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Family Pandalidae (Crustacea, Decapoda, Caridea) Collected by the RV "Soela" from the Northwest Australian Shelf

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Abstract Twenty species of shrimps belonging to the family Pandalidae (Decapoda, Caridea) are reported from the northwest Australian shelf. They are the representatives of the genera *Chlorotocella*, *Chlorotocus*, *Heterocarpus* and *Plesionika*, and all of them are first recorded from the area with reasonable certitude.

Introduction

Shrimps of the family Pandalidae in the northwest Australian shelf have little been studied as well as in the southern regions of the Indo-Pacific. On the other hand, for the last few decades, several pandalid shrimps have been commercially fished or considered to be a potentially explorable resource in the deep-sea of the tropical areas (*e.g.*, SUSEELAN, 1976; HOLTHUIS, 1980; KING, 1984).

Recent systematic works on the pandalid shrimp (CHACE, 1985; HAYASHI, 1986) have revealed that the Indo-Pacific pandalid fauna is rich and complex in species composition more than what has been generally recognized, especially in members of the genus *Plesionika*. It is therefore worth dealing with the pandalid shrimp of this area not only in the zoogeography but also in fishery interest.

This paper deals with 20 species of the family Pandalidae representing the four genera *Chlorotocella*, *Chlorotocus*, *Heterocarpus* and *Plesionika* collected during the recent surveys of the northwest Australian shelf fauna made by the RV "Soela" of the Division of Fisheries, CSIRO, Australia.

The sampling position data positive to the pandalid shrimps are given in Table 1.

Representative series of shrimps reported here is deposited in the Northern Territory Museum, Darwin, Australia, and the other specimens are in the National Science Museum, Tokyo.

In each species, the carapace length is given for indicating the shrimp size.

Table 1. List of sampling data.

Cruise	Stn	Date	Position	Depth (m)
0183	2	28 Feb. 1983	18°06′S, 118°00′E	340
0283	T/58	2 Feb. 1983	18°06′S, 118°00′E	350
	NWS- 8	26 Apr. 1983	19°29′S, 118°52′E	40
	NWS-15	27 Apr. 1983	19°05′S, 113°53′E	80
	NWS-16	27 Apr. 1983	19°04′S, 118°50′E	80
	NWS-17	27 Apr. 1983	19°05′S, 118°53′E	80
0184	2	27 Jan. 1984	18°59′S, 118°19′E	418
	6	28 Jan. 1984	18°03′S, 118°14′E	405
	14	30 Jan. 1984	19°00′S, 116°08′E	348
	16	31 Jan. 1984	18°37′S, 117°02′E	506
	18	31 Jan. 1984	18°43′S, 117°02′E	404
	19	31 Jan. 1984	18°46′S, 117°06′E	352
	20	31 Jan. 1984	18°55′S, 117°05′E	296
	22	1 Feb. 1984	18°34′S, 117°30′E	202
	23	1 Feb. 1984	18°34′S, 117°32′E	357
	27	2 Feb. 1984	18°05′S, 118°10′E	402
	29	2 Feb. 1984	18°10′S, 118°14′E	302
	30	2 Feb. 1984	17°41′S, 118°42′E	357
	33	3 Feb. 1984	17°30′S, 118°41′E	505
	42	5 Feb. 1984	16°51′S, 119°54′E	449
	52	10 Feb. 1984	15°45′S, 120°39′E	448
	54	10 Feb. 1984	15°50′S, 120°44′E	349
	55	10 Feb. 1984	15°58′S, 120°45′E	297
	58	11 Feb. 1984	15°11′S, 121°07′E	407
	60	11 Feb. 1984	15°07′S, 121°05′E	502
	61	12 Feb. 1984	14°40′S, 121°26′E	503
	66	12 Feb. 1984	14°28′S, 122°01′E	300
	70	13 Feb. 1984	13°43′S, 122°14′E	495
	73	14 Feb. 1984	14°11′S, 122°33′E	349
	76	14 Feb. 1984	13°42′S, 122°57′E	349
	79	15 Feb. 1984	13°17′S, 122°36′E	489
	80	15 Feb. 1984	12°49′S, 122°55′E	500
	83	16 Feb. 1984	14°52′S, 121°39′E	258
	85	16 Feb. 1984	14°52′S, 121°40′E	222
	91	18 Feb. 1984	16°07′S, 120°20′E	547
	92	18 Feb. 1984	16°08′S, 120°09′E	598

List of Species

Chlorotocella gracilis BALSS, 1914
Chlorotocus crassicornis (COSTA, 1871)
Heterocarpus dorsalis BATE, 1888
H. gibbosus BATE, 1888
H. laevigatus BATE, 1888
H. sibogae DE MAN, 1917
H. woodmasoni ALCOCK, 1901
Plesionika lophotes CHACE, 1985
P. martia orientalis CHACE, 1985
P. ocellus (BATE, 1888)
P. parvimartia CHACE, 1985
P. pumila CHACE, 1985
P. quasigrandis CHACE, 1985
P. reflexa CHACE, 1985

Plesionika bifurca ALCOCK et ANDERSON, 1894
P. grandis DOFLEIN, 1902
P. indica DE MAN, 1917
P. semilaevis BATE, 1888
P. spinidorsalis (RATHBUN, 1906)
P. unidens BATE, 1888

Family P a n d a l i d a e

Key to Northwest Australian Genera

1. Second pereiopod with two or three carpal articulations 2
— Second pereiopod with more than four carpal articulations..... 3
2. Supraorbital spine present.....*Chlorotocella*
— Supraorbital spine absent.....*Chlorotocus*
3. Carapace with longitudinal carinae on lateral surface.....*Heterocarpus*
— Carapace without longitudinal carina on lateral surface.....*Plesionika*

Genus ***Chlorotocella*** BALSS, 1914

Chlorotocella gracilis BALSS, 1914

(Fig. 1a)

Chlorotocella gracilis BALSS, 1914, p. 33, figs. 16–22; HAYASHI & MIYAKE, 1968, p. 12, figs. 1, 4a; CHACE, 1985, p. 11; HAYASHI, in BABA *et al.*, 1986, pp. 115, 266, fig. 72.

