

New records of symbiotic shrimps of the genus *Dasycaris* Kemp, 1922 from Vietnam and Papua New Guinea, with redescription of *D. ceratops* Holthuis, 1952 (Crustacea: Decapoda: Pontoniinae)

Новые находки симбиотических креветок рода *Dasycaris* Kemp, 1922 из Вьетнама и Новой Гвинеи с переописанием *D. ceratops* Holthuis, 1952 (Crustacea: Decapoda: Pontoniinae)

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KEY WORDS. *Dasycaris ceratops*, *Dasycaris zanzibarica*, Indo-Pacific, Pennatularia, symbioses, sexual dimorphism.

КЛЮЧЕВЫЕ СЛОВА. *Dasycaris ceratops*, *Dasycaris zanzibarica*, Indo-Pacific, Pennatularia, симбиоз, половой диморфизм.

ABSTRACT. The pontoniine shrimp *Dasycaris ceratops* is for the first time reported from Vietnam in the South China Sea. The hydroid *Lytocarpia* sp. occupied by some juvenile specimens is a new host for the species. The species is redescribed and illustrated here based on an adult male collected from the sea-pen *Virgularia* sp. The examination of the present male specimen of *D. ceratops* contributes to the knowledge on intraspecific variability of the rostral and carapacial teeth armament, and allows to report on previously undescribed structures, e.g., the anteroventral denticulation of the carapace, the fine denticulation of the cutting edges on the first pereopods, the movable anteroventral lobe on the first abdominal pleurae and the unique subdivision of the first male pleopodal endopod. The colour in life and some morphological characters of juveniles are described. *Dasycaris ceratops* is compared with specimens of *D. zanzibarica* from Vietnam, Australia and Papua New Guinea. Madang lagoon in north-eastern Papua New Guinea, the southern Bismarck Sea, is a new country record for the latter species.

РЕЗЮМЕ. Понтониинная креветка *Dasycaris ceratops* впервые отмечена для Вьетнама в Южно-Китайском море. Впервые в качестве хозяина указывается гидроид *Lytocarpia* sp., на котором отмечены некоторые ювенильные экземпляры. Вид переописан и иллюстрирован на примере взрослого самца, собранного с морского пера *Virgularia* sp. Исследование данного экземпляра расширяет сведения о внутривидовой изменчивости набора зубцов на роструме и карапаксе и позволяет описать ранее неописанные структуры, такие как антеровентральные зубчики карапакса, тонкую зазубренность режущих краев переопод первой пары, подвижную

антеровентральную лопасть на первых абдоминальных плеврах и уникальное подразделение эндопода плеопода первой пары самца. Описаны прижизненная окраска и некоторые морфологические признаки ювенильных особей. Проведено сравнение *Dasycaris ceratops* с экземплярами *D. zanzibarica* из Вьетнама, Австралии и Папуа Новой Гвинеи. Лагуна Маданг на северо-востоке Папуа Новой Гвинеи (южная часть моря Бисмарка) является новым местонахождением данного вида для страны.

Introduction

Dasycaris Kemp, 1922 is a genus of the Indo-West Pacific pontoniine shrimps, presently containing four species of somewhat morphologically aberrant shrimps symbiotic with pennatularian sea-pens, antipatharian black corals, and hydroids [Bruce, 1974, 1983; Chace, Bruce, 1983; Li, 2001]. The genus *Dasycaris* was originally established by Kemp [1922] for *D. symbiotes* Kemp, 1922 based on a male-female pair of specimens from India. The larger specimen, the ovigerous female, was described in details and figured in toto [Kemp, 1922: pl. 9], while some body parts were also figured [same: Figs 76–77] but not directly attributed to either specimen. Only the abdominal pleurae were compared between the sexes, demonstrating sexual dimorphism in the shape of the first two pleurae in this species. Later, Monod [1976] provided a short notice on another ovigerous female of the species collected from Nouméa, with figures of the carapace, eye, abdomen, mandible, the third maxilla and the first chelipeds [Monod, 1977: Figs 54–60].

Subsequently, three other species were described, *D. doederleini* (Balss, 1924), *D. ceratops* Holthuis,

1952, and *D. zanzibarica* Bruce, 1973. The original description, and the only report, of *D. doederleini*, based on a single ovigerous female from Japan, was very brief and only provided with a single line-figure of the carapace and abdomen [Balss, 1924]. Similarly, *D. ceratops* was described by Holthuis [1952] on the basis of a single ovigerous female from Borneo Bank, Makassar Strait. Detailed description, as well as figures of the total lateral aspect and some body parts, including most mouth appendages were provided [Holthuis, 1952]. Later, Bruce [1977] contributed to the knowledge of this species with a short notice on a juvenile female collected from antipatharian coral at Queensland, and also figured the carapace with eye and abdomen [Bruce, 1977]. Only the original study on *D. zanzibarica* by Bruce [1973] is based on a wider series of 9 specimens containing also mature representatives of both sexes. This well-illustrated report also draws attention to the variability of the relatively low-lobate carapaces [Bruce, 1973: Figs. 1–6]. This also is the only *Dasycaris* species for which the male gonopods have been described and figured [Bruce, 1973]. Later, Bruce [1991] provided a figure of a high-lobate ovigerous female from New Caledonia.

As a part of investigation of the symbiotic marine shrimps of Vietnam in co-operation with the Vietnam-Russian Tropical Centre (principal investigator Prof. T.A. Britaev), a small series of *D. ceratops* specimens was collected by the author in 2008. The examination of a single mature male specimen collected from a seapen, and several juveniles found thereon as well as on a hydroid colony, allow to detect some distinctions from published reports of the species, as well as to point out some interesting unpublished structures typical for, at least, the present species. The species is recorded for

the first time from Vietnam and also from a new host.

Subsequently, specimens of another species, *D. zanzibarica*, were also collected from Vietnam, and others were obtained during international expeditions to the Great Barrier Reef, Queensland, Australia (*Creefs Lizard Island Expedition, 2010*), and Madang, Papua New Guinea (*Papua-Niugini Expedition, 2012*). Morphological and colour diversity is discussed, and colour photographs of both species are provided for comparative purposes.

The following abbreviations are used in the text: MNHN — Muséum National d'Histoire Naturelle, Paris, France; UO — University of Ostrava, Czech Republic; PoCL — post-orbital carapace length.

This paper is dedicated, in the occasion of their jubilees, to two 'Very-Important-Persons' in my life — **Nikolai A. Zarenkov** and **Rudolf N. Burukovsky**, my teachers, and, I allow myself to believe, also good friends — to celebrate their outstanding contributions to decapod crustacean systematics, and their assistance in my graduate and post-graduate studies and subsequent carcinological career.

Systematics

Family Palaemonidae Rafinesque, 1815

Subfamily Pontoninae Kingsley, 1878

Genus *Dasycaris* Kemp, 1922

Dasycaris ceratops Holthuis, 1952

Figs. 1–5, 6a–e.

Dasycaris ceratops Holthuis, 1952: 176, Figs. 87–88.

Dasycaris ceratops. — Bruce, 1973: 259, Fig. 7C. — 1977: 173, Fig. 5.

