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A NEW SPECIES OF *SOLENOCERA* (CRUSTACEA:
DECAPODA: SOLENOCERIDAE) FROM
NORTHERN AUSTRALIA

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Abstract.—*Solenocera australiana*, new species, a close ally of *S. halli* and *S. melantho*, is described from material collected in shallow water, 15 to 24 m, off the Northern Territory, Australia. This species is characterized by the antennular flagella which gradually narrow distally toward the 2 or 3 distalmost articles; the roughly lanceolate distal part of the dorsolateral lobules of the petasma which are supported by submesial ribs; and the presence of two pairs of thelycal protuberances on the anterior part of sternite XIV, the mesial one usually considerably larger than the lateral, as well as by the straight anterior border of the thoracic ridge.

In July 1972, during routine fishery monitoring by the staff of the Fisheries Division, Department of Primary Production, Darwin, a collection of shrimps of the genus *Solenocera* was taken from commercial grounds north of Groote Eylandt in the western Gulf of Carpentaria. Since that time additional specimens have been obtained during the course of sampling of penaeid shrimps by fishery research vessels in waters adjacent to the Northern Territory, mostly in Van Diemen Gulf, but also in other localities off this province by commercial trawlers.

Van Diemen Gulf has not attracted significant commercial fishing for penaeid shrimps—the only members of the superfamily Penaeoidea that at present are economically important in northern Australia—and to make a preliminary evaluation of its potential as a fishery, a series of brief surveys were made between May 1977 and February 1978. Although the surveys were neither comprehensive nor very conclusive, large concentrations of small penaeids were found. Along with these shrimps, particularly in the 15 to 24 m depth zone, a total of 108 individuals of what proved to be an undescribed species of *Solenocera* were obtained. Further specimens became available from the commercial catches of the *F. V. Taroona* in Van Diemen Gulf through the courtesy of Mr. P. G. MacLean, and from factory samples taken from fishing grounds north of Melville I—Port Essington.

Representatives of the genus *Solenocera* have been previously reported from Australian waters. Schmitt (1926) noted the occurrence of *S. melantho* De Man, 1911, off the east coast, 19 km NNE of Bowen, Queensland, but the single specimen available to him has not been examined by us. Because

of the close similarity between De Man's species and the one described herein, it is not possible to ascertain to which, if to either, that specimen belongs. Recently J. A. Redfield (personal communication) collected a *Solenocera* sp. among 27 species of shrimps collected in the Gulf of Carpentaria, at Albatross Bay, and noted that this find represented a new Australian record. In addition, W. Dall has informed us that he has found *S. alticarinata* Kubo, 1949, and "*S. depressa* [Kubo, 1949] (?)," off western Australia, and added that the latter might have belonged to the species described here. Unfortunately, his material is no longer extant.

The paucity of records of *Solenocera* off Australia is rather surprising considering the studies that have been made of the commercial shrimp catches and of collections obtained during exploratory surveys in many areas of the continental shelf. Perhaps this new member of the genus *Solenocera* exists in limited quantities in company with small penaeids in several areas off the coast of Australia. Probably it has been present in many catches obtained in the past, but was overlooked because commercial operations in Australian waters are aimed at larger species such as *Penaeus* (*Penaeus*) *esculentus* Haswell, 1879, tiger prawn; *Penaeus* (*Penaeus*) *semisulcatus* De Haan, 1844, green tiger prawn; *Penaeus* (*Fenneropenaeus*) *merguiensis* De Man, 1888, banana prawn; *Metapenaeus endeavouri* (Schmitt, 1926), endeavour prawn; and *Metapenaeus ensis* (De Haan, 1844), offshore greasy back prawn.

Solenocera australiana, new species

Figs. 1-7

Material.—(All from off the Northern Territory, Australia).

Holotype: ♀, USNM 173115, 40 mm carapace length, about 125 mm total length; type locality: north of Groote Eylandt, Gulf of Carpentaria, 13°34'S, 136°30'E, 22 m, 14 July 1972, *Apache* sampling cruise 21, haul 3. Allotype: ♂, USNM 173117, 20.5 mm carapace length, about 72 mm total length, fishing grounds north of Melville I-Port Essington, commercial catch (sample from processing plant in Darwin), September 1977.

The paratypes are deposited at the USNM, the Australian Museum (AM) and the Fisheries Division, Department of Primary Production (FDP): 1 ♂ 4 ♀, USNM, collected with holotype. 1 ♂ 10 ♀, USNM, 1 ♀ (FDP), collected with allotype. 1 ♂ 10 ♀, USNM, 1 ♂ (FDP), Van Diemen Gulf, 11°47'S, 132°27'E, 20 m, 20 August 1977, P. G. McLean, *Taroona* (commercial catch). 2 ♂ 2 ♀, USNM, Van Diemen Gulf, 11°52'S, 132°26'E, 22 m, 26 October 1977, *Sandra-K*, survey cruise 9, haul 8. 1 ♂ 20 ♀ 3 intersexes, USNM, 2 ♂ 7 ♀, BMNH, Van Diemen Gulf, 12°04'S, 131°43'E, 15 m, 9 June 1977, *Sandra-K*, survey cruise 6, haul 7. 2 ♂ 14 ♀, USNM, Van Diemen Gulf, 12°02'S, 131°41'E, 15 m, 5 May 1977, *Sandra-K*, survey cruise

