

## *Lysmata dispar* sp. nov., a new shrimp from the Dampier Archipelago, Western Australia, with notes on other species of the family Hippolytidae (Crustacea: Decapoda: Caridea)

Ken-Ichi Hayashi

13-7 Yoshimi-Ryuohcho, Shimonoseki, Yamaguchi, 759-6522 Japan.

email: hayadomus@jcom.home.ne.jp

**Abstract** – A new species, *Lysmata dispar*, was found from a collection of shrimps from the Dampier Archipelago. It bears an unequal second pair of pereopods, with the carpus having more than 30 subsegments, and a comparatively long stylocerite. The combination of these characters distinguishes *L. dispar* immediately from all known species. A full description of this species and a list of a further eight species of seven genera of the family Hippolytidae, with short notes on three members new to Australian waters, is presented.

### INTRODUCTION

The hippolytid genus *Lysmata* has recently been reviewed several times and contains about 30 species from worldwide tropical to warm-temperate regions (Chace, 1997; Wicksten, 2000a, b; Burukovsky, 2000). Chace (1997) presented a list of 25 species known at that time with a key to all of them. Wicksten (2000a, b) enlarged this genus, including four new species from the East Pacific, with a key to eight eastern Pacific species. About one-third of the known species are described from the Indo-West Pacific region (Chace, 1997). Of these, the following three have been recorded from Australian waters (Davie, 2002), *L. amboinensis* (De Man, 1888), *L. ternatensis* De Man, 1902, and *L. vittata* (Stimpson, 1860).

Among the samples of a survey of the Dampier Archipelago, carried out by the Western Australian Museum, three species of this genus were found. Two are the well-known species, *L. multiscissa* (Nobili, 1904) and *L. vittata*. The third is a new species, somewhat related to *L. multiscissa*, but bearing an unequal second pair of pereopods, with a carpus with more than 30 subsegments, and a comparatively long stylocerite. These characters immediately distinguish this species from all the known species.

The present paper describes this new species in detail, with figures, and briefly introduces new members of the hippolytids to Australian waters, as well as a list of other species collected from the Dampier Archipelago.

### MATERIALS AND METHODS

The specimens examined are all deposited at the Western Australian Museum (WAM). The specimen

size is measured as carapace length (CL), from the posterior margin of the orbit to the posterior margin of the carapace. Other abbreviations are as follows: juv.(s), juvenile(s); ovig. ovigerous; stn, station. Species with an asterisk (\*) are new to the Australian fauna

### SYSTEMATICS

#### *Lysmata dispar* sp. nov.

Figures 1-3

#### Material examined

##### *Holotype*

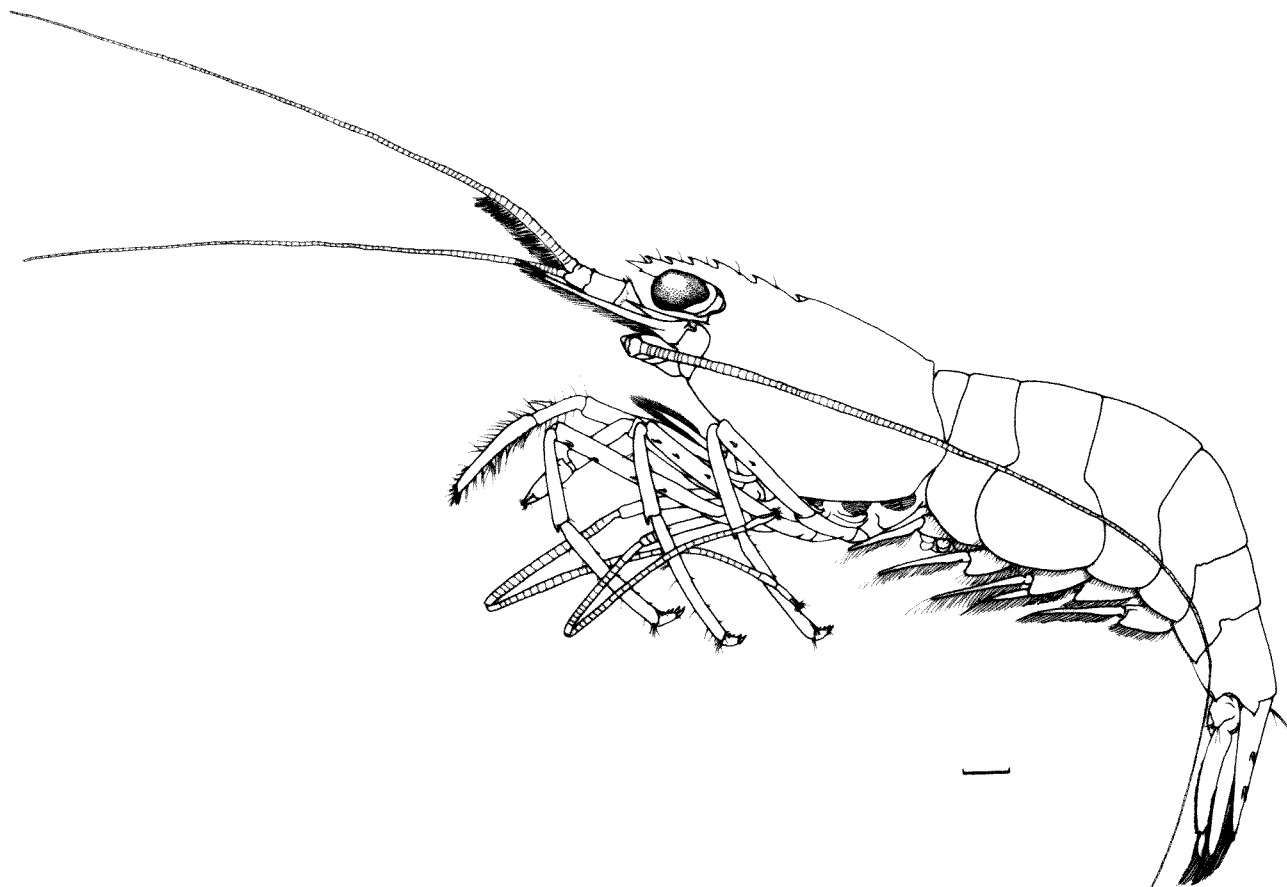
WAM C 29212 (ovig. female, 4.9 mm), stn DA3/99/48, Goodwyn I. (20°32.000'S, 116°32.420'E), intertidal, 31.08.1999.

