.2 mm), NSMT-Cr 16935; WA05-G480, 1 ovig. (cl 13.3 mm), NSMT-Cr 16951; WA05-G650, 2♀♀ (cl 11.0, 13.0 mm), 1 ovig. (cl 14.2 mm), NSMT-Cr 16943; WA05-G750, 1 ovig (cl 14.0 mm), NSMT-Cr 16937; WA05-G900, 1 ovig. (cl 14.0 mm), NSMT-Cr 16940; WA05-H750, 2♀♀ (cl 10.5, 11.9 mm), 3 ovig. 13.2–13.6 mm), NSMT-Cr 16934; WA05-H900, 1 ovig. (cl 12.2 mm), NSMT-Cr 16939; WA06-B650, 3 ovig. (cl 12.4–16.1 mm), NSMT-Cr 17496; WA06-DE480, 4 ovig. (cl 13.8–17.2 mm), NSMT-Cr 17493; WA06-E480, 1♀ (cl 15.2 mm; infected with rhizocephalan), 1 ovig. (cl 16.8 mm), NSMT-Cr 17485; WA06-E510, 1♂ (cl 12.3 mm), 1♀ (cl 10.3 mm), 2 ovig. (cl 16.2, 19.3 mm), NSMT-Cr 17479; WA06-E550, 2 ovig. (cl 15.5, 18.6 mm), NSMT-Cr 17489; WA06-E650, 1♂ (cl 12.8 mm), 3♀♀ (cl 13.6–13.9 mm; 2 specimens infected with rhizocephalan), 10 ovig. (cl 13.6–18.3 mm), NSMT-Cr 17484; WA06-E650, 3♂♂ (cl 11.6–14.6 mm; 2 specimens infected with rhizocephalan), 1 ovig. (cl 16.5 mm), NSMT-Cr 17487; WA06-E750, 7♂♂ (cl 7.8–11.7 mm), 4 ovig. (cl 13.3–16.0 mm), NSMT-Cr 17482; WA06-E900, 1♂ (cl 10.1 mm), 1ovig. (cl 15.6 mm), NSMT-Cr 17499; WA06-F425, 2♀♀ (12.0, 15.0 mm; smaller specimen infected with rhizocephalan), NSMT-Cr 27488; WA06-F450, 15♀♀ (cl 13.4–15.6 mm; all infected with rhizocephalan), NSMT-Cr 17481; same data, 4♀♀ (cl 10.9–14.9 mm; largest one infected with rhizocephalan), 8 ovig. (cl 15.4–17.3 mm), NSMT-Cr 17480; WA06-F480, 6♂♂ (cl 10.2–12.5 mm), 6♀♀ (11.1–15.2 mm; 2 specimens infected with rhizocephalan), 13 ovig. (cl 14.6–15.7 mm), NSMT-Cr 17483; same data, 1♀ (cl 15.4 mm; infected with rhizocephalan), NSMT-Cr 17502; WA06-F510, 1♂ (cl 9.0 mm), 1♀ (cl 9.7 mm), 5 ovig. (cl 14.0–14.5 mm), NSMT-Cr 17495; WA06-F550, 3♀ (cl 11.5–13.4 mm; 2 infected with rhizocephalan), 1 ovig. (cl 14.4 mm), NSMT-Cr 17486; WA06-F650, 3 ovig. (cl 12.7–16.3 mm), NSMT-Cr 17491; WA06-F750, 1♂ (cl 10.5 mm), 2 ovig. (cl 12.3, 13.0 mm), NSMT-Cr 17494; WA06-F900, 1 ovig. (cl 11.0 mm), NSMT-Cr 17498; WA06-FG450, 1♀ (cl 9.1 mm), NSMT-Cr 17501; WA06-FG480, 4 ovig. (cl 13.2–14.8 mm), NSMT-Cr 17492; WA06-G480, 1♂ (cl 8.0 mm), 1♀ (cl 8.6 mm), NSMT-Cr 17497; WA06-G550, 2♂♂ (cl 9.6, 11.5 mm), 3♀♀ (cl 9.8–14.4 mm), NSMT-Cr 17490; WA07-A650, 3♀♀ (cl 7.5–16.0 mm), 1 ovig. (cl 14.0 mm), NSMT-Cr 19229; WA07-B650, 2♀♀ (cl 6.4, 7.2 mm), 2 ovig. (cl 15.4, 16.7 mm), NSMT-Cr 19230; WA07-B750, 1♀ (cl 8.4 mm), 4 ovig. (cl 10.5–12.6 mm), NSMT-Cr 19231; WA07-B1200, 2♂♂ (cl 9.3, 10.2 mm), NSMT-Cr 19232; WA07-C650, 1♂ (cl 12.4 mm), 1 ovig. (cl 13.3 mm), NSMT-Cr 19233; WA07-C750, 1♂ (cl 8.0 mm), 2♀♀ (cl 8.5, 11.5 mm), 2 ovig. (cl 12.0, 14.5 mm), NSMT-Cr 19234; WA07-D450, 2♀♀ (cl 9.4, 15.4 mm; larger one infected with

rhizocephalan), 1 ovig. (cl 14.0 mm), NSMT-Cr 19235; WA07-D510, 3 ovig. (cl 13.6–15.0 mm), NSMT-Cr 19236; WA07-D550, 1♀ (cl 11.0 mm), 2 ovig. (cl 16.0, 16.1 mm), NSMT-Cr 19237; WA07-D650, 1♀ (cl 19.1 mm), 2 ovig. (cl 15.0, 16.5 mm), NSMT-Cr 19238; WA07-D750, 3♀♀ (cl 8.0–11.0 mm), 1 ovig. (cl 13.8 mm), NSMT-Cr 19239; WA07-D900, 2♀♀ (cl 9.2, ca. 9.6 mm), 1 ovig. (cl 14.6 mm), NSMT-Cr 19240; WA07-E510, 2♀♀ (cl 16.0, 16.6 mm; smaller one infected with rhizocephalan), 5 ovig. (cl 12.6–19.0 mm), NSMT-Cr 19241; WA07-G1200, 1 ovig. (cl 13.3 mm), NSMT-Cr 19242.

R/V *Tansei-maru*, KT07-29, stn K2, off Kushiro, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 2 November 2007, beam trawl, 2♀♀ (cl 6.8, 7.1 mm), NSMT-Cr 19410.

Size. Largest male cl 10.2 mm, largest female cl 19.0 mm, ovigerous females cl 11.5–19.3 mm.

Color. Body generally light pink, with tinge of red and yellow on branchiostegite; rostrum transparent, tip reddish; abdomen with red vertical (transverse) bars on pleura of each somite; telson and uropods red; eyestalk red, cornea dark grayish brown; antennule and antenna light pink; third maxilliped and pereopods light pink, with tinge of red on ultimate segment of third maxilliped, fingers of first pereopod, and distal parts of propodi of posterior three pereopods (Fig. 20F).

Distribution. North Pacific, ranging from Oregon to Sea of Japan, including Bering Sea; 90–2090 m (Vinogradov, 1950; Hayashi, 1993). In Japanese waters, known from Hokkaido, Sea of Japan, and off northeastern Honshu (Hayashi, 1993; Tsuchida *et al.*, 2008).

Eualus kuratai Miyake and Hayashi, 1967
[Japanese name: Kurata-mo-ebi]
(Fig. 21A)

Eualus kuratai Miyake and Hayashi, 1967: 253, fig. 3a–d; Igarashi, 1971: 1, pl. 1, fig. 2; Hayashi, 1993: 313, 244e, 245d.

Material examined. R/V *Wakataka-maru*, WA07-C450, 1 ovig. (cl 11.1 mm), NSMT-Cr 19271; WA07-D450, 1 ovig. (cl 11.3 mm), NSMT-Cr 19272.

Color. Body and antennae generally orange-brown, rostrum paler; cornea dark gray; pereopods yellowish translucent; eggs yellow green (Fig. 21A).

Distribution. Previously known only from waters around Hokkaido (Hayashi, 1993). The present material extends the geographical range of this species to northeastern Honshu.

Eualus middendorffi Brashnikov, 1907
[Japanese name: Kitatsuno-mo-ebi]
(Fig. 21B)

Eualus middendorffi Brashnikov, 1907: 165, fig. 23a–b; Miyake and Hayashi, 1967: 250, fig. 2a–c; Hayashi, 1993: 390, figs. 247b, 248b.
Spirontocaris middendorffi – Urita, 1942: 21, fig. 5.

Material examined. R/V *Wakataka-maru*, WA05-G350, 1 ovig. (cl 12.6 mm), NSMT-Cr 16938; same data, 1 ovig. (cl 12.5 mm), NSMT-Cr 16946; WA06-A210, 1♂ (cl 11.0 mm), 1 ovig. (cl 13.0 mm), NSMT-Cr 17511; WA06-B310D, 1 ovig. (cl 15.1 mm), NSMT-Cr 17508; WA06-DE350, 1 ovig. (cl 14.7 mm), NSMT-Cr 17509; WA06-E380, 2♂♂ (cl 10.0, 10.4 mm), 1 ovig. (cl 13.0 mm), NSMT-Cr 17507; WA06-F350, 1 ovig. (cl 16.1 mm), NSMT-Cr 17506; WA06-F425, 1♂ (cl 10.4 mm), NSMT-Cr 17510; WA07-B410, 2♂♂ (cl 12.7, 13.3 mm), 2 ovig. (cl 12.7, 13.2

mm), NSMT-Cr 19249; WA07-A210, 6♂♂ (cl 8.0–10.6 mm), 3♀♀ (cl 8.7–9.1 mm), NSMT-Cr 19243; WA07-A250, 1 ovig. (cl 13.3 mm), NSMT-Cr 19244; WA07-A350, 4 ovig. (cl 12.4–15.1 mm), NSMT-Cr 19245; WA07-A410, 2 ovig. (cl 11.5, 14.2 mm), NSMT-Cr 19246; WA07-B250, 2 ovig. (cl 12.2, 13.6 mm), NSMT-Cr 19247; WA07-B310, 1 ovig. (cl 15.0 mm), NSMT-Cr 19248; WA07-B450, 1 ovig. (cl 15.0 mm), NSMT-Cr 19250; WA07-C210, 1♂ (cl 11.4 mm), 1 ovig. (cl 12.8 mm), NSMT-Cr 19251; WA07-C250, 1 ovig. (cl 12.9 mm), NSMT-Cr 19252; WA07-C310, 1♂ (cl 13.5 mm), NSMT-Cr 19253; WA07-C350, 4 ovig. (cl 12.7–13.4 mm), NSMT-Cr 19254; WA07-C410, 3 ovig. (cl 13.4–15.2 mm), NSMT-Cr 19255; WA07-C450, 1 ovig. (cl 15.1 mm), NSMT-Cr 19256; WA07-D250, 2♂♂ (cl 11.1, 13.3 mm), NSMT-Cr 19257; WA07-D310, 1 ovig. (cl 13.0 mm), NSMT-Cr 19258.

R/V *Soyo-maru*, stn SO07-C8, off Miyako, Iwate Prefecture, 39˚42.0´N, 142˚12.9´E to 39˚40.8´N, 142˚13.1´E, 214–216 m, 6 August 2007, bait trap, 1♂ (cl 9.6 mm), 4♀♀ (cl 12.4–13.0 mm), NSMT-Cr 19561.

Color. Body and antennae generally light pink, rostrum nearly transparent; cornea dark grey; third maxilliped, anterior two pereopods and pleopods reddish; posterior three pereopods generally transparent, merus banded with light pink; eggs greyish green (Fig. 21B).

Size. Largest male cl 13.3 mm, largest female cl 15.2 mm, ovigerous females cl 12.0–15.2 mm.

Distribution. Restricted to East Asian waters, including Sea of Okhotsk and Sea of Japan; 30–300 m. In Japan, previously known from waters around Hokkaido and Sea of Japan southward to Tottori Prefecture (Igarashi, 1969; Komai *et al.*, 1992; Hayashi, 1993). Now newly recorded from northeastern Honshu.

Eualus spathulirostris (Yokoya, 1933)
[Japanese name: Yokoya-tsuno-mo-ebi]
(Fig. 21C)

Spirontocaris spathulirostris Yokoya, 1933: 28, fig. 10.

Eualus spathulirostris – Miyake and Hayashi, 1968: 367, figs. 1–2; Hayashi, 1993: 391, figs. 247d, 248d, 249; Cha *et al*., 2001: 108–109, unnumbered figs.

Material examined. R/V *Wakataka-maru*, WA05-DE250D, 1 ovig. (cl 7.0 mm), NSMT-Cr 16979; WA05-G150, 1♀ (cl 4.3 mm), NSMT-Cr 16949; WA05-H150, 1♀ (cl 3.9 mm), NSMT-Cr 16953; WA06-A250D, 2♀♀ (cl 6.9, 7.0 mm), NSMT-Cr 17546; WA06-D210D, 3♀♀ (cl 5.8–6.6 mm), NSMT-Cr 17547; WA06-E250, 1♀ (cl 7.9 mm), NSMT-Cr 17545; WA06-F150, 1♂ (cl 5.0 mm), 1♀ (cl 4.5 mm), NSMT-Cr 17550; WA06-F210, 1♀ (cl 6.4 mm), 1 ovig. (cl 6.6 mm), NSMT-Cr 17549; WA06-F250, 1♂ (cl 5.2 mm), 6♀♀ (cl 4.6–7.2 mm), NSMT-Cr 17548; WA06-F280, 3♀♀ (cl 5.5–6.7 mm), NSMT-Cr 17542; WA06-G350, 3♀♀ (cl 6.4–6.9 mm), NSMT-Cr 17543; WA06-G380, 3♂♂ (cl 5.2–5.5 mm), 9 ♀♀(cl 6.6–7.7 mm), NSMT-Cr 17544; WA07-A210, 5♂♂ (cl 5.0–5.5 mm), 8♀♀ (cl 5.6–6.2 mm), NSMT-Cr 19259; WA07-A250, 2♂♂ (cl 5.2, 5.3 mm), 2♀♀ (cl 5.6, 6.1 mm), NSMT-Cr 19260; WA07-A250D, 4♂♂ (cl 5.0–5.9 mm), NSMT-Cr 19261; WA07-B210, 6♀♀ (cl 5.2–6.0 mm), NSMT-Cr 19262; WA07-C310, 1♀ (cl 7.0 mm), NSMT-Cr 19263; WA07-D210, 1♀ (cl 5.9 mm), NSMT-Cr 19264; WA07-D210D, 2♂♂ (cl 5.0, 5.1 mm), 4♀♀ (cl 4.8–7.2 mm), NSMT-Cr 19265.

Color. Body generally light pink, with tinge of red on ventrolateral part of carapace and pleura of second and fourth abdominal somites; rostrum transparent; third maxilliped and pereopods transparent, with tinge of red on meri of third to fifth pereopods (Fig. 21C).

Size. Largest male cl 5.9 mm, largest female cl 7.9 mm.

Distribution. Previously known from off Iwate Prefecture, Tsugaru Strait, off Tsushima, and

Yellow Sea; 110–285 m (Hayashi, 1993).

Eualus townsendi (Rathbun, 1902)
[Japanese name: Komaru-iso-mo-ebi]
(Figs. 8–9)

Spirontocaris townsendi Rathbun, 1902; 1904.
Spirontocaris minuta – Yokoya, 1933: 28, fig. 11.
Eualus townsendi – Butler, 1980: 201, unnumbered fig., pl. 8C; Hayashi, 1993: 392, figs. 247e, 248e.

Material examined. R/V *Wakataka-maru*, WA06-DE350, 1 ovig. (cl 10.2 mm), NSMT-Cr 17500; WA07-F410, 1 ovig. (cl 10.2 mm), NSMT-Cr 19416.

Description. Body (Fig. 8A, D) moderately slender for genus.

Rostrum (Fig. 8A–B) slightly curving dorsally, directed forward, styliform, slightly overreaching distal margin of antennal scale, 1.33–1.36 times as long as carapace; dorsal margin armed with 6 teeth including 4 on rostrum proper and 2 on carapace, posteriormost tooth arising at 0.35 of carapace length, distal 0.30 of dorsal margin unarmed; ventral limb moderately high, general profile gently convex, ventral margin with 7 teeth in distal 0.60, distalmost 2 teeth very small; lateral carina blunt. Carapace (Fig. 8A–C) with postrostral ridge low, becoming blunt posterior to posteriormost tooth of rostral series, extending beyond midlength of carapace; dorsal margin in lateral view faintly sinuous or nearly straight; no postorbital tooth; antennal tooth moderately small; suborbital lobe roundly triangular, shorter than antennal tooth; pterygostomial angle with small tooth.

Abdomen (Fig. 8D) dorsally rounded, somewhat geniculate. Second somite with faint transverse groove on tergite. Dorsal surface of third tergite convex posteriorly, posterodorsal margin fairly produced and partially overhanging anterior part of fourth tergite. Pleura of anterior four somites broadly rounded, fifth pleuron with posteroventral tooth; posterolateral margin of fifth pleuron sinuous. Sixth somite about 1.80 times longer than fifth somite and 2.40–2.80 times longer than high, bearing small posteroventral tooth; posterolateral process terminating in acute tooth. Telson (Fig. 8E) about 1.20 length of sixth somite, 4.50 times longer than wide, lateral margins parallel in anterior 0.35, and then tapering posteriorly, armed with 5 or 6 pairs of dorsolateral spines; posterior margin (Fig. 8F) convex, with 3 pairs of greatly unequal spines (intermediate pair longest, mesial pair slender).

Eye (Fig. 8C) subpyriform; cornea wider and shorter than eyestalk; ocellar spot small; maximal diameter of cornea 0.18 of carapace length.

Antennular peduncle (Fig. 8A, C) falling short of midlength of antennal scale; first segment distinctly longer than distal 2 segments combined, unarmed on dorsodistal margin; stylocerite reaching distal margin of second segment, tapering to slender, sharp tooth, mesial margin sinuous; second segment short, with moderately large tooth at dorsolateral distal angle; third segment short, with small dorsodistal tooth; lateral flagellum with thickened aesthetasc-bearing about half length of carapace. Antenna (Fig. 8A, C) with basicerite bearing moderately large ventrolateral distal tooth; carpocerite reaching distal margin of second segment of antennular peduncle; antennal scale 1.07 times as long as carapace and 3.70 times longer than wide, lateral margin straight, distal lamella oblique and roundly truncate, distinctly exceeding beyond small distolateral tooth.

Third maxilliped (Fig. 9A) moderately stout, distinctly reaching beyond midlength of antennal scale, but not reaching distal margin of antennal scale; ultimate segment about 2.80 length of penultimate segment, tapering distally, with several darkly pigmented corneous spines distally; antepenultimate segment subequal in length to distal 2 segments combined, with long, slender spine on distolateral margin; exopod well-developed; coxa with rounded lateral process.

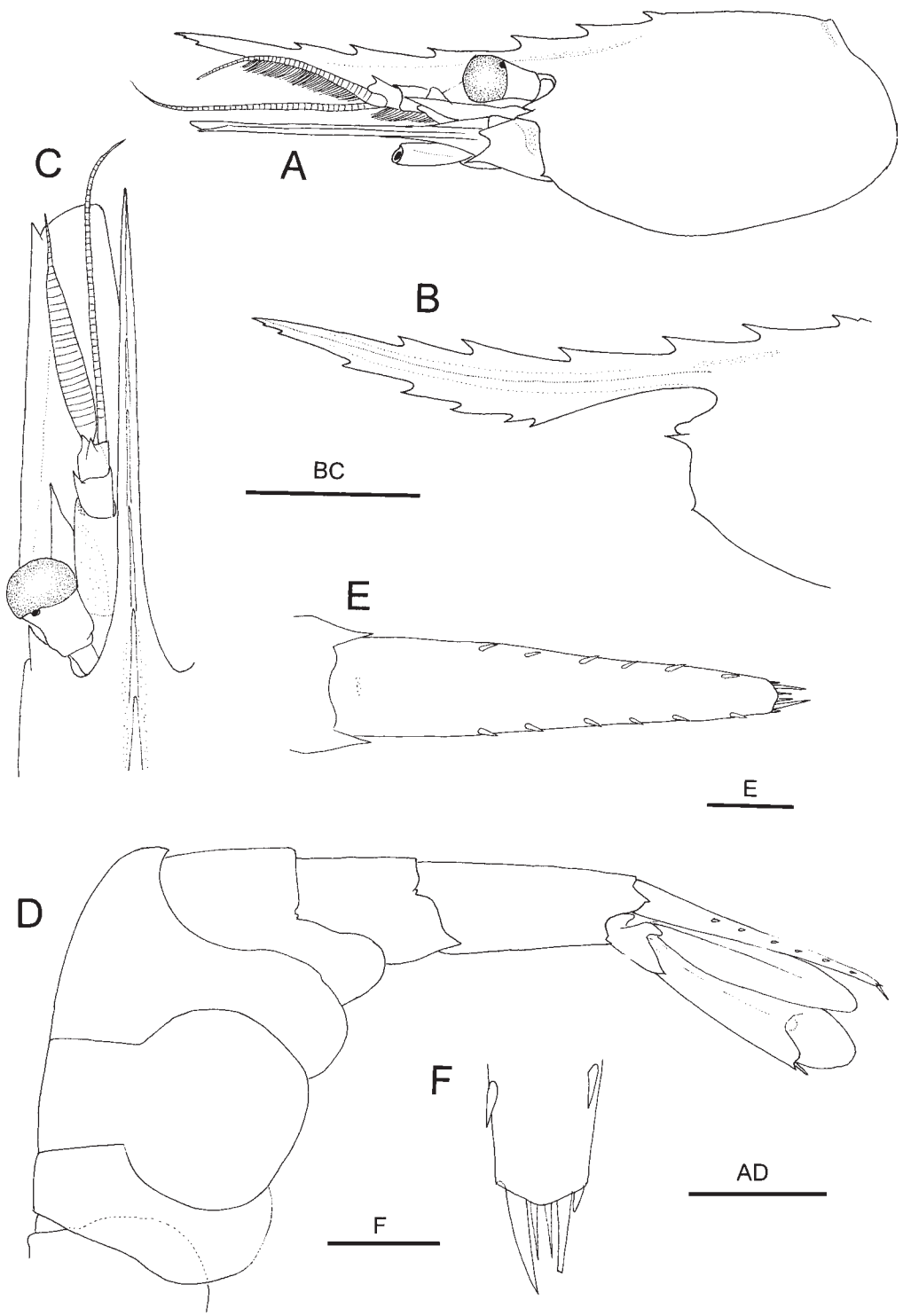

Fig. 8. *Eualus townsendi* (Rathbun, 1902), ovigerous female (cl 10.2 mm), WA06-DE350, NSMT-Cr 17500. A, carapace and cephalic appendages, lateral view; B, anterior part of carapace, lateral view; C, anterior part of carapace and cephalic appendages, dorsal view; D, abdomen, lateral view (setae omitted); E, telson, dorsal view; F, posterior margin of telson, dorsal view. Scale bars: 5 mm for A–D; 2 mm for E; 1 mm for F.

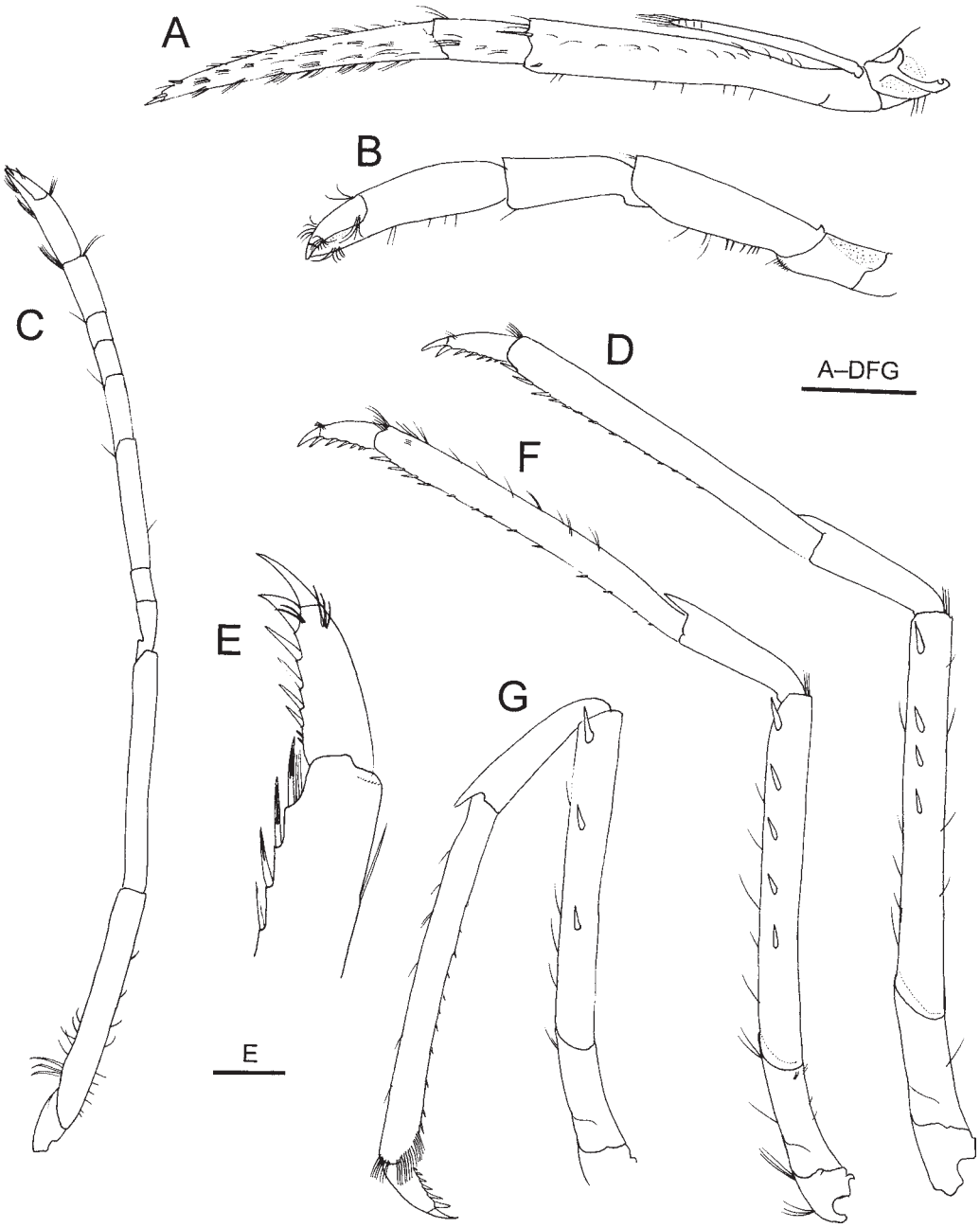

Fig. 9. *Eualus townsendi* (Rathbun, 1902), ovigerous female (cl 10.2 mm), WA06-DE350, NSMT-Cr 17500, left thoracic appendages. A, third maxilliped, lateral view; B, first pereopod, lateral view; C, second pereopod, lateral view; D, third pereopod, lateral view; E, same, dactylus, lateral view; F, fourth pereopod, lateral view; G, fifth pereopod, lateral view. Scale bars: 2 mm for A–D, F–G; 0.5 mm for E.