Material examined. 0283-NWS-8, 1 ovig. ♀ (3.3 mm); 0283-NWS-15, 2 ♂♂ (3.7, 4.0 mm), 2 exs (3.6, 3.7 mm); 0283-NWS-16, 1 ♀ (2.5 mm), 1 ovig. ♀ (3.2 mm).

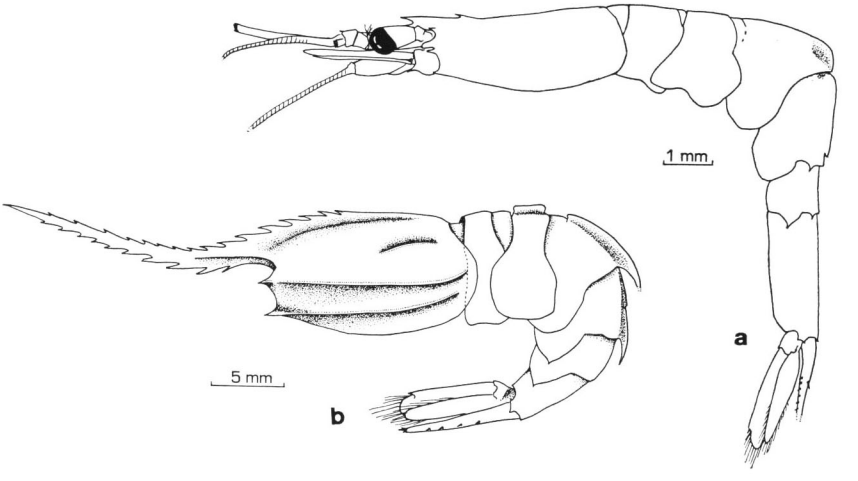

Fig. 1. a, *Chlorotocella gracilis* BALSS — ♂ (3.7 mm). b, *Heterocarpus sibogae* DE MAN — young (11.1 mm).

Remarks. In four of the seven "Soela" specimens, the third abdominal somite is compressed and forming an obtuse carination, but is rounded dorsally in the rest specimens.

The pleuron of the fifth somite is usually armed with a small spine or a denticle on the posteroventral margin, but is rounded in the two specimens from station 0283-NWS-16. These conditions seem to be individually variable, since one female has the third somite rounded dorsally and the pleuron of the fifth somite armed with a spine.

Distribution. Indo-Malay Archipelago; Philippines; Japan.

Genus ***Chlorotocus*** A. MILNE EDWARDS, 1882

Chlorotocus crassicornis (COSTA, 1871)

Pandalus crassicornis COSTA, 1871, p. 90, pl. 2, fig. 2.
Chlorotocus gracilipes A. MILNE EDWARDS, 1882, p. 14; 1883, pl. 17.
Chlorotocus crassicornis: ZARIQUIEY ALVAREZ, 1968, p. 98, figs. 35 a, 41 a, b; FUJINO & MIYAKE, 1970, p. 263; CROSNIER & FOREST, 1973, p. 184, figs. 58–60; CHACE, 1985, p. 12, figs. 7, 8; HAYASHI, in BABA *et al.*, 1986, pp. 117, 267, fig. 73.
Chlorotocus gracilipes var. *andamanensis* ALCOCK et ANDERSON, 1899, p. 284.

Material examined. 0184–30, 1 ♀ (20.5 mm); 0184–85, 1 ovig. ♀ (15.8 mm).

Remarks. The ovigerous female from station 0184–85 has the rostrum reaching the end of the antennal scale, but it is much shorter in the other specimen. As CHACE (1985) noted, it is evident that the rostral length is variable among individuals.

Distribution. Eastern Atlantic; Mediterranean Sea; South Africa to Indonesia; Philippines; South and East China Seas; Korea Straits; Japan.

Genus ***Heterocarpus*** BATE, 1888

Key to Northwest Australian Species

1. Antennal carina complete, running nearly whole length of lateral surface of carapace 2
— Antennal carina short, not extending beyond hepatic region..... 3
2. Intermediate carina absent on carapace; third abdominal somite with prominent dorsal spine near mid-length.....*H. woodmasoni*
— Intermediate carina present on posterior part of carapace; first and second somites with distinct dorsal carina; third and fourth somites ending with posteromedian tooth.....*H. sibogae*
3. Abdomen with posteromedian spine on third to fifth somites.....*H. dorsalis*
— Abdomen without posteromedian spine on any somite..... 4
4. Carapace with branchiostegal spine overreaching antennal spine; sixth abdominal somite grooved dorsally.....*H. laevigatus*

— Carapace with branchiostegal spine not overreaching antennal spine; sixth abdominal somite rounded dorsally; rostral crest rather developed..... .....*H. gibbosus*

Heterocarpus dorsalis BATE, 1888

Heterocarpus dorsalis BATE, 1888, p. 630, pl. 111; DE MAN, 1920, p. 171, pl. 15, fig. 43; CALMAN, 1939, p. 206; BARNARD, 1950, p. 684, fig. 127 a; KENSLEY, 1977, p. 38, fig. 15 a; KING, 1984, p. 186, 1 fig.; CHACE, 1985, p. 22, fig. 13 d; HAYASHI, in BABA *et al.*, 1986, pp. 117, 267, fig. 74.
Heterocarpus alphonsi BATE, 1888, p. 632, pl. 112, fig. 1.
Heterocarpus affinis BORRADAILE, 1915, p. 208.
Heterocarpus dorsalis alphonsi: MONOD, 1973, p. 123, figs. 28–31.

Material examined. 0184–61, 2 ♂♂ (ca. 30, 36.1 mm), 1 ♀ (28.9 mm), 10 ovig. ♀♀ (31.2–40.0 mm).

Remarks. In the "Soela" specimens, the rostral teeth vary from 12 to 15 on the dorsal margin and 11–15 on the ventral margin. In the former series, two or three teeth are placed clearly behind the orbital margin, but each of the two and three spined forms seems to show no evident correlation with the total number of the dorsal rostral teeth.