##### *Paratypes*

WAM C 29553 (1 male, 4.6 mm; 1 ovig. female, 5.4 mm), data same as holotype; WAM C 28089 (1 male, 4.1 mm), stn DA3/99/65, Enderby I. (20°37.10'S, 116°26.72'E), dive, 13-15 m, 06.09.1999.

#### Diagnosis

Rostrum not overreaching antennular peduncle, rostral formula 2+4/2. Carapace with prominent antennal spine discrete from orbital angle, and with small pterygostomial spine. Orbital angle visible in dorsolateral view as distinct, blunt process. Antennule with stylocerite reaching nearly to distolateral margin of first antennular segment, dorsal flagellum with very short, single joint of accessory branch. Antennal scale 3.2 times as long as wide, distolateral spine slightly overreaching blade. Third maxilliped with exopod reaching



**Figure 1** *Lysmata dispar* sp. nov.: holotype (ovig. female, CL 4.9 mm), from Goodwyn Island.

beyond midlength of antepenultimate segment. First pereopod with chela 1.1 times as long as carpus. Right second pereopod longer and larger than left second pereopod; carpus composed of 30 or 32 subsegments in both sides; merus composed of 21–26 subsegments in right leg, 17–22 subsegments in left leg; ischium composed of 5 subsegments in both sides. Third pereopod with dactylus biunguiculate, with 3 spines on posterior margin. Maximum postorbital carapace length 4.1–4.6 mm in males, 4.9–5.4 mm in ovigerous females.

### Description

Moderate sized shrimp with firm antennular and antennal flagella (Figure 1). Carapace smooth with strong antennal and small, acute pterygostomial spines (Figure 2b); suborbital angle rectangle curved medially; anterior margin largely concave just below antennal spine, continuing straight ventrally to pterygostomial spine (Figure 2c). Rostrum nearly straight, with developed midrib, reaching end of first segment of antennular peduncle; apex sharp (Figure 2b). Dorsal margin slightly convex, with six subequal spines, posterior most tooth with faint suture at base and rather far from other fixed teeth; posterior two teeth on carapace and third tooth just above orbit; short seta present on small step at nearly mid length between

succeeding two teeth from second (Figure 2b). Ventral margin sinuous, with two or three teeth on distal convex part, tuft of hairs on basal concave part (Figure 2b).

Abdomen smooth, third and fourth somites subequal, longest, and first and fifth somites subequal, shortest; sixth somite 1.8–1.9 times as long as fifth somite and 1.1 times as long as deep at base (Figure 2d). Pleura of first to third somites rounded; small spine occasionally present on that of fourth somite and always distinct sharp spine on fifth somite (Figure 2d, e). Telson tapered, and flattened dorsally, with two pairs of dorsolateral spines, proximal pair situated at proximal two-fifths, distal pair at mid length between proximal pair and distal margin of telson (Figure 2f). Distal margin convex with small median point; two pairs of spines, outer short and inner long, and one pair of long plumose setae present (Figure 2g).

Eye well developed, cornea semispherical, placed obliquely on short stalk; ocellus absent (Figure 2a, h). Antennular peduncle long, stout, first segment longer than second and third segments combined, with two-four short marginal spines, unarmed ventrally, dorsomedial margin expanded forward; second segment slightly longer than third segment with two or three marginal spines. Stylocerite pointed anteriorly, reaching nearly to outer distal