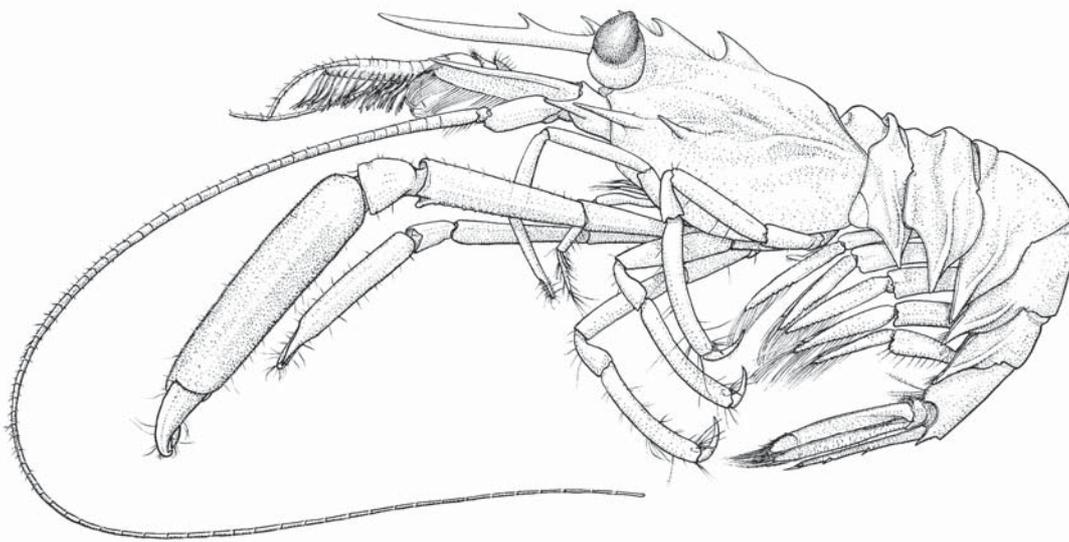


Fig. 1. *Dasycaris ceratops* Holthuis, 1952, male, Nha Trang Bay, Vietnam, total aspect, lateral. Scale bar — 1 mm.

Рис. 1. *Dasycaris ceratops* Holthuis, 1952, самец, залив Нячанг, Вьетнам, общий вид, вид сбоку. Масштабная линейка 1 мм.

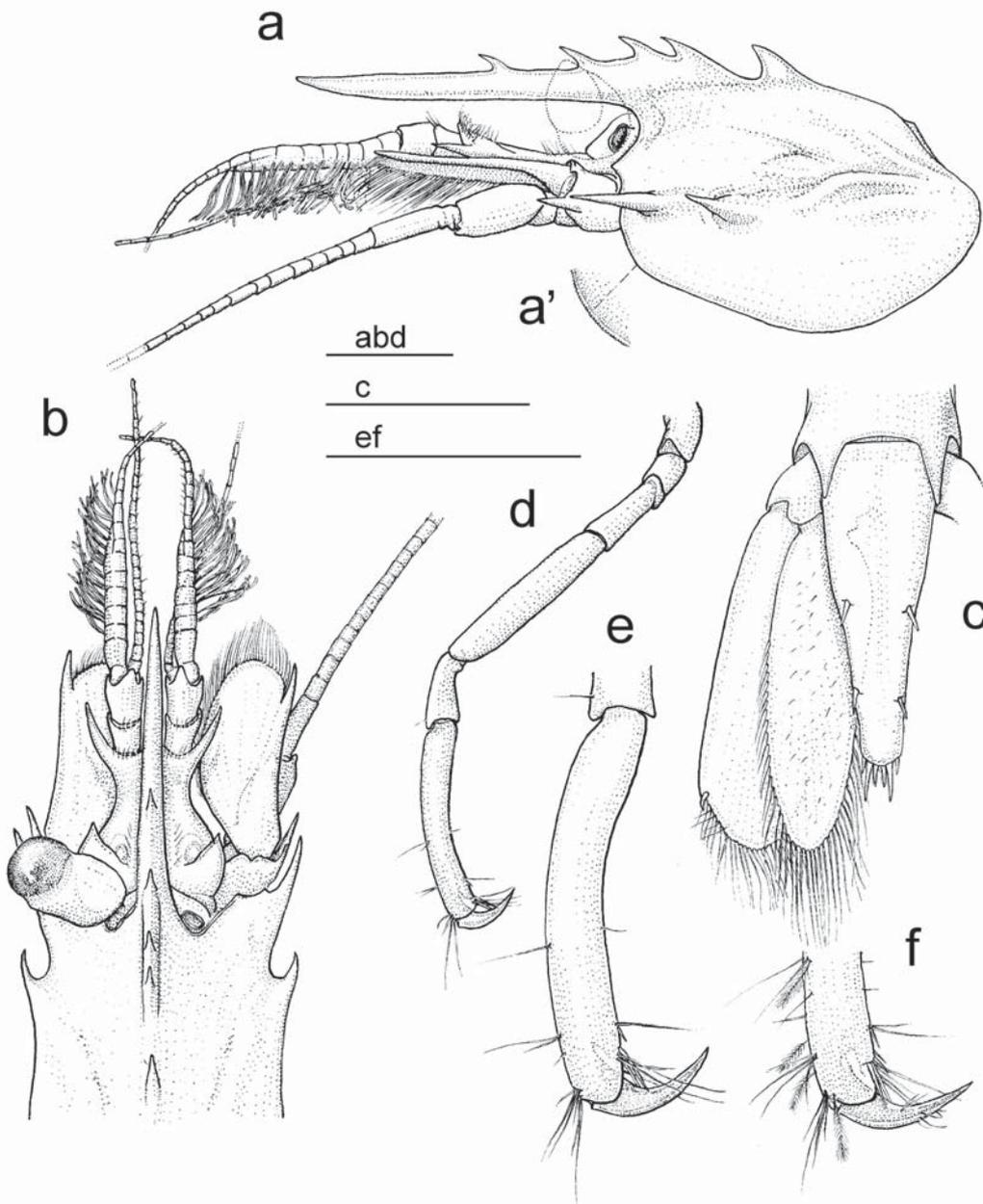


Fig. 2. *Dasycaris ceratops* Holthuis, 1952, male, Nhatrang Bay, Vietnam; a — carapace and antennae, lateral; eye indicated by dotted line; a' — detail, denticulate anteroventral angle of carapace; b — carapace, eye, and antennae, dorsal; c — telson and uropod, dorsal; d — third pereopod, lateral; e — same, propodus and dactylus; f — fifth pereopod, distal propodus and dactylus, lateral. Scale bars — 1 mm (a' — unscaled).

Рис. 2. *Dasycaris ceratops* Holthuis, 1952, самец, залив Нячанг, Вьетнам; а — карапакс и антенны, вид сбоку; глаз обозначен точечной линией; а' — деталь, зазубренный антеровентральный угол; б — карапакс, глаз и антенны, дорсальный вид; с — тельсон и уropод, дорсальный вид; d — pereopod третьей пары, вид сбоку; e — то же, пропод и дактиль; f — pereopod пятой пары, дистальная часть пропода и дактиль, вид сбоку. Масштабная линейка 1 мм (а' — немасштабировано).