Distribution. South Africa to Indonesia; Philippines; Japan; Southwest Pacific.

Heterocarpus gibbosus BATE, 1888

Heterocarpus gibbosus BATE, 1888, p. 634, pl. 112, fig. 2; DE MAN, 1920, p. 163, pl. 14, fig. 39; KING, 1984, p. 184, 1 fig.; CHACE, 1985, p. 29, figs. 13 f, 17.

Material examined. 0184–73, 4 ♂♂ (26.2–32.3 mm), 1 ♀ (36.2 mm), 1 ovig. ♀ (36.0 mm).

Distribution. Eastern Africa to Indonesia; Philippines; Japan; Southwest Pacific.

Heterocarpus laevigatus BATE, 1888

Heterocarpus laevigatus BATE, 1888, p. 636, pl. 112, fig. 3; DE MAN, 1920, p. 159, pl. 13, fig. 37; BARNARD, 1950, p. 684, fig. 127 b; FIGUEIRA, 1957, p. 41, figs. 5, 6, pl. 4, fig. 1; 1958, p. 24, fig. 1; CROSNIER & FOREST, 1973, p. 195, fig. 61 c; KENSLEY, 1977, p. 38, fig. 15 b; KING, 1984, p. 185, 1 fig.; CHACE, 1985, p. 33, fig. 13 i; HAYASHI, in BABA *et al.*, 1986, pp. 119, 268, fig. 75.

Material examined. 0184–80, 1 ovig. ♀ (56.9 mm).

Distribution. Eastern Atlantic; South Africa to Indonesia; Philippines; West Pacific.

Heterocarpus sibogae DE MAN, 1917

(Fig. 1 b)

Heterocarpus sibogae DE MAN 1917, p. 283; 1920, p. 169, pl. 14, fig. 42; SCHMITT, 1926, p. 380;

CALMAN, 1939, p. 206; MONOD, 1973, p. 122, figs. 26, 27; KING, 1984, p. 183, 1 fig.; CHACE, 1985, p. 36, figs. 13 m, 18–20; HAYASHI, in BABA *et al.*, 1986, pp. 119, 268, fig. 76.

Material examined. 0283–T/58, 1 ♂ (32.5 mm), 2 ♀♀, (22.4, 22.6 mm); 0184–22, 1 ♂ (32.2 mm); 0184–79, 2 ovig. ♀♀ (29.6, 36.3 mm); 0184–85, 1 young (11.1 mm).

Remarks. The "Soela" specimens have prominent dorsal carinae on the first two abdominal somites. A young specimen (11.1 mm), however, shows the first somite rounded dorsally, but is markedly carinated on the second somite.

Distribution. Eastern Atlantic; South Africa to Indonesia; South China Sea; Philippines; Japan; Hawaii; Australia; Southwest Pacific.

Heterocarpus woodmasoni ALCOCK, 1901

Heterocarpus woodmasoni ALCOCK, 1901, p. 108; ALCOCK & MCARDLE, 1901, pl. 51, fig. 2; DE MAN, 1920, p. 156, pl. 13, fig. 36; CALMAN, 1939, p. 204; KENSLEY; 1969, p. 170, fig. 12; CHACE, 1985, p. 42, fig. 13 q.

Material examined. 0283–T/58, 2 ♂♂ (22.6, 29.0 mm), 1 ovig. ♀ (25.9 mm); 0184–2, 2 ♂♂ (28.5, 32.7 mm), 1 ovig. ♀ (29.7 mm).

Distribution. South Africa to Indonesia; Philippines; South China Sea.

Genus *Plesionika* BATE, 1888

The genus *Plesionika* is probably still in a complicated position. The genus *Parapandalus* was synonymized with *Plesionika* by CHACE (1985), who definitely considered that the presence or absence of the epipods on the pereiopods has no phylogenetic importance at the generic or subgeneric rank.

On the other hand, BURUKOVSKY (1981) proposed the subgeneric division for *Plesionika* s. s. (*Plesionika* and *Nothocaris*) on the basis of the shape of the second pereiopods. Further discussion may be referred to CHACE (1985). The following key is mostly based on CHACE (1985) excepting a few modifications.

Key to Northwest Australian Species

1. Epipod absent on any pereiopods 2
— Epipods present on some pereiopods 3
2. Rostrum with ventral margin armed with more than 20 teeth above antennal scale; ocellus elongate oval ..... *P. quasigrandis*
— Rostrum with ventral margin armed with 9 or 10 teeth above antennal scale; ocellus nearly rounded ..... *P. grandis*
3. Posterior dorsal rostral teeth with bluntly barbed tips ..... *P. pumila*
— None of dorsal rostral teeth with bluntly barbed tips 4
4. Third abdominal somite armed with recurved posteromedian spine ..... *P. reflexa*
— Third abdominal somite without posteromedian spine 5

5. Telson with four pairs of dorsolateral spines, excluding subterminal pair..... 6
— Telson with three pairs of dorsolateral spines, excluding subterminal pair..... 7
6. Seven to ten dorsal rostral teeth placed on carapace; pleuron of fourth somite without posteroventral spine; exopod of uropod shorter than endopod..... ..... *P. spinidorsalis*
— Three to five dorsal rostral teeth placed on carapace; pleuron of fourth somite with posteroventral spine; exopod of uropod as long as endopod....*P. bifurca*
7. Dorsal rostral teeth immovable.....11
— Some of posterior dorsal rostral teeth movable..... 8
8. Second pereiopods of both sides nearly equal in length.....10
— Second pereiopods of both sides considerably unequal in length..... 9
9. Third abdominal somite compressed with dorsal carina forming an obtuse tooth; distolateral spine of antennal scale barely reaching distal margin of blade.... ..... *P. unidens*
— Third abdominal somite rounded dorsally; distolateral spine of antennal scale not reaching distal margin of blade.....*P. lophotes*
10. Rostrum with dorsal margin armed with more than 25 close-set spines; pleuron of fourth somite with posteroventral spine.....*P. indica*
— Rostrum with dorsal margin armed with less than 20 teeth; pleuron of fourth somite without posteroventral spine.....*P. ocellus*
11. Anteriormost tooth of dorsal rostral series arising clearly anterior to distal end of antennular peduncle; maximum body length less than 15 mm in carapace length.....*P. parvimartia*
— Anteriormost tooth of dorsal rostral series usually not arising anterior to end of antennular peduncle; maximum body length more than 20 mm in carapace length.....12
12. Eye not kidney-shaped; posterior margin of orbit nearly vertical; exopod of third pleopod usually more than 0.80 times as long as carapace..... ..... *P. martia orientalis*
— Eye kidney-shaped; posterior margin of orbit concave dorsad; exopod of uropod usually less than 0.75 times as long as carapace.....*P. semilaevis*