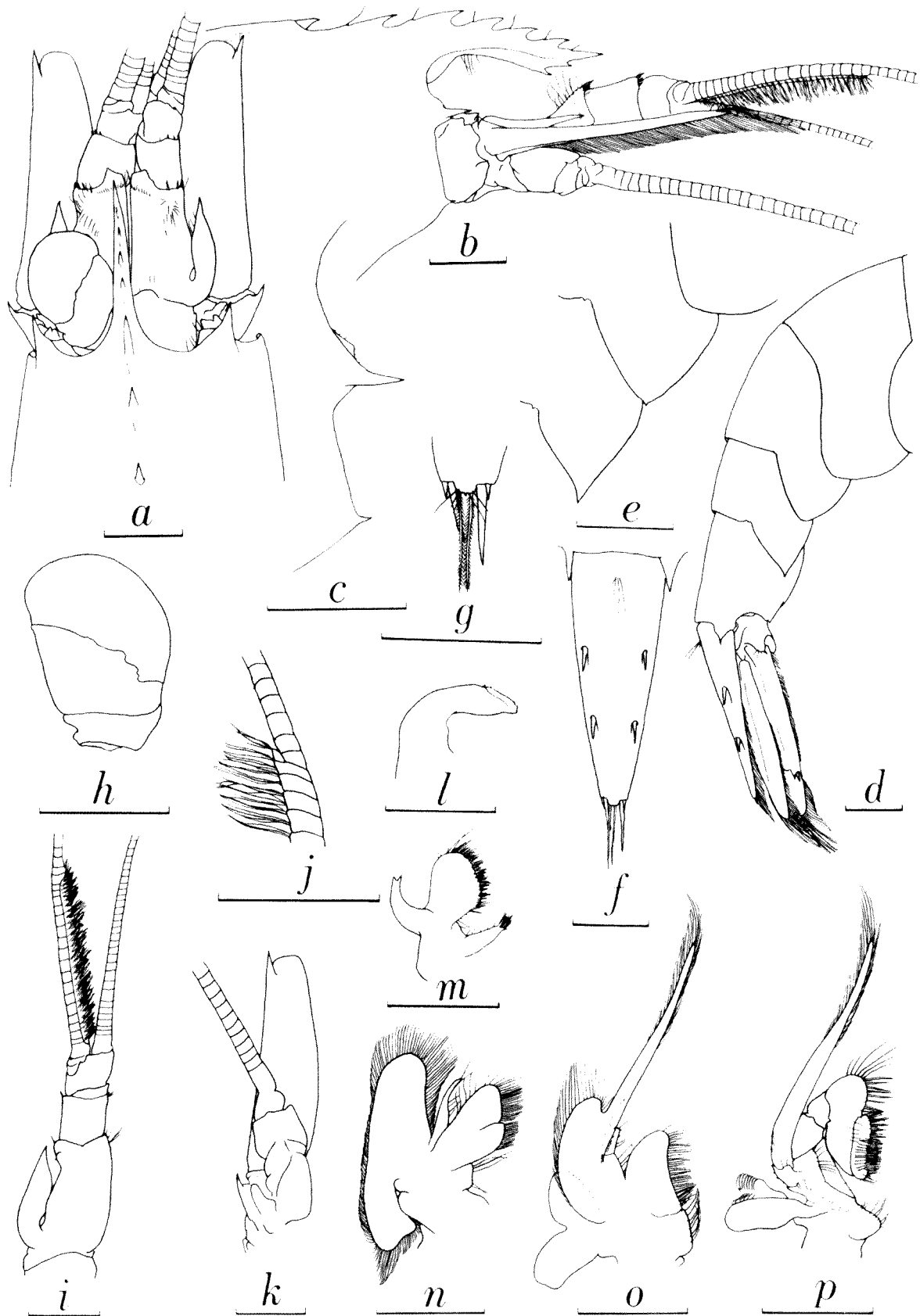


Figure 2 *Lysmata dispar* sp. nov.: a-d, f-p, holotype (ovig. female, CL 4.9 mm); e, paratype (ovig. female, CL 5.4 mm). a, anterior part of body, right eye removed, dorsal view; b, same, lateral view; c, anterior margin of carapace, oblique view; d, abdomen, lateral view; e, pleura of third to fifth abdominal somites, lateral view; f, telson, dorsal view; g, distal end of telson, dorsal view; h, right eye, dorsal view; i, right antennule, ventral view; j, accessory branch of right outer antennular flagellum, mesial view; k, right antenna, ventral view; l, left mandible; m, left maxillule; n, left maxilla; o, left first maxilliped; p, left second maxilliped. Scales 1.0 mm.

margin of first antennular segment (Figure 2i). Outer flagellum longer than body, slightly thickened basal 18–20 joints bearing tufts of dense setae; accessory flagellum very short, consists of only one joint (Figure 2j); inner flagellum as long as outer flagellum, slightly slender. Second antenna with stout scale, extending beyond distal end of antennular peduncle, 3.2–3.3 times as long as wide; outer margin nearly straight or slightly concave, ending in large spine; blade shorter than outer distal spine (Figure 2a, k). Basicerite short, with blunt spine on outer distal margin; carpocerite short, nearly as long as distal margin of first antennular peduncle (Figure 2b, k); flagellum stout and longer than body.

Mouth parts typical for genus (Figures 2l–p, 3a). Mandible comparatively small, consisting of molar process only, with oblique distal edge (Figure 2l). Palp of maxillule feebly bilobed, upper lacinia broad oval, with short setae marginally; lower lacinia slender and short with spinous setae distally (Figure 2m). Palp of maxilla slender, extending as far as level of distal end of distal endite, with two distal setae; scaphognathite well developed, densely setose marginally; distal endite well developed, deeply bilobed, both lobes densely setose medially; proximal endite feebly developed, simple, sparsely with long setae (Figure 2n). First maxilliped with three segmented palp, extending beyond level of distal margin of caridean lobe; exopod well developed, with large caridean lobe; distal and proximal endites simple, densely setose marginally; epipod large, deeply bilobed (Figure 2o). Second maxilliped composed of five distinct segments, distal segment narrow, articulated with lower distal part of second segment, armed with some spinous setae and dense marginal setae; second segment with some rather long spinous setae and sparsely long setae; exopod well developed as in first maxilliped; epipod suboval with well lamellate podobranch (Figure 2p). Third maxilliped pediform, overreaching distal end of antennular peduncle by distal segment; distal segment tapering densely setose, with three to seven spines distodorsally; penultimate segment short, nearly half as long as distal segment, sparsely setose; proximal segment as long as distal two segments combined, distal two-thirds triangular in cross section, sparsely with line of long setae on each margin; exopod long, reaching distal third of proximal segment; strap like epipod with terminal hook on crescent plate of basal segment (Figure 3a).