MATERIAL EXAMINED. 2 juveniles, UO 118B-Vn08, Mun Is., Nhatrang Bay, Vietnam, 14 Sep. 2008, from *Lytocarpia* sp. (Hydrozoa), flat sandy bottom, depth 12 m, coll. Z. Đuriš. — 1 male, 2 juveniles, UO 126-Vn08, Nhatrang Bay, Mun Is., 16 Sep. 2008, from 2 colonies of *Virgularia* sp. (Pennatularia), flat sandy bottom, depth 12.3 m, coll. Z. Đuriš.

DESCRIPTION OF ADULT MALE. Medium sized pontonine shrimp with well calcified subcylindrical body (Fig. 1). Carapace (Figs. 1, 2a) smooth, some-

what areolated posterolaterally. Rostrum styliform, straight, far overreaching antennular peduncle (Figs. 1, 2a,b), 1.3 times longer than postorbital carapace length, bearing two slender, widely separated dorsal teeth on proximal 0.2 and 0.4 of length; ventral margin unarmed. Carapace dorsally with two closely spaced teeth slightly larger than rostral ones; large acute epigastric tooth present on dorsal midlength of carapace. Orbit

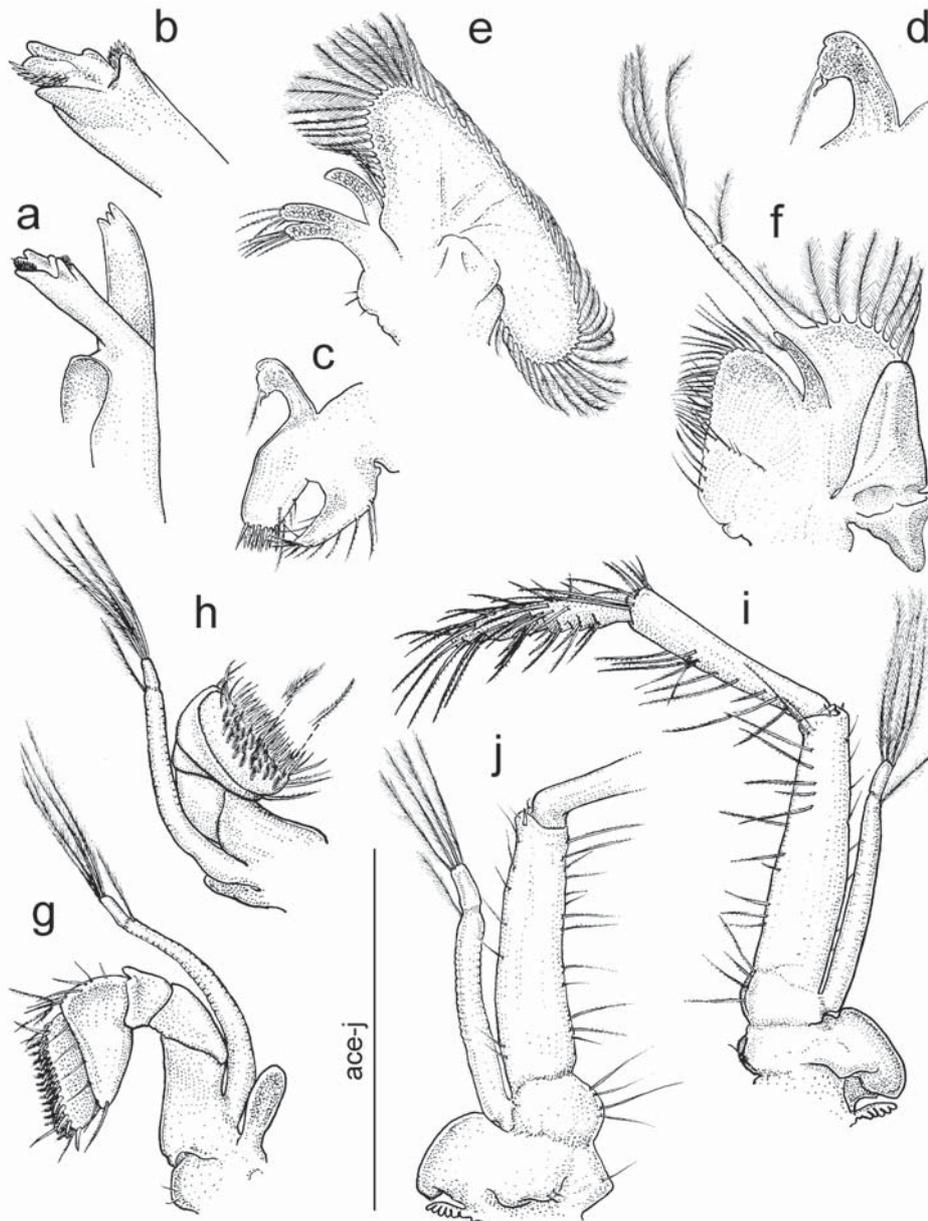


Fig. 3. *Dasyctis ceratops* Holthuis, 1952, male, Nhatrang Bay, Vietnam, mouthparts (from the right side); a — mandible; b, same, molar process; c — maxillula; d — same, palp; e — maxilla; f — first maxilliped; g — second maxilliped, outer aspect; h — same, inner aspect; i — third maxilliped, lateral; j — same, inner aspect of proximal segments.

Рис. 3. *Dasyctis ceratops* Holthuis, 1952, самец, залив Нячанг, Вьетнам, ротовые придатки (правые); а — мандибула; б — то же, моллярный отросток; с — максилула; д — то же, пальпа; е — максилла; ф — максиллипод первой пары; г — максиллипод второй пары, внешняя сторона; h — то же, внутренняя сторона; и — максиллипод третьей пары, вид сбоку; j — то же, внутренняя сторона проксимальных сегментов.

feebly developed, inferior orbital angle subacute. Large, slender submarginal antennal spine reaching distal margin of antennal basicerite; hepatic spine much smaller, lying posteriorly at same level as hepatic spine; supraorbital spines absent. Anteroventral angle of carapace rounded, with margin finely denticulate (Fig. 2a').

Fourth thoracic sternite unarmed.

Abdominal segments (Fig. 1) smooth. Pleura of first five abdominal segments all produced ventrally to

acute processes with obtuse median carina; first and second pleurae obtusely angulate anteroventrally, first pleura with movable membranous anteroventral plate; first and second segments slightly produced dorsally, third segment not produced in dorsal midline; fifth segment 0.6 times length of sixth one, latter 1.5 times longer than deep, subcylindrical, slightly curved, posterolateral angle strongly produced, acute, anteroventral angle less produced, obtusely angulate.