Plesionika bifurca ALCOCK et ANDERSON, 1894

Plesionika bifurca ALCOCK et ANDERSON, 1894, p. 155; DE MAN, 1920, p. 136, pl. 12, fig. 31; CHACE, 1985, p. 56, fig. 24.
Pandalus (*Plesionika*) *bifurca*: ALCOCK & MCARDLE, 1901, pl. 51, fig. 6.

Material examined. 0184–58, 1 ovig. ♀ (9.8 mm); 0184–60, 1 ovig. ♀ (13.8 mm); 0184–70, 1 ovig. ♀ (12.2 mm); 0184–80, 1 ovig. ♀ (14.2 mm); 0185–85, 1 ovig. ♀ (12.3 mm).

Remarks. For the distinction between this species and *P. spinidorsalis*, refer to the "remarks" under the latter species.

Distribution. Eastern Africa to Indonesia, South China Sea; Philippines; South of Japan.

Plesionika grandis DOFLEIN, 1902

(Fig. 2 a–c)

Plesionika spinipes var. *grandis* DOFLEIN, 1902, p. 618, pl. 3, figs. 3–5.
Parapandalus spinipes: DE MAN, 1920, p. 142, pl. 12, fig. 33 a, c–e, pl. 13, fig. 33, 33 b. (Nec *Nothocaris spinipes* BATE.)
Plesionika grandis: CHACE, 1985, p. 66, figs. 28, 29; HAYASHI, in BABA *et al.*, 1986, pp. 133, 271, fig. 83.

Material examined. 0184–20, 1 ♀ (18.6 mm); 0184–52, 1 ovig. ♀ (16.5 mm); 0184–85, 1 ♀ (12.0 mm), 1 ovig. ♀ (17.0 mm).

Description. Rostrum overreaching antennal scale, with closely set teeth, ventral margin armed with less than 30 teeth, of which nine or ten teeth are situated above antennal scale. Orbital margin rather evenly concave. Abdomen without dorsal carina and posteromedian spine. Sixth somite 1.63–1.76 times as long as fifth, 1.60–1.75 times as long as high. Pleura of fourth and fifth somites with posteroventral tooth. Ocellus nearly rounded. Antennal scale 0.87–0.95 times as long as carapace, about 5.0 times as long as wide, distolateral spine slightly overreaching distal margin of blade. Third maxilliped with penultimate segment 1.38–1.64 times as long as

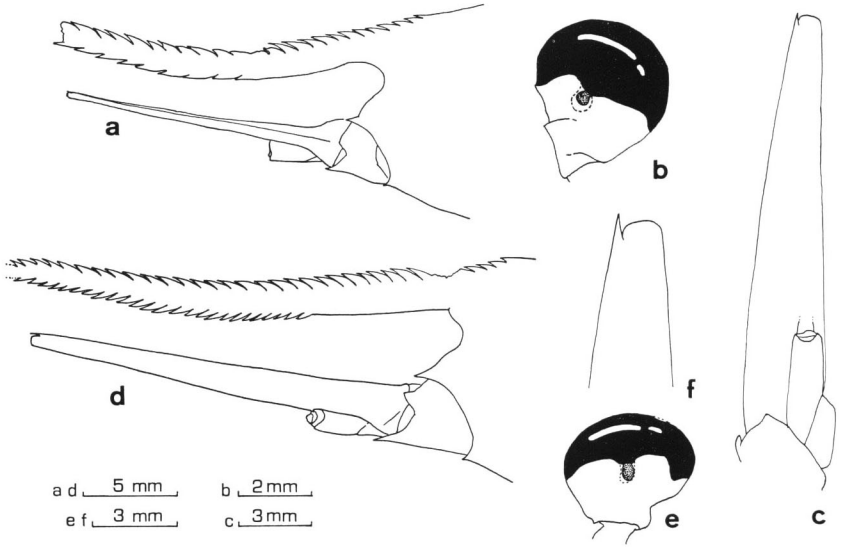

Fig. 2. *Plesionika grandis* DOFLEIN (a–c) — ♀ ovig. (18.6 mm): a, anterior part of carapace and antennal scale; b, eye, left; c, antennal scale, right.——*Plesionika quasigrandis* CHACE (d–f) —♀ ovig. (24.8 mm): d, anterior part of carapace and antennal scale; e, eye, right; f, apex of antennal scale, right.

distal. Second pereiopods of both sides subequal, 20–26 carpal articles. None of pereiopods with epipod.

Remarks. This species is very closely allied to *P. quasigrandis*. The "Soela" specimens of *P. grandis* is distinguishable from the latter by having nine or ten ventral rostral teeth placed above the antennal scale, instead of more than 20 teeth in the latter, the ocellus is nearly rounded rather than oblong-oval, the ventrolateral spine of the basicerite less developed than it is in the latter, and the orbital margin regularly concave in the posterodorsal portion rather than slightly convex.

This species is also closely related to *P. spinipes* (BATE), but in the latter species, the distolateral spine of the antennal scale is well advanced and the ventral rostral margin above the antennal scale is, so far illustrated by CHACE (1985), armed with only six teeth.

Distribution. Indonesia; Japan.