Strap-like epipods on third maxilliped to second pereopod and corresponding setobranchs on first to third pereopod.

First pereopod (Fig. 9B) moderately stout, not reaching midlength of antennal scale; chela 1.70 times longer than carpus; dactylus 0.55 times as long as palm, terminating in 2 darkly pigmented, strong corneous claws; fixed finger terminating in single corneous claw; merus with small

denticle on dorsal margin proximally and with short row of spiniform setae on ventral margin proximally. Second pereopod (Fig. 9C) slightly falling short of distal margin of antennal scale; carpus divided in 7 unequal articles (third longest); ischium subequal in length to merus. Third to fifth pereopods moderately long and slender, generally similar in structure. Third pereopod (Fig. 9D) falling short of distal margin of antennal scale; dactylus (Fig. 9E) 0.25–0.30 times as long as propodus, about 2.20 times longer than high, terminating in strong unguis armed with 6 or 7 accessory spinules notably increasing in size distally on over entire length of flexor margin; propodus with 2 rows of slender spinules on ventral margin; carpus 0.40 times as long as propodus; merus armed with 3 or 4 spines on lateral surface. Fourth pereopod (Fig. 9F) overreaching midlength of antennal scale by 0.40 length of propodus; dactylus with 6 or 7 accessory spinules except for subterminal unguis; merus with 5 lateral spines. Fifth pereopod (Fig. 9G) reaching midlength of antennal scale by tip of propodus; dactylus with 6 or 7 accessory spinules; merus with 3 lateral spines.

Pleopods typical of genus; ventrolateral lobe of protopods expanded in spawning molt; endopod of first pleopod subtriangular, without appendix interna. Uropod (Fig. 8D) with stout protopod bearing sharp posterolateral tooth; endopod reaching posterior margin of telson; exopod slightly longer than endopod, slightly overreaching posterior margin of telson.

Distribution. Pribilof Islands to Puget Sound; Sea of Japan and Sea of Okhotsk; 38–630 m (Rathbun, 1904; Butler, 1980; Hayashi, 1993). New record for northeastern Honshu.

Remarks. Hayashi (1993) found that a specimen identified as *Spirontocaris minuta* Yokoya, 1930 by Yokoya (1933) actually represented *Eualus townsendi*, and this constitutes the only known record of this species from Japanese waters. The present specimens agree well with the description of Butler (1980) except for the number of dorsolateral spines on the telson. In the present specimens there are five or six pairs of dorsolateral spines, rather than four described by Butler (1980). Nevertheless, the difference could just be intraspecific variation.

Among the East Asian species of *Eualus*, *E. townsendi* is easily recognized by the presence of normally developed, strap-like epipods on the third maxilliped to the second pereopod, the elongate rostrum and antennal scale, which are longer than the carapace, and the elongate sixth abdominal somite.

Genus ***Heptacarpus*** Holmes, 1900

Heptacarpus maxillipes (Rathbun, 1902)

[New Japanese name: Shinkai-tsuno-mo-ebi]

(Fig. 21E)

Spirontocaris maxillipes Rathbun, 1902: 898; 1904: 92, fig. 40.
Heptacarpus maxillipes – Birshtein and Zarenkov, 1970: 420; Komai, 1993: 545, figs. 1A, 2, 3.

Material examined. R/V *Wakataka-maru*, WA05-F1200, 2♂♂ (cl 4.2, 4.3 mm), 2♀♀ (cl 4.6, 5.1 mm), 2 ovig. (cl 8.1, 8.9 mm), NSMT-Cr 16981; WA06-E750, 3♂♂ (cl 3.9–4.0 mm), 2♀♀ (cl 3.3, 5.5 mm), NSMT-Cr 17554; same data, 2♀♀ (cl 4.9, 5.0 mm), NSMT-Cr 17551; WA06-E900, 2 ovig. (cl 5.8, 6.3 mm), NSMT-Cr 17536; WA06-F410, 1 ovig. (cl 10.1 mm), NSMT-Cr 17553; WA06-FG480, 1 ovig. (cl 7.5 mm), NSMT-Cr 17541; WA06-G480, 1 ovig. (cl 7.6 mm), NSMT-Cr 17537; WA06-G550, 1♂ (cl 5.0 mm), NSMT-Cr 17539; WA06-H1500D, 2♀♀ (cl 7.0 mm, smaller specimen damaged), NSMT-Cr 17538; WA07-B1500D, 1♂ (cl 4.1 mm), NSMT-Cr 19417; WA07-C550, 1♂ (cl 4.3 mm), NSMT-Cr 19267; WA07-C900, 1 ovig. (cl 7.1 mm), NSMT-Cr 19268; WA07-D650, 1♀ (cl 6.6 mm), NSMT-Cr 19269.

R/V *Tansei-maru*, KT07-29, stn K2, off Kushiro, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N,

144˚52.2´E, 1535–1543 m, 2 November 2007, beam trawl, 1♂ (cl 4.0 mm), NSMT-Cr 19388.

Color. Body and antennae generally light pink, abdomen banded with pale pink and transparent; rostrum transparent; cornea dark grey; third maxilliped pink; first pereopod red, with tinge of white laterally; second pereopod pale pink; third to fifth pereopods reddish, with tinge of white laterally; eggs greyish green (Fig. 21E).

Size. Largest male cl 5.0 mm, largest female cl 10.1 mm, ovigerous females 7.1–10.1 mm.

Distribution. Aleutian Islands, Kurile Islands, Pacific coast of Japan from Hokkaido to Fukushima Prefecture; 280–1580 m (Rathbun, 1904; Birshtein and Zarenkov, 1970; Komai, 1993).

Heptacarpus moseri (Rathbun, 1902)
[New Japanese name: Akaobi-tsuno-mo-ebi]
(Fig. 21F)

Spirontocaris moseri Rathbun, 1902: 897; 1904: 91, fig. 39.
Heptacarpus moseri – Butler, 1980: 223, unnumbered fig., pl. 6A; Komai, 1993: 549, fig. 1B, 4.

Material examined. R/V *Wakataka-maru*, WA06-E450, 3 ovig. (cl 9.6–14.8 mm), NSMT-Cr 17555; WA07-C450, 1 ovig. (cl 11.2 mm), NSMT-Cr 19270.

Color. Body and antennae generally pink, abdomen conspicuously banded with pink and white; cornea dark gray; third maxilliped and first pereopod red, with tinge of white laterally; second pereopod pale pink; third to fifth pereopods with pink propodi, carpi paler, and meri paler in distal 0.7 and reddish in proximal 0.3, ischia yellowish; pleopods reddish; eggs grayish green (Fig. 21F).

Size. Largest female cl 14.8 mm, ovigerous females 9.6–14.8 mm.

Distribution. North Pacific, Bering Sea to Washington State, Pacific coast of northern Japan from Hokkaido to Iwate Prefecture; intertidal to 1100 m.

Genus ***Lebbeus*** White, 1847
Lebbeus compressus Holthuis, 1947
[Japanese name: Tosaka-mo-ebi]
(Fig. 21D)

Spirontocaris gibberosa Yokoya, 1933: 24, fig. 8. Not *Spirontocaris gibberosa* Balss, 1914 [= *Saron marmoratus* (Olivier, 1811)].
Lebbeus compressus Holthuis, 1947: 40; Miyake, 1982: 53, pl. 18, fig. 4; Hayashi, 1986b: 111, 264, fig. 68; Hayashi, 1992a: 116; 1992b: 436, figs. 233b, 234b.

Material examined. R/V *Wakataka-maru*, WA06-F210, 2 ovig. (cl 8.9, 9.5 mm), NSMT-Cr 17535; WA06-G210, 2♂♂ (cl 3.2, 5.7 mm), NSMT-Cr 17533; WA06-H250, 1♂ (cl 4.0 mm), 1♀ (cl 4.0 mm), NSMT-Cr 17534; WA07-G250, 1♀ (cl 5.6 mm), NSMT-Cr 19266.

Color. Carapace with complicated markings of red and white oblique lines; abdomen generally pink, telson and uropod paler, middorsal carina on third somite transparent; cornea gray; antennae white; First pereopod with fingers, carpus and merus red, palm white; posterior three pereopods generally colorless, with tint of red on ischia (Fig. 21D).

Size. Largest male cl 5.7 mm, largest female cl 9.5 mm, ovigerous females cl 8.9–9.5 mm.

Distribution. Japanese endemic, Iwate Prefecture to Tosa Bay; 290–450 m (Hayashi, 1986b; 1992a).

Lebbeus similior sp. nov.
[New Japanese name: Futago-ibara-mo-ebi]
(Figs. 10–12)

Material examined. Holotype: ♀ (cl 12.4 mm), R/V *Wakataka-maru*, WA05-F1200, off Sohma, Fukushima Prefecture, 37˚47.6´N, 142˚37.1´E to 37˚47.4´N, 142˚37.2´E, 1196–1196 m, 28 October 2005, NSMT-Cr 16980.

Description. Body (Fig. 10) moderately stout; integument thin.

Rostrum (Fig. 11A–B) nearly straight, directed forward, reaching distal margin of first segment of antennular peduncle, 0.48 times as long as carapace, deepest at distal 0.25 where third ventral tooth arising; dorsal margin armed with 7 small to moderately large equidistant teeth, increasing in size posteriorly, 4 on rostrum proper and 3 on carapace, posteriormost tooth arising at 0.22 of carapace length; ventral margin armed with 3 teeth in distal 0.25, distalmost tooth close to rostral tip, making rostral apex bifurcate; lateral carina obsolete. Carapace (Figs. 10, 11A–B) with low, but distinct postrostral ridge extending beyond midlength of carapace; dorsal profile slightly convex, anterior part slightly sloping to rostrum; supraorbital tooth moderately large, directed slightly dorsally; deep U-shaped notch just inferior to base of supraorbital tooth; orbital margin somewhat depressed; suborbital lobe slightly falling short of antennal tooth, tip blunt; antennal tooth well developed, slender; pterygostomial tooth relatively long; anterolateral margin between antennal and pterygostomial teeth noticeably sinuous, with conspicuous U-shaped notch inferior to antennal tooth.

Abdomen (Fig. 10) with pleura of anterior three somites rounded, those of fourth and fifth somites each with sharp posteroventral tooth. Second somite with transverse groove bordered posteriorly by conspicuous ridge. Third somite rounded dorsally, posterodorsal margin somewhat produced posteriorly. Sixth somite 1.24 times longer than fifth somite, 1.64 times longer than high, with small posteroventral tooth and sharply pointed posterolateral process. Telson (Fig. 11C) 1.60

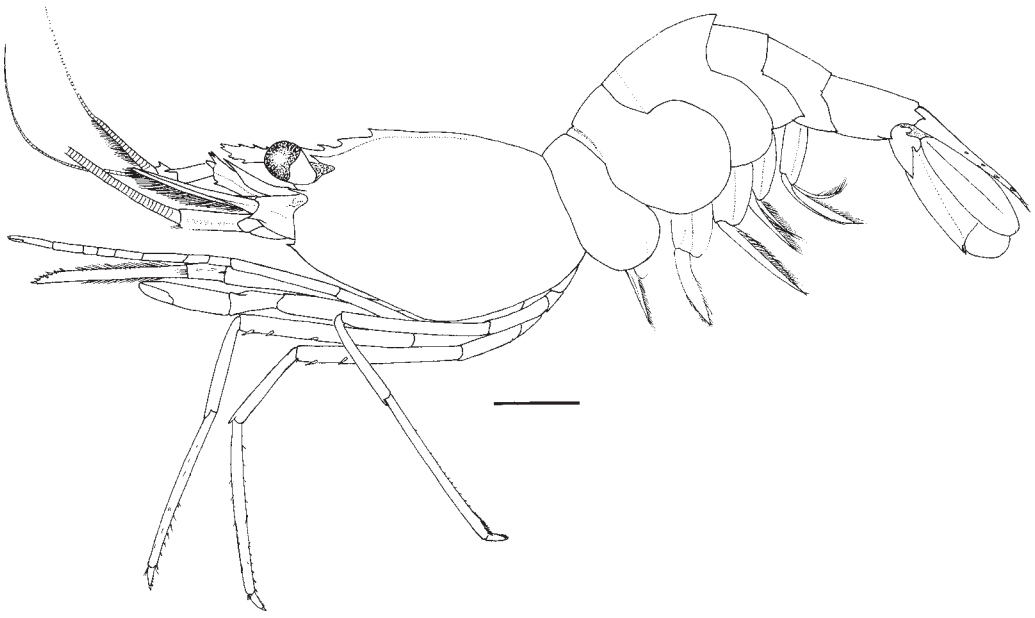

Fig. 10. *Lebbeus similior* sp. nov., holotype, female (cl 12.4 mm), WA05-F1200, NSMT-Cr 16980, habitus in lateral view. Scale bar: 5 mm.

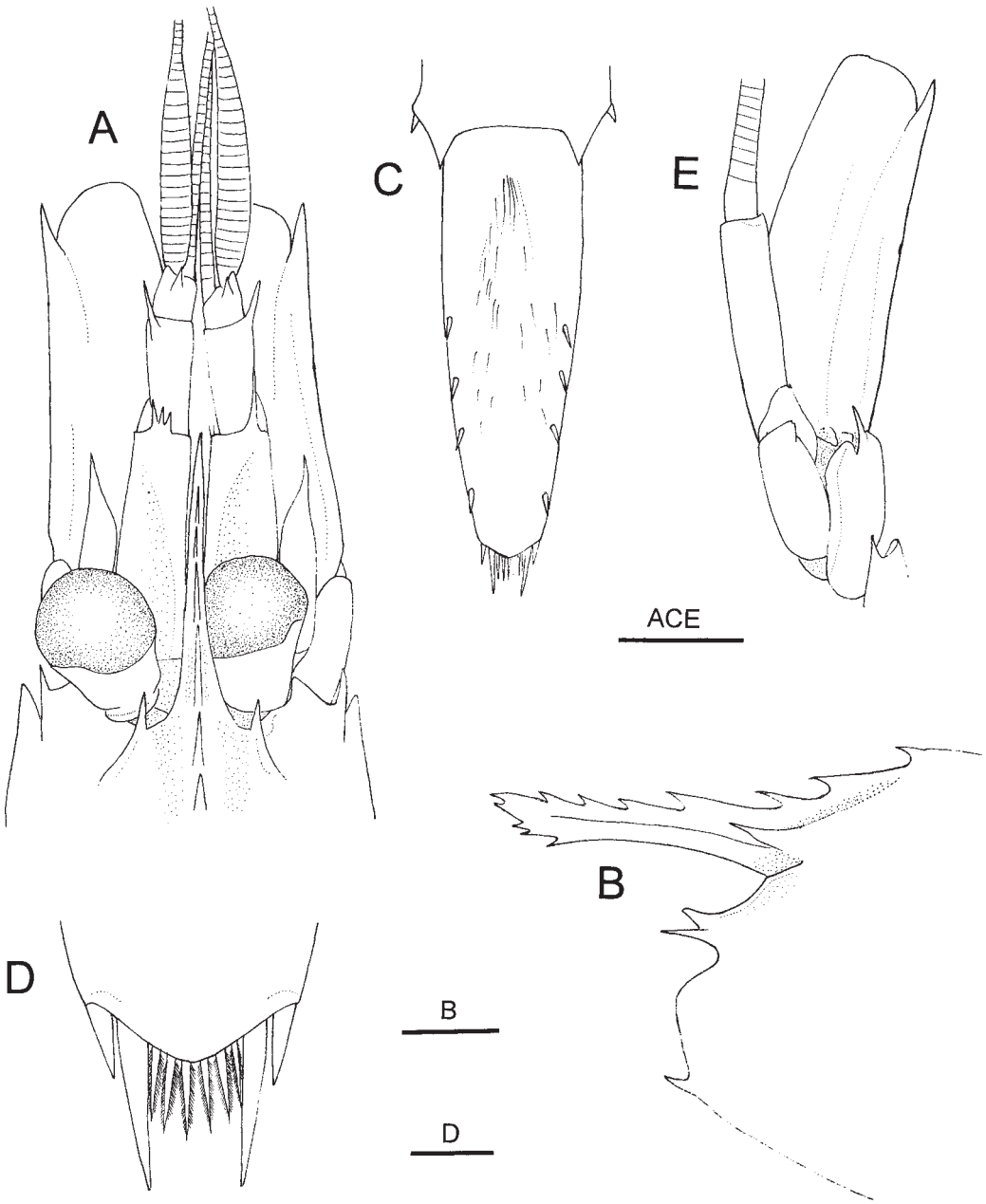

Fig. 11. *Lebbeus similior* sp. nov., holotype, female (cl 12.4 mm), WA05-F1200, NSMT-Cr 16980. A, anterior part of carapace and cephalic appendages, dorsal view (setae omitted); B, anterior part of carapace, lateral view; C, telson, dorsal view; D, posterior margin of telson, dorsal view; E, antenna, ventral view (setae omitted). Scale bars: 2 mm for A–C, E; 0.5 mm for D.

times longer than sixth abdominal somite, 3.0 times longer than wide, armed with 4 pairs of lateral spines; dorsal surface with scattered setae; posterior margin (Fig. 11D) convex, with 6 setulose spiniform setae.

Eye (Figs. 10, 11A) subpyriform; cornea moderately small, darkly pigmented, its maximum diameter 0.20 of carapace length; ocellus absent; eyestalk slightly shorter than cornea, cup-

shaped.

Antennular peduncle (Figs. 10, 11A) relatively slender; first segment longer than distal two segments combined, slightly narrowed distally, with 3 sharp dorsodistal teeth on left and 1 slender, elongate tooth on right; stylocerite moderately slender, closely approximated to first segment mesially, tapering distally in sharp spine not reaching distal margin of first segment; second segment about 0.60 times as long as first segment, slightly broadened distally, armed with long, slender tooth at dorsolateral distal angle; third segment short, with small tooth on dorsodistal margin. Lateral flagellum long, total length subequal to carapace length; aesthetasc-bearing portion somewhat thickened, about 0.40 times as long as carapace, bearing dense aesthetascs; mesial flagellum subequal in length to lateral flagellum.

Antenna (Figs. 10, 11A, E) with moderately stout basicerite, bearing blunt dorsolateral projection and sharp ventrolateral tooth. Antennal scale 0.63 times as long as carapace, 2.90 times longer than wide; lateral margin faintly concave; distolateral tooth moderately slender, nearly reaching roundly truncate distal margin of lamella. Carpocerite slightly overreaching midlength of antennal scale.

Mouthparts not dissected. Third maxilliped (Figs. 10, 12A) moderately slender, overreaching antennal scale by about 0.60 length of ultimate segment; ultimate segment 2.90 times longer than penultimate segment, distal portion bearing several corneous spines (Fig. 12B); antepenultimate segment slightly shorter than distal two segments combined, with 1 small sharp tooth on distolateral margin and with 1 small movable spinule at ventrodistal angle (Fig. 12C); no exopod.

Strap-like epipods present on third maxilliped and first to third pereopods and corresponding setobranchs present above bases of first to fourth pereopods.

First pereopod (Figs. 10, 12D) moderately stout; chela 1.70 times longer than carpus, distal part of fingers practically obscured by tufts of setae; dactylus 0.67 times as long as palm, with 2 corneous claws; fixed finger terminating in corneous claw; merus 4.1 times longer than wide, with tiny spiniform tubercle on dorsal margin proximally and with short row of spiniform setae on ventral margin subproximally; ischium unarmed. Second pereopod (Fig. 12E) moderately slender, overreaching antennal scale by chela and distal 3 carpal articles; chela about 0.25 times as long as carpus; carpus consisting of 7 articles, third article longest; merus slightly shorter than ischium; ischium with 4 spiniform setae on ventral margin subproximally. Third to fifth pereopods relatively long and slender, generally similar (Fig. 10). Third pereopod (Fig. 12F) overreaching antennal scale by about 0.80 length of propodus; dactylus (Fig. 12G) short, 0.17 times as long as propodus, 3.0 times longer than wide, bearing 7 accessory spinules on slightly convex flexor margin; these accessory spinules noticeably increasing in size distally, distalmost one particularly broad (basal width subequal to that of terminal unguis), its upper margin sharply edged (Fig. 12H); propodus with 2 rows of slender spinules on flexor surface; carpus 0.60 times as long as propodus; merus about 9.2 times longer than wide, armed with 5 lateral spines; ischium unarmed. Fourth pereopod (Fig. 12I) overreaching antennal scale by 0.5 length of propodus; dactylus with 7 accessory spinules; merus with 3 lateral spines; no epipod. Fifth pereopod (Fig. 12J) overreaching antennal scale by 0.25 length of propodus; dactylus 0.15 times as long as propodus, with 7 accessory spinules; propodus with cluster of grooming setae on flexor surface distally; carpus 0.52 times as long as propodus; merus with 1 subdistal ventrolateral spine.

Pleopods without distinctive feature. Uropod with protopod terminating in acute tooth posterolaterally (Fig. 10); exopod slightly longer than endopod, both slightly overreaching posterior margin of telson.

Color. Unavailable.

Distribution. Known only from the type locality, off Sohma, Fukushima Prefecture, 1196 m.

Remarks. *Lebbeus similior* sp. nov. belongs in the group of species with strap-like epipods on

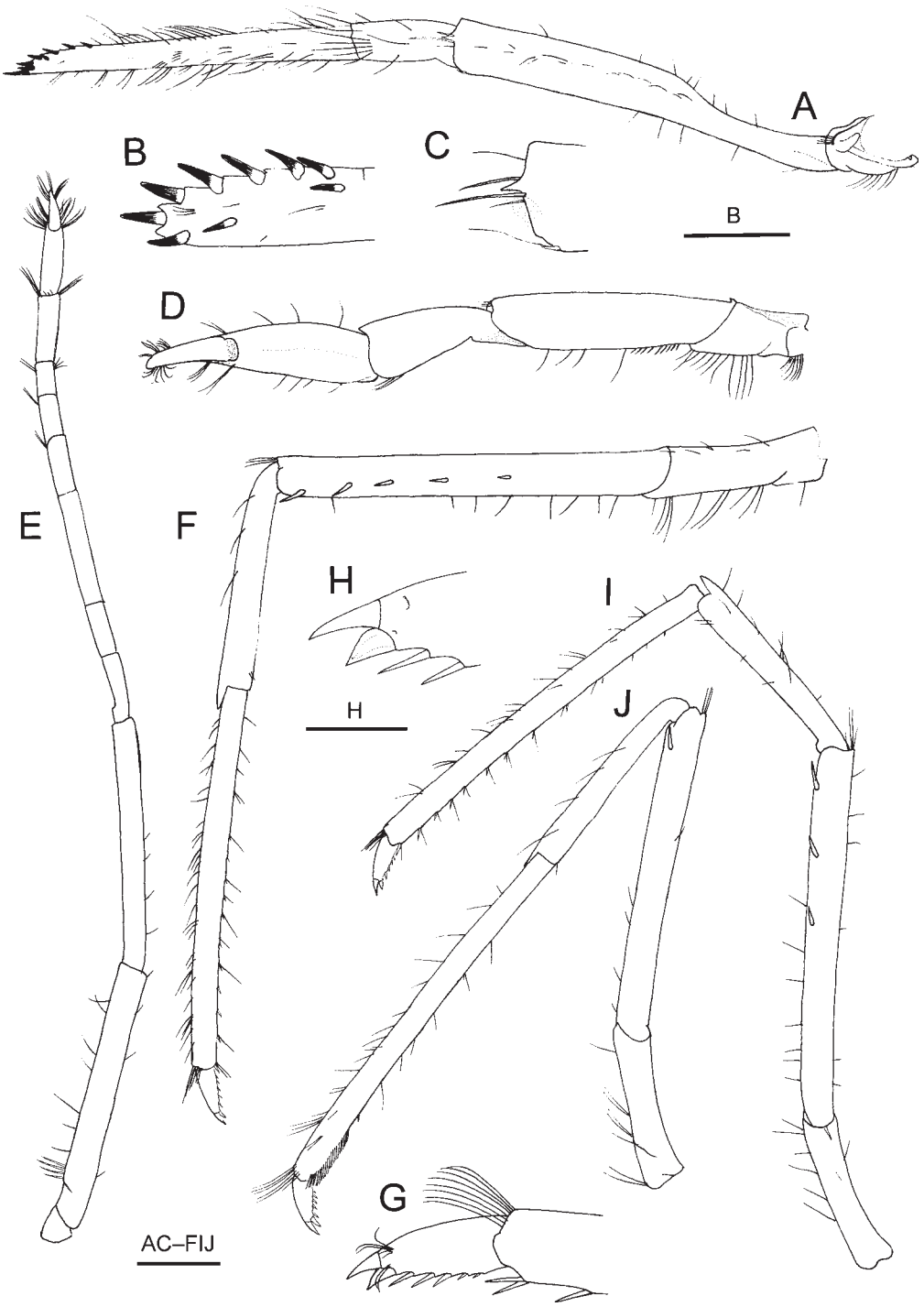

Fig. 12. *Lebbeus similior* sp. nov., holotype, female (cl 12.4 mm), WA05-F1200, NSMT-Cr 16980, left thoracic appendages. A, third maxilliped, lateral view; B, same, distal part of ultimate segment, extensor (dorsal) view; C, distal margin of antepenultimate segment, lateral view; D, first pereopod, lateral view; E, second pereopod, lateral view; F, third pereopod, lateral view; G, same, dactylus, lateral view; H, same, distal part; I, fourth pereopod, lateral view; J, fifth pereopod, lateral view. Scale bars: 2 mm for A, D–F, I–J; 1 mm for B–C; 0.5 mm for H.

the first to third pereopods, which contains 26 species (Komai, 2004; Jensen, 2006). It is morphologically similar to *L. antarcticus* (Hale, 1941), *L. carinatus* Zarenkov, 1976, *L. polyacanthus* Komai, Hayashi and Kohtsuka, 2004, and *L. washingtonianus* (Rathbun, 1902). Shared characters include: rostrum reaching or slightly overreaching distal margin of first segment of antennular peduncle, armed with more than three dorsal and more than one ventral teeth; distinct notch present inferior to base of supraorbital tooth of carapace; anterolateral margin between antennal and pterygostomial teeth strongly sinuous with conspicuous notch just inferior to antennal tooth; fourth abdominal pleura armed with posteroventral tooth; first segment of antennular peduncle with one to three sharp teeth at distolateral angle (Butler, 1980; Ward, 1985; Fransen, 1997; Komai *et al.*, 1996, 2004). Differences between the new species and the four allied species are discussed below:

Lebbeus antarcticus. This species is very similar to *L. similior*. The meral spines on the third pereopod seem to be less numerous in *L. similior* than in *L. antarcticus* (five versus eight) (Ward, 1985). The cornea of the eye is relatively larger in the new species than in *L. antarcticus* (the maximum diameter of the cornea is 0.20 of the carapace length versus 0.13–0.15) (Ward, 1985; Komai *et al.*, 1996). *Lebbeus antarcticus* is only known from the Indian Ocean Sector of the Antarctic, at depths of 450–640 m (Hale, 1941; Ward, 1985; Komai *et al.*, 1996).