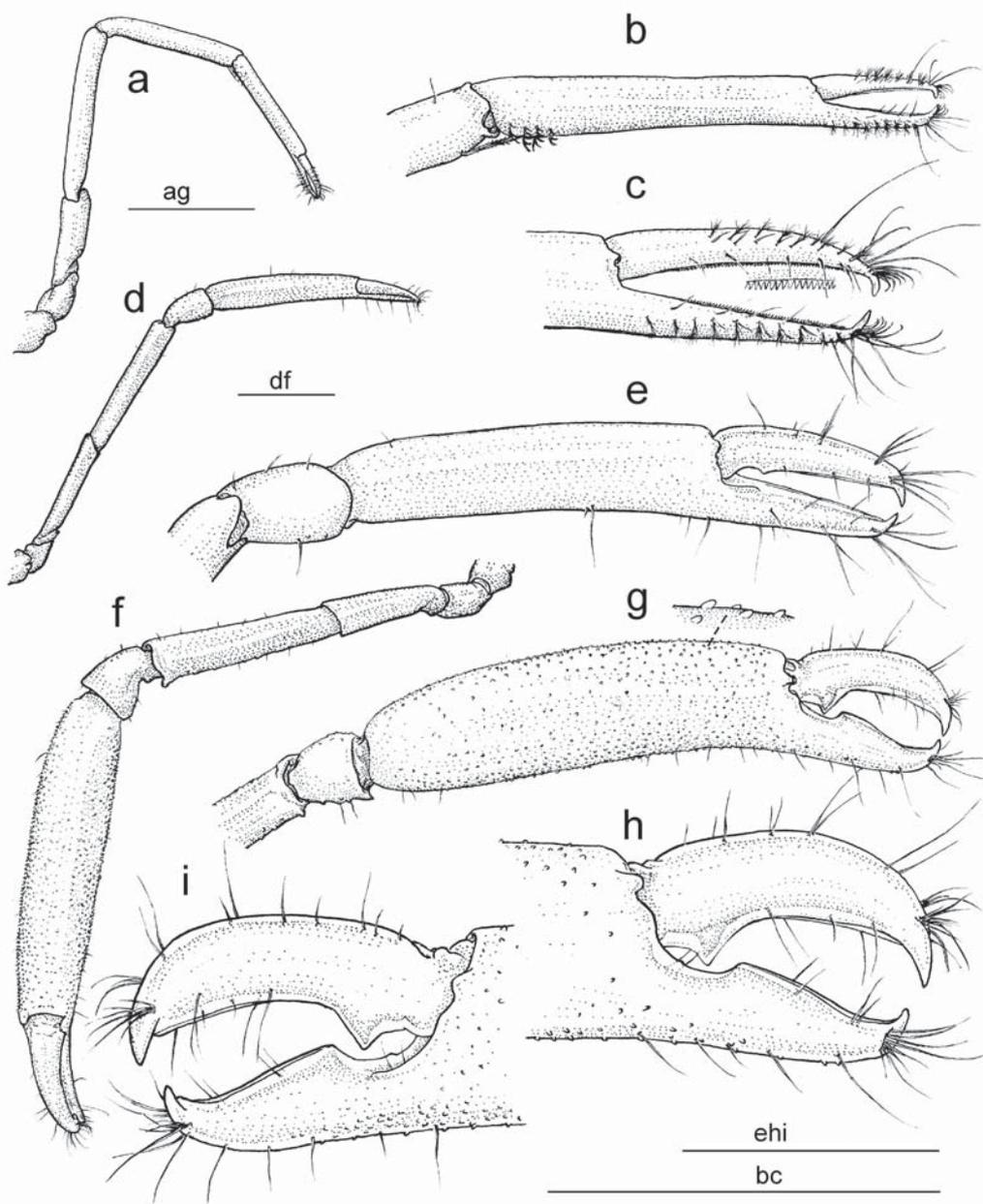


Fig. 4. *Dasycaris ceratops* Holthuis, 1952, male, Nhatrang Bay, Vietnam; a — right first pereiopod, lateral; b — same, distal segments, lateral; c — same, tips of fingers, with detail of dactylar cutting edge; d — minor second pereiopod, lateral; e — same, chela; f — major second pereiopod, lateral; g — same, distal merus, carpus and chela, mesial, with detail of dorsal tuberculation of palm; h — same, distal palm and fingers; i, same, lateral.

Рис. 4. *Dasycaris ceratops* Holthuis, 1952, самец, залив Нячанг, Вьетнам; а — правый переопод первой пары, вид сбоку; б — то же, дистальные сегменты, вид сбоку; с — то же, концы пальцев клешни с показом деталей режущего края дактиля; д — малая переопода второй пары, вид сбоку; е — то же, клешня; ф — большая переопода второй пары, вид сбоку; г — то же, дистальная часть мероподита, карпоподита и клешни, мезиальный вид с деталями дорсальной туберкулярной скульптуры клешни; h — то же, дистальная часть клешни; i — то же, вид сбоку.

Telson (Fig. 2c) about 1.3 times longer than dorsal length of sixth abdominal segment and 2.7 times longer than broad, tapering posteriorly with feebly concave posterolateral margins; two pairs of submarginal dorsal spines small, less than 0.1 of telson length, situated at about 0.5 and 0.75–0.8 of telson length; posterior margin rounded, with three pairs of spines; lateral spines

smaller than dorsal spines, submedian setose, subequal to dorsal spines, intermediate spines short and stout, about twice length of submedian spines.

Eyes (Figs. 1, 2b) well developed, with cornea oblique, ovoid, with conical dorsal projections; eyestalk slightly flattened, about 1.3 times as long as wide; no accessory pigment spot visible.

Antennular peduncle (Fig. 2a,b) slightly shorter than postorbital carapace length, and much shorter than rostrum. Basal segment distinctly constricted by deep lateral concavity on distal third, about 2.2 times longer medially than wide basally; stylocerite short and bluntly leaf-like, not reaching to middle of segment length, with statocyst normally developed; distolateral angle armed with slender acute tooth exceeding distal border of intermediate segment; small acute tooth present at middle of medial ventral border; intermediate and distal segments about 0.3 and 0.4 of medial length of basal segment, respectively. Upper flagellum biramous, with rami fused proximally for first 7 segments, shorter free ramus consisting of 3 segments, about 15 groups of aesthetascs present on stouter part of flagellum; longer free ramus consisting of up to 15 slender segments. Lower flagellum bearing over 20 segments.

Antenna (Fig. 2a,b) with basicerite bearing strong lateral spiniform tooth. Scaphocerite exceeding antennular peduncle by length of distolateral spine; lateral border gently concave with strong distolateral tooth more than 0.2 of lateral border length and barely exceeding anterior margin of lamella; lamella 2.4 times longer than broad, with anterior and medial margins continuously rounded; carpocerite short and stout, subcylindrical, and reaching approximately to middle of scaphocerite; antennal flagellum normally developed, long.

Mandible (Fig. 3a,b) without palp; molar process elongate, with 5 blunt distal teeth and small dorsal and ventral groups of setae; incisor process slender, with 3 small teeth distally.

Maxillula (Fig. 3c,d) normal; palp slender, distally expanded, rounded, feebly bilobed, with long setulose seta and small hooked seta on inner lobe; upper lacinia robust, slightly tapering proximally, and bearing about 9 short stout serrulate spines distally; lower lacinia strongly tapering distally, with around 15 setae evenly distributed along margins.