Plesionika indica DE MAN, 1917

Plesionika longipes var. *indica* DE MAN, 1917, p. 279; 1920, p. 121, pl. 10, fig. 25 a–g, pl. 11, fig. 25.
Plesionika indica: CALMAN, 1939, p. 198; CHACE, 1985, p. 70, figs. 31, 32.

Material examined. 0283–T/58, 2 ♂♂ (27.4, 28.9 mm); 0184–14, 4 ♂♂ (25.6–39.8 mm), 1 ♀ (28.0 mm), 1 ovig. ♀ (35.4 mm); 0184–19, 1 ♂ (37.4 mm), 1 ovig. ♀ (40.5 mm).

Distribution. Zanzibar; Indonesia; Philippines; South China Sea.

Plesionika lophotes CHACE, 1985

Plesionika binoculus: DE MAN, 1920, p. 134, pl. 12, fig. 30; HAYASHI & KOIKE, 1976, p. 47, fig. 1 a′–e′. (Nec *Nothocaris binoculus* BATE.)
Plesionika lophotes CHACE, 1985, p. 81, fig. 37; HAYASHI, in BABA *et al.*, 1986, pp. 135, 272, fig. 85.

Material examined. 0184–85, 2 ♂♂ (13.6, 14.0 mm), 1 ♀ (17.0 mm), 1 ovig. ♀ (16.8 mm).

Remarks. The ovigerous female of this series is probably abnormal in the number of the dorsolateral telson spines, bearing eight on the right and seven on the left sides, while in the rest specimens with complete telson, there are three pairs of spines, excluding the subterminal pair.

Distribution. Indonesia to Philippines; Japan.

Plesionika martia orientalis CHACE, 1985

(Fig. 3 a, b)

Plesionika martia orientalis CHACE, 1985, p. 84, figs. 38, 39, 53, 54.

Material examined. 0184–85, 1 ♀ (17.9 mm), 4 ovig. ♀♀ (27.5–32.0 mm); 0184–91, 2 ovig. ♀♀ (25.3, 29.6 mm); 0184–92, 1 ♂ (26.0 mm).

Description. Rostrum far overreaching antennal scale, with six or seven (range in 5–9) teeth on proximal portion. Orbital margin nearly vertical posteriorly, not concave posterodorsad. Abdomen without dorsal carina or posterodorsal spine. Sixth somite 1.79–1.87 times (mean: 1.84) as long as fifth, 2.05–2.32 times (mean: 2.17) as long as high. Pleuron of fifth somite with small spine or denticle. Telson 1.09–1.20 times (mean: 1.15) as long as sixth somite, normarlly with three pairs of dorsolateral spines, excluding subterminal pair. Antennal scale 0.88–0.94 times (mean: 0.91) as long as carapace, 4.74–5.16 times (mean: 4.97) as long as wide, distolateral spine reaching as far as end of distal margin of blade. Third maxilliped with penultimate segment 1.14–1.19 times (mean: 1.17) as long as distal segment. Second pereiopods subequal in length, with 24–31 carpal articles. Exopod of third pleopod 0.83–0.94 times (mean: 0.87) as long as carapace. Epipods on first four pereiopods.

Remarks. This species is closely related to *P. semilaevis*, but is distinguished from the latter by having the orbital margin nearly vertical posteriorly, the eye not kidney-shaped, and the third pleopodal exopod usually more than 0.8 times as long as the carapace.

Distribution. Reliable records are from Indonesia and the Philippines.

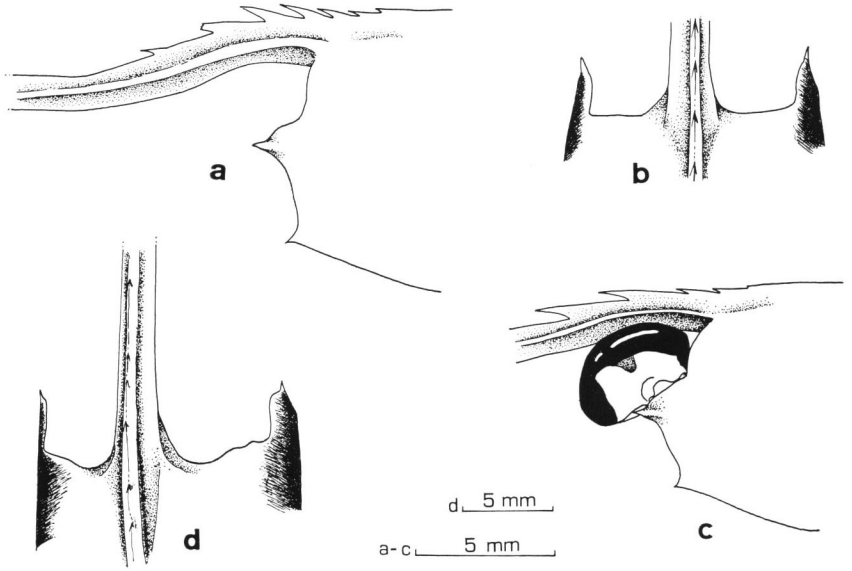

Fig. 3. *Plesionika martia orientalis* CHACE (a, b) — ♀ ovig. (29.6 mm): a, anterior part of carapace; b, same, dorsal aspect. *Plesionika semilaevis* BATE (c, d) — ♀ ovig. (21.5 mm): c, anterior part of carapace and eye — ♂ (18.9 mm); d, anterior part of carapace, dorsal aspect.

Plesionika ocellus (BATE, 1888)

(Fig. 4 a, b)

Nothocaris ocellus BATE, 1888, p. 657, pl. 114, fig. 3.
Plesionika sindoi RATHBUN, 1906, p. 915, pl. 21, fig. 4; DE MAN, 1920, p. 126, pl. 11. fig. 27.
Plesionika ocellus: CHACE, 1985, p. 90, fig. 40.

Material examined. 0184–54, 1 ♀ (15.4 mm) (NTM Cr. 002020); 0184–55, 1 ovig. ♀ (8.0 mm), 0185–66, 1 ovig. ♀ (14.1 mm).