Lebbeus carinatus. The dorsal rostral series includes seven teeth in *L. similior*, whereas only four in *L. carinatus*. The ventral rostral teeth are more widely spaced in the new species than in *L. carinatus*. The anterolateral notch just inferior to the antennal tooth of the carapace seems to be narrower in *L. similior* than in *L. carinatus*. *Lebbeus carinatus* is known only from the holotype off Peru, at depths of 1680–1860 m (Zarenkov, 1976; Fransen, 1997).

Lebbeus polyacanthus. The posteriormost tooth of the dorsal rostral series arises more anteriorly in *L. similior* than in *L. polyacanthus* (0.22 of the carapace length versus 0.36–0.44). The convexity on the anterolateral margin of the carapace is angular in the new species, rather than rounded in *L. polyacanthus*. Meral spines on the third pereopod are less numerous in *L. similior* than in *L. polyacanthus* (five versus nine to 13). *Lebbeus polyacanthus* is only known from Toyama Bay and off Noto Peninsula, Sea of Japan, at depths of 250–400 m (Komai *et al*., 2004).

Lebbeus washingtonianus. The dorsal rostral series includes seven teeth (including three postrostral teeth) in *L. similior*, whereas only four or five teeth (including two postrostral teeth) in *L. washingtonianus*. The stylocerite reaches nearly to the distal margin of the first segment of the antennular peduncle, whereas it reaches only to the distal 0.70–0.80 of the first segment of the antennular peduncle. *Lebbeus washingtonianus* is only known with certainty from the northeastern Pacific from British Columbia to California, at depths of 820–1808 m (Rathbun, 1904; Wicksten, 1978; Butler, 1980). It is noteworthy to mention that *L. washingtonianus* sensu Kikuchi and Ohta, 1995, reported from hydrothermally influenced fields on Iheya Ridge, Mid-Okinawa Trough, Japan. Specimens from the Mid-Okinawa Trough are different from specimens from the northeastern Pacific in having more numerous dorsal teeth on the rostrum (five to seven versus four or five), less sinuous anterolateral margin of the carapace and more numerous dorsolateral spines of the telson (six versus four) (Kikuchi and Ohta, 1995; personal observation). There is little doubt that the hydrothermal vent specimens represent a species distinct from *L. washingtonianus*. The new species differs from the vent species in the markedly sinuous anterolateral margin of the carapace, fewer dorsolateral spines of the telson, as well as the structure of the distalmost accessory spinules on the dactyli of the third to fifth pereopods.

Etymology. The name is derived from the comparative of the Latin *similis* (= similar) and reflects the strong similarity to *Lebbeus antarcticus*, a close relative, but distributed in a far distant locality.

Genus ***Spirontocaris*** Bate, 1888
Spirontocaris brevidigitata Kobjakova, 1935
[Japanese name: Toge-mo-ebi]
(Figs. 13, 14, 15A–D, 16, 21G–H)

Spirontocaris spinus – Brashnikov, 1907: 138, fig. 14c.

Spirontocaris brevidigitata Kobjakova, 1935: 88, fig. 3; Derjugin and Kobjakova, 1935: 142; Kobjakova, 1936: 221 (key), figs. 6–7; 1937: 128; Holthuis, 1947: 8 (list), 37 (key); Vinogradov, 1950: 200 (key), fig. 38; Igarashi, 1969: 5, pl. 4, fig. 12; Sokolov, 2001: 112, fig. 10.

? *Spirontocaris spina laevidens* Kobjakova, 1936: 221 (key) [type locality: not specifically indicated]; 1937: 127; Vinogradov, 1950: 200 (key).

Spirontocaris spina – Urita, 1942: 14; Miyake, 1982: 50, pl. 17, fig. 3. Not *Spirontocaris spina* (Sowerby, 1805).

Spirontocaris spinus - Hayashi, 1976: 18; 1977: 177 (in part), fig. 8a–n; 1993: 164, figs. 243g, 244i.

Spirontocaris arcuata – Cha *et al.*, 2001: 118–119, unnumbered figs.

Material examined. R/V *Wakataka-maru*, WA05-DE250D, 2 ovig. (cl 10.0, 10.4 mm), NSMT-Cr 16933; WA05-DE380D, 1 ovig. (cl 9.3 mm), NSMT-Cr 16954; same data, 5 juv. (cl 3.4–4.2 mm), NSMT-Cr 16956; WA05-EF250D, 1♀ (cl 9.4 mm), NSMT-Cr 19564; WA05-F350, 1♀ (cl 8.5 mm), NSMT-Cr 16955; WA05-F380, 1 ovig. (cl 13.2 mm), NSMT-Cr 16947; WA05-FG350, 4♀♀ (cl 9.1–10.3 mm), 1 ovig. (cl 13.4 mm), NSMT-Cr 16936; WA05-FG380, 1 ovig. (cl 11.8 mm), NSMT-Cr 16948; same data, 1 ovig. (cl 8.8 mm), NSMT-Cr 16952; WA05-G425, 1 ovig. (cl 11.6 mm), NSMT-Cr 16950; WA06-DE280, 2♀♀ (cl 9.5, 12.5 mm), 2 ovig. (cl 10.3, 11.2 mm), NSMT-Cr 17515; WA06-DE350, 1♀ (cl 9.9 mm), 16 ovig. (cl 10.9–12.2 mm), NSMT-Cr 17520; WA06-E250, 2 ovig. (cl 10.8, 14.5 mm), NSMT-Cr 17516; WA06-E280, 2 ovig. (cl 13.2, 13.6 mm), NSMT-Cr 17514; WA06-E310, 1♂ (cl 7.6 mm), 4 ovig. (cl 12.4–13.2 mm), NSMT-Cr 17512; WA06-E350, 1♀ (cl 9.9 mm), 3 ovig. (cl 12.3–14.5 mm), NSMT-Cr 17518; WA06-E380, 4 ovig. (cl 11.2–15.0 mm), NSMT-Cr 17517; WA06-E425, 1 ovig. (cl 13.6 mm), NSMT-Cr 17525; WA06-F350, 1♀ (cl 11.6 mm), 2 ovig. (cl 12.0, 12.4 mm), NSMT-Cr 17519; WA06-F380, 2♂♂ (cl 9.8, 10.4 mm), 4 ovig. (cl 10.5–14.2 mm), NSMT-Cr 17513;_WA06-G380, 1♀ (cl 10.0 mm), 2 ovig. (cl 12.5, 13.0 mm), NSMT-Cr 17526; WA07-A210, 1♀ (cl 10.0 mm), NSMT-Cr 19419; WA07-A250, 4 ovig. (cl 8.4–11.3 mm), NSMT-Cr 19212; WA07-A310, 2 ovig. (cl 10.4, 12.4 mm), NSMT-Cr 19214; WA07-B250, 1♀ (cl 7.1 mm), 8 ovig. (cl 9.6–13.6 mm), NSMT-Cr 19215; WA07-B310, 4 ovig. (cl 10.1–11.9 mm), NSMT-Cr 19216; WA07-B350, 1♂ (cl 7.0 mm), 2♀♀ (cl 7.7, 8.6 mm), 6 ovig. (cl 11.0–13.3 mm), NSMT-Cr 19217; WA07-B410, 1♂ (cl 7.0 mm), NSMT-Cr 19218; WA07-C210, 2♀♀ (cl 4.8, 8.9 mm), 1 ovig. (cl 8.4 mm), NSMT-Cr 19220; WA07-C250, 4 ovig. (cl 10.6–12.0 mm), NSMT-Cr 19220; WA07-C310, 1♂ (cl 6.0 mm), 3 ovig. (cl 9.2–13.2 mm), NSMT-Cr 19221; WA07-C350, 2♂♂ (cl 6.1, 7.4 mm), 2♀♀ (cl 6,7, 7.9 mm), 3 ovig. (cl 10.3–12.0 mm), NSMT-Cr 19222; WA07-C350D, 1 ovig. (cl 11.8 mm), NSMT-Cr 19223; WA07-C410, 3♀♀ (cl 8.6–9.1 mm), 1 ovig. (cl 10.6 mm), NSMT-Cr 19224; WA07-D210, 1 ovig. (cl 10.4 mm), NSMT-Cr 19421; WA07-D250, 2 ovig. (cl 12.6, 14.4 mm), NSMT-Cr 19225; WA07-D310, 3 ovig. (cl 12.0–14.3 mm), NSMT-Cr 19226; WA07-D350, 5 ovig. (cl 10.3–14.0 mm), NSMT-Cr 19227; WA07-D410, 1♂ (cl 7.7 mm), 3 ovig. (cl 11.4–13.0 mm), NSMT-Cr 19228.

Supplemental material. R/V *Wakataka-maru*, 1994 cruise, stn 3, off Rokkasho Village, Aomori Prefecture, 40˚53.5´N, 141˚46.5´E, 314 m, 14 October 1994, trawl, coll. D. Tsutsui, 3 ovig. (cl 12.5–13.0 mm), CBM-ZC 1121; R/V *Mizunagi*, Yamato Bank, Sea of Japan, depth not recorded, 26 June 1989, trawl, 3♀♀ (cl 15.0–16.5 mm), 3 ovig. (cl 15.3–16.0 mm), CBM-ZC 639; Sea of Japan off Togi, Noto Peninsula, 300–400 m, commercial shrimp trap, 16 April 2002, coll. H. Kohtsuka, 1♀ (cl 17.0 mm), 2 ovig. (cl 15.2, 15.4 mm), CBM-ZC 7632; Kitami-Yamato Bank, Sea of Okhotsk, 44˚17.0´N, 144˚17.8´E, 287 m, 7 June 1993, otter trawl, coll. M. Yabe, 1♀ (cl 13.2 mm), CBM-ZC 528.

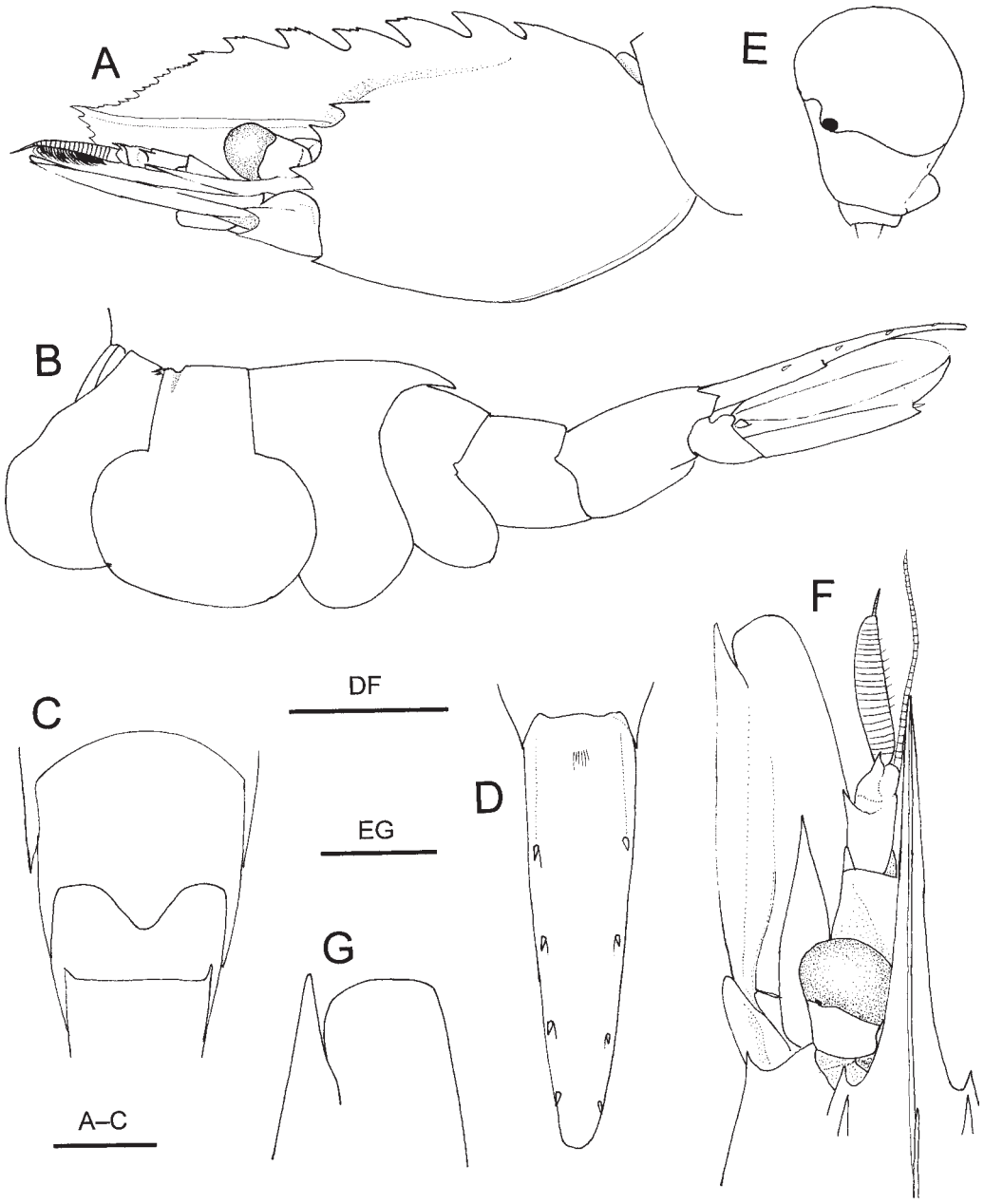

Fig. 13. *Spirontocaris brevidigitata* Kobjakova, 1935, ovigerous female (cl 15.8 mm), Yamato Bank, Sea of Japan, CBM-ZC 639. A, carapace and cephalic appendages, lateral view; B, abdomen, telson and uropod, lateral view (setae omitted); C, third and fourth abdominal somites, dorsal view; D, telson, dorsal view (spines on posterior margin damaged); E, left eye, dorsal view; F, anterior part of carapace and left cephalic appendages, dorsal view; G, distal part of antennal scale, dorsal view. Scale bars: 5 mm for A–D, F; 2 mm for E, G.

Comparative material. Spirontocaris spinus (Sowerby, 1805): R/V *Shinkai-maru*, stn T-49, Davis Strait west of Greenland, 67˚49´N, 56˚33´W, 185–188 m, 26 November 1991, otter trawl, 1♂ (cl 8.3 mm), CBM-ZC 415.

Description. Female.Body (Fig. 13A–B) relatively large, robust.

Rostrum (Fig. 13A, 16) deep, 0.7–0.8 times as long as carapace, distinctly overreaching distal

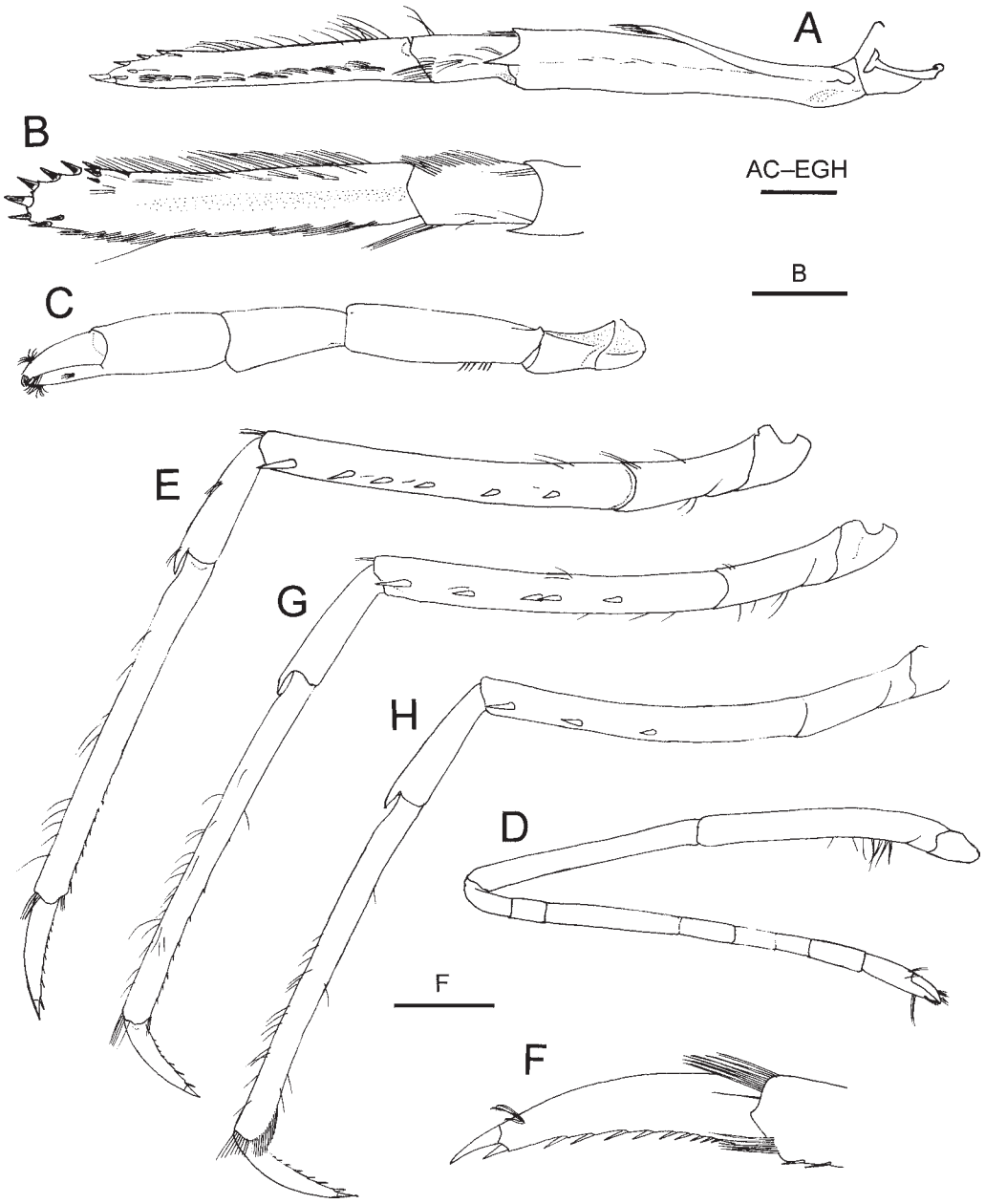

Fig. 14. *Spirontocaris brevidigitata* Kobjakova, 1935, ovigerous female (cl 15.8 mm), Yamato Bank, Sea of Japan, CBM-ZC 639, left thoracic appendages. A, third maxilliped, lateral view; B, same, distal two segments and distal part of antepenultimate segment, dorsal (extensor) view; C, first pereopod, lateral view; D, second pereopod, lateral view; E, third pereopod, lateral view; F, same, dactylus and distal part of propodus, lateral view; G, fourth pereopod, lateral view; H, fifth pereopod, lateral view. Scale bars: 2 mm for A–E, G–H; 1 mm for F.

margin of antennular peduncle; convex dorsal margin with numerous small teeth (size of teeth considerably variable, but generally decreasing in size distally; arrangement also highly variable); ventral rim as deep as dorsal rim, distal margin subtruncate or rounded, ventral margin strongly convex, irregularly denticulate in distal 0.3; midaxis conspicuous, slightly curved upward distally,

terminating in sharp tooth reaching beyond distal margin of ventral rim. Carapace (Fig. 13A, F) with 4 or 5 large middorsal teeth, posteriormost tooth arising at 0.7–0.8 of carapace length, anterior two teeth occasionally with minute accessory denticle(s); dorsal profile of rostrum to carapace slightly convex or slightly sinuous with faint concavity at base of rostrum; supraorbital teeth moderately small, subequal; suborbital lobe strong, triangular, directed mesially, overreaching moderately small antennal tooth; pterygostomial tooth small; orbital margin evenly concave; anterolateral margin between antennal and pterygostomial teeth straight or slightly sinuous.

Abdomen (Fig. 13B) dorsally smooth. Tergite of second somite with distinct transverse groove. Posterodorsal margin of third somite strongly produced in roundly triangular lobe, overhanging anterior half of fourth somite when fully extended. Pleura of anterior three somites rounded, those of fourth and fifth somite each with small ventrolateral tooth (tooth on fourth pleuron occasionally faint). Sixth somite 1.35–1.50 times longer than high, with sharply pointed posterolateral process and small posteroventral tooth. Telson (Fig. 13D) 1.6–1.9 times longer than sixth somite, with 4 pairs of dorsolateral spines; posterior margin normally produced in triangular projection, armed with 3 pairs of spines (second pair longest) (in figured specimen, spines broken off).

Eye (Fig. 13E) subpyriform, with small ocellar spot dorsally; cornea wider than eyestalk, maximal diameter 0.16–0.18 of carapace length; eyestalk with mesial papilla blunt, arising somewhat proximal to base of cornea.

Antennular peduncle (Fig. 13F) reaching or overreaching midlength of antennal scale; first segment about 1.8 times longer than distal two segments combined, unarmed on dorsodistal margin; stylocerite gradually tapering distally to sharp point, reaching distal margin of second segment of antennular peduncle, but not reaching or overreaching distal end of third segment of antennular peduncle; second segment with sharp distolateral tooth; third segment short, with small dorsodistal tooth; outer flagellum thick in aesthetasc-bearing portion, but abruptly tapering distally to short terminal portion, about half length of antennular peduncle, with numerous aesthetascs; inner flagellum thin, somewhat longer than outer flagellum. Antennal basicerite stout, bearing bluntly triangular dorsodistal lobe and acute ventrodistal tooth; antennal scale (Fig. 13F–G) 0.6–0.7 times as long as carapace, lateral margin nearly straight to slightly sinuous, mesial margin gently convex, distolateral tooth reaching or slightly overreaching broadly rounded or subtruncate distal lamella; carpocerite reaching level of distal margin of first segment of antennular peduncle.

Third maxilliped (Fig. 14A) stout, reaching or slightly overreaching distal margin of antennal scale; ultimate segment (Fig. 14B) somewhat flattened dorsoventrally, lateral and mesial margins subparallel in proximal 0.80, and then tapering to rounded tip, armed with darkly pigmented spines distally, mesial row extending to 0.25 length of mesial margin, bases of spines occasionally produced in tiny teeth; penultimate segment 0.35–0.40 times as long as ultimate segment; antepenultimate segment somewhat flattened proximally, with small dorsolateral and dorsomesial teeth and strong lateral tooth on distal margin; exopod well-developed, distinctly overreaching midlength of antepenultimate segment; coxa with small, rounded lateral lobe.

Strap-like epipods on third maxilliped to third pereopod, and corresponding setobranchs on first to fourth pereopod.