Maxilla (Fig. 3e) with slender non-setose palp; proximal endite obsolete, broadly rounded; distal endite elongate, deeply bilobed and sparsely setose distally; scaphognathite well developed, moderately broad, about 2.4 times longer than wide.

First maxilliped (Fig. 3f) with elongated slender palp bearing single short plumose subterminal seta; basal and coxal endites fused, forming broad lamina, without any notch in medial border, latter provided with serrulate setae; exopod well developed, with 4 long plumose terminal setae and shorter subterminal one, constricted distally just behind subterminal seta and, thus, appearing subdivided; caridean lobe large, with plumose marginal setae; epipod large, bilobed.

Second maxilliped (Fig. 3g,h) with terminal segment subrectangular, elongate, almost 3 times wider than long; with medial border and distoventral side armed with rows of short stout serrulate setae, and with several longer ones distally; penultimate segment broadly subtriangular, with distal margin bearing series of

separately set long simple setae; carpus, merus and ischio-basis normal; exopod well developed, setose and subdivided similarly to exopod of first maxilliped; coxa rounded medially, with elongated simple epipod, without podobranch.

Third maxilliped (Fig. 3i,j) slender; antepenultimate segment with a small movable spine dorsolaterally, segment fused from merus to basis, with ischio-basal line of junction feebly indicated, combined segment slender, about 4.5 times longer than broad, medial border sparsely setose; penultimate segment slender, about 0.7 times length of preceding segment, and 5 times longer than wide; terminal segment 0.8 of length of penultimate segment, slender and tapering, about 5.5 times longer than wide; medial and distal border of penultimate segment with few long finely serrulate setae, distal segment more densely setose with longer setae distally and shorter setae proximally, latter arranged ventrally to transverse rows; basis produced medially, rounded, with few serrulate setae; coxa widely triangular medially, with single seta; large, broadly rounded lateral lobe and small arthrobranch composed of about 5 low lamellae, present laterally on coxa. Exopod slender, falling to reach distal margin of antepenultimate segment, setose and subdivided similarly to exopods of first and second maxillipeds.

First pereopod (Fig. 4a–c) slender and extends beyond antennular peduncle by length of chela. Chela slender, long, about 7.5 times longer than basal height; palm subcylindrical and more than 5 times longer than basal height; fingers slender, tapering and slightly compressed, about 0.4 of palm length, with strongly hooked tips; proximal 0.2 of cutting edges entire, remaining 0.8 of cutting edges finely denticulate with about 60 denticles, but otherwise unarmed. Carpus slightly stouter than chela, subcylindrical, about 6 times longer than wide, merus as slender as carpus, but slightly longer. Ischium half length of merus and slightly longer than basis, coxa short and stout, without distinct median lobe.

Second pereopods (Fig. 1) robust, similar but markedly unequal. Minor second pereopod (Fig. 4d,e) exceeding antennular peduncle by chela. Chela about half length of major chela. Palm subcylindrical, not markedly swollen proximally and about 4 times longer than high distally. Dactylus half length of palm and similar to dactylus of major second pereopod but more elongate, slender, and with tooth on cutting edge less developed. Fixed finger lacking teeth, cutting edge entire throughout its length. Carpus, merus and ischium similar to major second pereopod but less robust, smooth, unarmed.

Major cheliped (Fig. 4f,i) exceeding antennular peduncle by end of merus. Palm of chela of major second pereopod finely tuberculate, subcylindrical, about 3.7 times longer than wide. Dactylus about 0.4 of palm length, stout and slightly compressed, arched, with strongly rounded dorsal margin and hooked tip; proximal 0.25 of cutting edge bearing single large triangular tooth, distal cutting edge entire. Fixed finger more

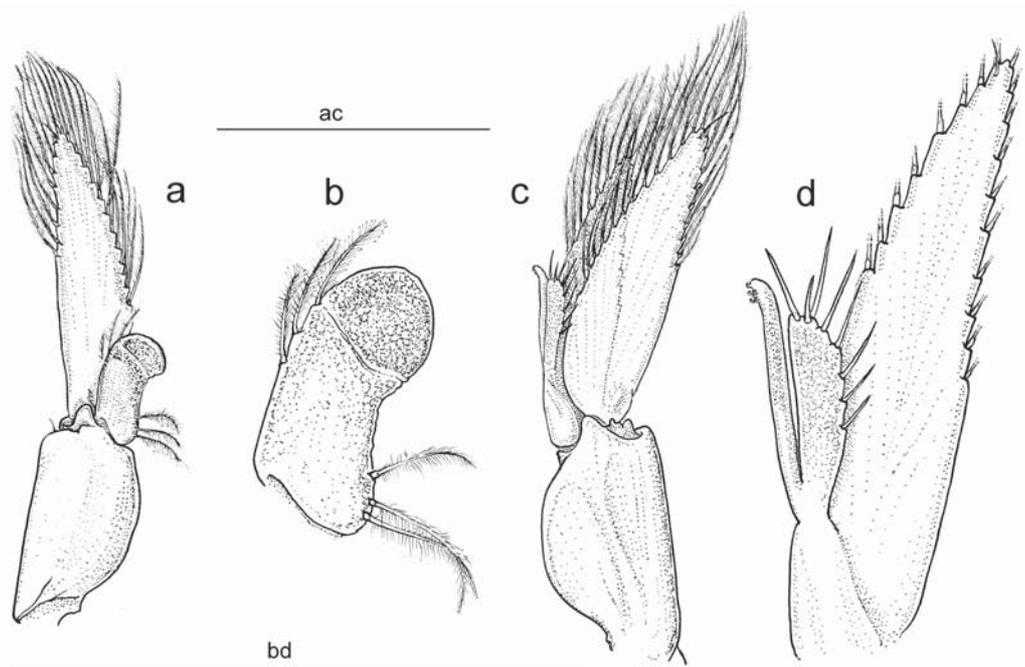


Fig. 5. *Dasycaris ceratops* Holthuis, 1952, male, Nhatrang Bay, Vietnam; a — first male pleopod, total aspect; b — same, endopod; c — second male pleopod, total aspect; d — same, endopod. Scale bars — 1 mm.

Fig. 5. *Dasycaris ceratops* Holthuis, 1952, самец, залив Нячанг, Вьетнам; а — плеопод первой пары, общий вид; б — то же, эндопод; с — плеопод второй пары, общий вид; д — то же, эндопод. Масштаб 1 мм.

straight, distally hooked, with entire distal 0.6 of cutting edge rising proximally to low tooth, proximal part formed as shallow notch with mesial socket opposing dactylar tooth. Carpus short, with length subequal to its height and about 0.2 times length of palm, expanded distally, scarcely granulated ventrally and dorsally, with small acute distoventral tooth. Merus subcylindrical, 3.6 times longer than wide and 0.6 times length of palm, ventrally granulated, distoventral angle with subacute tooth. Ischium unarmed, 0.6 times length of merus.