Description. Rostrum broken off at tip, with four or five teeth posterior to orbital margin, possibly movable. Orbital margin convex, nearly vertical or slightly convex posteriorly. Abdomen without dorsal carinae and posteromedian spines. Pleuron of fourth somite rounded posteroventrally, and of fifth with spine on posteroventral margin. Sixth somite 1.80–1.85 times as long as fifth somite, about 1.8 times as long as high. Telson broken off in all specimens. Antennal scale 0.78–0.85 times as long as carapace, 4.17–5.20 times as long as wide. Stylocerite slightly overreaching dorsal arc of first segment of antennular peduncle. Third maxilliped with penultimate segment 1.24–1.33 times as long as distal. Second pereiopods of both sides subequal in length, with 18–20 carpal articles. Epipods on first four pereiopods.

Remarks. According to CHACE (1985), *P. ocellus* is most reliably distinguishable from *P. fimbriata* CHACE by the length and the form of the dactyls of the three posterior pereiopods. None of the "Soela" specimens has the complete posterior pereiopods. At this time, the definite identity of the present specimens is not clear with reliable certitude, but the orbital margin is nearly vertical posteriorly rather than regularly concave and the dorsal rostral portion posterior to the orbital

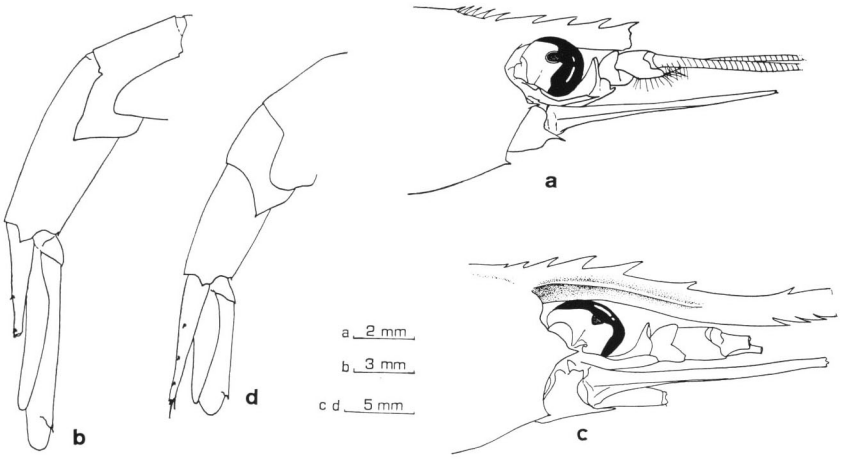

Fig. 4. *Plesionika ocellus* BATE (a, b) — ♀ ovig. (8.0 mm): a, anterior part of body; b, posterior part of body. *Plesionika parvimartia* CHACE (c, d) — ♀ ovig. (14.8 mm): c, anterior part of body; d, posterior part of body.

margin is provided with four or five teeth instead of three or four. These seem to correspond with this species, not with the latter.

Distribution. Indonesia; South China Sea; Philippines; Hawaiian Islands.

Plesionika parvimartia CHACE, 1985

(Fig. 4 c, d)

Plesionika martia var. *semilaevis*: DE MAN, 1920, p. 116 (part).
Plesionika parvimartia CHACE, 1985, p. 93, figs. 42, 43.

Material examined. 0184–18, 1 ovig. ♀ (14.5 mm).

Description. Distal part of rostrum broken off, armed with seven teeth on proximal portion, distalmost tooth arising anterior to end of first antennular peduncle. Orbital margin convex both in ventral and posterior margins. Abdomen without dorsal carina and posteromedian spine. Sixth abdominal somite 2.1 times as long as fifth somite, 2.29 times as long as high. Pleuron of fifth somite without denticle on posteroventral margin. Telson damaged.

Antennal scale damaged. Eye kidney-shaped, 0.26 times as long as carapace. Stylocerite overreaching dorsal arc of first segment of antennular peduncle. Second pereiopods of both sides subequal, with 20 right and 21 left carpal articles. Exopod of third pleopod 0.75 times as long as carapace. Epipods on first four pereiopods.

Remarks. This species is closely allied to *P. semilaevis*. In the specimen examined, the posterior pereiopods are wanting, but the distalmost tooth of the dorsal rostral series is placed far beyond the end of the antennular peduncle, and the sixth somite is proportionally slender than in the latter species, showing 2.29 times as long as high (this is the slenderest value known for *P. semilaevis* of this series). The body size as the adult seems to agree with the description by CHACE (1985), and no egg-carrying females of *P. semilaevis* less than 15 mm in carapace length occurred in the "Soela" specimens. For an additional discussion, see the "remarks" under *P. semilaevis*.

Distribution. Reliable records are from Indonesia and the Philippines.

Plesionika pumila CHACE, 1985

(Fig. 5)

Plesionika pumila CHACE, 1985, p. 100, figs. 45, 46.

Material examined. 0283–NWS–17, 1 ♂ (4.0 mm).

Remarks. The "Soela" collection is in reality the third specimen for this species. This small shrimp is characterized by the posterior teeth of the dorsal rostral series with bluntly barbed tips, which are shared by the eastern Pacific *P. mexicana* CHACE and the Hawaiian *P. exigua* RATHBUN. But this species differs from the former in the fewer rostral dorsal spines and the shorter stylocerite, and also from the latter in having epipods on anterior four pereiopods.