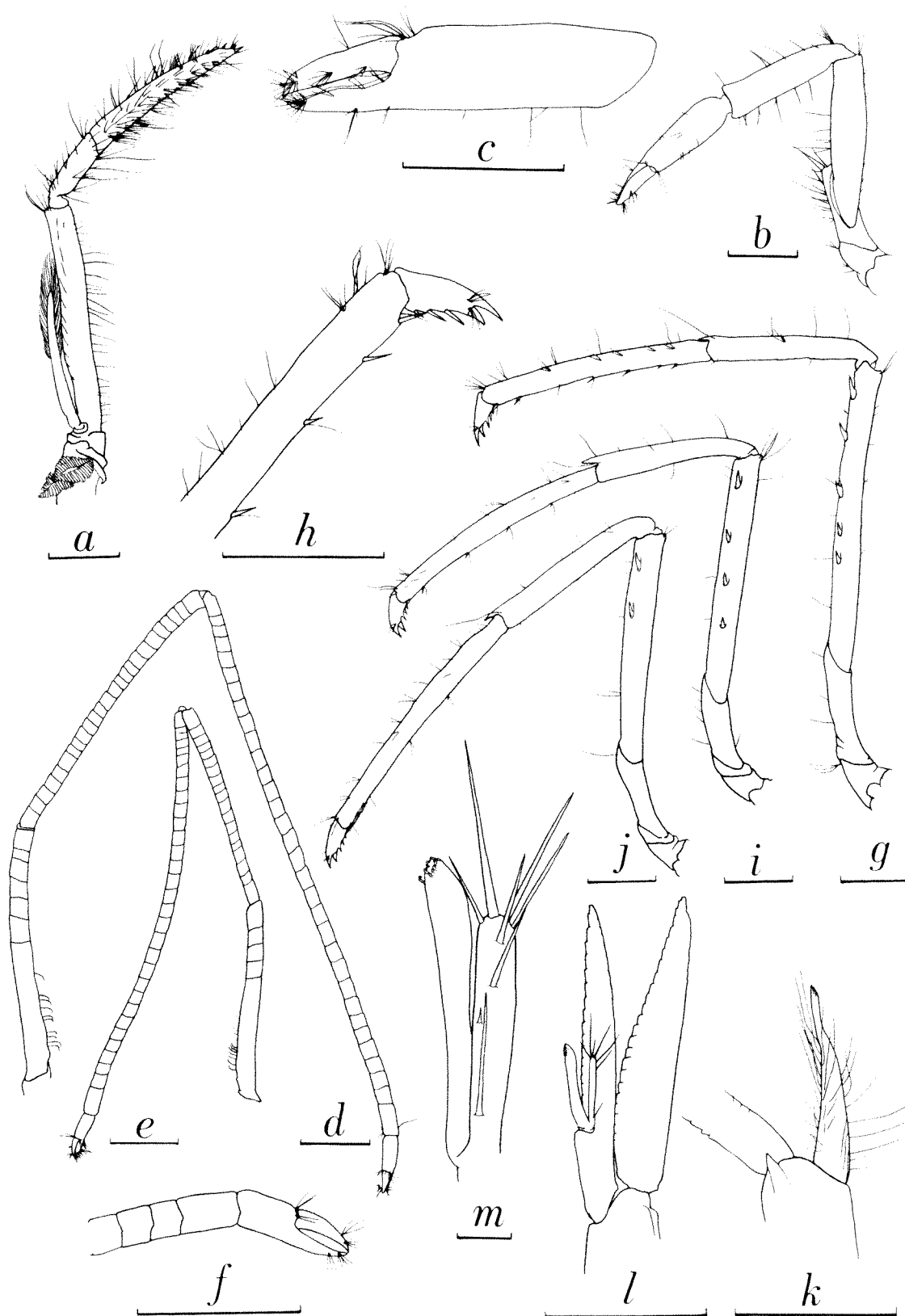
First pereopod moderately robust, overreaching antennular peduncle by chela or chela and part of palm (Figure 3b); chela slightly compressed, fingers 0.6 times as long as palm; cutting edges concave proximally making narrow gap when fingers closed; palm smooth, subcylindrical (Figure 3c); carpus cylindrical, 0.9 times as long as chela length;

merus 1.3 times as long as carpus, very obliquely articulated with ischium; epipod strap like as in third maxilliped. Second pereopods long and slender, distinctly unequal in length, right leg longer and more robust than left (Figure 3d, e). Right leg overreaching antennal scale or antennular peduncle by mero-carpal articulation, chela small, cutting edges entire (Figure 3f); carpus slender, long, nine times as long as chela length, composed of 31 or 32 subsegments; merus about half as long as carpus, 21–26 subsegments; ischium slightly shorter than merus, five subsegments (Figure 3d). Left leg overreaching distal margin of first antennular segment by mero-carpal articulation, chela smaller but similar in shape to right one; carpus more than nine times as long as chela, composed of 30 or 31 subsegments, 0.7 times as right leg; merus half as long as carpus, 17–22 subsegments, 0.7 times as long as right leg; ischium as long as merus, five subsegment, 0.8 times as long as right leg (Figure 3e).

Third pereopod moderately robust, reaching beyond antennal scale or antennular peduncle by mero-carpal articulation; dactylus compressed, ending in strong claw with four spines on posterior margin (Figure 3h); propodus about four times as long as dactylus, armed with five or six spines on posterior margin; carpus 0.8 times as long as propodus, two very small spines on posterior margin; merus 1.6 times as long as carpus, four or five large spines on distal three-fifths of lateral surface; ischium obliquely articulated with merus, 0.25 times as long as merus, unarmed (Figure 3g).