Ambulatory pereopods robust, with third pereopod (Fig. 2d,e) exceeding tip of scaphocerite by length of dactylus. Third pereopod dactylus robust but slightly compressed, simple, feebly hooked but straighter distally, about three times longer than basal width. Propodus stout and distinctly curved, uniformly high throughout, about 6.5 times longer than wide, with pair of long distoventral spines and single short subterminal spinule; propodus with few simple long setae distally and some ones on distal half of dorsal and ventral borders. Carpus about 0.4 of propod length, expanded distally; merus subequal to propodus length, and about 5.5 times longer than broad, unarmed; ischium simple, about 0.6 times length of merus; basis and coxa short, unarmed. Fourth and fifth pereopods similar to third pereopods, propodus of fifth pereopod (Fig. 2f) with 3 subterminal spinules proximally to pair of long distoventral spines, and with some plumose setae distodorsally in addition to simple ones.

Endopod of first male pleopod (Fig. 5a,b) 0.4 of exopod length, stout and flattened, 2.3 times longer

than greatest width; endopod subdivided by oblique suture on distal 0.6–0.7 of length to subrectangular basal part and subcircular, medially produced, apex; basal part with 3 plumose setae proximally on mesial border, and with 3 plumose setae distally on lateral margin. Second male pleopod (Fig. 5c,d) with slender appendix interna exceeding midlength of exopod; appendix masculina falling short to appendix interna but distinctly stouter, about 4 times longer than broad in middle, with 3 simple terminal setae and series of 5 similar ones on distal 0.6 of lateral border.

Uropods (Fig. 2c) normal. Basipodite unarmed laterally. Exopod about 3 times longer than wide with feebly convex, entire, lateral border terminating distally in short mobile spine, without fixed tooth laterally. Endopod more slender, about 3.5 times longer than broad.

MEASUREMENTS. Male: post-orbital carapace length (PoCL) 2.1 mm; total body length 11 mm; rostrum length 2.8 mm; rostrum formula (1+2) + 2/0.

JUVENILES. The juveniles, both males and females (PoCL around 1.4 mm) collected from the sea-pen and hydroid are mutually identical in their shape, and closely similar to the male described above. Their rostrum and carapacial teeth are well developed, identical in the shape and number to the large male (above). The abdominal pleura are more sharply produced, pleurae I–II are bilobed in juvenile males and juvenile females, with the lobes triangular, and the anterior lobe shorter than the posterior ones, but proportionally larger than those of the large male; pleurae III–V are simple, acutely

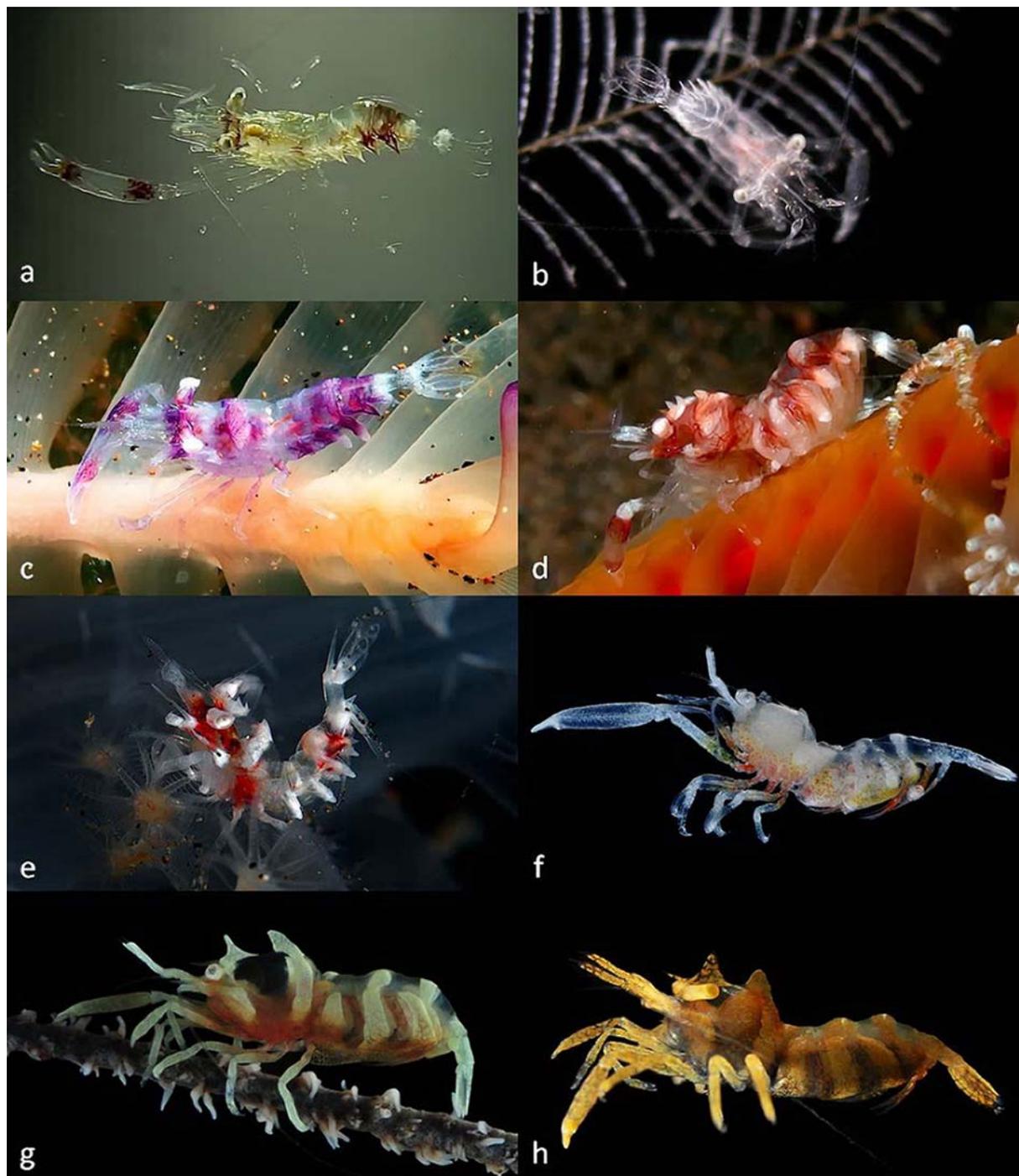


Fig. 6. Colour pattern of *Dasycaris* spp., a–e — *D. ceratops* Holthuis, 1952: a, b — Nhatrang Bay, Vietnam — a, male UO 126-Vn08, b — juvenile UO 118B-Vn08 on *Lytocarpia* sp. (Hydrozoa); c–e — male, ovigerous female and juvenile, resp. (not collected), from *Pteroeides* sp. (Pennatularia), Philippines; f–h — *D. zanzibarica* Bruce, 1973, ovigerous females: f, g — Madang, Papua New Guinea, MNHN IU-2013-11019 and 10039, resp. (g — on *Cirripathes* sp., Antipatharia); h — UO 40-Vn10, Nhatrang Bay, Vietnam. Photos: a, b, h — author, c–e — A. Ryanskiy, f, g — A. Anker.