The specimen examined did not have the right second pereiopod fixed completely

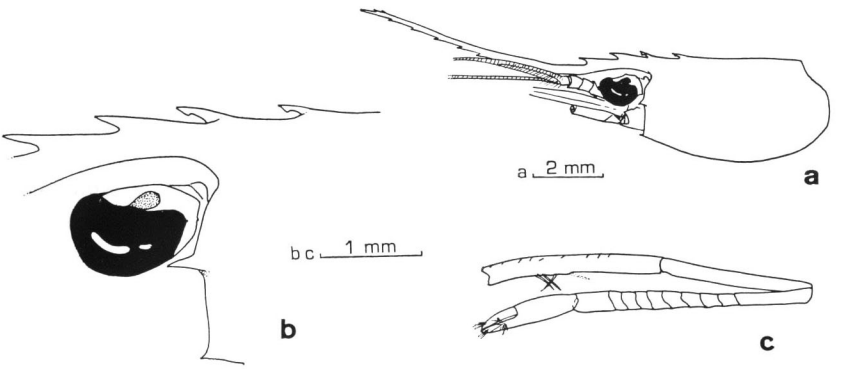

Fig. 5. *Plesionika pumila* CHACE — ♂ (4.0 mm): a, anterior part of body; b, anterior part of carapce; c, right second pereiopod.

to the body, but a leg attached to the pereiopods fits to the shrimp. It is therefore safe to conclude that *P. pumila*, as CHACE (1985) reasonably suggested, has the unequal second pereiopods. In this specimen, the left pereiopod is provided with 35 carpal articles, and the right has 10 articles.

Very recently one of us (YH) received two additional specimens of *P. pumila* from Dr. A. J. BRUCE, which were collected from the same area as this series (19°04.25′S, 119°00.65′E). One of these specimens is observed to have the complete second pereiopods, having nine carpal articles in the right leg and 27 in the left. Thus the unequal second pereiopods are undoubtedly confirmed.

Distribution. Previously only known from the Sulu Archipelago, Philippines.

Plesionika quasigrandis CHACE, 1985

(Fig. 2 d–f)

Plesionika quasigrandis CHACE, 1985, p. 104, figs. 47, 48.

Material examined. 0184–14, 1 ovig. ♀ (24.8 mm).

Description. Rostrum 1.3 times as long as carapace, with at least 44 dorsal (supposedly 47) and 37 ventral close-set teeth, including more than 20 ventral teeth situated above antennal scale. Orbital margin faintly convex on posterodorsal portion. Abdomen without dorsal carina and posterodorsal spine. Third to fifth terga faintly concave in lateral aspect. Sixth somite 1.78 times as long as fifth, 1.95 times as long as high. Pleura of fourth and fifth somites with posteroventral spine, ventral margin sinuous. Ocellus slightly oblong. Stylocerite reaching dorsal arc of first segment of antennular peduncle. Antennal scale 0.94 times as long as carapace, 4.9 times as long as wide, distolateral tooth overreaching distal margin of blade. Third maxilliped broken. Second pereiopods of both sides nearly subequal, right with 20 and left with 24 carpal articles. None of pereiopods with epipod.

Remarks. For distinction from *P. grandis*, see the "remarks" under the latter.

Distribution. Philippines.

Plesionika reflexa CHACE, 1985

Plesionika reflexa CHACE, 1985, p. 108, fig. 49; HAYASHI, in BABA *et al.*, 1986, pp. 137, 273, fig. 88.

Material examined. 0183–2, 2 ♂♂ (17.6, 20.1 mm), 1 ovig. ♀ (20.0 mm), 0184–2, 1 ♂ (18.2 mm); 0184–18, 1 ♂ (15.3 mm); 0184–27, 1 ovig. ♀ (16.5 mm).

Remarks. The "Soela" specimens agree well with the original description and illustrations of CHACE (1985), the posteromedian spine being consistently recurved upwards. HAYASHI (1986, in BABA *et al.*) mentioned that the specimen taken from Kyushu-Palau ridge is similar to the typical form of *P. ensis* (A. MILNE EDWARDS) in the structure (not mentioned in the English text; p. 273).

Distribution. Indonesia; Philippines; South China Sea; Japan.

Plesionika semilaevis BATE, 1888

(Fig. 3 c, d)

Plesionika semilaevis BATE, 1888, p. 644, pl. 113, fig. 3; CHACE, 1985, p. 113, figs. 51–54.
Plesionika martia var. *semilaevis*: DE MAN, 1920, p. 116 (part).

Material examined. 0184–2, 1 ♀ (17.4 mm), 1 ovig. ♀ (18.9 mm); 0184–6, 1 ovig. ♀ (21.5 mm); 0184–14, 2 ♂♂ (17.3, 19.0 mm), 1 ovig. ♀ (18.8 mm); 0184–16, 2 ♂♂ (20.3, 22.3 mm), 2 ovig. ♀♀ (21.0, 24.4 mm); 0184–18, 1 ♂ (18.9 mm), 1 ovig. ♀ (16.1 mm); 0184–19, 3 ♀♀ (15.6–17.3 mm), 1 ovig. ♀ (16.5 mm); 0184–76, 1 ex (11.1 mm); 0184–85, 2 ♂♂ (17.5, 17.9 mm), 1 ♀ (19.0 mm), 1 ovig. ♀ (18.4 mm); 0184–91, 2 ♂♂ (15.3, 17.6 mm), 1 ♀ (17.1 mm), 2 ovig. ♀♀ (17.9, 18.0 mm), 1 ex (15.8 mm); 0184–92, 1 ♂ (16.7 mm).

Remarks. The distinction of the species from *P. martia orientalis* is referred to the "remarks" under the latter.

CHACE (1985, p. 121) suggested that the Hawaiian population of the early concept of *P. martia* differs slightly from the Philippine-Indonesia population, though the size of the eye falls in the range of the latter.

Little doubt also remains about the identity of the Japanese population. By the kind cooperation of Prof. Tadashi KUBOTA of the Marine Biological Center, Tokai University, we were able to reexamine 32 specimens reported early by HANAMURA from Suruga Bay under the name of *P. martia*.

Comparison between these specimens and the "Soela" specimens has shown that both the population have the body size as the adult and the eye size fallen into the same range, but differ in several characters. In Suruga Bay specimens, the rostrum is armed with 6–9 dorsal teeth with mode in seven (56.3%), and the second pereiopod has 17–24 (most commonly 19–20) carpal articles, while in the "Soela" specimens the rostrum is armed with 5–8 dorsal teeth with mode in six (62.5%) and the second pereiopod has 17–24 (most commonly 19–20) carpal articles. The telson of Suruga

Bay specimens is usually shorter than the uropodal exopod (76.7% of specimens examined), but in the "Soela" specimens this value is proportionately small (34.7%).