First pereopod (Fig. 14C) moderately stout, reaching or slightly overreaching midlength of antennal scale; dactylus 0.7–0.8 times as long as palm, terminating in 2 dark brown claws; tips of both fingers obscured by tufts of stiff setae; palm subcylindrical; carpus slightly shorter than palm, with well developed grooming apparatus dorsomesially near distal margin; merus slightly becoming wider distally, with tiny tooth or denticle proximally on dorsal surface and with short row of stiff setae on ventral surface proximally; ischium short, with distinct dorsolateral ridge. Second pereopod (Fig. 14D) overreaching antennal scale by length of chela; carpus divided in 7 articles,

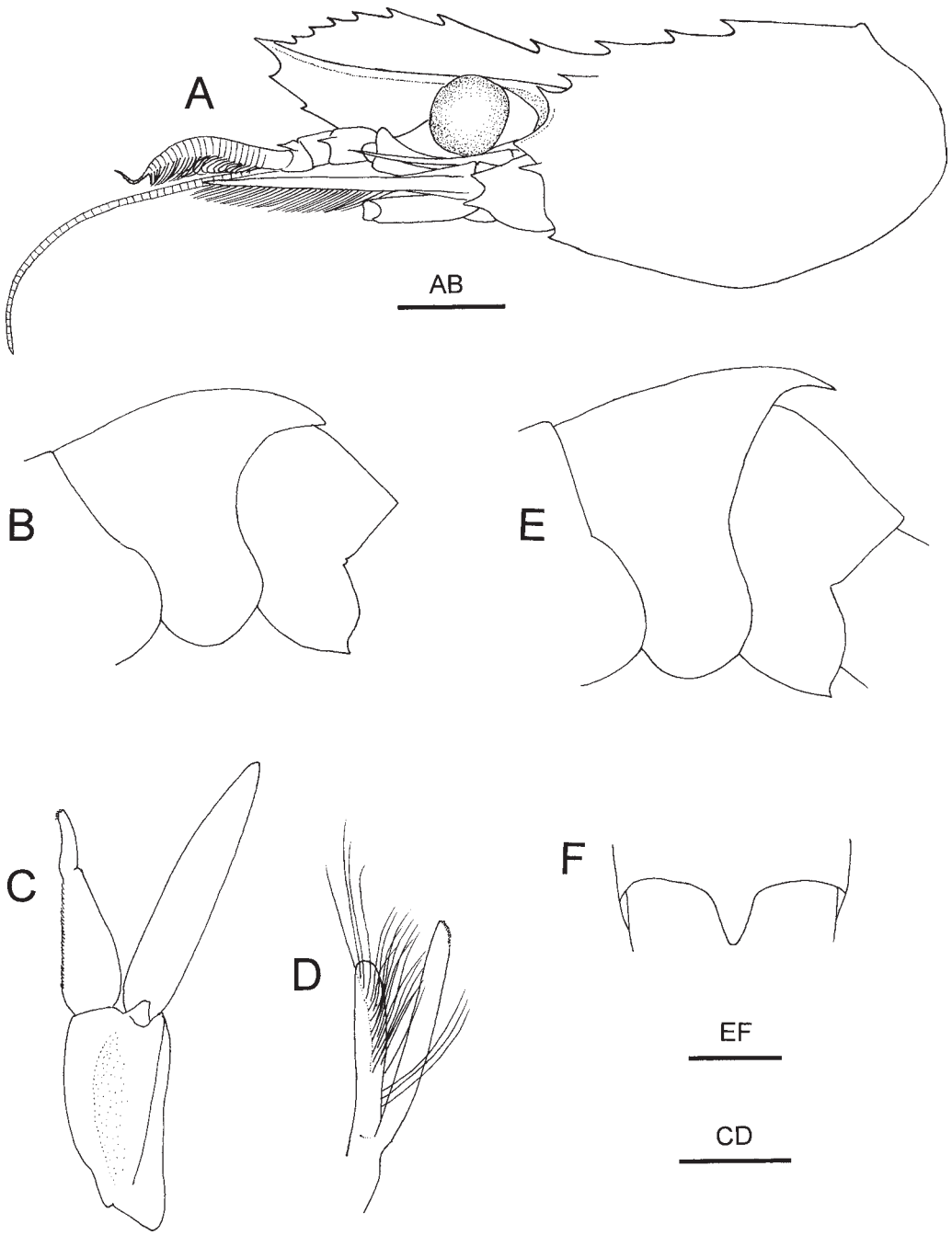

Fig. 15. A–D, *Spirontocaris brevidigitata* Kobjakova, 1935, male (cl 6.1 mm), WA07-C310; E, F, *Spirontocaris spinus* (Sowerby, 1805), male (cl 8.3 mm), Davis Strait, Greenland, CBM-ZC 415. A, carapace and cephalic appendages, lateral view; B, E, third and fourth abdominal somites, lateral view; C, left first pleopod, ventral view (setae omitted); D, appendices interna and masculina of left second pleopod, dorsal view; F, posterodorsal margin of third abdominal tergum. Scale bars: 2 mm for A–B, E–F; 1 mm for C; 0.5 mm for D.

third article longest. Third to fourth pereopods relatively slender, generally similar in shape and length. Third pereopod (Fig. 14E) overreaching antennal scale by length of dactylus to 0.1 length of propodus; dactylus (Fig. 14F) 0.25–0.35 times as long as propodus, 5.0–6.0 times longer than

high, gently curved, terminating distally clearly demarcated unguis, armed with 6–11 accessory spinules on flexor margin (distalmost accessory spinule somewhat remote from subterminal unguis); propodus with 2 rows of spinules on ventral surface; carpus 0.35–0.40 times as long as propodus; merus with 5–7 spines on lateral surface ventrally. Fourth pereopod (Fig. 14G) reaching antennal scale by dactylus; dactylus with 6–8 accessory spinules; merus with 4 or 5 spines laterally. Fifth pereopod (Fig. 14H) reaching distal end of antennular peduncle by tip of propodus; dactylus 0.35–0.45 times as long as propodus, with 6–8 accessory spinules; propodus with grooming setae distally; merus with 2 or 3 spines laterally.

Female first pleopod with endopod larger than exopod. Uropodal endopod reaching posterior margin of telson, exopod slightly shorter than endopod.

Males. Smaller than females. Rostrum (Fig. 15A) less deep than in females, dorsal margin with 7 teeth. Carapace (Fig. 15A) with 3 or 4 relatively small middorsal teeth, posteriormost tooth arising slightly posterior to midlength; dorsal profile in lateral view slightly sinuous with concavity above rostral base. Abdomen (Fig. 15B) generally similar to that of female. Maximum diameter of cornea 0.25 of carapace length (Fig. 15A). Outer antennular flagellum stout, with longer aesthetascs; inner flagellum elongate, subequal in length to carapace (Fig. 15A). Third maxilliped and posterior three pereopods more slender than in females. First pleopod (Fig. 15C) with endopod elongate triangular, slightly shorter than exopod, terminally with long appendix interna, bearing row of curved spiniform setae on mesial margin. Second pleopod with appendix masculina slightly shorter than appendix interna, bearing numerous long setae on mesial surface (Fig. 15D).

Color. Substantially variable, but ground color of body red or dark red; rostrum sometimes paler, tips of middorsal teeth whitish; anterior five abdominal sometimes mottled with red and white, but sixth somite red or dark red; telson and uropod paler; antennular peduncle pink or red; antennal scale pale red or pink, lateral margin sometimes white; third maxilliped with distal part of ultimate segment white, remaining red or dark red; second to fifth pereopods pink or red, sometimes obscurely banded; eggs grayish green (Fig. 21G–H).

Size. Largest male cl 10.4 mm; largest female cl 16.5 mm, ovigerous females cl 8.4–16.0 mm.

Distribution. Sea of Japan southward to southwestern part of Korea, Sea of Okhotsk, northeastern Honshu; 60–1380 m, but usually 150–400 m (Kobjakova, 1935; Hayashi, 1977; Sokolov, 2001; this study).

Remarks. Taxonomic identity of the taxa related to *Spirontocaris spinus* (Sowerby, 1805), i.e., *S. brevidigitata* (type locality: Peter the Great Bay, Sea of Japan), *S. spina intermedia* Makarov, in Kobjakova, 1936 (type locality: the Sea of Okhotsk, Bering Sea and Chukchi Sea), and *S. spina laevidens* Volk, in Kobjakova, 1936 (type locality: the Sea of Japan), has been a subject to disagreement. Vinogradov (1950) recognized these three taxa, although the latter two were ranked as subspecies of *S. spinus*, following Kobjakova (1936, 1937). Hayashi (1977) synonymized *S. brevidigitata*, *S. spina intermedia* and *S. spina laevidens* with *S. spinus*, as the characters used for differentiating these taxa by Kobjakova (1936, 1937) and Vinogradov (1950) are all variable and thus do not provide any diagnostic significance. On the other hand, Sokolov (2001) argued that *S. brevidigitata* and *S. intermedia* are distinct from *S. spinus* based on an examination of extensive material.

The present material, including specimens from the Sea of Okhotsk, Sea of Japan, and northeastern Honshu, is identified with *S. brevidigitata* following Sokolov (2001). Sokolov (2001) distinguished *S. brevidigitata* from *S. spinus* by the shorter stylocerite (falling short of the distal end of the antennular peduncle versus overreaching it), the tip of the midaxis of the rostrum clearly reaching beyond the distal margin of the ventral limb, fewer dorsal teeth on the rostrum, and the less produced posterodorsal margin of the third abdominal somite. Examination of the present

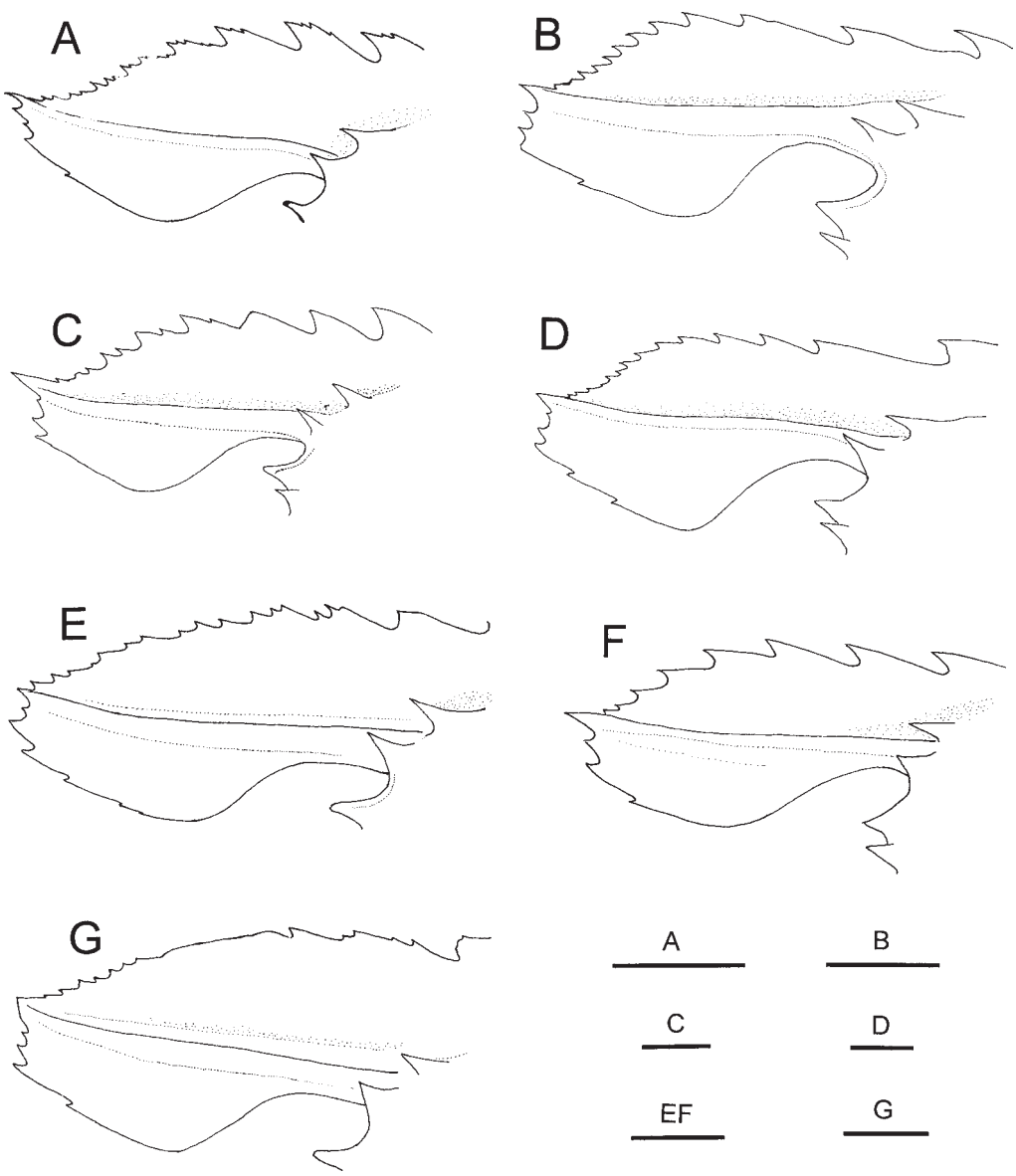

Fig. 16. *Spirontocaris brevidigitata* Kobjakova, 1935. Rostra, showing variation in shape and armature. A, ovigerous female (cl 15.8 mm), Yamato Bank, Sea of Japan, CBM-ZC 639; B, ovigerous female (cl 8.4 mm), WA07-C210, NSMT-Cr 19219; C, ovigerous female (cl 12.2 mm), off Rokkasho Village, CBM-ZC 1121; D, ovigerous female (cl 10.4 mm), WA07-D210, NSMT-Cr 19421; E, female (cl 11.9 mm), WA07-B250, 19215; F, female (cl 7.3 mm), same lot; G, female (cl 12.8 mm), same lot. Scale bars: 5 mm for A; 2 mm for B–G.

material supports that the length of the antennular stylocerite and of the shape of the third abdominal tergite are constant. In *S. spinus*, the posteromedian process of the third abdominal tergite is narrowly triangular (cf. Fig. 15F and Fig. 13C); the dorsal profile of the third tergite in the lateral view is less convex than in *S. brevidigitata* (cf. Fig. 15E and Fig. 15B). On the other hand, the shape and armature of the rostrum is considerably variable among individuals (see Fig. 16), and thus we could not find any diagnostic significance in the rostral armament.

Further, Sokolov (2001) noted that *S. brevidigitata* and *S. intermedia* were distinguishable by

the shape and armament for one another. According to him, *S. intermedia* is characterized by the presence of a large tooth on the ventral margin of the rostrum. As mentioned above, however, the rostral armature is quite variable in the present series, and there are some specimens having large tooth or teeth on the ventral limb of the rostrum. There are no other diagnostic characters correlated to the rostral armament. We question if *S. inermedia* is indeed a valid taxon, but a detailed comparison with the material from the Bering and Chukchi seas is necessary to reach final conclusion.

Sokolov (2001) did not consider *S. spinus laevidens*, and indeed distinguishing between this taxon and *S. brevidigatata* remains problematic. According to the key of Vinogradov (1950), *S. spina laevidens* is distinguished from *S. brevidigitata* by the tip of the mid-axis of the rostrum extending as far as or not overreaching the anterior margin of the ventral limb, but in the present series, this character varies considerably as mentioned above. It seems reasonable to consider that *S. spina laevidens* is a junior synonym of *S. brevidigitata* at present.

Spirontocaris arcuata Rathbun, 1902 (type locality: Washington Sound, Straits of Fuca) is also very similar to *S. spinus* and *S. brevidigitata*. Unfortunately, during this study, no specimens unumbiguously referable to *S. arcuata* were available for comparison. Nevertheless, a comparison of the present series with the descriptions of *S. arcuata* by Rathbun (1902, 1904) and Butler (1980) suggests that *S. brevidigitata* probably differs from *S. arcuata* in the shape of the antennal scale and the proportionally longer dactyli of the last three pereopods. In the present specimens, the distolateral tooth of the antennal scale reaches or only slightly overreaches the roundly truncate distal margin of the lamella, but it distinctly overreaches the rounded lamella in *S. arcuata*, according to Butler (1980).

Cha *et al.* (2001) referred specimens from Korea to *Spirontocaris arcuata* without comment, but the description closely agrees with the present specimens, and we here refer this record to *S.brevidigtata*.

Spirontocaris prionota (Stimpson, 1864)
[Japanese name: Mutsu-toge-mo-ebi]

Hippolyte prionota Stimpson, 1864: 153.
Spirontocaris prionota – Hayashi, 1977: 175, fig. 7; Butler, 1980: 161, unnumbered fig.

Material examined. R/V *Wakataka-maru*, WA9201, stn 4, off Hachinohe, Aomori Prefecture, 40˚50.9´N, 141˚42.6´E, 200–202 m, 12 February 1992, 1 ovig. (cl 4.0 mm), NSMT-Cr 17611.

Distribution. North Pacific, California to Sea of Japan; Bering Sea; subtidal to 163 m (Hayashi, 1977; Butler, 1980). In Japanese waters, occurring in Hokkaido, Aomori Prefecture, Toyama Bay, and Ishikawa Prefecture (Hayashi, 1977). The present specimen slightly extends the bathymetric range to 202 m.

Family Nematocarcinidae
Genus ***Nematocarcinus*** Bate, 1888
Nematocarcinus tenuipes Bate, 1888
[New Japanese name: Tosaka-itoashi-ebi]
(Fig. 17A–C)

Nematocarcinus tenuipes Bate, 1888: 812, pl. 132, fig. 6; Burukovsky, 2000: 164, fig. 3; Hayashi, 2007: 91, fig. 37d.
Nematocarcinus longirostris Bate, 1888: 806 (in part).
Nematocarcinus parvidentatus Bate, 1888: 814.
Nematocarcinus productus Bate, 1888: 810 (in part); Chace, 1986: 72 (in part).

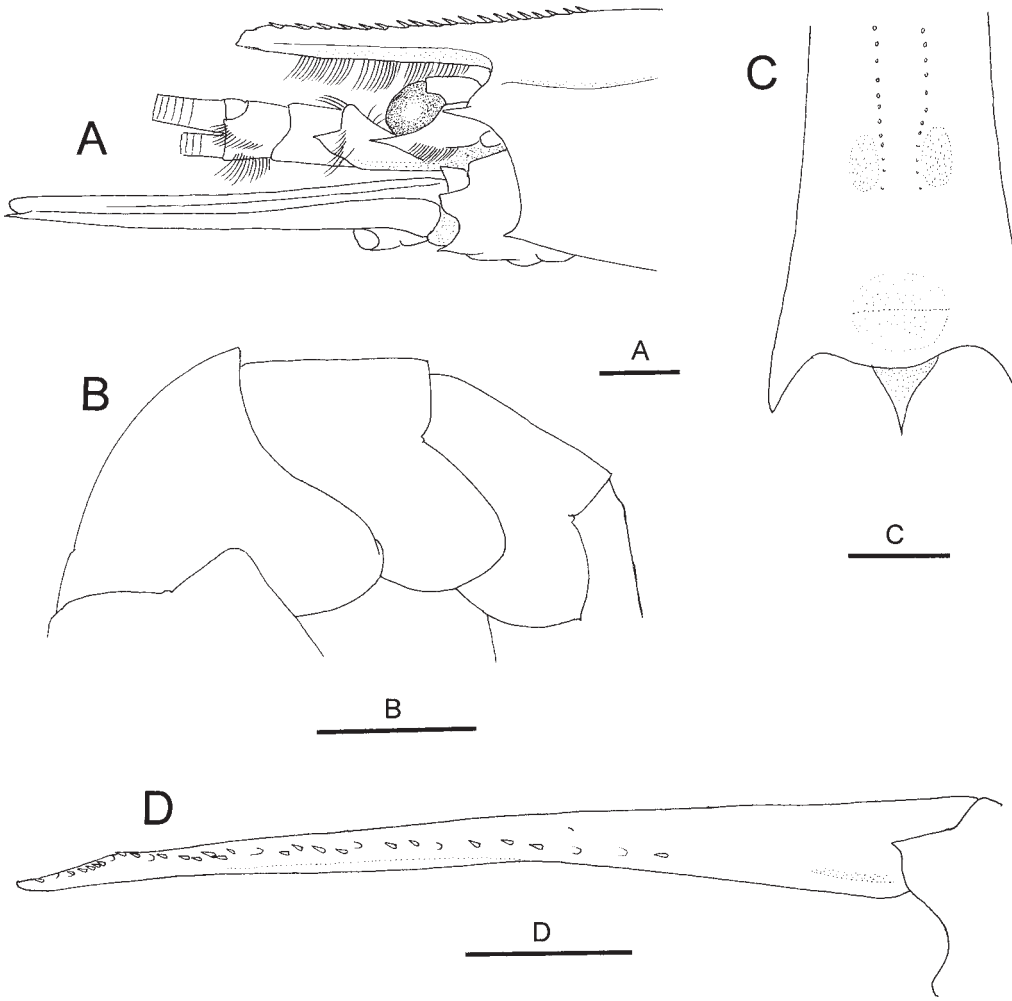

Fig. 17. A–C, *Nematocarcinus tenuipes* Bate, 1888, female (cl 16.4 mm), WA07-G1200, NSMT-Cr 19423; D, *Systellapsis paucispinosa* Crosnier, 1987, ovigerous female (cl 33.3 mm), WA07-B1200, NSMT-Cr 19314. A, anterior part of carapace and cephalic appendages, dorsal view; B, third to fifth abdominal somites, lateral view; C, sixth abdominal somite, ventral view; D, telson, lateral view. Scale bars: 5 mm for B, D; 2 mm for A; 1 mm for C.

Nematocarcinus serratirostris Burukovsky, 1991: 41, figs. 9–11.

Material examined. R/V *Wakataka-maru*, WA06-F1500, 1♂ (cl 15.6 mm), 1♀ (cl 11.8 mm), NSMT-Cr 17449; WA07-C750, 1 young (cl 10.3 mm), NSMT-Cr 19307; WA07-G1200, 1♂ (cl 16.4 mm), 1 specimen (cl 17.0 mm), NSMT-Cr 19423.

Distribution. Widely distributed in the Indo-West Pacific; 518–3429 m. In Japanese waters, recorded from off Izu Islands (Bate, 1888; as *N. parvidentatus*) and Suruga Bay (Ohta, 1983). Newly recorded from northeastern Honshu.

Remarks. This taxon was synonymized with *Nematocarcinus productus* Bate, 1888 by Chace (1986), but Burukovsky (2000) showed that it is a valid species.

The present specimens except for the young specimen from WA07-C750 are identified with *N. tenuipes* on account of the following features (see Burukovsky, 2000): the rostrum overreaches the distal margin of the antennular peduncle, bearing at least 19 spines in dorsal rostral series (Fig.

17A); the posterodorsal margin of the third abdominal tergite is only moderately produced, broadly rounded (Fig. 17B); and the ventrodistal organ on the sixth abdominal somite consisting of a pair of oval spots a single row of setae (only setal pits are preserved in the specimens examined) on either side of the midline, which extends the posterior end of the spot (Fig. 17C). The identification of the young specimen is provisional, because the distal part of the rostrum seems to be abnormal, and reaches only to the second segment of the antennular peduncle; the ventrodistal organ on the sixth abdominal somite agrees with that of other larger specimens.

Family Oplophoridae
Genus ***Acanthephyra*** A. Milne-Edwards, 1881
Acanthephyra eximia Smith, 1884
[Japanese name: Toge-hiodoshi-ebi]
(Fig. 22A)

Acanthephyra eximia Smith, 1884: 376, pl. 14, fig. 1; Aizawa, 1974: 29; Chace, 1986: 18, figs. 2j, 4j, 5j, 6h, 9a; Hayashi, 1986b: 86, 254, fig. 46; 1988: 122, fig. 144e, 145c; 2007: 24, figs. 6e, 7c; Komai, 1991: 62.
Acanthephyra angusta Bate, 1888: 737, pl. 124, fig. 6, 6a.
Acanthephyra edwardsii Bate, 1888: 747, pl. 126, fig. 1, 1z.
Acanthephyra brachytelsonis Bate, 1888: 747, pl. 126, fig. 1.
Acanthephyra pulchra A. Milne-Edwards, 1890: 163.

Material examined. R/V *Wakataka-maru*, WA05-E900, 2♀♀ (cl 19.5, 30.5 mm), NSMT-Cr 16905; WA05-F750, 1♀ (cl 13.0 mm), NSMT-Cr 16917; WA05-F750, 1♂ (cl 19.5 mm), NSMT-Cr 16906; WA05-G900, 1♀ (cl 24.0 mm), NSMT-Cr 16907; WA05-H900, 1♀ (cl 16.0 mm), NSMT-Cr 16910; WA06-E900, 1♀ (cl 20.0 mm), NSMT-Cr 17450; same data, 1 ♂ (cl 17.1 mm), 1 ♀ (cl 16.9 mm), 1 cephalothorax, NSMT-Cr 17461; WA06-F900, 1♂ (cl 30.3 mm), NSMT-Cr 17453; same data, 1♀ (cl 13.3 mm), NSMT-Cr 17448; WA07-A510, 4♀♀ (cl 11.6–17.3 mm), NSMT-Cr 19308; WA07-B510, 1♂ (cl 15.1 mm), NSMT-Cr 19309; WA07-B650, 5♀♀ (cl 18.9–22.6 mm), NSMT-Cr 19310; WA07-C750, 1♂ (cl 24.7 mm), NSMT-Cr 19311; WA07-D750, 2♀♀ (cl 13.7, 20.0 mm), NSMT-Cr 19312; WA07-D900, 2♀♀ (cl 21.0 mm, not measured), 1 specimen (not sexed, cl 15.0 mm), NSMT-Cr 19313.

Color. Entirely crimson red; cornea black, with reflecting pigment (Fig. 22A).

Size. Largest male cl 30.3 mm; largest female cl 30.5 mm.

Distribution. Most tropical and temperate waters in the world; 200–4700 m (Chace, 1986). In Japanese waters, known from Hokkaido to Ryukyu Islands (Komai, 1991; Hayashi, 2007).

Acanthephyra quadrispinosa Kemp, 1939
[Japanese name: Sagami-hiodoshi-ebi]
(Fig. 22B)

Acanthephyra quadrispinosa Kemp, 1939: 571, 572, 576, 578; Aizawa, 1974: 31; Hayashi, 1988: 47, fig. 142; 2007: 26, fig. 8.
Acanthephyra purpurea – Miyake, 1982: 20, pl. 7, fig. 4. Not *Acanthephyra purpurea* A. Milne-Edwards, 1881.