Fig. 6. Прижизненная окраска *Dasycaris* spp., a–e — *D. ceratops* Holthuis, 1952: a, b — залив Нячанг, Вьетнам — a, самец UO 126-Vn08, b — ювенильный экземпляр UO 118B-Vn08 с *Lytocarpia* sp. (Hydrozoa); c–e — самец, яйценосная самка и ювенильный экземпляр соответственно (не собраны), с *Pteroeides* sp. (Pennatularia), Филиппины; f–h — *D. zanzibarica* Bruce, 1973, яйценосная самка: f, g — Маданг, Папуа Новая Гвинея, MNHN IU-2013-11019 и 10039, соответственно (g — с *Cirripathes* sp., Antipatharia); h — UO 40-Vn10, залив Нячанг, Вьетнам. Фото: a, b, h — автор, c–e — А. Рянский, f, g — А. Анкер.

produced. The juvenile male examined has the first pleopodal endopod similar to that of the large male, subdivided.

COLOUR. Adult male (Fig. 6a): initially, when collected, the darker patches were purple, later changing to brown; body and major chela largely semi-transparent, slightly yellowish tinged, and with sparse dark brown and white patches; other appendages transparent; in adult male a distinct brown transverse patch connecting bases of eyes and rostrum, similar patches present on abdominal pleurae III and posteriorly on tergum and pleurae of abdominal segment IV, and as diffused transverse distal and proximal bands on palm of major chela; diffuse white patches present mainly on eyes and on abdominal pleurae I and II, posterodorsally on abdominal segment V and transversally on base of tail fan; latter otherwise transparent; when relaxed, large white chromatophores may expand dorsally on tail fan arranged into irregular transverse bands.

Juvenile specimens (Fig. 6b), PoCL around 1.4 mm: body semi-transparent, eyes whitish connected by narrow transverse white band, abdominal pleurae sharply outlined by white line, intestine white.

Photographed specimens from Philippines. Male (Fig. 6c): cornea bright white; body generally semi-transparent, with whitish tinge, eyestalks and major chela widely covered by dense network of purple and reddish, almost violet, softly diffused lines; mid of major chela palm almost colourless; rostrum, antennae, legs (except major chela) and sixth abdominal segment and tail fan semi-transparent. Ovigerous female (Fig. 6d): body, major chela, and abdominal pleurae more densely covered by network of irregularly transverse brown lines on creamy background (brown lines on carpus and fingers of minor chela, irregularly longitudinal), alternated with diffused white patches dorsally on posterior cephalothorax, and on abdominal segments III–V; cornea bright white, dense white patches distally on antennular peduncle and on base of tail-fan; distal rostrum, major parts of antennae, most pereopods, abdominal segment VI and posterior tail-fan transparent. Juvenile specimen (Fig. 6e) semitransparent, with red patches on bases of antennae and anterior cephalothorax, posteriorly on sides of cephalothorax, and on sides of fourth abdominal segment; eyes bright white, transverse band dorsally on carapace, abdominal pleurae, and base of tail fan white.

REMARKS. See Discussion.

HOSTS. *Pteroeides*, *Scleroblemnon*, and *Virgularia* (Pennatularia) [Bruce, 1974; Fransen, 2012], unidentified antipatharian [Bruce, 1983], and *Lytocarpia* (Hydrozoa) (new host, present report: Fig. 6b).

DEPTH RANGE. 12–64 m.

DISTRIBUTION. Nha Trang Bay, Vietnam (new record), previous report from the South China Sea: Hainan [Li, 2001]; other records: Zanzibar [Bruce, 1973, 1977], Madagascar [Li, Bruce, 2006]; Borneo Bank, Indonesia (type locality) [Holthuis, 1952]; Queensland, Australia [Bruce, 1981, 1987], Semporna, Malaysia [Fransen, 2012].

Dasycaris zanzibarica Bruce, 1973

Fig. 6f–h.

Dasycaris zanzibarica Bruce, 1973: 247, Figs. 1–6.

Dasycaris zanzibarica. — Bruce, 1991: 265, Fig. 27. — Marin, Savinkin, 2007: 179, 195, 196, Fig. 89B.

MATERIAL. 1 male, 1 female, UO 40-Vn10, Mun Is., Nha Trang Bay, Vietnam, 12 Aug. 2010, sandy bottom with patch reefs, from sea-whip *Cirripathes* sp., coll. Z. Đuriš, I. Horká. — 1 male, MTQ W 33352 (fcn 150-Au10), *CReefs 2010*, stn L110-100, 14° 39.7'S, 145°28.3' E, Bommie Bay, lagoon, Lizard Is., Great Barrier Reef, Australia, 8 Sep. 2010, low slope of bommie, from *Cirripathes* sp., 10.9 m, coll. Z. Đuriš. — 1 ovigerous female, MNHN IU-2013-10039 (fcn PZD#587-Png12), *Papua-Niugini 2012*, stn PR203, 05°10.3'S, 145°48.5'E, Panab Is., Madang, Papua New Guinea, 7 Dec. 2012, slope, depth 13 m, from *Cirripathes* sp., coll. Z. Đuriš. — 1 male, 1 ovigerous female, MNHN IU-2013-11019 (fcn PZD#601B-Png12), *Papua-Niugini 2012*, stn PR211, 05°15.5' S, 145°47.3'E, S. Yabob Is., Madang, Papua New Guinea, 8 Dec. 2012, slope, depth 16 m, from *Cirripathes* sp., coll. D. Uyen.

REMARKS. All specimens examined agree in general with the original description by Bruce [1973], but they are variable in the shape and height of the dorsal carapacial lobes. An ovigerous PNG female (MNHN... 11019) is low-lobate dorsally on the carapace (Fig. 6f), another PNG ovigerous female (Fig. 6g) has high, slightly anteriorly recurved, dorsal lobes. The Australian male is similar to the latter female, but its lobes are lower. Instead, the Vietnamese ovigerous female (Fig. 6h) possess strong dorsal lobes, more widely triangular, erect. All PNG and Australian specimens (Fig. 6f,g) are similarly coloured bearing white antennae, eyes, pereopods, dorsal carapacial lobes and transverse bands on carapace and abdomen, while a similar pattern but mainly yellow-brown in colour is present in the Vietnamese specimens (Fig. 6h).

Abdominal pleurae and the male first gonopods were examined in those specimens for a comparison with the above specimens of *D. ceratops*. While all available females of *D. zanzibarica* have all abdominal pleurae rounded and soft, in the males a slight variability was apparent. The posteroventral angles of pleura I–V were acute in the single PNG male, while in the Vietnamese and Australian males pleurae IV–V are feebly pointed or rounded, respectively. Pleurae I, however, possess a very large, anteriorly produced anteroventral membranous lobe, not reported in the original description [Bruce, 1973], much larger than that in *D. ceratops* (above).

The endopod of the male first pleopod is undivided, generally similar to that figured by Bruce [1973: Fig. 2H], but not as slender; that of the PNG male is wider, stouter.

For other remarks see the Discussion.

HOSTS. *Cirripathes* spp. (Cnidaria: Antipatharia).