Fourth pereopod similar in shape to third pereopod, but each segment slightly shorter than that of third pereopod, reaching distal margin of eye by mero-carpal articulation; dactylus same as in third pereopod; propodus with four-six spines on posterior margin; carpus 0.8 times as long as propodus with one or two very small spines on posterior margin; merus 1.5 times as long as carpus, with four or five lateral spines on anterior three-fourths (Figure 3i). Fifth pereopod similar in shape to two preceding pereopods, reaching anterior margin of carapace by mero-carpal articulation; propodus longer than those of two preceding pereopods, with three or four tufts of setae distoposteriorly and one or two spines on posterior margin; carpus as long as that of third pereopod, unarmed; merus distinctly shorter than that of fourth pereopod, with two-four lateral spines (Figure 3j).

First pleopod with endopod tapered, 0.7 times as long as exopod, distally naked, other parts densely setose in ovigerous females; in males endopod tapered, but slightly expanded distally with some coupling hooks (Figure 3k). Second to fifth pleopods equally biramous, endopod with appendix interna in both sexes; in males endopod



**Figure 3** *Lysmata dispar* sp. nov.: a, holotype (ovig. female, CL 4.9 mm); b-j, paratype (ovig. female, CL 5.5 mm); k-m, paratype male (CL 4.6 mm). a, left third maxilliped, lateral view; b, left first pereopod, lateral view; c, chela of right first pereopod, ventral view; d, right second pereopod, lateral view; e, left second pereopod, lateral view; f, chela of left second pereopod, ventral view; g, left third pereopod, lateral view; h, dactylus and distal part of propodus of left third pereopod, lateral view; i, left fourth pereopod, lateral view; j, left fifth pereopod, lateral view; k, endopod of right first pleopod, posterior view; l, right second pleopod, setae omitted, anterior view; m, same, appendices masculina and interna. Scales a-l, 1.0 mm, m, 0.1 mm.

of second pleopod with slender appendix masculina, with six long simple setae distally, one short seta mid length, one long simple seta proximally; appendix interna longer than corpus of appendix masculina (Figure 3l, m).

Uropod longer than telson, outer margin of exopod straight, setose, ending in two small fixed spines with one rather long movable spine between them; diaeresis well marked.

Eggs numerous and small, 0.45 x 0.70 mm.

### Distribution

Known from the type locality, Goodwyn Island, and Enderby Island, Dampier Archipelago, intertidal to depths of 13–15 m.

### Color in life

Not reported.

### Etymology

The specific epithet, Latin *dispar* means unequal, in reference to the characteristic unequal second pair of pereopods.

### Remarks

The genus *Lysmata* Risso, 1816 is divided into two species groups on the basis of the outer antennular flagellum having a distinct accessory branch in one group, or accessory branch absent or with no more than two free joints in the other group (Chace, 1997; Wicksten, 2000b), though Holthuis (1947; 1993) recognized them as two separate genera. The new species belongs to the latter group, which was referred to the genus *Hippolysmata* Stimpson, 1860 by Holthuis (1947; 1993). Chace (1997) included 17 species in this group, although he did not recognize the genus and Wicksten (2000b) added two new species in this group.

The present new species is closely related to *L. olavoi* Fransen, 1991, known from the Azores, in having an unequal second pair of pereopods with a carpus of more than 30 subsegments, and a rather long stylocerite reaching nearly to the distolateral margin of the first antennular peduncle. Some species of the genus are considered to have the second pair of pereopods not strictly equal, but subequal. For instance, in a redescription of a specimen from the type locality, Hong Kong, of *L. vittata*, Bruce (1990) showed the right leg slightly longer than the left, and the carpal segmentation a little more numerous in the right leg. In *L. olavoi*, the right leg is considerably longer than the left leg. The carpus, merus and ischium of the right leg, however, have only one-four more subsegments than the respective segment of the left leg (Fransen, 1991). In the present new species the right leg is longer and larger than the left leg without exception and each segment of the right leg is 1.2–1.4 times

longer than the respective segment of the left leg. The numbers of carpal and ischial subsegments of the right side are not evidently different from those of the left side, but the meral subsegments differs considerably; the right leg has four-seven more subsegments than the left. The unequal length and size of the second pereopods are more prominent in the present new species than in *L. olavoi*.

The rostral teeth and the spine arrangement of the meri of the third and fourth pereopods differ in the two species. There are three rostral teeth on the carapace in *L. olavoi*, while only two in the new species. The meral spines of the third and fourth pereopods are double rows, one on the lateral surface and the other on the posterior margin in *L. olavoi*, and only one row on lateral surface in the new species. *Lysmata olavoi* is not a littoral species but a representative of rather deep waters of the eastern Atlantic Ocean.

*Lysmata morelandi* (Yaldwyn, 1971), known from New Zealand waters, has more than 30 subsegments of the carpus of the second pereopods and a relatively long stylocerite. It, however, differs from the present new species in the absence of the pterygostomial spine and by harbouring double rows of meral spines on the third and fourth pereopods as in *L. olavoi*.

*Lysmata amboinensis* (De Man, 1888), *L. ternatensis* De Man, 1902 and *L. vittata* (Stimpson, 1860) have previously been recorded from Australia (Davie, 2002). During the present survey, *L. multiscissa* (Nobili, 1904) was newly collected from the Dampier Archipelago, as mentioned below. The present new species, therefore, is the fifth species of *Lysmata* known from Australian waters. It is readily distinguished from the other species by the following characters: *L. ternatensis* bears a long accessory branch on the upper antennular flagellum, and the other three species have a short stylocerite, reaching at most the mid length of the first antennular segment, and they have few articles on the accessory branch of upper antennular flagellum or this is absent. *Lysmata amboinensis* and *L. vittata*, moreover, have less than 25 subsegments of the carpus of second pereopods.