Material examined. R/V *Wakataka-maru*, WA05-F750, 1♂ (cl 16.2 mm), NSMT-Cr 16912; WA06-E750, 1♀, NSMT-Cr 17464; WA06-F550, 2♂♂ (cl 14.0, 14.3 mm), 1♀ (cl 11.1 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 17456; WA06-F650, 1♂ (cl 12.3 mm), 1♀ (cl 16.0 mm), NSMT-Cr 17455; WA06-F750, 2♂♂ (cl 14.5, 15.9 mm), NSMT-Cr 17462; WA06-G480, 1♀, NSMT-Cr 17463; WA06-G510, 2♂♂ (cl 15.0, 16.0 mm), NSMT-Cr 17465; WA06-G550, 1 juv., NSMT-Cr 17454; WA07-A410, 1♂ (cl 10.3 mm), 2♀♀ (cl 9.5, 10.6 mm), 1 ovig. (cl 13.3 mm), NSMT-Cr

19273; WA07-A650, 1♂ (cl 16.6 mm), 2 ovig. (cl 14.3, 15.0 mm), NSMT-Cr 19274; WA07-A900, 1♂ (cl 16.0 mm), NSMT-Cr 19275; WA07-B450, 1♂ (cl 11.4 mm), 2♀♀ (cl 9.2, 11.2 mm), 2 juv. (cl 5.6, 6.0 mm), NSMT-Cr 19276; WA07-B510, 1♂ (cl 12.9 mm), 1♀ (cl 15.0 mm), 1 ovig. (cl 15.4 mm), NSMT-Cr 19278; WA07-B550, 2♂♂ (cl 9.0, 17.2 mm), 1♀ (cl 11.6 mm), 1 ovig. (cl 16.0 mm), NSMT-Cr 19277; WA07-B750, 2♂♂ (cl 12.0, 13.0 mm), 1♀ (cl 10.2 mm), NSMT-Cr 19279; WA07-B900, 2♂♂ (cl 14.2, 15.6 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 19280; WA07-B1200, 4♂♂ (cl 11.3–17.3 mm), 1♀ (cl 15.0 mm), 1 ovig. (cl 13.1 mm), NSMT-Cr 19281; WA07-C510, 1♂ (cl 12.2 mm), 1♀ (cl 12.2 mm), NSMT-Cr 19282; WA07-D550, 2♂♂ (cl 14.2, 20.6 mm), NSMT-Cr 19283; WA07-D650, 1♂ (cl 11.3 mm), 1♀ (cl 12.7 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 19284; WA07-D750, 1 ovig. (cl 15.2 mm), NSMT-Cr 19285; WA07-D900, 1♂ (cl 14.0 mm), NSMT-Cr 19286; WA07-G1200, 1♀ (cl 15.5 mm), NSMT-Cr 19287.

R/V *Soyo-maru*, stn SO07-C7-B, off Miyako, Iwate Prefecture, 39˚40.6´N, 142˚35.2´E to 39˚39.8´N, 142˚33.7´E, 815–820 m, 7 August 2007, benthos net, 1 ovig. (cl 17.1 mm), NSMT-Cr 19562.

R/V *Tansei-maru*, KT07-29, stn E3, off Erimo-misaki, eastern Hokkaido, 41˚39.1´N, 144˚07.5´E to 41˚37.2´N, 144˚07.6´E, bottom depths 1997–2043 m, 7 November 2007, 1 juv. (cl 4.4 mm), NSMT-Cr 19396; stn K3, off Kushiro, eastern Hokkaido, 42˚27.6´N, 144˚57.4´E to 42˚27.6´N, 144˚59.4´E, 7 November 2007, 1♂ (cl 11.9 mm), 2 juv. (cl 5.4, 7.2 mm), NSMT-Cr 19397; stn M3-2, off Miyako, Iwate Prefecture, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, bottom depths 1737–1709 m, 6 November 2007, beam trawl, 1♂ (cl 14.0 mm), NSMT-Cr 19398.

Color. Entirely vivid red; cornea dark brown (Fig. 22B).

Size. Largest male cl 20.6 mm, largest female cl 17.1 mm, ovigerous females cl 13.3–17.1 mm.

Distribution. Indo-Pacific; meso- and bathypelagic. In Japanese waters, recorded from Hokkaido to Ryukyu Islands (Komai, 1991; Hayashi, 2007).

Genus ***Hymenodora*** Sars, 1877

Hymenodora frontalis Rathbun, 1902

[Japanese name: Maru-hiodoshi-ebi]

(Fig. 22C)

Hymenodora frontalis Rathbun, 1902: 904; 1904: 28, fig. 8; Hayashi, 1988: 208, fig. 147b; Komai *et al*., 1999: 139.
Hymendora frontalis (sic) – Butler, 1980: 70, unnumbered fig., pl. 5E.

Material examined. R/V *Wakataka-maru*, WA06-E750, 3♀♀, NSMT-Cr 17447; WA06-E1200, 1♂, 2 specimens, NSMT-Cr 17452; WA06-F900, 1♀, NSMT-Cr 17451; WA07-A900, 2♀♀ (cl 8.0, 8.8 mm), NSMT-Cr 19288; WA07-B650, 1♂ (cl 12.0 mm), 7♀♀ (cl 8.5–12.5 mm), NSMT-Cr 19289; WA07-B750, 1♀ (cl 14.0 mm), NSMT-Cr 19290; WA07-B900, 1♂ (cl 8.0 mm), 1♀ (cl 10.8 mm), 1 ovig. (cl 12.2 mm), 2 specimens, NSMT-Cr 19291; WA07-B1200, 1♂ (cl 13.7 mm), 5 specimens (cl 7.6–11.6 mm), NSMT-Cr 19292; WA07-C650, 1 specimen (cl 8.4 mm), NSMT-Cr 19293; WA07-C900, 4♀♀ (cl 10.0–10.6 mm), NSMT-Cr 19294; WA07-D1500D, 1 juv. (cl 4.6 mm), NSMT-Cr 19295.

R/V *Soyo-maru*, stn SO07-O1, off Onahama, Fukushima Prefecture, 36˚46.0´N, 141˚51.4´E to 36˚43.8´N, 141˚48.1´E, bottom depths 2020–2068 m, 8 August 2007, benthos net, 1♀ (cl 9.8 mm), NSMT-Cr 19563.

R/V *Tansei-maru*, KT07-29, stn K1, off Kushiro, eastern Hokkaido, 42˚35.0´N, 144˚48.0´E to 42˚34.7´N, 144˚49.9´E, 1028–1075 m, 7 November 2007, beam trawl, 1 specimen, NSMT-Cr 19390; stn K2, off Kushiro, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 2

November 2007, beam trawl, 1♀ (cl 11.6 mm), 1 juv., NSMT-Cr 19391; stn K3, off Kushiro, 42˚27.6´N, 144˚57.4´E to 42˚27.6´N, 144˚59.4´E, 2037–2025 m, 7 November 2007, beam trawl, 1♀ (cl 12.2 mm), 2 juv., NSMT-Cr 19392; stn M1, off Miyako, Iwate Prefecture, 39˚17.9´N, 142˚28.4´E to 39˚16.8´N, 142˚27.4´E, 1039-1041 m, 6 November 2007, beam trawl, 1♀ (cl 6.1 mm), NSMT-Cr 19393; stn M2, off Miyako, 39˚16.2´N, 142˚41.1´E to 39˚18.6´N, 142˚43.7´E, 1528–1603 m, 6 November 2007, beam trawl, 1 specimen (cl 9.0 mm), NSMT-Cr 19394; stn M3-3, off Miyako, 39˚20.0´N, 142˚51.0´E to 39˚21.8´N, 142˚51.9´E, 1728–1719 m, 6 November 2007, beam trawl, 1♀ (cl 12.0 mm), NSMT-Cr 19395.

Color. Generally reddish orange; cornea opaque (Fig. 22C).

Size. Largest female cl 12.5 mm. ovigerous female cl 12.2 mm.

Distribution. North Pacific, Japan to southern California, Bering Sea; meso- and bathypelagic. In Japan, occurring in waters off Hokkaido to Mie Prefecture (Aizawa, 1974; Hayashi, 2007).

Genus ***Notostomus*** A. Milne-Edwards, 1881
Notostomus japonicus Bate, 1888
[Japanese name: Atama-ebi]
(Fig. 22D)

Notostomus japonicus Bate, 1888: 830, pl. 135, fig. 1; Stevens and Chace, 1965: 277, figs. 1–4; Aizawa, 1974: 33; Butler, 1980: 63, unnumbered fig.; Hayashi, 2007: 59, fig. 25.

Material examined. R/V *Wakataka-maru*, WA05-F750, 1 ovig. (cl 40.3 mm), NSMT-Cr 16959; WA05-E900, 1♀ (cl 43.3 mm), NSMT-Cr 16957; WA05-G900, 1♂ (cl 41.4 mm), NSMT-Cr 16958; WA07-A410, 1 juv. (cl 13.5 mm), NSMT-Cr 19315; WA07-A750, 1 ovig. (cl 41.3 mm), NSMT-Cr 19316; WA07-B650, 1 ovig. (damaged), NSMT-Cr 19317; WA07-B750, 1♀ (cl 43.0 mm), 3 ovig. (cl 40.5–44.7 mm), NSMT-Cr 19318; WA07-B900, 1♂ (cl 41.3 mm), 1♀ (cl ca. 27.4 mm), 2 ovig. (cl 33.8, 43.4 mm), NSMT-Cr 19319; WA07-B1200, 1 ovig. (cl 43.6 mm), NSMT-Cr 19320; WA07-C900, 1♀ (cl 41.4 mm), NSMT-Cr 19321; WA07-D750, 1 ovig. (cl 40.2 mm), NSMT-Cr 19322; WA07-D900, 1 ovig. (damaged), NSMT-Cr 19323; WA07-E1500, 1♀ (cl 38.0 mm), NSMT-Cr 19324; WA07-G1500, 3♂♂ (cl 40.1–41.0 mm), NSMT-Cr 19325.

Color. Body and appendages entirely crimson red; eye dark brown (Fig. 22D).

Size. Largest male cl 41.3 mm, largest female cl 44.7 mm, ovigerous females 33.8–44.7 mm.

Distribution. North Pacific, Alaska to Oregon and Japan (Butler, 1980; Hayashi, 2007); meso- and bathypelagic. In Japan, occurring in waters off northeastern Honshu.

Genus ***Oplophorus*** H. Milne Edwards, 1837
Oplophorus spinosus (Brullé, 1839)
[Japanese name: Oki-hiodoshi-ebi]
(Fig. 22E)

Palaemon spinosus Brullé, 1839: 18.
Oplophorus spinosus – Hayashi, 1986b: 88, figs. 49, 89, 255; 1987: 200, fig. 126b, d, g; 2007: 64, fig. 27b, d, g.

Material examined. R/V *Wakataka-maru*, WA06-F210, 1♂, NSMT-Cr 17477; WA06-F510, 1♂ (cl 12.0 mm), 1♀ (cl 11.9 mm), NSMT-Cr 17474; WA06-F550, 1♂, 2♀♀, NSMT-Cr 17475; WA06-F650, 4♀♀, NSMT-Cr 17460; WA06-FG410, 5♀♀ (cl 9.4–12.7 mm), NSMT-Cr 17558; WA06-F750, 2♀♀, NSMT-Cr 17476; WA06-F900, 1♂ (cl 17.2 mm), NSMT-Cr 17472; WA06-F1500, 2♂♂ (cl 14.5, 18.3 mm), NSMT-Cr 17469; WA06-FG480, 4♂♂ (cl 13.6–19.0 mm), 1♀ (cl

10.6 mm), NSMT-Cr 17458; WA06-G450, 1♂, NSMT-Cr 17471; WA06-G480, 1♂ (cl 14.2 mm), 1♀ (cl 14.3 mm), NSMT-Cr 17466; WA06-G510, 2♂♂ (cl 17.3, 20.0 mm), NSMT-Cr 17459; WA06-G550, 1♂ (cl 17.4 mm), 1♀ (cl 12.9 mm), 1 ovig. (cl 15.3 mm), NSMT-Cr 17473; WA06-G650, 1 ovig. (cl 14.6 mm), NSMT-Cr 17457; WA06-G900, 1♂ (cl 15.3 mm), NSMT-Cr 17468; WA06-FG450, 2♀♀, NSMT-Cr 17470; WA06-H1500D, 1♀, NSMT-Cr 17467; WA07-A510, 1♀ (cl 7.8 mm), NSMT-Cr 19296; WA07-B510, 1♂ (cl 17.0 mm), NSMT-Cr 19297; WA07-C350, 2♂♂ (cl 16.2, 16.6 mm), NSMT-Cr 19298; WA07-C450, 1♀ (cl 10.0 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 19299; WA07-C510, 2♂♂ (cl 13.2, 13.6 mm), NSMT-Cr 19300; WA07-C550, 1♂ (cl 17.5 mm), 1♀ (cl 9.4 mm), NSMT-Cr 19301; WA07-C650, 1♂ (cl 14.5 mm), 1♀ (cl 12.0 mm), NSMT-Cr 19302; WA07-D510, 2♂♂ (cl 10.0, 1.0 mm), 1♀ (cl 14.9 mm), 1 ovig. (cl 15.0 mm), NSMT-Cr 19303; WA07-D750, 1♂ (cl 16.0 mm), 1♀ (cl 14.1 mm), NSMT-Cr 19304; WA07-D900, 1♂ (cl 17.1 mm), 1♀ (cl 14.4 mm), NSMT-Cr 19305; WA07-E510, 2♂♂ (cl 15.8, 18.7 mm), 1♀ (cl 12.5 mm), 1 ovig. (cl 14.3 mm), NSMT-Cr 19306.

R/V *Tansei-maru*, KT07-29, stn M2, off Miyako, 39˚16.2´N, 142˚41.1´E to 39˚18.6´N, 142˚43.7´E, 1528–1603 m, 5 November 2007, beam trawl, 1♂ (cl 18.8 mm), 1♀ (cl 13.2 mm), NSMT-Cr 19411.

Color. Carapace transparent, dark red gut and scarlet hepatopancrea visible; rostrum reddish; first five abdominal somites reddish brown or dark red laterally, colorless dorsally, sixth somite, telson and uropods generally colorless, but with reddish brown or dark brown band around base of telson and uropod; cornea black, with reflecting pigment; antennae pale reddish brown; third maxilliped, pereopods, and protopods of pleopods dark red; rami of pleopods yellowish (Fig. 22E).

Size. Largest male cl 18.8 mm, largest female cl 15.0 mm, ovigerous females cl 14.3–15.0 mm.

Distribution. Indian Ocean, southern Japan, off Hawaii, seamounts west of North America, northeast of Easter Island, western and eastern subtropical North Atlantic, central South Atlantic; mesopelagic (Chace, 1986). In Japan, previously known from waters southward to central Honshu (Hayashi, 2007a); now newly recorded from northeastern Honshu.

Genus ***Systellapsis*** Bate, 1888

Systellapsis paucispinosa Crosnier, 1987

[Japanese name: Mitsukado-hiodoshi-ebi]

(Fig. 17D, 22F)

Systellapsis braueri – Butler, 1980: 65, unnumbered fig.; Chace, 1986: 63 (in part).
Systellapsis braueri paucispinosa Crosnier, 1987: 953, figs. 3a, b, 4; Komai *et al.*, 1999: 142; Hayashi, 2007: 69, fig. 30.

Material examined. WA07-B1200, 1 ovig. (cl 33.3 mm), NSMT-Cr 19314.

Color. Entirely dark red; cornea black (Fig. 22F).

Distribution. Indonesia, Japan, northeastern Pacific from Vancouver Island to Los Angeles; bathypelagic, 200–4000 m (Butler, 1980; Crosnier, 1987; Hayashi, 1987, 2007; Komai *et al.*, 1999).

Remarks. Crosnier (1987) proposed a subspecific division of *Systellapsis braueri* Balss, 1925, describing a new subspecies *S. braueri paucispinosus* for the Pacific population, while referring the Atlantic population to the nominotypical subspecies. Crosnier (1987) indicated that his new taxon was distinguished from the nominotypical form primarily by the presence of a middorsal carina on the fourth abdominal somite and fewer lateral spines on the telson, which are arranged in a single row (Fig. 17D). In the Atlantic form, the fourth abdominal somite lacks a middorsal carina; the lateral spines of the telson are more numerous and are arranged in double or

multiple rows. Previous descriptions of the Pacific population (e.g., Butler, 1980; Hayashi, 2007) and the present specimen well supports the realiability of these differentiating characters used by Crosnier (1987), suggesting that the two different populations are specifically isolated. We propose to elevate the two subspecific taxa to full species.

Family Pandalidae

Genus ***Pandalopsis*** Bate, 1888

Pandalopsis coccinata Urita, 1941

[Japanese name: Higoromo-ebi]

(Fig. 22G)

Pandalopsis coccinata Urita, 1941: 12, figs. 1–2; Igarashi, 1969: 4, pl. 3, fig. 8, pl. 14, fig. 42; Komai, 1994a: 541, fig. 2; Hayashi, 2008: 58, figs. 550a, 551a–b, 552a–d.

Not *Pandalopsis coccinata* – Miyake, 1982: pl. 21, fig. 6. = *Pandalopsis* cf. *longirostris* Rathbun, 1902.

Material examined. WA05-E480, 1♂ (cl 15.4 mm), NSMT-Cr 16973; same data, 1♂ (cl 21.1 mm), NSMT-Cr 16969; same data, 1 ovig. (cl 41.0 mm), NSMT-Cr 16963; WA05-E550, 1♂ (cl 27.8 mm), NSMT-Cr 16964; WA05-F450, 2♂♂ (cl 20.4, 22.2 mm), NSMT-Cr 16970; WA05-F510, 1♂ (cl 31.3 mm), NSMT-Cr 16967; same data, 1 ovig. (cl 45.5 mm), NSMT-Cr 16962; WA05-F550, 1♂ (cl 21.0 mm), NSMT-Cr 16971; WA05-GH480, 3♂♂ (cl 16.0–19.1 mm), NSMT-Cr 16975; WA06-E480, 1♂ (cl 21.0 mm), 1 juv. (cl 15.6 mm), NSMT-Cr 17273; WA06-E510, 1♂ (cl 29.0 mm), NSMT-Cr 17272; WA06-E550, 2♂♂ (cl 13.6, 23.2 mm), NSMT-Cr 17275; WA06-F425, 2♂♂ (cl 30.4, 31.8 mm), NSMT-Cr 17276; WA06-F450, 3♂♂ (cl 17.4–25.0 mm), NSMT-Cr 17270; WA06-F480, 2♂♂ (cl 17.1, 24.0 mm), NSMT-Cr 17266; WA06-F510, 2♂♂ (cl 18.3, 19.3 mm), NSMT-Cr 17265; WA06-F550, 2♂♂ (cl 16.8, 22.4 mm), NSMT-Cr 17268; WA06-F650, 1♂ (cl 22.6 mm), NSMT-Cr 17269; WA07-FG450, 2♂♂ (cl 18.0, 18.4 mm), NSMT-Cr 19274; WA06-G480, 1♂ (cl 28.9 mm), NSMT-Cr 17271; WA06-G650, 2♂♂ (cl 23.3, 27.0 mm), NSMT-Cr 17267; WA07-A550, 1♂ (cl 27.2 mm), 1 ovig. (cl 36.4 mm), NSMT-Cr 19327; WA07-D510, 1♂ (cl 26.3 mm), NSMT-Cr 19328; WA07-D550, 2♂♂ (cl 20.4, 34.5 mm), NSMT-Cr 19329.

Color. Body generally wine red or dark purplish red, mottled with paler irregular markings; rostrum with distinct white band subdistally; pleural margin occasionally reddish in large specimens; cornea dark brown, with reflecting pigment; third maxilliped and pereopods generally wine red or dark red, lateral surface of second to fifth pereopods sometimes whitish; pleopods also wine red or dark red, lateral surfaces of protopods sometimes whitish (Fig. 22G).

Size. Largest male 34.5 mm, ovigerous female cl 36.4 mm.

Distribution. Southern part of the Sea of Okhotsk, Pacific coast of Hokkaido to northeastern Honshu southward to Choshi, Chiba Prefecture; 200–780 m (Komai, 1994a; unpublished data).

Pandalopsis rubra Komai, 1994

[Japanese name: Beni-morotoge-ebi]

(Fig. 22H)

Pandalopsis rubra Komai, 1994a: 552, figs. 1, 9, 10; Tsuchida *et al*., 2008: 255, fig. 21.11; Hayashi, 2008: 184, figs. 554g–h, 555g–h, 557l–o.

Material examined. R/V *Wakataka-maru*, WA06-E1200, 5♂♂ (cl 23.4–26.6 mm), 1 ovig. (cl 27.4 mm), NSMT-Cr 17277; WA07-1200, 6♂♂ (cl 22.9–26.9 mm), NSMT-Cr 19366; WA07-E1500, 1♂ (cl 25.4 mm), 1 ovig. (cl 31.4 mm), NSMT-Cr 19367; WA07-G1200, 1 transitional ♂ (cl 30.2 mm), NSMT-Cr 19368; WA07-G1500, 2♂♂ (cl 22.4, 28.5 mm), 1 transitional ♂ (cl 31.3

mm), NSMT-Cr 19369.

R/V *Tansei-maru*, KT07-29, stn K2, off Kushiro, eastern Hokkaido, 42˚30.3´N, 144˚50.5´E to 42˚30.6´N, 144˚52.2´E, 1535–1543 m, 7 November 2007, beam trawl, 2 juv. (cl 6.5, 11.0 mm), NSMT-Cr 19373; stn M3-1, off Miyako, Iwate Prefecture, 39˚20.0´N, 142˚51.0´E to 39˚21.8´N, 142˚51.9´E, 1728–1719 m, 5 November 2007, beam trawl, 2♂♂ (cl 24.8, 27.0 mm), 2 ovig. (cl 31.1, 33.0 mm), NSMT-Cr 19374; stn M3-2, off Miyako, 39˚20.2´N, 142˚51.4´E to 39˚19.2´N, 142˚49.2´E, 1737–1709 m, 6 November 2007, beam trawl, 1 transitional ♂ (cl 30.3 mm), 1 ovig. (cl 33.4 mm), NSMT-Cr 19375; stn M3-3, off Miyako, 39˚20.1´N, 142˚51.2´E to 39˚19.2´N, 142˚49.1´E, 1733–1695 m, 8 November 2007, beam trawl, 2♂♂ (25.0, 25.0 mm), 1 ovig. (cl 33.3 mm), NSMT-Cr 19376.

Color. Entirely red; cornea dark brown, with reflecting pigment (Fig. 22H).

Size. Males cl 22.4–27.0 mm, transitional males cl 30.2–31.3 mm, ovigerous females 31.1–33.4 mm.

Distribution. Pacific coast of eastern Hokkaido and off northeastern Honshu; 1000–1700 m (Komai, 1994; this study).

Remarks. Tsuchida *et al.* (2008) recorded this species from off northeastern Honshu for the first time. The present specimens agree well with the type series in every diagnostic aspect (Komai, 1994a), including the elongate rostrum, relatively fewer dorsolateral spines of the telson and the usually unarmed carpus of the fifth pereopod.

Genus ***Pandalus*** Leach, 1814

Pandalus eous Makarov, 1935

[Japanese name: Hokkoku-aka-ebi]

(Fig. 23A)

Pandalus borealis var. *eous* Makarov, 1935: 321, figs. 2–3.
Pandalus borealis eous – Vinogradov, 1950: 194, pl. 4, fig. 20A; Sokolov, 2001: 105, figs. 2–3.
Pandalus eous – Squires, 1992: 257, fig. 1b, d; Komai, 1999: 1293, figs. 12–13; Hayashi, 2008: 363, figs. 559a, 562a–f.