Further, differences in some of the proportions are as follows:

Measurements	Suruga Bay specimens			"Soela" specimens		
	range	mean	s.d.	range	mean	s.d.
1) 6th somite/5th*	2.02–2.33	2.17	0.09	1.91–2.27	2.06	0.08
2) Telson/6th somite*	0.94–1.08	1.00	0.03	1.03–1.18	1.09	0.04
3) Ant. scale/carapace*	0.94–1.08	1.02	0.04	0.89–1.02	0.97	0.03
4) Ant. scale/width***	4.89–6.13	5.45	0.41	4.49–6.20	5.30	0.44
5) 3rd maxilliped penult./distal*	1.17–1.39	1.25	0.08	1.08–1.32	1.19	0.07
6) 3rd pleopodal exopod/carapace**	0.66–0.81	0.72	0.05	0.61–0.79	0.69	0.05

* Significant at 1% level. ** Significant at 5% level. *** No significant difference.

These differences appear to show a similar tendency to those observed by CHACE between the Hawaiian and the Philippine-Indonesian populations. He believed that the differences between the two populations may show the specific or subspecific significance. As our examination is limited both in the number of specimens and the geographical areas, it is not certain for the present time whether these disparities in our observations are meaningful at the specific or subspecific level rather than the geographic variability.

Through the examination of Suruga Bay specimens, we sometimes encountered several difficulties in separating some of them, especially small specimens, from *P. parvimartia*, since in some specimens, the anteriormost tooth of the dorsal rostral teeth is arising slightly beyond the end of the antennular peduncle. In three of them that spine is situated far beyond the end of the antennular peduncle, but one of the latter with the complete third pereiopod has the dactylus 0.30 (range in all specimens: 0.29–0.35) times as long as the propodus. This value is much smaller than the ratio known for *P. parvimartia*.

Distribution. Reliable records are from Indonesia and the Philippines.

Plesionika spinidorsalis (RATHBUN, 1906)

Pandalus spinidorsalis RATHBUN, 1906, p. 917, pl. 21, fig. 5.
Plesionika spinidorsalis: CHACE, 1985, p. 132, figs. 60, 61.

Material examined. 0184–23, 1 ovig. ♀ (16.0 mm); 0184–30, 2 ovig. ♀♀ (17.1, 17.4 mm); 0184–33, 1 ovig. ♀ (13.2 mm); 0184–42, 1 ovig. ♀ (14.8 mm); 0184–70, 1 ♂ (15.6 mm); 0184–76, 1 ♂ (15.1 mm), 1 ♀ (13.7 mm).

Remarks. This species is most similar to *P. bifurca*. It is distinguishable from the latter by having eight or nine teeth on the carapace instead of four or five teeth,

the pleuron of the fourth somite rounded instead of bearing such a spine on the posteroventral margin, the antennal scale with a strong distolateral tooth, distinctly overreaching the distal margin of the blade instead of a small tooth slightly overreaching the blade, the exopod of the uropod shorter than the endopod instead of the subequal endopod and uropod, and the body somewhat compressed instead of being subcylindrical.

Distribution. Indonesia; Philippines; South China Sea; Hawaii.

Plesionika unidens BATE, 1888

Plesionika unidens BATE, 1888, p. 648, pl. 113, fig. 4; DE MAN, 1920, p. 129, pl. 11, fig. 28 a, b, pl. 12, fig. 28; CHACE, 1985; p. 134; HAYASHI, in BABA *et al.*, 1986, pp. 139, 274, fig. 90.

Material examined. 0184–83, 2 ovig. ♀♀ (ca. 13, 13.7 mm).

Remarks. In the available specimens, the third abdominal somite is carinated dorsally, forming an obtuse tooth-like projection near mid-length. But this condition is variable depending on individuals, since both of the rounded and the carinated forms have been observed by some early workers.

Distribution. Admiralty Islands; Andaman Sea; Bay of Bengal; Indonesia; Philippines; Japan.

Biogeographical Notes

As mentioned elsewhere, all the species and subspecies recorded in this paper, viz., one species of *Chlorotocella*, one species of *Chlorotocus*, five species of *Heterocarpus*, and thirteen species of *Plesionika* are newly added to the northwest Australian shelf fauna. Of these, six *Plesionika* species are described very recently from Indonesian-Philippine waters by CHACE (1985). It is definitely said that the sea in question has hitherto been unexploited at all.

The known geographical ranges of the species dealt herewith are summarized in Table 2. It is remarkable that 1) all the species from the northwest Australian shelf are known from the western Pacific, 2) the western Indian Ocean is represented only by eight species, three of which are recorded from the eastern Atlantic, and 3) no species so far known extends their distribution to the western Atlantic and also to the eastern Pacific. The Atlantic elements of the benthic decapod crustacean fauna markedly differ from those of the Indo-Pacific region, and each area shows a characteristic faunal composition. The geographical pattern of pandalid shrimp seems to be quite similar to that of the benthic decapod crustaceans, but in pelagic shrimp several species are commonly distributed throughout the Atlantic and Indo-Pacific Oceans.

Table 2. Known records of northwest Australian shelf Pandalidae.

W. Atlantic	E. Atlantic*	W. Indian Ocean	N.W. Australian Shelf	W. Pacific	Hawaii	E. Pacific
			Chlorotocella gracilis	○		
	○	○	*Chlorotocus crassicornis*	○		
		○	*Heterocarpus dorsalis*	○		
		○	*H. gibbosus*	○		
	○	○	*H. laevigatus*	○	○	
	○	○	*H. sibogae*	○		
		○	*H. woodmasoni*	○		
		○	*Plesionika bifurca*	○		
			P. grandis	○		
		○	*P. indica*	○		
			P. lophotes	○		
			P. martia orientalis	○		
			P. ocellus	○	○	
			P. parvimartia	○		
			P. pumila	○		
			P. quasigrandis	○		
			P. reflexa	○		
			P. semilaevis	○		
			P. spinidorsalis	○	○	
			P. unidens	○		

* Including Mediterranean Sea.

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