Other hippolytids collected from the Dampier Archipelago during the survey are as listed below. The species with an asterisk are new to the Australian fauna and briefly introduced.

### *Gelastocaris paronae* (Nobili, 1905)

#### Type locality

Zanzibar (Nobili, 1905).

#### Material examined

WAM C 28062 (1 male, 2.9 mm), stn DA3/99/41, S of Norbill Bay, NE of Georgeff Reefs (20°29.24'S,

116°36.97'E), dive, 1–4 m, 28/29.08.1999; WAM C 28063 (1 female, 2.4 mm), stn DA3/99/41, S of Norbill Bay, NE of Georgeff Reefs (20°29.24'S, 116°36.97'E), dive, 1–4 m, 28/29.08.1999; WAM C 28090 (2 males, 2.2, 2.6 mm; 1 ovig. female, 4.4 mm), stn DA3/99/65, Enderby I. (20°37.10'S, 116°26.72'E), dive, 13–15 m, 06.09.1999.

#### Distribution

Wide ranging through the Indo-West Pacific region, from Mozambique to New Caledonia (Chace, 1997). In Australia, Cape Jaubert, N.W. Australia (Balss, 1921), Flat-Top Bank, Timor Sea (Bruce, 1994).

#### *Latreutes mucronatus* (Stimpson, 1860)

#### Type locality

Hong Kong (Stimpson, 1860).

#### Material examined

WAM C 26530 (1 male, 2.0 mm), stn DA3/99/51, Enderby I. (20°35.20'S, 116°30.91'E), shore, intertidal, 01.09.1999; WAM C 28059 (1 female, 1.8 mm), stn DA3/99/68, Nelson Rocks (20°27.98'S, 116°39.73'E), dive, 6.5 m, 07.09.1999.

#### Distribution

Wide ranging through the Indo-West Pacific region, from the Red Sea and South Africa to Indonesia (Chace, 1997). In Australia, Cape Jaubert, N.W. Australia (Balss, 1921), Flat-Top Bank, Timor Sea (Bruce, 1994). Gurney (1937) referred a fourth zoea collected from Great Barrier Reef to this species with some hesitation.

#### \**Lysmata multiscissa* (Nobili, 1904)

#### Type locality

Djibouti, Red Sea (Nobili, 1904).

#### Material examined

WAM C 29208 (1 male, 4.8 mm), stn DA2/99/82, Kendrew I. (20°27.57'S, 116°32.35'E–20°27.18'S, 116°32.29'E), rake box dredge, 32–36 m, 25.07.1999.

#### Remarks

The present specimen is a young male, and somewhat resembles the new species *L. dispar* in having only one joint of the accessory branch of the outer antennular flagellum, and the carpus of the second pereopod with 31 subsegments (the left leg is missing). It has a long rostrum, extending beyond the distal end of the antennular peduncle. The dorsal margin is provided with 8 teeth and the ventral margin with 5 teeth. The stylocerite is short, not reaching the midlength of the first antennular

segment. These characters distinguish *L. multiscissa* from *L. dispar*.

#### Distribution

Red Sea (Nobili, 1904; Balss, 1915) and New Caledonia (Monod, 1969), at a depth of 35 m. *Lysmata multiscissa* is a new member of the Australian fauna.

#### *Lysmata vittata* (Stimpson, 1860)

#### Type locality

Hong Kong (Stimpson, 1860).

#### Material examined

WAM C 25692 (1 ovig. female, 6.0 mm), stn DA1/98/31, Searipple Passage (20°31.23'S, 116°51.18'E), shore, intertidal, 28.10.1998.

#### Distribution

Widely ranging throughout the Indo-West Pacific region, from Eastern Africa to Philippines and Indonesia at a depth of 54 m (Chace, 1997). In Australia, Dirk Hartog Island, W. Australia (Hale, 1929), Low Isles, Great Barrier Reef (McNeill, 1968), Moreton Bay, Queensland (Wadley, 1978), Bullocky Point, Darwin, Northern Territory (Bruce, 1983).