Material examined. R/V *Wakataka-maru*, WA05-DE380D, 1 juv., NSMT-Cr 16976; WA05-E410, 1 ovig. (cl 23.0 mm), NSMT-Cr 16972; WA05-E425, 1♂ (damaged), 1ovig. (cl 25.0 mm), NSMT-Cr 16966; WA-05-E450, 1 juv., NSMT-Cr 16977; same data, 5♂♂ (cl 15.1–19.5 mm), 2 ovig. (cl 23.5, 23.8 mm), NSMT-Cr 16965; WA05-E480, 8♂♂ (cl 16.2–20.0 mm), 1 ovig. (cl 24.0 mm), NSMT-Cr 16968; WA06-B650, 1 transitional ♂ (cl 20.5 mm), NSMT-Cr 17245; WA05-E480, 3♂♂ (cl 14.0–16.0 mm), NSMT-Cr 16974; WA06-D210D, 2 juv., NSMT-Cr 17256; WA06-DE350, 3♂♂ (cl 16.8–17.0 mm), 1 juv., NSMT-Cr 17251; WA06-E210, 1 juv., NSMT-Cr 17257; WA06-E250, 1 juv. (cl 9.0 mm), NSMT-Cr 17252; WA06-E280, 3♂♂ (cl 14.2–17.2 mm), 1 juv., NSMT-Cr 17244; WA06-E310, 1♂ (cl 15.5 mm), 1 transitional ♂(cl 21.5 mm), 1 juv., NSMT-Cr 17233; WA06-E350, 2♂♂ (cl 15.6, 20.3 mm), 1 ovig. (cl 23.2 mm), NSMT-Cr 17235; WA06-E380, 1♂ (cl 21.5 mm), 1 ovig. (cl 24.5 mm), 1 juv. (cl 8.4 mm), NSMT-Cr 17236; same data, 1♂ (cl 15.2 mm), NSMT-Cr 17254; WA06-E410, 1♂ (cl 20.0 mm), 1 ovig. (cl 26.4 mm), NSMT-Cr 17247; WA06-E425, 1 transitional ♂ (cl 20.9 mm), 1 ovig. (cl 23.2 mm), NSMT-Cr 17239; same data, 4 juv., NSMT-Cr 17258; WA06-E450, 3♂♂ (cl 15.7–19.4 mm), NSMT-Cr 17231; WA06-E480, 2♂♂ (cl 18.8, 20.2 mm), NSMT-Cr 17234; WA06-E510, 3♂♂ (cl 19.3–21.8 mm), NSMT-Cr 17248; WA06-E550, 1 transitional ♂ (cl 23.5 mm), 1 ovig. (cl 29.0 mm), NSMT-Cr 17242; WA06-E650, 1♂ (cl 15.0 mm), NSMT-Cr 17259; WA06-EF380, 1♂ (cl 15.0 mm), NSMT-Cr 17253; WA06-F350, 6♂♂ (cl 13.9–17.3 mm), 1 ovig. (cl 26.0 mm), 2 juv., NSMT-Cr 17238; WA06-F380, 4♂♂ (cl 15.7–16.6 mm), NSMT-Cr 17250; WA06-F425, 6♂♂ (cl 15.5–17.0 mm), 1 transitional ♂ (cl 22.6 mm), NSMT-Cr 17232; WA06-F450, 5♂♂ (cl 15.3–20.0 mm), NSMT-Cr 17240;

WA06-G280, 5♂♂ (cl 13.8–16.2 mm), 2 ovig. (cl 25.2, 26.8 mm), NSMT-Cr 17237; WA06-G310, 1♂ (cl 15.0 mm), 1 ovig. (cl 24.0 mm), NSMT-Cr 17243; WA06-G350, 5♂♂ (cl 13.2–16.7 mm), NSMT-Cr 17241; WA06-G380, 2♂♂ (cl 16.3, 17.1 mm), 2 ovig. (cl 24.6, 26.2 mm), NSMT-Cr 17249; WA06-G425, 1♂ (cl 16.6 mm), 1 ovig. (cl 24.8 mm), NSMT-Cr 17246; WA06-G450, 1♂ (cl 17.3 mm), NSMT-Cr 17255; WA07-A210, 3♂♂ (cl 9.0–101. mm), 2 juv. (cl 8.3, 8.6 mm), NSMT-Cr 19330; WA07-A250, 3♂♂ (cl 10.6–16.1 mm), 1 juv. (cl 8.4 mm), NSMT-Cr 19331; WA07-A310, 4♂♂ (cl 13.7–21.0 mm), NSMT-Cr 19332; WA07-A350, 1♂ (cl 16.0 mm), 1 transitional ♂ (cl 18.2 mm), 2♀♀ (cl 19.4, 20.0 mm), 1 juv. (cl 9.0 mm), NSMT-Cr 19333; WA07-A410, 8♂♂ (cl 9.2–15.0 mm), 1 transitional ♂ (cl 21.4 mm), 9 juv. (not measured), NSMT-Cr 19334; WA07-B210, 4♂♂ (cl 11.0–15.3 mm), 4 juv. (cl 7.7–8.5 mm), NSMT-Cr 19335; WA07-B250, 2♂♂ (cl 14.4, 14.5 mm), NSMT-Cr 19336; WA07-B310, 4♂♂ (cl 10.0–19.7 mm), 1 juv. (cl 8.0 mm), NSMT-Cr 19337; WA07-B350, 5♂♂ (cl 9.0–18.6 mm), 2 juv. (cl 7.3, 8.0 mm), NSMT-Cr 19338; WA07-B410, 3♂♂ (cl 9.1–15.0 mm), 2 ovig. (cl 22.0, 24.0 mm), NSMT-Cr 19339; WA07-B450, 3♂♂ (9.2–19.7 mm), 1 juv. (cl 8.1 mm), NSMT-Cr 19340; WA07-B510, 3♂ (cl 9.9–19.0 mm), 1 ovig. (cl 23.4 mm), NSMT-Cr 19341; WA07-B550, 2 ovig. (cl 23.6, 24.5 mm), NSMT-Cr 19342; WA07-B650, 1♂ (cl 18.0 mm), NSMT-Cr 19343; WA07-C210, 8 juv. (cl 7.6–11.0 mm), NSMT-Cr 19344; WA07-C250, 3♂♂ (cl 9.6–11.0 mm), 1 juv. (cl 8.6 mm), NSMT-Cr 19345; WA07-C310, 1 juv. (cl 8.3 mm), NSMT-Cr 19346; WA07-C350, 2♂♂ (cl 15.2, 16.4 mm), 2 juv. (cl 8.5, 9.0 mm), NSMT-Cr 19347; WA07-C350D, 3 juv. (cl 8.0–9.0 mm), NSMT-Cr 19348; WA07-C410, 1♂ (cl 15.7 mm), 1transitional ♂ (cl 21.6 mm), NSMT-Cr 19349; WA07-C450, 2♂♂ (cl 5.0, 15.5 mm), NSMT-Cr 19350; WA07-C510, 2♂♂ (cl 14.2, 16.0 mm), NSMT-Cr 19351; WA07-C550, 2♂♂ (cl 11.1, 16.5 mm), 1 ovig. (cl 28.1 mm), NSMT-Cr 19352; WA07-C650, 1♂ (cl 14.8 mm), NSMT-Cr 19353; WA07-C750, 1♂ (cl 15.3 mm), NSMT-Cr 19354; WA07-D210, 2 juv. (cl 10.2, 10.6 mm), NSMT-Cr 19355; WA07-D250, 5♂♂ (cl 10.0–12.8 mm), NSMT-Cr 19356; WA07-D310, 1♂ (cl 10.8 mm), 1♀ (cl 26.4 mm), 1 ovig. (cl 27 mm), NSMT-Cr 19357; WA07-D350, 1♂ (cl 14.6 mm), 1♀ (cl 27.2 mm), 1 ovig. (cl 27.3 mm), 1 juv. (cl 9.6 mm), NSMT-Cr 19358; WA07-D410, 3♂♂ (cl 10.0–16.0 mm), 1 juv. (cl 8.0 mm), NSMT-Cr 19359; WA07-D450, 1♂ (cl 16.5 mm), NSMT-Cr 19360; WA07-D510, 2♂♂ (cl 13.4, 21.0 mm), NSMT-Cr 19361; WA07-D650, 1 juv. (cl 8.6 mm), NSMT-Cr 19362; WA07-E510, 6♂♂ (cl 11.5–22.5 mm), NSMT-Cr 19363.

Color. Entire body covered with fine red dots, without distinct markings; telson and uropods darker; cornea dark grey; antennal flagellum uniformly red; pereopods generally red, proximal portion of meri sometimes whitish; eggs greyish green (Fig. 23A).

Size. Males cl 10.0–21.5 mm, transitional males cl 18.2–22.6 mm, ovigerous females cl 23.3–29.0 mm.

Distribution. North Pacific, Sea of Japan to Puget Sound, Washington State; Bering Sea; Chukchi Sea; 16–1380 m (Butler, 1980; Komai, 1999). In Japanese waters, occurring in Hokkaido, Sea of Japan southward to Tottori Prefecture, northeastern Honshu southward to Choshi, Chiba Prefecture.

Pandalus hypsinotus Brandt, 1851
[Japanese name: Toyama-ebi]
(Fig. 23B)

Pandalus hypsinotus Brandt, 1851: 125; Igarashi, 1969: 2, pl. 2, fig. 4, pl. 8, fig. 38; Butler, 1980: 143, unnumbered fig.; Komai, 1999: 1306, figs. 18–19; Hayashi, 2008: 367, figs. 559c, 562j–l; Komai and Eletskaya, 2008: figs. 6B, 7.

Material examined. R/V *Wakataka-maru*, WA07-A410, 1♂ (cl 31.0 mm), NSMT-Cr 19326; WA07-B350, 1♂ (cl 27.6 mm), NSMT-Cr 19364; WA07-D310, 1♂ (cl 26.0 mm), NSMT-Cr

19365.

Color. Base color light orange; carapace with reddish areas around postorbital and cardiac regions, branchial region with some white spots or blotches; abdomen with red or brown transverse band on each somite; telson and uropods reddish; antennular and antennal flagella banded with red and white; third maxilliped generally red; first pereopod dark red; third to fifth pereopods red or dark pink, distal parts of propodi darker, merus with darker bands; pleopods reddish (Fig. 23B).

Distribution. North Pacific, Sea of Japan to British Columbia, Canada; Bering Sea; 5–501 m (Butler, 1980; Komai, 1999). In Japan, occurring in Hokkaido, Sea of Japan southward to Wakasa Bay, northeastern Honshu southward to Miyagi Prefecture (Komai, 1999; Hayashi, 2008).

Pandalus teraoi Kubo, 1937
[Japanese name: Terao-botan-ebi]
(Fig. 23C)

Pandalus teraoi Kubo, 1937: 96, figs. 4–6; Komai, 1999: 1334, figs. 31–32, 44A; Hayashi, 2008: 546, figs. 563i–j, 564f–g, 566i–j.

Material examined. R/V *Wakataka-maru*, WA06-G210, 3♂♂ (cl 13.2–18.1 mm), NSMT-Cr 17263; WA06-G250, 2 transitional ♂♂ (cl 23.5, 24.5 mm), NSMT-Cr 17262; WA06-G280, 7♂♂ (cl 16.5–23.5 mm), 1 transitional ♂ (damaged), NSMT-Cr 17264; WA06-G310, 1♂ (cl 23.3 mm), NSMT-Cr 17260; WA06-G380, 1♂ (cl 20.1 mm), NSMT-Cr 17261.

Color. Generally yellowish or light orange; proximal half of rostrum pale yellow or nearly colorless; spines of dorsal rostral series white; abdomen with two rows of red spots laterally, third tergite with paired very large red spot circumscribed by white; antennular flagellum white in thickened aesthetasc-bearing portion, red in distal part; antennal scale with red transverse band; meri of third to fifth pereopods tinged with orange, carpi and propodi whitish, distal parts of propodi orangish; pleopods pinkish or reddish (Fig. 23C).

Distribution. Japanese endemic, restricted to the Pacific coast of Honshu from Fukushima to Wakayama Prefecture; 140–310 m (Komai, 1999).

Genus ***Plesionika*** Bate, 1888

Plesionika semilaevis Bate, 1888
[Japanese name: Jinken-ebi]
(Fig. 23D)

Plesionika semilaevis Bate, 1888: 644, pl. 68, fig. 3; Chace, 1985: 113, figs. 51–54, Ohtomi and Hayashi, 1995: 1035, fig. 1.

Material examined. R/V *Wakataka-maru*, WA06-F210, 1 juv. (cl 10.2 mm), NSMT-Cr 17353.

Color. Body entirely pink, branchial region of carapace with numerous red dots; pereopods dotted with red; pleopods reddish (Fig. 23D).

Distribution. Philippines, Indonesia, French Polynesia, South and East China seas, Japan; 176–700 m (Chace, 1985; Chan and Crosnier, 1987; Li and Komai, 2003). In Japanese waters, recorded from Suruga Bay, Tosa Bay, and Kagoshima Bay (Hayashi and Ohtomi, 1995). Newly recorded from northeastern Honshu.

Remarks. The *Plesionika martia* (A. Milne-Edwards, 1883) group, to which *P. semilaevis* belongs, is generally considered to be a difficult species complex (e.g., Chace, 1985; Chan and

Crosnier, 1997). The present small specimen was identified with *P. semilaevis* following the key of Chace (1985) and the diagnosis provided by Ohtomi and Hayashi (1995). Furthermore, *P. semilaevis* is the sole member of the *P. martia* complex so far recorded in central Japan (Komai, unpublished data), just south of the surveyed area, and this may support the present identification.

Family Pasiphaeidae
Genus ***Leptochela*** Stimpson, 1860
Leptochela sydniensis Dakin and Colefax, 1940
[Japanese name: Maru-soko-shira-ebi]

Leptochela sydniensis Dakin and Colefax, 1940: 153, figs. 245–246; Chace, 1976: 40, figs. 32–34; Hanamura, 1986: 80, figs. 2–4; Hayashi, 2007: 212, figs. 86e–f, 87.

Material examined. R/V *Wakataka-maru*, WA07-D210, 1♀ (cl 4.6 mm), NSMT-Cr 19150.

Distribution. Widely distributed in the Indo-West Pacific, Arabian Sea to Japan, as well as southeastern and southern Australia; subtidal to 300 m. In Japan, recorded from various localities in Hokkaido to Kyushu (Hanamura, 1986; Hayashi, 2007).

Genus ***Parapasiphae*** Smith, 1884
Parapasiphae sulcatifrons Smith, 1884
[Japanese name: Tosaka-oki-ebi]
(Fig. 23E)

Parapasiphae sulcatifrons Smith, 1884: 384, pl. 5, fig. 4, pl. 6, figs. 1–7; Butler, 1980: 58, unnumbered fig.; Hayashi, 1990: 304, figs. 189–190; Komai *et al.*, 1999: 143.

Material examined. R/V *Wakataka-maru*, WA06-E1200, 1♀ (cl 23.3 mm), NSMT-Cr 17364; WA06-F1500, 1 ovig. (cl 24.2 mm), NSMT-Cr 17365; WA07-B900, 1♀ (cl 24.0 mm), NSMT-Cr 19144; WA07-B1200, 1♂ (cl 20.6 mm), 1♀ (cl 18.3 mm), NSMT-Cr 19145.

R/V *Tansei-maru*, KT07-29, stn H2, off Hachinohe, Aomori Prefecture, 40˚00.0´N, 143˚31.4´E to 41˚00.8´N, 143˚30.2´E, bottom depths 2055–2032 m, 8 November 2007, beam trawl, 1 juv., NSMT-Cr 19387.

Color. Body and appendages entirely red; cornea light orange (Fig. 23E).

Distribution. Cosmopolitan; meso- and bathypelagic. In Japan, recorded from off Hokkaido to Nansei Islands (Komai *et al.*, 1999; Hayashi, 2008).

Genus ***Pasiphaea*** Savigny, 1816
Pasiphaea amplidens Bate, 1888
[Japanese name: Tsuno-shira-ebi]
(Fig. 23F)

Pasiphaea amplidens Bate, 1888: 870, pl. 141, fig. 2; Hayashi, 1986b: 97, 259, fig. 56; 2004: 331, fig. 6; 2007: 224, figs. 92a–b, 93a; Komai *et al.*, 1999: 143, fig. 3.
Pasiphaea ampridens (sic) – Hayashi, 1990: 400, figs. 192a, f, 193a.

Material examined. R/V *Wakataka-maru*, WA07-C410, 2♀♀ (cl 11.0, 11.9 mm), NSMT-Cr 19149.

Color. Body entirely reddish, with scattered red dots, telson and uropods darker; rostrum transparent; cornea greyish brown; antennae and pereopods also reddish, fingers of first and second pereopods darker (Fig. 23F).

Distribution. Known with certainty only from Japan, including Suruga Bay, Tosa Bay, Ohsumi Islands and East China Sea; meso- and bathypelagic, 542–1418 m (Hayashi, 2004).

Remarks. The present specimens agree well the descriptions by Komai *et al.* (1999) and Hayashi (2004). Hayashi (2004) suggested that *Pasiphaea vereshchaka* Burukovsky, 1993, described from the northwestern Indian Ocean, might be conspecific with *P. amplidens*.

Pasiphaea sinensis Hayashi and Miyake, 1971
[Japanese name: Oki-shira-ebi]
(Fig. 23G)

Pasiphaea sinensis Hayashi and Miyake, 1971: 39, fig. 1; Hayashi, 1986b: 97, 259, fig. 57; 1990: 401, figs. 192c, h, 193c, 194; 2004: 233, fig. 14A–E; 2007: 228, figs. 92f–g, 93d, 94.

Material examined. R/V *Wakataka-maru*, WA06-E450, 2♀♀ (cl 19.8, 21.6 mm), NSMT-Cr 17354; WA07-B450, 1♀ (cl 20.6 mm), NSMT-Cr 19140; WA06-E900, 1♀ (21.6 mm), NSMT-Cr 17355; WA06-F480, 3♀♀ (cl 19.2–20.1 mm), NSMT-Cr 17356; WA06-F510, 3♀♀ (cl 25.0–34.0 mm), NSMT-Cr 17357;WA06-F550, 1♀ (cl 27.0 mm), NSMT-Cr 17358; WA06-FG510, 1♀ (cl 19.2 mm), NSMT-Cr 17359; WA06-G450, 1♀ (cl 19.0 mm), NSMT-Cr 17360; WA06-G480, 1♀ (cl 33.4 mm), NSMT-Cr 17361; WA06-G510, 2♂♂ (cl 34.6, 39.0 mm), 3♀♀ (cl 21.2–49.0 mm), NSMT-Cr 17362; WA06-G550, 1♂ (cl 35.2 mm), 1♀ (cl 32.3 mm), NSMT-Cr 17363; WA07-C450, 3♀♀ (cl 19.9–22.7 mm), NSMT-Cr 19141; WA07-D510, 4♀♀ (cl 14.0–19.3 mm), NSMT-Cr 19142; WA07-E510, 2♀♀ (cl 30.8, 40.6 mm), NSMT-Cr 19143.

Color. Body and appendages entirely rose red, fingers of first and second pereopods dark red; cornea greyish brown (Fig. 23G).

Size. Largest female cl 40.6 mm.

Distribution. Previously known only from East China Sea and Tosa Bay; 400–1075 m (Hayashi, 2004). The present material extends the geographical range of this species to northeastern Honshu.

Pasiphaea cf. ***tarda*** Krøyer, 1845
[Japanese name: Kita-shira-ebi]

Pasiphaea tarda – Butler, 1980: 56, unnumbered fig.; Hayashi, 1986b: 99, 260, fig. 58; 2007: 229, figs. 92j, k, 93f.

Material examined. R/V *Wakataka-maru*, WA06-F1500, 1♀ (cl 58.0 mm), NSMT-Cr 17366; WA07-E1500, 1♀ (cl 57.8 mm), NSMT-Cr 19151.

Remarks. This species has been recorded from various localities in the world, including the North Pacific, Australia, tropical East Pacific, North Atlantic, southeastern Atlantic off Angola to Namibia, and Antarctica (cf. Hayashi, 2006), although only specimens from the North Atlantic are referred to this taxon with certainty. Hayashi (1986b) and Komai (1991) indicated that the spines on the basis of the second pereopod are more numerous in the North Pacific specimens than in the North Atlantic specimens. Considering the very wide geographical range, it is possible that more than one species are confounded under *P. tarda*. In fact, no specimens referable to *P. tarda* have been encountered in the collections from the Japanese coast southward from Boso Peninsula.

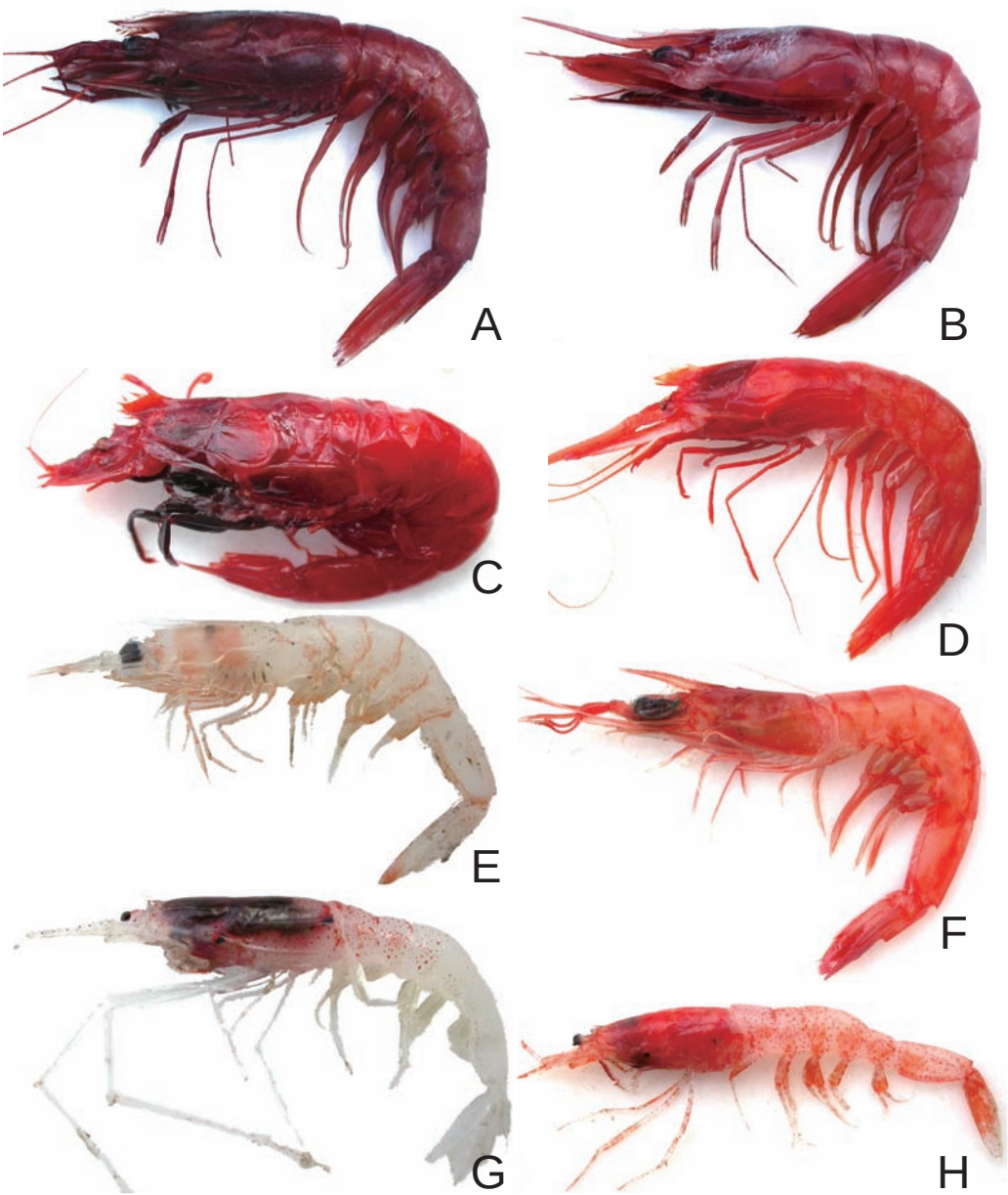

Fig. 18. A, *Aristaeomorpha foliacea* (Risso, 1827); B, *Aristeus mabahissae* Ramadan, 1938; C, *Bentheogennema borealis* (Rathbun, 1902); D, *Benthesicymus investigatoris* Alcock and Anderson, 1899; E, *Funchalia taaningi* Burkeonroad, 1940; F, *Penaeopsis eduardoi* Pérez-Farfante, 1976; G, *Parasergestes armatus* (Krøyer, 1855); H, *Eusergestes similis* (Hansen, 1903).

Fig. 19. A, *Sergia prehensilis* (Bate, 1881); B, *Sergia regalis* (Gordon, 1939); C, *Argis hozawai* (Yokoya, 1939); D, *Argis lar* (Owen, 1839); E, *Crangon dalli* Rathbun, 1902; F, *Metacrangon nipponensis* (Yokoya, 1933); G, *Metacrangon cornuta* sp. nov.; H, *Metacrangon* sp.

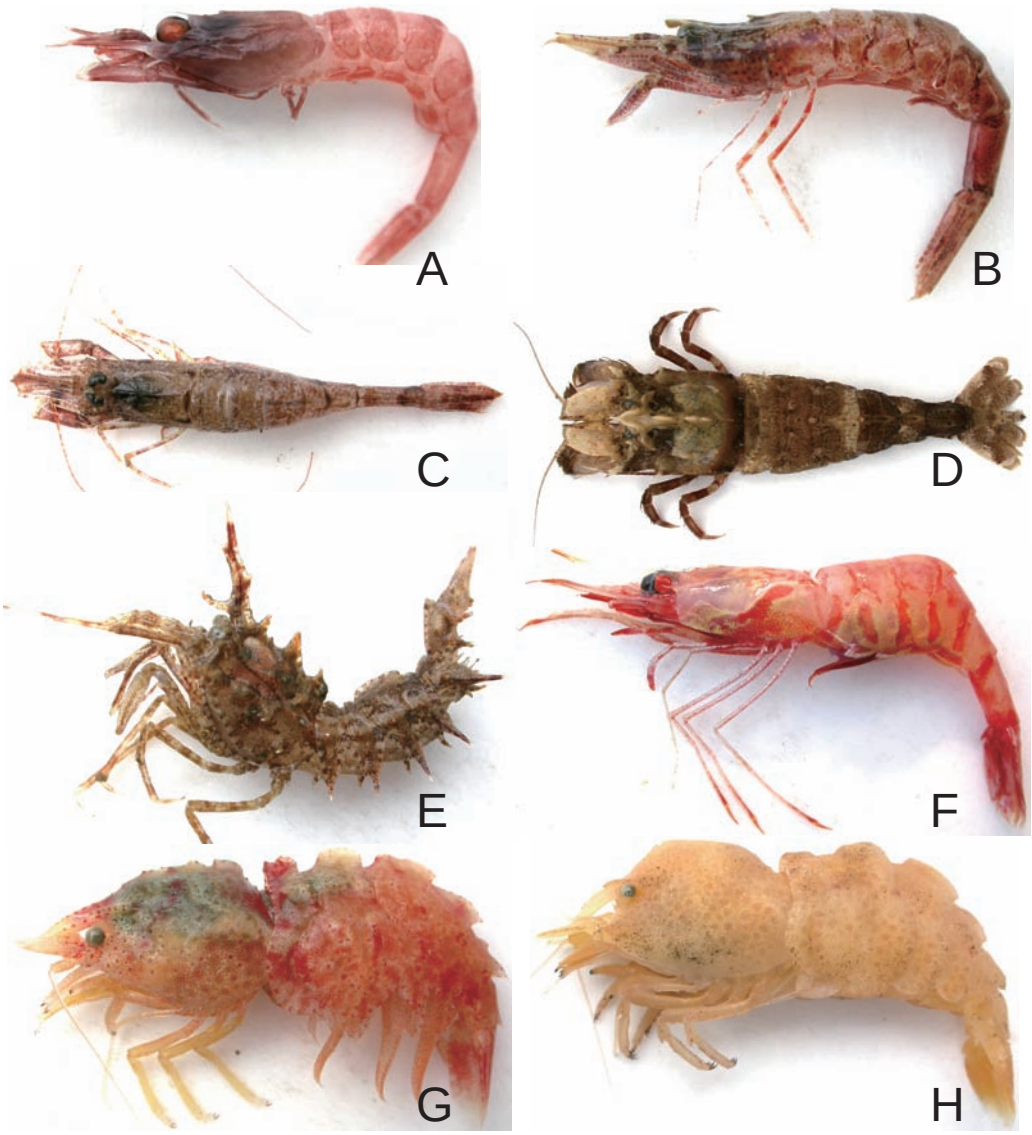

Fig. 20. A, *Neocrangon abyssorum* (Rathbun, 1902); B, *Neocrangon sagamiensis* (Balss, 1913); C, *Neocrangon communis* (Rathbun, 1899); D, *Sclerocrangon boreas* (Phipps, 1774); E, *Paracrangon echinata* Dana, 1852; F, *Eualus biungius* (Rathbun, 1902); G, *Birulia kishinouyei* (Yokoya, 1930); H, *Birulia sachalinensis* (Brashnikov, 1903).