DEPTH RANGE. 4–39 m [Li, Bruce, 2006].

DISTRIBUTION. Previously reported from Nha Trang Bay, Vietnam [Marin, Savinkin, 2007; Marin, 2012], and from Lizard Island, Queensland, Australia [Bruce, 1983]. Other Indo-West Pacific records are Zanzibar [Bruce, 1973]; Madagascar, Philippines [Li, Bruce, 2006]; Semporna, Malaysia [Fransen, 2012]; Kalimantan and Ternate, Indonesia [Fransen, 2004,

2010]; Taiwan [Jeng 1988]; Japan [Okuno, 1996]; Papua, Indonesia [Fransen, 2008]; W. Australia [Berggren, 1997]; NE Australia [Bruce, 1983]; New Caledonia [Bruce, 1991]; Madang — new record from New Guinea (present report).

Discussion

Despite a comparatively limited number of specimens of *Dasycaris symbiotes*, *D. ceratops* and *D. zanzibarica* having been reported up to now, a remarkably wide variability of some morphological characters have been indicated in previous reports. Among them, the shape of the rostrum and dorsal carapacial teeth or lobes seems to be the most variable. The differences in the extension of the dorsal lobes on the carapace are well illustrated by Bruce [1973] for *D. zanzibarica*. This species is easily distinguishable from its congeners by a completely toothless rostrum. Other species possess acute teeth on the rostrum and on the carapace. Their number, position and level of lateral compression are characters used for a separation the species [Bruce 1973; Chace, Bruce, 1993].

A well developed, styliform rostrum and dorsal carapacial teeth in the present male specimen of *D. ceratops* are similar, but stronger to that of Bruce's [1973] juvenile female mentioned above. Together with that, both are quite distinct from the original illustration of the ovigerous female holotype from Borneo by Holthuis [1952: Fig. 87a] who described, in addition to a single dorsal rostral tooth, the presence of... "four large compressed teeth; the posterior of these teeth is situated behind the middle of the carapace, the other three are placed rather close together in the anterior part of the carapace, forming a basal crest to the rostrum; the anterior tooth stands just over the orbit" [Holthuis, 1952: 176]. Such a compressed crest of teeth is mentioned also by Chace and Bruce [1993] in their identification key. The present adult male and juveniles have crest-arranged dorsal teeth, but the epigastric tooth is sharp, not triangular, and on the rostrum, anterior to the basal crest of 3 teeth, is only 1 proximal slender tooth in the Holthuis' type as well as in the present male specimen, but two in the Australian juvenile female [Bruce, 1977]. A wider series of specimens from various regions is thus necessary for morphological and molecular comparison for confirmation of conspecific status of the specimens discussed here.

Together with a general variability of the carapacial structures, intraspecific variability is also linked to distinct sexual dimorphism. As adult females are, as a rule, larger and more densely coloured, and, thus, more frequently collected than males, the descriptions of all four species were done primarily on females. Moreover, in *D. doederleini* only a single female specimen is known. Male characters have been described only for *D. zanzibarica* [see: Bruce, 1973] up to now. In consequence the identification keys covering all species provided by Bruce [1973] or Chace and Bruce

[1993] were based mainly on adult females, and based on rostral armament, dorsal carapacial teeth or lobes and the shape of female abdominal pleurae. Pleurae III-V are acutely produced posteroventrally in females of all species except *D. zanzibarica*, which may occasionally possess a small acute tooth there [Bruce, 1973; Chace, Bruce, 1993]. Abdominal pleurae I and II are posteroventrally acute in *D. doederleini* [see Balss, 1924: Fig. 2] or rounded in *D. symbiotes* [e.g., Kemp, 1922: Pl. 9; Monod, 1976: Fig. 55], while only pleurae II are produced in *D. ceratops* (e.g., Holthuis, 1952: Fig. 87A). Sometimes also pleurae I may bear a small posteroventral process in the latter species, as shown by Bruce [1977: Fig. 5] for the juvenile female. The presence or shape of the pleural process in females may, thus, also depend on the developmental stage of specimens, and the last three species might be confused. However, *Dasycaris ceratops* can be easily distinguished by the ovoid shape of the cornea from *D. symbiotes* and *D. doederleini* which have globular eyes [Chace, Bruce, 1993].

As mentioned above, male specimens have not been described in details for *D. ceratops*, *D. doederleini*, or *D. symbiotes*. The present report provides a description of an adult male of *D. ceratops* partially filling this lack. The stronger rostro-carapacial armament in the present male specimen is mentioned above. Abdominal pleurae I–V are all sharply produced ventrally or posteroventrally, with a distinct vertical keel on each lobe. Quite remarkable is a movable, membranous, anteroventral rounded plate on the abdominal pleurae (Fig. 1), not reported before. However, it is not a special male character as such a plate is also present in juvenile males from Vietnam, and may be found also in other species and sexes. At least, a similar line is feebly but visible on a photo of *D. ceratops* from the Philippines (Fig. 6c) and a feeble drawn line possibly also indicating such a suture is present in Kemp's figure of *D. symbiotes* female [Kemp, 1922: Pl. 9]. A large membranous anteroventral lobe is also present in all three available male specimens of *D. zanzibarica*, from Vietnam, PNG and Australia, despite not being reported from the allotype male in the original description. Instead, Bruce [1973: 254] reported the male pleurae as calcified and rigid. As the membranous or movable plate may play role in an extension of the movement range for the last pereopods, its presence in *Dasycaris* shrimps needs closer examination and might possibly also be present in the two remaining species, *D. symbiotes* and *D. doederleini*. In such a case, it could be an additional character of generic importance.

The male gonopods have been described and illustrated only for *D. zanzibarica* [Bruce, 1973: 254, Fig. 2H,I]. The second gonopod possesses an appendix masculina which is elongate, setose and shorter than the appendix interna, as in the present specimen of *D. ceratops*. Also the endopod of the first male gonopod has a similar elongate shape with a subcircular apex distinctly curved medially, but no subdivision was re-

corded nor by Bruce [1973], nor in the present specimens of the species. The present adult male specimen of *D. ceratops* has a stouter and wider endopod (similar to the present specimens of *D. zanzibarica*), with the apex separated from the basal part by a distinct transverse suture. This subdivision of the endopod of the first male pleopod is possibly unique among pontoniine shrimps. Also the proximomedial setation is different in the present species (3 plumose setae and no simple setae, vs. 2 + 2 ones, resp., in *D. zanzibarica*), and the distolateral setae (3 plumose ones in the present species) are not reported for *D. zanzibarica*.

Another undescribed structure is the fine denticulation distally on the cutting edges of the first pereopods fingers in the present specimen of *D. ceratops* (Fig. 4b,c). There is no mention of such denticles in the original description of the species by Holthuis [1952]. Such structure is not known for any other species of the genus. Only *D. zanzibarica* possess 3-4 small tooth there [Bruce, 1973; same on the present specimens examined], while for *D. symbiotes* the cutting edges were originally reported as unarmed [Kemp, 1922], but for *D. doederleini* the ornamentation of those cutting edges remains unknown.

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