#### \**Lysmatella prima* Borradaile, 1915

Figure 4a–c

#### Type locality

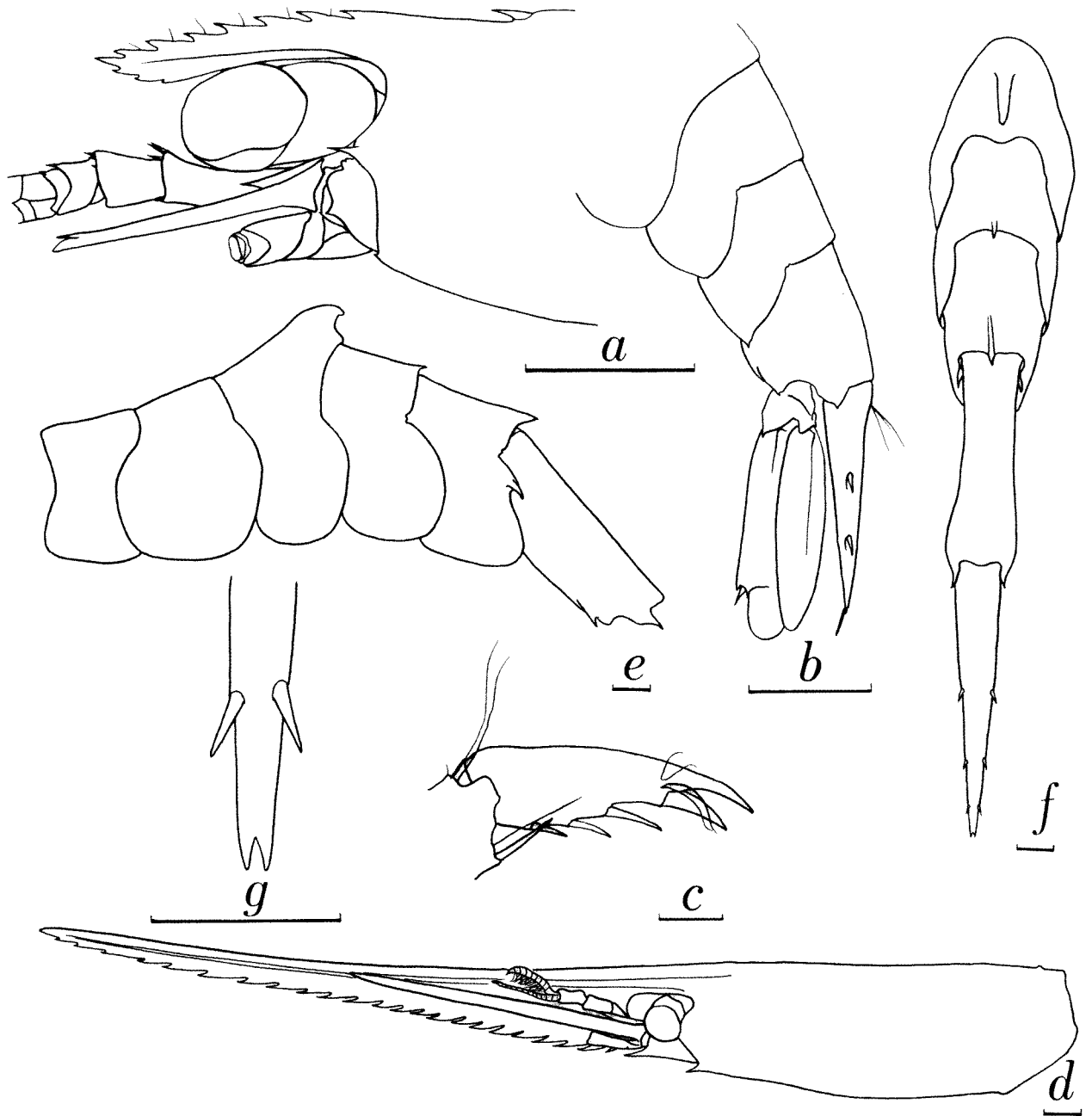
Maldives (Borradaile, 1915).

#### Material examined

WAM C 29207 (1 male, 2.8 mm), stn DA2/99/85, Brigadier I. (20°26.38'S, 116°39.76'E–20°26.09'S, 116°40.10'E), rake box dredge, 28–29 m, 26.07.1999; WAM C 29206 (1 female, 2.2 mm), stn DA2/99/13, Haüy I. (20°26.52'S, 117°00.50'E – 20°26.27'S), 117°00.56'E, rake box dredge, 19.5 m, 16.07.1999; WAM C 27549 (1 male, 4.1 mm), stn DA3/99/56, Eaglehawk I. (20°38.94'S, 116°26.22'E), 2–11 m, 03.09.1999.

#### Remarks

The genus *Lysmatella* Borradaile, 1915 is very similar to the genus *Lysmata* in general body form. The pereopods, however, are entirely devoid of an epipod in *Lysmatella*, but the first four pereopods are provided with the epipod in *Lysmata*. *Lysmatella prima* is the only known species of the genus. Three specimens examined are all young, and some characters differ from those of the adults as partly pointed out by Holthuis (1947). The rostrum over-reaches the antennular peduncle and also the antennal scale, and are armed with 8–11



**Figure 4** *Lysmatella prima* Borradaile, 1915: **a, c**, (female, CL 2.2 mm); **b**, male (CL 2.8 mm). *Tozeuma armatum* Poulson, 1875: **d-g**, (ovig. female, CL 9.9 mm). **a, d**, anterior part of body, setae omitted, lateral view; **b**, posterior part of abdomen, setae omitted, lateral view; **c**, dactylus of third right pereopod, lateral view; **e**, abdomen, setae omitted, lateral view; **f**, third to sixth abdominal somites and telson, dorsal view; **g**, distal end of telson, dorsal view. Scales **a, b, d-g**, 1.0 mm, **c**, 0.1 mm.

teeth on the dorsal margin and 5–9 teeth on the ventral margin in adults (Borradaile, 1915; Kemp, 1916; Holthuis, 1947; Zarenkov, 1971; Hayashi, 1994a; Chace, 1997). In the present material, however, the rostrum is short, not reaching the distal end of the second antennular peduncle and armed with 6–8 teeth on the dorsal margin and only two teeth on the ventral margin (Figure 4a). The pleura of the fourth and fifth abdominal somites are sharply pointed in adults (Borradaile, 1917;

Hayashi, 1994a; Chace, 1997), but the spine on the fourth pleuron is weak or entirely absent in the present material (Figure 4b). The dactylus of the third pereopod changes shape with growth. In adults the distal claw is extremely slender, much narrower than the second spine on the posterior margin (Chace, 1997), but in the present material the size of the distal claw is as large as or not extremely more slender than the second spine (Figure 4c).



**Distribution**

Maldive and Andaman Islands, Japan, Philippines, and Indonesia, to a depth of 62 m (Chace, 1997). New to Australian waters.