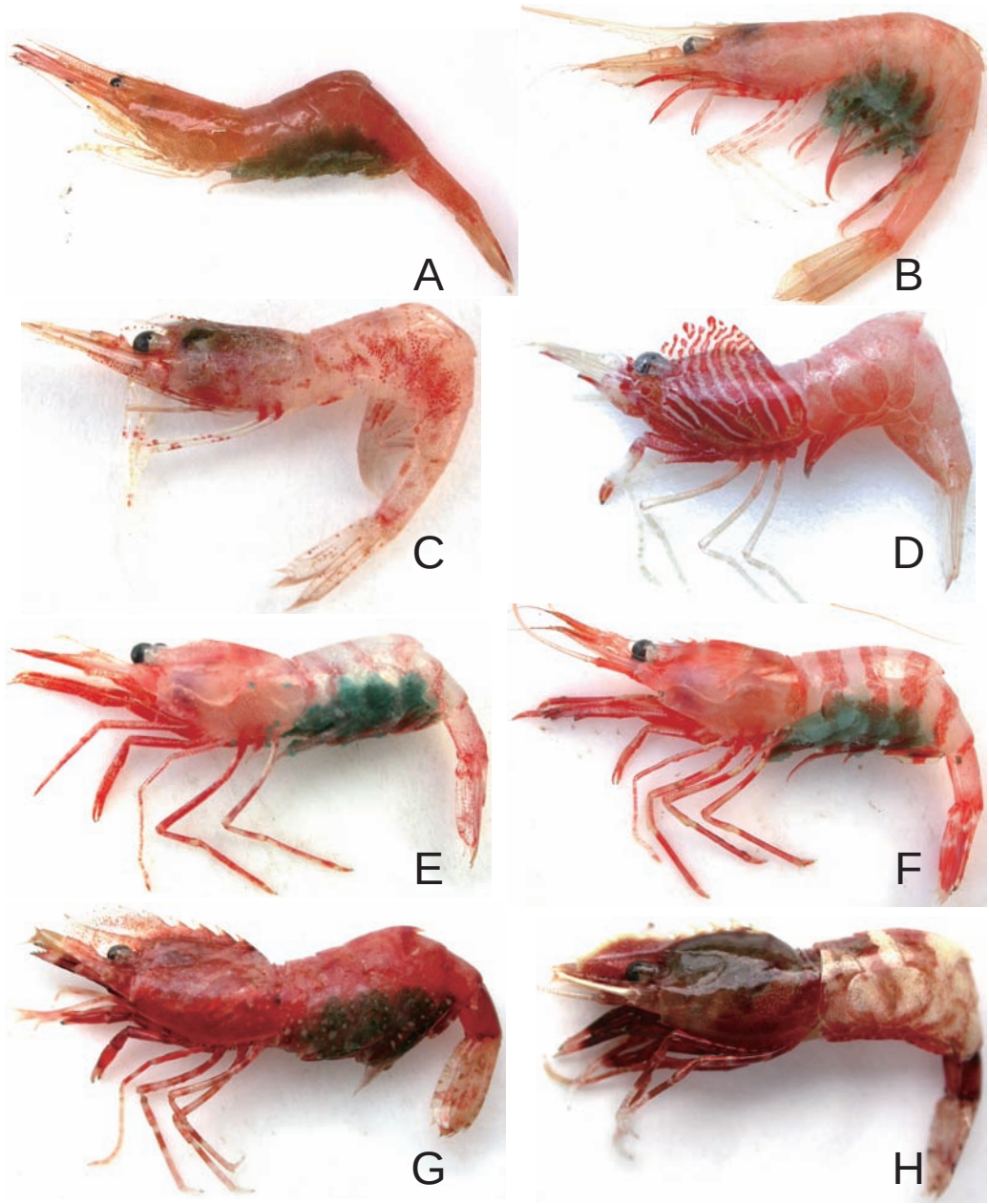

Fig. 21. A, *Eualus kuratai* Miyake and Hayashi, 1967; B, *Eualus middendorffi* Brashnikov, 1907; C, *Eualus spathulirostris* (Yokoya, 1933); D, *Lebbeus compressus* Holthuis, 1947; E, *Heptacarpus maxillipes* (Rathbun, 1902); F, *Heptacarpus moseri* (Rathbun, 1902); G, H, *Spirontocaris brevidigitata* Kobjakova, 1935.

Fig. 22. A, *Acanthephyra eximia* Smith, 1884; B, *Acanthephyra quadrispinosa* Kemp, 1939; C, *Hymenodora frontalis* Rathbun, 1902; D, *Notostomus japonicus* Bate, 1888; E, *Oplophorus spinosus* (Brullé, 1839); F, *Systellapsis paucispinosa* Crosnier, 1987; G, *Pandalopsis coccinata* Urita, 1941; H, *Pandalopsis rubra* Komai, 1994.

Fig. 23. A, *Pandalus eous* Makarov, 1938; B, *Pandalus hypsinotus* Brandt, 1851; C, *Pandalus teraoi* Kubo, 1937; D, *Plesionika semilaevis* Bate, 1888; E, *Parapasiphae sulcatifrons* Smith, 1884; F, *Pasiphaea amplidens* Bate, 1888; G, *Pasiphaea sinensis* Hayashi and Miyake, 1971; H, *Polycheles helleri* Bate, 1878.

Infraorder Polychelida
Family Polychelidae
Genus ***Polycheles*** Heller, 1862
Polycheles helleri Bate, 1878
[Japanese name: Hime-senjyu-ebi]
(Fig. 23H)

Polycheles helleri Bate, 1878: 277 (in part); 1888: 138 (in part), pl. 14, fig. 2; Galil, 2000: 327, fig. 18; Ahyong and Chan, 2004: 179, figs. 3H–I, 4G.
Stereomastis nana – Baba, 1986: 157. Not *Stereomastis nana* Smith, 1884.

Material examined. R/V *Wakataka-maru*, WA05-H900, 1♂ (cl 29.5 mm), NSMT-Cr 16930; WA06-E1200, 1♂ (cl 21.5 mm), NSMT-Cr 17367; WA06-G900, 1♀ (cl 38.0 mm), NSMT-Cr 17368; WA06-G1200, 2♂♂ (cl 26.5, 27.0 mm), 3♀♀ (cl 20.3–25.6 mm), NSMT-Cr 17369; WA06-H1500D, 1♀, NSMT-Cr 17370; WA07-C900, 1 postlarva (cl 20.2 mm), NSMT-Cr 19146; WA07-G1500, 1 juv. (cl 20.8 mm), NSMT-Cr 19147; WA07-H750, 1♀ (cl 35.1 mm), NSMT-Cr 19148.

Color. Body and appendages entirely rose red (Fig. 23H).

Distribution. Western Indian Ocean to Australia, Indonesia, New Guinea, New Caledonia, Taiwan, Japan; 787–2947 m (Galil, 2000; Ahyong and Chan, 2004). In Japan, recorded from off northeastern Honshu (Baba, 1986, as *Stereomastis nana*; see Galil, 2000).

Discussion

Zoogeography

The hydrography of waters off northeastern Honshu is greatly affected by the cold water Oyashio Current arising from the Sea of Okhotsk and the Bering Sea and to a lesser degree by the warm Kuroshio Current, extending from the east of the Philippines. This study records 63 species (except for *Metacrangon cornuta* sp. nov., described from off Kushiro, eastern Hokkaido) from deep-water off northeast Honshu (>200 m). Of them 44 can be considered benthic or benthopelagic forms, and 19 species are meso- and/or bathypelagic forms. With regard to benthic or benthopelagic species except for *Metacrangon* sp. and *Lebbeus similior* sp. nov. (for which distributional information is limited), four major distributional patterns can be recognized: (1) cold water species restricted to East Asia, (2) temperate water species restricted to East Asia, including Japanese endemics, (3) North Pacific species, and (4) Indo-West Pacific species (Table 3). The first category contains 15 species distributed in the Sea of Okhotsk, Sea of Japan, Hokkaido and in northeastern Honshu; the southern limits of their distributional ranges in the Pacific coast of the Japanese archipelago lie in northeastern Honshu. The second category includes six species distributed mainly around the Japanese Archipelago, of which all but *Birulia kishinouyei* are restricted to the Pacific coast of Honshu to Kyushu or the northern part of the East China Sea. *Birulia kishinouyei* occurs along the Pacific coast and the Sea of Japan. The third category contains 16 species widely distributed in the northern North Pacific, sometimes extending to the west coast of North America via the Bering Sea or the Aleutian Islands. The fourth category includes 12 species widely distributed in the tropical Indo-West Pacific. The cold water faunal elements are dominant in the region, represented by those referred to the first and third categories (31 of 49 species (63%) under consideration). The occurrence of the species of the fourth category reflects the influence of the warm Kuroshio Current in the region. Four species, *Penaeopsis eduardoi*, *Hymenopenaeus aequalis*, *Nematocarcinus tenuipes* and *Plesionika semilaevis*, are so far found only in the southern part of the surveyed area (Fukushima to Ibaraki) and are represented by only a single or a few specimens, and thus the occurrence of these species may be sporadic.

Table 3. List of benthic or benthopelagic species found in northeastern Honshu, categorized according to general distributional pattern.

1. Cold water species restricted to East Asia (15 species)
   Argis hozawai, Metacrangon nipponensis, M. trigonorostris, Birulia sachalinensis, Eualus kuratai, E. middendorffi, E. spathulirostris, Pandalopsis coccinata, P. rubra.
2. Temperate water species restricted to East Asia, including Japanese endemics (six species)
   Neocrangon sagamiensis, Sclerocrangon unidentata, Birulia kishonouyei, Lebbeus compressus, Pandalus teraoi, Pasiphaea sinensis.
3. North Pacific species (16 species)
   Argis lar, Crangon dalli, Neocrangon abyssorum, Neocrangon communis, Paracrangon echinata, Sclerocrangon boreas, S. zenkevitchii, Eualus biunguis, E. townsendi, Heptacarpus maxillipes, H. morseri, Spirontocaris brevidigitata, S. prionota, Pandalus eous, P. hypsinotus, Pasiphaea cf. tarda.
4. Indo-West Pacific species (12 species)
   Aristaeomorpha foliacea, Aristeus mabahissae, Benthsicymus investigatoris, B. crenatus, Penaeopsis eduardoi, Hymenopemaeus aequalis, Nematocarcinus tenuipes, Acanthephyra eximia, Plesionika semilaevis, Leptochela sydniensis, Pasiphaea cf. tarda, Polycheles helleri
5. Information limited
   Metacrangon sp., *Lebbeus similior* sp. nov.

Table 4. List of meso- or bathypelagic species categorized according the general distribution pattern.

1. North Pacific species (four species)
   Bentheogennema borealis, Eusergestes similis, Hymenodora frontalis, Notostomus japonicus,
2. Indo-Pacific species (15 species)
   Gennadas incertus, G. parvus, G. propinquus, Funchalia taaningi, Neosergestes armatus, Parasergestes orientalis, Sergia japonica, S. prehensilis, S. regalis, S. talismani, Acanthephyra quadrispinosa, Oplophorus spinosus, Systellapsis paucispinosus, Parapasiphae sulcatifrons, Pasiphaea amplidens

Nineteen species of meso- or bathypelagic forms can be categorized into two major groups: (1) North Pacific species mainly distributed in cold waters in the North Pacific (four species), and (2) Indo-Pacific species mainly distributed in the tropical Indo-West, some of them extending also to the Atlantic Ocean (15 species) (Table 4.).

Vertical distribution

Vertical distributions of the benthic species found in northeastern Honshu are summarized in Table 5. The species composition of the upper bathyal zone differs substantially between the depths 200–900 m and 1000–2000 m. It is clear that the shallower zone (200–900 m) is more species-rich, where 36 species can befound. The available literature records suggest that *Paracrangon echinata*, *Birulia kishinouyei*, *B. sachalinensis* and *Spirontocaris prionota* are primarily shallow water species, and the occurrence of them in the upper bathyal zone around 200 m might only be sporadic. Four species, *Benthesicymus investigatoris*, *Heptacarpus maxillipes*, *Nematocarcinus tenuipes* and *Polycheles helleri* bathymetrically extend to 1200 to 1500 m. It is suggested that the three species, *Neocrangon abyssorum*, *Lebbeus similior* sp. nov., and *Pandalopsis rubra*, mainly inhabit depths greater than 1000 m, although *N. abyssorum* has a very wide vertical range from 900–3000 m. In addition, *Metacrangon cornuta* sp. nov. also occurs at the depth of about 1500 m. Two species, *Benthesicymus crenatus* and *Sclerocrangon zenkevitchii* are typically abyssal species found in the depths greater than 3000 m (Kim *et al.*, 2000).

Acknowledgments

We thank the late Drs. Brian Kensley (National Museum of Natural History, Smithsonian

Table 5. Summary of bathymetric ranges of benthic or benthopelagic species found in northeastern Honshu.Table 5. Summary of bathymetric ranges of benthic or benthopelagic species found in northeastern Honshu.

Species/depths (m)	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	3000	4000～
Aristaeomorpha foliacea				●																		
Aristeus mabahissae				●	●	●																
Benthesicymus investigatoris					●			●			●											
Benthesicymus crenatus																						●
Argis hozawai		●	●																			
Argis lar		●	●																			
Crangon dalli	●	●	●	●																		
Metacrangon nipponensis				●					●													
Metacrangon trigonorostris		●	●	●																		
Metacrangon sp.															●							
Neocrangon abyssorum									●			●			●		●			●	●	
Neocrangon communis		●	●	●	●	●	●															
Neocrangon sagamiensis	●	●																				
Paracrangon echinata	●	●																				
Sclerocrangon boreas		●																				
Sclerocrangon unidentata							●															
Sclerocrangon zenkevitchii																				●		
Birulia kishinouyei	●	●																				
Birulia sachalinensis		●																				
Eualus biunguis				●	●	●	●		●													
Eualus kuratai				●																		
Eualus middendorffi		●	●	●																		
Eualus spathulirostris	●	●	●																			
Eualus townsendi			●																			
Heptacarpus maxillipes					●	●	●		●			●										
Heptacarpus morseri				●																		
Lebbeus compressus		●																				
Lebbeus similior sp. nov.												●										
Spirontocaris brevidigitata	●	●	●																			
Spirontocaris prionota		●																				

Table 5. (Continued)

Species/depths (m)	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	3000	4000～
Nematocarcinus tenuipes							●					●										
Acanthephyra eximia					●	●	●		●													
Pandalopsis coccinata				●	●	●																
Pandalopsis rubra												●			●		●					
Pandalus eous		●	●	●	●	●	●															
Pandalus hypsinotus			●	●																		
Pandalus teraoi		●	●																			
Plesionika semilaevis		●																				
Leptochela sydniensis		●																				
Pasiphaea sinensis				●	●				●													
Pasiphaea cf. tarda															●							
Polycheles helleri							●		●			●			●							

Institution) and Sammy De Grage (Oxford Museum of Natural History) for making available comparative material. Sincere thanks are also extended to Drs. Tin-Yam Chan (Institute of Marine Biology, National Taiwan Ocean University) and S. De Grave for reviewing the manuscript and for offering valuable comments for improvements. The junior author's cordial thanks are due to Drs. M. Ito, T. Hattori, and Y. Narimatsu and the crew of the R/V *Wakataka-maru* of the FRA for their generous help in collecting specimens on board. His thanks are also due to Dr. S. Kojima of the Ocean Research Institute, The University of Tokyo, and the crew of the R/V *Tansei-maru* of the JAMSTEC for their support during the KT07-29 cruise. The senior author thanks his museum colleague Mrs. Kotoe Natsui for helping to interpret Korean literature.

References

Adensamer, T., 1898. Decapoden gesammelt auf S. M. Schiff Pola in den Jahren 1890–1894. Berichte der Commision für Erforschung des östlichen Mittelmeeres. XXII. Zoologische Ergebnisse. XI. *Denkschriften der Kaiserlichen Akademie der Wissenschaften*, Wien, **65**: 597–628.

Ahyong, S. T. and T.-Y. Chan, 2004. Polychelid lobsters of Taiwan (Decapoda: Polychelidae). *Raffles Bulletin of Zoology*, **52**: 171–182.

Aizawa, Y., 1974. Ecological studies of micronektonic shrimps (Crustacea, Decapoda) in the western North Pacific. *Bulletin of the Ocean Research Insititute, University of Tokyo*, **6**: 1–84.

Alcock, A. and A. R. S. Anderson, 1899a. Natural history notes from H. M. Royal Indian Marine Survey Ship "Investigator", commander T. H. Heming, R. N., commanding. Series III, No. 2. An account of the deep-sea Crustacea dredged during the surveying season 1897–98. *Annals and Magazine of Natural History*, Seventh Series, **3**: 1–27, 278–292.

Alcock, A. and A. R. S. Anderson, 1899b. Illustrations of the Zoology of the Royal Indian Marine Surveying Ship "Investigator", Crustacea, part 7. Pls. 36–45. Indian Museum, Calcutta.

Baba, K. 1986. Macruran Reptantia, Anomura and Brachyura. *In*: Baba, K., K. Hayashi and M. Toriyama (eds.), *Decapod Crustaceans from Continental Shelf and Slope around Japan*, pp. 148–231, 279–316. Japan Fisheries Resource Conservation Association. (In Japanese and English.)

Balss, H., 1914. Ostasiatische Decapoden, II: Die Natantia und Reptantia. *Abhandlungen der Bayerischen Akademie der Wissenschaften*, München, 2 (supplement), (10): 1–101, pl. 1.

Balss, H., 1913. Diagnosen neuer ostasiatischer Macruren. *Zoologischer Anzeiger*, **42**: 234–239.

Balss, H., 1927. Macrura der Deutchen Tiefsee-Expedition. 3. Natantia, Teil B. *Wissenschafliche Ergebnisse der Deutchen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–1899*, **23**: 247–275, pls. 1–6.

Barnard, K. H., 1947. Descriptions of new species of South African decapod Crustacea, with notes on synonymy and new records. *Annals and Magazine of Natural History*, Eleventh Series, **13**: 361–392.

Bate, C. S., 1878. On the Willemoesia group of Crustacea. *Annals and Magazine of Natural History*, Fifth Series, **2**: 273–283, pl. 13.

Bate, C. S., 1881. On the Penaeidae. *Annals and Magazine of Natural History*, Fifth Series, **8**: 169–196, pls. 11, 12.

Bate, C. S., 1888. Report on the Crustacea Macrura collected by the Challenger during the years 1873–1876. *Report on the Scientific Results of the Voyage of H.M.S. "Challenger" during the years 1873–76, Zoology*, **24**: I–XC, 1–942, pls. 1–150.

Birshtein, Y. A. and L. G. Vinogradov, 1953. New data on the dacapod crustacean fauna in the Bering Sea. *Zoologischeskii Zhurnal*, **79**: 215–228. (In Russian.)

Birshtein, Y. A. and N. A. Zarenkov, 1970. [Bottom decapods (Crustacea: Decapoda) of the Kurile-Kamchatka Trench area]. *In*: Bogorov, V. G. (ed.), [*Fauna of the Kurile-Kamchatka Trench and its Environment*]. *Trudy Instituta Okeanologii*, **86**: 420–426. (In Russian.)

Brandt, F., 1851. Krebse. *In*: Middendorff, A. Th. v. (ed.) *Reise in den äussersten Norden und Osten Sibiriens während der Jahre 1843 und 1844 mit allerhöchster Genehmigung auf veranstaltung der Kaiserlichen Akademie der Wissenchaften zu St. Petersburg ausgeführt und in Verbindung mit vielen Gelehten herausgegeben*, 2, pp. 79–148, pls. 5–6. Buchdruckerei der Kaiserlichen Akademie der Wissenschaften, St. Petersburg.

Brashnikov, V., 1907. Material representing the fauna of the Eastern Russian Seas collected by the Schooner "Storosh" in 1899–1902. *Zapiski Imperatorskoi Akademii Nauk*, Series 8, **20**: 1–185, pls. 1, 2. (In Russian.)

Brullé, M., 1839. Crustacés *In*: Baker-Webb, P. and S. Berthelot (eds.), *Histoire naturelle des Iles Canaries*, 2, pp. 13–18. Paris.

Burkenroad, M. D., 1940. Preliminary descriptions of twenty-one new species of pelagic Penaeidea (Crustacea Decapoda) from the Danish Ocenographical Expedition. *Annals and Magazine of Natural History*, Eleventh Series, **6**: 35–54.

Burukovsky, R. N., 2000a. Taxonomy of *Nematocarcinus* (Decapoda, Nematocarcinidae). 1. Description of disto-ventral

organ and revision of *N. productus*, *N. tenuipes*, *N. intermedius*, *N. parvidentatus*, *N. longirostris* and *N. proximatus*. *Zoologischeskii Zhurnal*, **79**: 161–170. (In Russian with English abstract.)

Burukovsky, R. N., 2000b. Taxonomy of shrimps of the genus *Nematocarcinus* (Decapoda, Nematocarcinidae). 6. Redescription of species from the groups *undulatipes* and *gracilis* with descriptions of two new species. *Zoologischeskii Zhurnal*, **79**: 1155–1167. (In Russian with English abstract.)

Burukovsky, R. N., 2003. Redescription of *Argis trigonorostris* (Yokoya, 1933) (Decapoda, Caridea, Crangonidae). *Problemii Gidrobiologii I Ikhtiopatologii, Svornik Nauchvikh Trudov, Kaliningradskii Gosudarstvennii Tekhnicheskii Universitet*, 2003: 44–52.

Butler, T. H., 1980. Shrimps of the Pacific coast of Canada. *Canadian Bulletin of Fisheries and Aquatic Sciences*, **202**: i–xii, 1–280, frontispiece, pls. 1–8.

Cha, H. K., Lee, J. U., Park, C. S., Baik, C. I., Hong, S. Y., Park, J. H., Lee, D. W., Choi, Y. M., Hwang, K., Kim, Z. G., Choi, K. H., Sohn, H., Sohn, M. H., Kim, D. H. and Choi, J. H., 2001. Shrimps of the Korean Waters. 188 pp. National Fisheries Research and Development Institute, Pusan. (In Korean.)

Chace, F. A., Jr., 1937. The Templeton Crocker Expedition. VII. Caridean decapod Crustacea from the Gulf of California and the west coast of Lower California. *Zoologica*, **22**: 109–138.

Chace, F. A., Jr., 1976. Shrimps of the pashiphaeid genus *Leptochela* with descriptions of three new species (Crustacea: Decapoda: Caridea). *Smithsonian Contributions to Zoology*, (222): i–iii, 1–51.

Chace, F. A., Jr., 1985. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 3: Families Thalassocarididae and Pandalidae. *Smithsonian Contributions to Zoology*, (411): 1–143.

Chace, F. A., Jr., 1986. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 4: Families Oplophoridae and Nematocarcinidae. *Smithsonian Contributions to Zoology*, (432): 1–82.

Chan, T.-Y. and A. Crosnier, 1997. Crustacea Decapoda: Deep-sea shrimps of the genus *Plesionika* Bate, 1888 (Pandalidae). *In*: Crosnier, A. (ed.), Résultats des Campagnes MUSORSTOM, Vol. 18. *Mémoires du Muséum national d'Histoire naturelle*, (176): 187–234.

Christoffersen, M. L., 1988. Genealogy and phylogenetic classification of the world Crangonidae (Crustacea, Caridea), with a new species and new records for the south western Atlantic. *Revista Nordestina de Biologia*, **6**: 43–59.

Crosnier, A., 1978. Crustacés Décapodes Pénéides Aristeidae (Benthesicyminae, Aristeinae, Solenocerinae). *Faune de Madagascar*, **46**: 1–197.

Crosnier, A., 1984. Penaeoid shrimps (Benthesicymidae, Aristeidae, Solenoceridae, Sicyonidae) collected in Indonesia during the Corindon II and IV expeditions. *Marine Research in Indonesia*, **24**: 19–47.

Crosnier, A., 1985. Crevettes pénéides d'eau profonde récoltées dans l'ocean Indien lors des campagnes BENTHEDI, SAFARI I et II, MS/32REUNION. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 4e série, **7**, section A: 839–877.

Crosnier, A., 1987. *Systellapsis intermedia* (Crustacea Decapoda Oplophoridae), espéce nourvelle de l'Indo-Pacifique. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 4e série, **9**, section A: 947–959.

Dakin, W. J. and A. N. Colefax, 1940. The plankton of the Australian coastal waters of New South Wales, Part No. I. *Publications of the University of Sydney Department of Zoology, Monograph*, **1**: 1–215, pls. 1–4.

Dana, J. D., 1852. Conspectus Crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe reipublicae foederatae duce, lexit et descripsit. *Proceedings of the Academy of Natural Sciences, Philadelphia*, **6**: 10–28.

Dana, J. D., 1855. Crustacea, Atlas. *United States Exploring Expedition, during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N.*, **14**: 1–27, pls. 1–96.

Derjugin, K. M. and Kobjakova, Z. I., 1935. Zur Dekapodenfauna des Japaneschen Meeres. *Zoologischer Anzeiger*, **112**: 141–147.

Fransen, C. H. J. M., 1997. *Lebbeus africanus* spec. nov., a new shrimp (Crustacea, Decapoda, Caridea, Hippolytidae) from Mauritanian waters, with redescriptions of four other species in the genus. *Zoologische Mededelingen*, **71**: 231–260.

Galil, B. S., 2000. Crustacea Decapoda: Review of the genera and species of the family Polychelidae Wood-Mason, 1874. *In*: Crosnier, A. (ed.), Résultats des Campagnes MUSORSTOM, Vol. 21. *Mémoires du Museum national d'Histoire naturelle*, (184): 285–387.

Gordon, I., 1939. A new species of *Sergestes* (Crustacea, Decapoda) from the South Atlantic. *Annals and Magazine of Natural History*, Eleventh Series, **4**: 498–509.

Grippa, G., 1976. *Funchalia woodwardi* Johnson, 1867 nelle acque di Sicilia, con observazioni sul gelere. *Atti della Societá Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano*, **117**: 117–137.

Hale, H. M., 1941. Decapod Crustacea. *British, Australian and New Zealand Antarctic Expedition 1929–1931 Reports*, Series B (Zoology and Botany), **4**: 257–286.

Hanamura, Y., 1979. A checklist of pelagic shrimps from Japanese waters. *Annual Report of the Institution of the Oceanic Research and Development, Tokai University*, **1**: 161–181.

Hanamura, Y., 1983. Pelagic shrimps (Penaeidea and Caridea) from Baja California and its adjacent region with description of a new species. *Bulletin of the Biogeographical Society of Japan*, **38**: 51–85.

Hanamura, Y., 1986. Records of pashiphaeid shrimp *Leptochela* (Decapoda: Caridea: Pasiphaeidae) from northern Japan. *Bulletin of the College of Arts and Science, Sapporo, Tokai University*, (5): 79–83.

Hansen, H. J., 1903. On the crustaceans of the genera *Petalidium* and *Sergestes* from the 'Challenger', with an account of luminous organs in *Sergestes challengeri*, n. sp. *Proceedings of the Zoological Society of London*, 1903: 52–79.

Hansen, H. J., 1919. The Sergestidae of the Siboga Expedition. *Siboga Expeditie*, **38**: 1–65.

Hansen, H. J., 1920. Les Sergestides des expéditions du Travailleur et du Talisman. *Bulletin du Muséum national d'Histoire naturelle*, Paris, **26**: 477–483.

Hansen, H. J., 1922. Crustacé décapodes (*Sergestes*) provenant des campagnes des yachts Hirondell et Princesse-Alice (1885–1915). *Résultats des Campagnes Scientifiques accomplies par le Prince Albert I de Monaco*, **64**: 1–232.

Hayashi, K., 1976. [Review of shrimps from the Sado Island and its neighbourhood]. *Niigataken Seibutsu Kyoikukaishi*, **11**: 12–22. (In Japanese with English summary.)

Hayashi, K., 1977. Studies of the hippolytid shrimps from Japan – VI. The genus *Spirontocaris* Bate. *Journal of the Shimonoseki University of Fisheries*, **25**: 155–186.

Hayashi, K., 1982. Prawns, shrimps and lobsters from Japan (8). *Aquabiology*, **4**: 438–442. (In Japanese.)

Hayashi, K., 1983. Prawns, shrimps and lobsters from Japan (9, 11–14). *Aquabiology*, **5**: 32–35, 188–191, 280–283, 366–369, 438–441. (In Japanese.)

Hayashi, K., 1984. Prawns, shrimps and lobsters from Japan (15–17). *Aquabiology*, **6**: 18–21, 140–143, 212–215. (In Japanese.)

Hayashi, K., 1985. Prawns, shrimps and lobsters from Japan (21). *Aquabiology*, **7**: 20–23. (In Japanese.)

Hayashi, K., 1986a. Prawns, shrimps and lobsters from Japan (29–32). *Aquabiology*, **8**: 196–199, 283–287, 374–377, 454–457. (In Japanese.)

Hayashi, K., 1986b. Penaeidea and Caridea. *In*: Baba, K., K. Hayashi and M. Toriyama (eds.), *Decapod Crustaceans from Continental Shelf and Slope around Japan*, pp. 38–149, 232–279, 279–316. Japan Fisheries Resource Conservation Association, Tokyo. (In Japanese and English.)

Hayashi, K., 1987. Prawns, shrimps and lobsters from Japan (33, 35–38). *Aquabiology*, **9**: 44–48, 198–201, 280–283, 364–367, 440–443. (In Japanese.)

Hayashi, K., 1988. Prawns, shrimps and lobsters from Japan (39–44). *Aquabiology*, **10**: 44–47, 120–123, 206–209, 280–283, 362–365, 442–445. (In Japanese.)

Hayashi, K., 1990. Prawns, shrimps and lobsters from Japan (52–55). *Aquabiology*, **12**: 122–125, 208–211, 304–307, 400–403. (In Japanese.)

Hayashi, K., 1992a. Studies of the hippolytid shrimps from Japan – VIII. The genus *Lebbeus* White. *Journal of Shimonoseki University of Fisheries*, **40**: 107–138.

Hayashi, K., 1992b. Prawns, shrimps and lobsters from Japan (63–68). Family Hippolytidae. *Aquabiology*, **14**: 24–28, 108–112, 180–184, 270–274, 341–345, 436–439. (In Japanese.)

Hayashi, K. 1992c. Dendrobranchiata Crustaceans from Japanese Waters. 300 pp. Seibutsu Kenkyusha, Tokyo. (In Japanese.)

Hayashi, K., 1993. Prawns, shrimps and lobsters from Japan (69–74). *Aquabiology*, **15**: 6–9, 88–91, 161–165, 241–244, 311–314, 390–393. (In Japanese.)

Hayashi, K., 2006. Revision of the *Pasiphaea alcocki* species group (Crustacea, Decapoda, Pasiphaeidae). *In*: Richer de Forges, B. and J.-L. Justine (eds.), Tropical Deep-Sea Benthos, Vol. 24. *Mémoires du Muséum national d'Histoire naturelle*, (193): 193–241.

Hayashi, K., 2007a. Caridean shrimps (Crustacea: Decapoda: Pleocyemata) from Japanese waters Part 1. Oplophoroidea, Nematocarcinoidea, Atyoidea, Stylodactyloidea, Pasiphaeoidea and Psalidopodoidea. xiv+292 pp. Seibutsukenkyusha, Tokyo. (In Japanese with English summary.)

Hayashi, K., 2008. Prawns, shrimps and lobsters from Japan (157–160). *Aquabiology*, **30**: 58–54, 181–187, 362–368, 541–546. (In Japanese.)

Hayashi, K. and J. N. Kim, 1999. Revision of the East Asian species of *Crangon* (Decapoda: Caridea: Crangonidae). *Crustacean Research*, (28): 62–103.

Hayashi, K. and S. Miyake, 1971. A new species of *Pasiphaea* from the East China Sea (Crustacea, Decapoda, Pasiphaeidae). *Proceedings of the Japanese Society of Systematic Zoology*, (7): 39–44.

Holthuis, L. B., 1947. The Hippolytidae and Rhynchocinetidae collected by the Siboga and Snellius Expeditions with remarks on other species. *Siboga Expeditie*, **39**a[8]: 1–100.

Igarashi, T., 1969. A list of marine decapod crustaceans from Hokkaido, deposited at the Fisheries Museum, Faculty of Fisheries, Hokkaido University I. Macrura. *Contribution from the Fisheries Museum, Faculty of Fisheries, Hokkaido University*, (11): 1–15, pls. 1–20.

Jensen, G. C., 2006. Three new species of *Lebbeus* (Crustacea: Decapoda: Hippolytidae) from the northeastern Pacific. *Zootaxa*, (1383): 23–43.

Judkins, D. C., 1978. Pelagic shrimps of the *Sergestes edwardsii* species group (Crustacea: Decapoda: Sergestidae). *Smithso-*

nian Contributions to Zoology, (256): 1–34.
Judkins, D. C. and B. Kensley, 2008. New genera in the family Sergestidae (Crustacea: Decapoda: Penaeidea). *Proceedings of the Biological Society of Washington*, **12**: 72–84.
Kemp, S., 1909. The Decapoda of the genus *Gennadas* collected by H.M.S. "Challenger". *Proceedings of the Zoological Society of London*, 1909: 718–730, pls. 73–75.
Kemp, S., 1910. Notes on Decapoda in the Indian Museum. I. The species of *Gennadas*. *Records of the Indian Museum*, **5**: 173–181.
Kemp, S. W., 1913. The Percy Sladen Trust Expedition to the Indian Ocean in 1905 under the leadership of Mr. J. Stanley Gardiner, Vol. 5(5). Pelagic Crustacea Decapoda of the H.M.S. "Sealark". *Transactions of the Linnean Society of London, Zoology*, **16**: 53–68.
Kemp, S. W., 1939. On *Acanthephyra purpurea* and its allies (Crustacea, Decapoda, Hoplophoridae). *Annals and Magazine of Natural History*, Eleventh Series, **4**: 568–579.
Kensley, B. F., 1971a. The family Sergestidae in the waters around southern Africa (Crustacea, Decapoda, Natantia). *Annals of the South African Museum*, **57**: 216–264.
Kensley, B. F., 1971b. The genus *Gennadas* in the waters around southern Africa. *Annals of the South African Museum*, **57**: 216–264.
Kikuchi, T. and T. Nemoto, 1991. Deep-sea shrimps of the genus *Benthesicymus* (Decapoda: Dendrobranchiata) from the western North Pacific. *Journal of Crustacean Biology*, **11**: 64–89.
Kikuchi, T. and S. Ohta, 1995. Two caridean shrimps of the families Bresiliidae and Hippolytidae from a hydrothermal field on the Iheya Ridge, off the Ryukyu Islands, Japan. *Journal of Crustacean Biology*, **15**: 771–785.
Kim, H. S., 1977. Macrura. *Illustrated Flora and Fauna of Korea*, **19**: 1–414. (In Korean.)
Kim, J. N., 2000. Systematic study on the family Crangonidae from East Asian waters and phylogenetic analysis of the Crangonidae (Crustacea, Decapoda, Caridea). 328 pp. Doctoral thesis, Nagasaki University.
Kim, J. N., K. Hayashi, Y. Natsukari and K. Yoshida, 2000. Abyssobenthic shrimps (Crustacea, Decapoda, Penaeidea and Caridea) from the Northwest Pacific collected by RV *Soyo-maru*. *Biogeography*, **2**: 3–20.
Kobjakova, Z. I., 1935. Beschreibung neuer Decapoden-Formen aus dem Japanischen Meer. *Zoologischer Anzeiger*, **112**: 85–92.
Kobjakova, Z. I., 1936. Zoogeographical review of the Decapoda fauna from the Okhotsk and Japanese Seas. *Transactions of the Natural Society of Leningrad*, **65**: 185–228. (In Russian.)
Kobjakova, Z. I., 1937. Systematisch Übersicht der Dekapoden aus dem Ochotskischen und Japanischen Meere. *Uchenie Zapiski Leningrad Universitet*, **15**: 93–154, pls. 1–3. (In Russian with German summary.)
Kobjakova, Z. I., 1955. New species of Crustacea, Decapoda from the southern part of Kurile-Sakhalin region. *Trudy Zoologischekogo Instituta, Akademii Nauk SSSR*, **18**: 235–242. (In Russian.)
Komai, T., 1991. Deep-sea decapod crustaceans from the Pacific coast of eastern Hokkaido, northern Japan (Crustacea, Decapoda, Penaeidea and Caridea). *Report of North Japan Sub-Committee for Bottom Fish, Research Committee for Fishery Resources*, (24): 55–96.
Komai, T., 1993a. Two new records of the genus *Heptacarpus* (Crustacea: Decapoda: Hippolytidae) from Japanese waters. *Proceedings of the Biological Society of Washington*, **106**: 545–553.
Komai, T., 1993b. Deep-sea shrimps of the family Aristeidae (Decapoda: Dendrobranchiata) from northern Japan, with the description of a new species of the genus *Aristeus*. *Crustacean Research*, (22): 21–34.
Komai, T., 1994a. Deep-sea shrimps of the genus *Pandalopsis* (Decapoda: Caridea: Pandalidae) from the Pacific coast of eastern Hokkaido, Japan, with the descriptions of two new species. *Journal of Crustacean Biology*, **14**: 538–559.
Komai, T., 1994b. [Taxonomic synopsis of Caridea (Pandalidae, Hippolytidae, Crangonidae) occurring on continental shelf of the Sea of Japan]. *Contributions to the Fisheries Research in the Japan Sea Block*, **31**: 81–107. (In Japanese.)
Komai, T., 1997a. Revision of *Argis dentata* and related species (Decapoda: Caridea: Crangonidae), with description of a new species from the Okhotsk Sea. *Journal of Crustacean Biology*, **17**: 135–161.
Komai, T., 1997b. A review of the *Metacrangon jacqueti* group, with descriptions of two new species (Decapoda, Caridea, Crangonidae). *Zoosystema*, **19**: 651–681.
Komai, T., 1999. A revision of the genus *Pandalus* (Crustacea: Decapoda: Caridea: Pandalidae). *Journal of Natural History*, **33**: 1265–1372.
Komai, T. and K. Amaoka, 1992. Redescription of *Argis hozawai* (Yokoya, 1939) from northern Japan (Crustacea, Decapoda, Crangonidae). *Proceedings of the Japanese Society of Systematic Zoology*, (48): 24–35.
Komai, T. and M. Eletskaya, 2008. A new species of the pandalid shrimp genus *Pandalus* (Crustacea: Decapoda: Caridea) from the Sea of Okhotsk off eastern Sakhalin, Russian Far East. Zootaxa, (1882): 46–56.
Komai, T. and J. N. Kim, 2004. Shrimps of the crangonid genus *Paracrangon* Dana (Crustacea: Decapoda: Caridea) from the northwestern Pacific: taxonomic review and description of a new species from Japan. *Scientia Marina*, **68**: 511–536.
Komai, T., T. Kikuchi, K. Nakaguchi and A. Go, 2000. Pelagic shrimps (Crustacea: Decapoda: Penaeidea and Caridea) from the Ohsumi Islands and southern Kyushu, Japan, collected by TRV "Toyoshio-maru" during cruises in 1996–1998. *Jour-*

nal of the Faculty of Applied Biological Science, Hiroshima University, **38**: 131–149.
Komai, T., S. Maruyama and K. Konishi, 1992. A list of decapod crustaceans from Hokkaido, northern Japan. *Researches on Crustacea*, (21): 189–205.
Komai, T. and M. Takeda, 1989. *Sclerocrangon unidentata*, a new crangonid shrimp from the Pacific coast of Honshu, Japan. *Bulletin of the Biogeographical Society of Japan*, **44**: 77–84.
Komai, T., I. Takeuchi and M. Takeda, 1996. Deep-sea shrimps (Crustacea: Decapoda: Caridea) from the Antarctic Sea collected during the JARE 35 Cruise. *Proceedings of the National Institute of Polar Research Symposium on Polar Biology*, **9**: 179–206.
Krøyer, H., 1855. Bidrag til Kundskab om Kraebdryslaeten *Sergestes* Edw. og om 11 Arter af same. *Oversigt over het Kongelige Danske Videnskabernes Selkabs Forhandlinger*, 1855: 22–34.
Kubo, I., 1937. One new and an imperfectly known deep-sea shrimps. *Journal of the Imperial Fisheries Institute*, Tokyo, **32**: 93–103.
Kubo, I., 1949. Studies on penaeids of Japanese and its adjacent waters. *Journal of the Tokyo College of Fisheries*, **36**: 1–467.
Kuris, A. M. and J. T. Carlton. 1977. Description of a new species, *Crangon handi*, and new genus *Lissocrangon*, of crangonid shrimps (Crustacea: Caridea) from the California coast, with notes on adaptation on body shape and coloration. *Biological Bulletin*, **153**: 540–559.
Li, X.-Z and T. Komai, 2003. Pandaloid shrimps from the northern South China Sea, with description of a new species of *Plesionika* (Crustacea: Decapoda: Caridea). *Raffles Bulletin of Zoology*, **51**: 257–275.
Minemizu, R., 2000. Marine Decapod and Stomatopod Crustaceans Mainly from Japan. 344 pp. Bun'ichi Sogo Publishing, Tokyo. (In Japanese.)
Makarov, V. V., 1935. Beschreibung neuer Dekapoden-Formen aus den Meeren des Fernen Ostens. *Zoologischer Anzeiger*, **109**: 319–325.
Man, J. G. de, 1907. Diagnoses of new species of macruran decapod Crustacea from the "Siboga-Expedition". Note XIV. *Notes from the Leiden Museum*, **29**: 127–147.
Man, J. G. de, 1911. The Decapoda of the Siboga Expedition. Part 1. Family Penaeidae. *Siboga Expeditie*, **39**a: 1–131.
Man, J. G. de, 1920. The Decapoda of the Siboga-Expedition, IV: Families Pasiphaeidae, Stylodactylidae, Hoplophoridae, Nematocarcinidae, Thalassocaridae, Pandalidae, Psalidopodidae, Gnathophyllidae, Processidae, Glyphocrangonidae, and Crangonidae. *Siboga-Expeditie*, **39**a^3: 1–318, pls. 1–25.
Man, J. G., de, 1929. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–16. L. On a small collection of Decapoda, one of which, a *Crangon*, caught by the Danish Pacific Expedition at the Jolo Islands, is new to science. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kobenhaven*, **87**: 105–134.
Miyake, S., 1982. Japanese Crustacean Decapods and Stomatopods in Color, Vol. I. vii + 261 pp., 56 pls. Hoikusha, Osaka. (In Japanese.)
Miyake, S. and K. Hayashi, 1967. Studies on the hippolytid shrimps from Japan, I. Revision of the Japanese species of the genus *Eualus*, with description of two new species. *Journal of the Faculty of Agriculture, Kyushu University*, **14**: 247–265.
Miyake, S. and K. Hayashi, 1968. Studies on the hippolytid shrimps from Japan, II. Redescription of *Eualus spathulirostris* (Yokoya). *Journal of the Faculty of Agriculture, Kyushu University*, **14**: 367–371.
Milne, D. S., 1968. *Sergestes similis* and *S. consobrinus* n. sp. (Decapoda) from the northeastern Pacific. *Crustaceana*, **14**: 21–34.
Milne-Edwards, A., 1890. Diagnose d'un crustacé macroure nouveau de la Méditerranée. *Bulletin de la Société Zoologique de France*, **15**: 163.
Nakazawa, K., 1932. [On three species of the genus *Sergestes* from Suruga Bay]. *Zoological Magazine*, **44**: 31–32. (In Japanese.)
Ohta, S., 1983. Photographic census of large-sized benthic organisms in the bathyal zone of Suruga Bay, central Japan. *Bulletin of the Ocean Research Institute, University of Tokyo*, (15): 1–244.
Ohtomi, J. and K. Hayashi, 1995. Some morphological characters of the deep-water shrimp *Plesionika semilaevis* from Kagoshima Bay, southern Japan (Crustacea, Decapoda, Caridea). *Fisheries Science*, **61**: 1035–1036.
Owen, R., 1839. Crustacea. *In*: *The Zoology of Captain Beechey's Voyage: Compiled from the Collections and Notes made by Captain Beechey, the Officers and Naturalist of the Expedition, during a Voyage to the Pacific and Bering Straits performed in His Majesty's Ship Blossom, under Command of Captain F. W. Beechey, R.N.F.R.S. in the Years 1825, 26, 27, and 28*, pp. 77–92. H. G. Bohn, London.
Parisi, B., 1919. I Decapodi giapponesi del Museo di Milano. VII. Natantia. *Atii della Societa Italiana di Scienze Naturali e del Museo Civico di Storia Naturale in Milano*, **58**: 59–99, pls. 2–6.
Pérez-Farfante, I., 1977. *Penaeopsis eduardoi*, a new species of shrimp (Crustacea: Penaeidae) from the Indo-Pacific. *Proceedings of the Biological Society of Washington*, **90**: 172–182.
Pérez-Farfante, I. and B. Kensley, 1997. Penaeoid and sergestoid shrimps and prawns of the world. Keys and diagnoses for

the families and genera. *Mémoires du Muséum national d'Histoire naturelle*, (175): 1–233.
Phipps, C. J., 1774. *A Voyage towards the North Pole undertaken by His Majesty's Command, 1773*. viii+253 pp., 14 pls., appendix. J. Nourse, the Strand, London. Not seen.
Ramadan, M. M., 1938. Crustacea: Penaeidae. *John Murray Expedition 1933–1934, Scientific Report*, **5**: 35–76.
Rathbun, M. J., 1899. List of Crustacea known to occur on and near the Pribilof Islands. *In*: Jordan, D. S. *et al*. (eds.), *The Fur Seals and Fur Seal Islands of the North Pacific Ocean, Part 3*. Washington, D. C., pp. 555–557.
Rathbun, M. J., 1902. Descriptions of new decapod crustaceans from the west coast of North America. *Proceedings of the United States National Museum*, **24**: 885–905.
Rathbun, M. J., 1904. Decapod crustaceans of the northwest coast of North America. *Harriman Alaska Expedition*, **10**: 1–190, pls. 1–10.
Rathbun, M. J. 1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission*, **23**: 827–930, pls. 1–24.
Risso, A., 1827. Histoire naturelle des principales productions de l'Europe Méridionale et particuliérement de celles des environs de Nice et des Alpes Maritimes, Vol. 5. vii+403 pp, 10 pls. F.-G. Levrault, Paris.
Sakai, K. and T. Nakano, 1983. Studies on the genus *Sergestes* (Crustacea, Decapoda) I. *Sergestes* (*Sergia*) *japonicus* Bate, 1881 and *Sergestes* (*Sergia*) *mollis* Smith, 1884. *Researches on Crustacea*, (12): 97–110.
Sakai, K. and T. Nakano, 1985. Studies on the genus *Sergestes* (Crustacea, Decapoda) II. *Sergestes seminudus* Hansen, 1919 and *Sergestes prehensilis* Bate, 1881. *Bulletin of the Shikoku Women's University*, **4**: 17–35.
Schmitt, W. L., 1921. The marine decapod Crustacea of California. *University of California Publications in Zoology*, **23**: 1–470, pls 1–50.
Smith, S. I., 1884. Report on the decapod Crustacea of the Albatross dredgings off the east coast of the United States in 1883. Report of Commissioner of Fish and Fisheries. *United States Commission of Fish and Fisheries*, **10**: 345–426, pls. 1–10.
Smith, S. I., 1886. Report on the decapod Crustacea of the Albatross dredgings off the east coast of the United States during the summer and autumn of 1884. *Report of the Commissioner for 1885, United States Commission of Fish and Fisheries*, **13**: 605–705, pls. 1–20.
Sokolov, V. I., 2001. Decapod crustaceans of the southwest Kamchatka Shelf: R/V "Professor Levanidov" collection in June 1996. *Arthropoda Selecta*, **10**: 103–136.
Squires, H. J., 1992. Recognition of *Pandalus eous* Makarov, 1935, as a Pacific species not a variety of the Atlantic *Pandalus borealis* Krøyer, 1838 (Decapoda, Caridea). *Crustaceana*, **63**: 257–262.
Stebbing, T. R. R., 1905. South African Crustacea. Part III. *Marine Investigations of South Africa*, **4**: 21–123, pls. 17–26.
Stevens, B. A. and F. A. Chace, Jr., 1965. The mosopelagic caridean shrimp *Notostomus japonicus* in the northeastern Pacific. *Crustaceana*, **8**: 273–284.
Stimpson, W., 1864. Descriptions of new species of marine invertebrates from Puget Sound, collected by the naturalists of the northwest boundary commission, A. H. Campbell, Esq., Commissioner. P*roceedings of the Academy of Natural Sciences of Philadelphia*, 1864: 153–161.
Toriyama, M. 1986. Outline of the Research. *In*: Baba, K., K. Hayashi and M. Toriyama (eds.), *Decapod Crustaceans from Continental Shelf and Slope around Japan*, pp. 22–29. Japan Fisheries Resource Conservation Association, Tokyo. (In Japanese and English.)
Tsuchida, S., T. Komai and K. Nakamura. 2008. Chapter 21, Arthropoda. *In*: K. Fujikura, T. Okutani, and T. Maruyama (eds.), *Deep-sea Life – Biological Observations using Research Submersibles*, pp. 252–265. Tokai University Press, Hatano. (In Japanese.)
Urita, T., 1941. One new shrimp of the genus *Pandalopsis* found in Hokkaido, Japan. *Zoological Magazine*, **53**: 12–16.
Urita, T., 1942. Decapod crustaceans from Saghalien, Japan. *Bulletin of the Biogeographical Society of Japan*, **12**: 1–78.
Vereshchaka, A. L., 1994. North Atlantic and Caribbean species of *Sergia* (Crustacea, Decapoda, Sergestidae) and their horizontal and vertical distribution. *Steenstrupia*, **20**: 73–95.
Vereshchaka, A. L., 2000. Revision of the genus *Sergia* (Decapoda: Dendrobranchiata: Sergestidae): Taxonomy and distribution. *Galathea Report*, (18): 69–207.
Vinogradov, L. G., 1950. Classification of shrimps, prawns and crabs from Far East. *Izvestia TINRO*, **33**: 179–358, pls. 1–53.
Ward, P., 1985. New records of *Lebbeus antarcticus* (Hale) (Crustacea: Decapoda) from the Antarctic Peninsula. *British Antarctic Survey Bulletin*, **69**: 57–63.
Wicksten, M. K. 1996. *Neocrangon zacae* (Chace, 1937) synonymized with *N. resima* (Rathbun, 1902), and compared with *N. communis* (Rathbun, 1899) (Decapoda: Caridea: Crangonidae). *Proceedings of the Biological Society of Washington*, **109**: 39–43.
Yokoya, Y., 1930. Macrura of Mutsu Bay. Report of the biological survey of Mutsu Bay. *Science Reports of the Tohoku University*, Series 4 (Biology), **5**: 525–548.
Yokoya, Y., 1933. On the distribution of decapod Crustacea inhabiting the continental shelf around Japan, chiefly based upon

the materials collected by S.S. "Soyo Maru" during the years 1923-1930. *Journal of the College of Agriculture, Tokyo Imperial University*, **12**: 1–236.

Yokoya, Y., 1939. Macrura and Anomura of decapod Crustacea found in the neighbourhood of Onagawa, Miyagi-ken. *Science Reports of the Tohoku University*, Series 4 (Biology), **14**: 261–289.

Zarenkov, N. A., 1965. Revision of the genus *Crangon* and *Sclerocrangon* G. O. Sars (Decapoda, Crustacea). *Zoologischeskii Zhurnal*, **44**: 1761–1775. (In Russian with English abstract.)

Zarenkov, N. A., 1993. On the new records of the deep-sea crangonid shrimp *Sclerocrangon zenkewitchii* Birshtein et Vinogradov, 1953 (Crustacea Decapoda Crangonidae) in the Kuril Trench and the Sea of Japan. *Arthropoda Selecta*, **2**: 17. (In Russian with English abstract.)