***Saron marmoratus* (Olivier, 1811)****Type locality**

Australia (Olivier, 1811).

**Material examined**

WAM C 28066, (2 males, 4.8, 3.6 mm), stn DA3/99/42, Georgeff Reef (20°29.34'S, 116°36.80'E), shore, intertidal, 28.08.1999.

**Distribution**

This species is one of the most common hippolytids living associated with coral reefs throughout most of the Indo-West Pacific region (Holthuis, 1947; Chace, 1997). A full synonymy and Australian records of the old literature were listed by Holthuis (1947). Subsequently, the species was reported from the following localities; Low Isles, Great Barrier Reef (McNeill, 1968), Dudley Point, Darwin, Northern Territory (Bruce, 1983).

***Thor paschalis* (Heller, 1862)****Type locality**

Red Sea (Heller, 1862).

**Material examined**

WAM C 25878 (1 ovig. female, 2.0 mm), stn DA1/98/10, Angel I. (20°28.41'S, 116°48.48'E), shore, 0–2 m, 20.10.1998; WAM C 28051 (1 ovig. female, 2.0 mm), stn DA3/99/36, Malus I. (20°30.06'S, 116°40.58'E), 6–14 m, 27.08.1999; WAM C 28053 (1 ovig. female, 1.9 mm), stn DA3/99/37, Malus I. (20°30.61'S, 116°40.92'E), 2.0–3.5 m, 27.08.1999; WAM C 28071 (1 male, 1.5 mm; 2 ovig. females, 1.9, 2.0 mm), stn DA3/99/48, Goodwyn I., (20°32.000'S, 116°32.420'E), intertidal, 31.08.1999; WAM C 28075 (1 male, 1.3 mm; 1 ovig. female, 2.2 mm; 1 female, 2.0 mm; 2 juvs 1.0, 0.8 mm), stn DA3/99/51, Enderby I. (20°35.20'S, 116°30.91'E), shore, intertidal, 01.09.1999; WAM C 28088 (1 ovig. female, 2.0 mm), stn DA3/99/64, West Lewis I. (20° 36.66"S, 116° 36.94"E), 2.0–5.0 m, rock, 06.09.99; WAM C 25880 (1 male, 1.1 mm; 2 ovig. females, 2.1, 1.7 mm; 2 juvs, 1.2, 1.3 mm), stn DA3/99/68, Nelson Rocks, (20°27.98'S, 116°39.73'E), dive, 6.5 m, 7.09.1999.

**Distribution**

*Thor paschalis* is a small species, living throughout the Indo-West Pacific region (Holthuis, 1947), though with some confusion about the synonymy (Chace, 1997). In Australia: Low Isles,

Great Barrier Reef (McNeill, 1968), Dudley Point, Darwin, Northern Territory (Bruce, 1983), Lord Howe Island (Bruce, 1985).

**\**Tozeuma armatum* Paulson, 1875**

Figure 4d–g

**Type locality**

Red Sea (Paulson, 1875).

**Material examined**

WAM C 29223 (1 ovig. female, 9.9 mm), stn DA3/99/68, Nelson Rocks (20°27.98'S, 116°39.73'E), dive, associated with gorgonian, 6.5 m, 7.09.1999.

**Remarks**

The present species is characterized by the smooth, hirsute integument, no supraocular tooth, 10–30 teeth on the ventral margin of the rostrum and a single large curved tooth on the third to fifth abdominal somites (Chace, 1997). The present specimen is a full-grown, nearly complete female. The rostrum is 1.7 times as long as the carapace, and armed with 24 teeth along the entire ventral margin (Figure 4d). The dorsal carina of the third abdominal somite is posteriorly high, terminating in a single curved tooth. The fourth and fifth somites are also carinate, each ending in a small tooth, the tooth on the fourth somite is smaller (Figure 4e, f). The pleuron of the fifth abdominal somite is armed with an acute ventrally curved tooth near the upper distal corner. As indicated by Chace (1997), the distal end of the telson is cleft (Figure 4g). Eggs are numerous and small, 0.45 x 0.63 mm. The present specimen agrees with Chace's (1997) diagnosis of *T. armatum* in these characters. There, however, are some discrepancies between them. The dorsal carina of the third abdominal somite is not sharply carinate (Chace, 1997), but flattened dorsally (Figure 4f) like the Japanese female treated by Hayashi (1994b) (NFU 530-2-1692, CL 10.0 mm). The pleuron of the fifth abdominal somite is rounded posteriorly on both sides (Figure 4e) in the Australian specimen. These differences seem to be individual variations, because the dorsal margin of the third somite has not been discussed in detail, except for Chace (1997), and the pleuron of the fifth somite is sometimes rounded posteriorly (Barnard, 1950).

**Distribution**

*Tozeuma armatum* is known from several localities of the Indo-West Pacific region (Holthuis, 1947; Hayashi, 1994b; Chace, 1997), but has not been previously reported from Australia. According to the collecting label, this specimen was associated with a simple, whip-like gorgonian, and the host is included in the storage bottle together with the

shrimp. Usually, *T. armatum* has been collected in a free living condition from surface waters (Holthuis, 1947) or at considerable depths (e.g., 50–110 m: Balss, 1914; Toriyama *et al.*, 1990), but recently commensalisms with whip-like gorgonians has been confirmed (Gosliner *et al.*, 1996; Debelius, 1999; Minemizu, 2000). A similar association is observed in *T. carolinense* Kingsley, 1878, in the western Atlantic and Caribbean, though it is usually found among sea grasses (Voss, 1956).

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