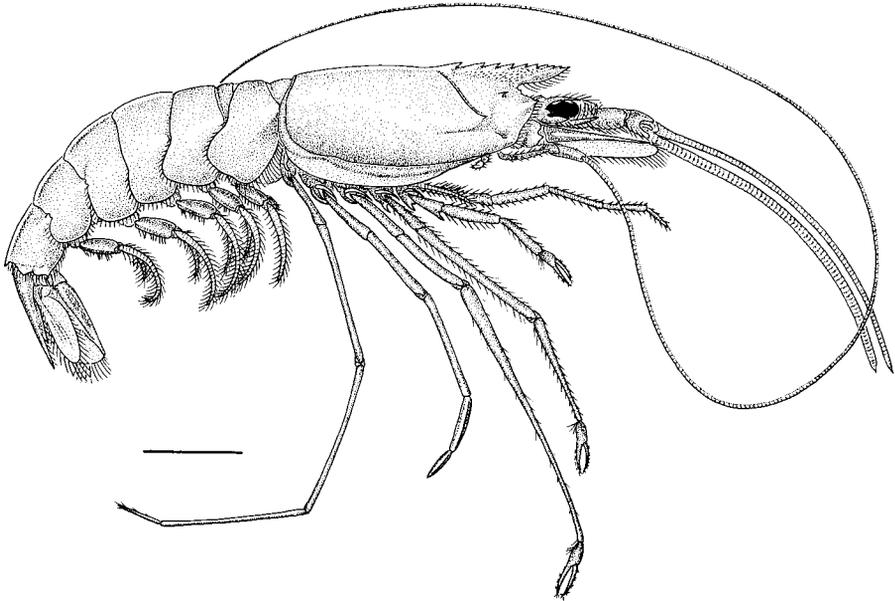


Fig. 1. *Solenocera australiana*, paratype, USNM 173118, ♀ 27 mm cl, Melville I-Port Essington fishing grounds, Australia: Lateral view. Scale = 10 mm.

4, haul 9. 2 ♀, USNM, Van Diemen Gulf, 12°04'S, 131°39'E, 16 m, 5 May 1977, *Sandra-K*, survey cruise 4, haul 5. 3 ♂ 6 ♀, AM, Van Diemen Gulf, 12°00'S, 131°35'E, 24 m, 5 May 1977, *Sandra-K*, survey cruise 4, haul 4.

Forty five additional specimens were examined by the second author and are deposited in the collection of the Fisheries Division, Department of Primary Production, Northern Territory.

Description.—Body glabrous (Fig. 1), but with elongate subtriangular patch of setae covering rostrum above adrostral carina and continuing to epigastric tooth (Fig. 2). Rostrum straight, deep, with ventral margin convex basally then almost straight to apex, and reaching to about distal extremity of eye. Number of rostral plus epigastric teeth 8 to 10 (percentage distribution: 8-5, 9-75, 10-20: N = 44); epigastric tooth about 1.4 times as far from first rostral tooth as latter from second; and fifth tooth (in occasional specimens fourth) in line with orbital margin. Postrostral carina well defined, blunt, extending almost to posterior margin of carapace; median sulcus consisting of fusiform or teardrop-like depression preceded and/or followed by few pits. Orbital spine short, postorbital spine slender, continuous with low blunt carina; antennal and hepatic spines small; pterygostomian and branchiostegal spines lacking. Cervical sulcus deep, almost reaching midline, and merging ventrally with dorsally directed groove and hepatic sulcus in

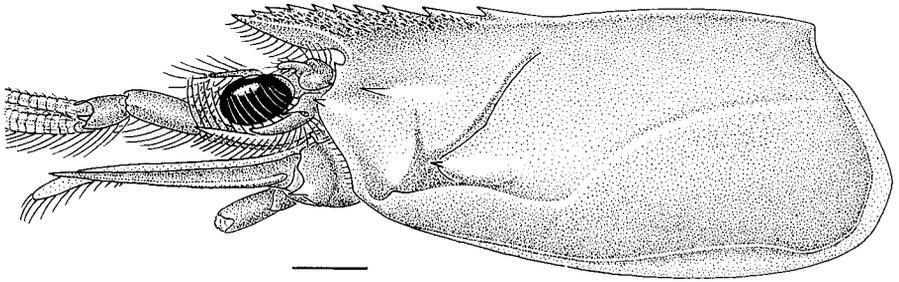


Fig. 2. *Solenocera australiana*, paratype, USNM 173116, ♀ 32 mm cl, N of Groote Eylandt, Gulf of Carpentaria, Australia: Anterior region, lateral view. Scale = 5 mm.

broad depression; hepatic sulcus extending posteriorly to slightly beyond dorsal extremity of cervical sulcus. Hepatic carina almost indistinct posteriorly, sharp anteriorly, forming arc bordering semicircular depression on pterygostomial region. Branchiocardiac carina weak but long, extending from or near posterior extremity of hepatic carina almost to posterior margin of carapace.

Prosartema falling short of distal margin of first antennular article, but its long terminal setae attaining proximal fourth of second article. Stylocerite relatively short, length equivalent to 0.6 of distance between its proximal end and mesial base of distolateral spine; distolateral spine short, barely surpassing distal margin of first article. Antennular flagella (Fig. 3A) with terminal part gradually narrowing toward distalmost 2 or 3 minute articles; flagella subequal in length, about twice as long as carapace in shrimp with 20 mm carapace length (cl), and 1.5 and 1.4 times as long in shrimp with 27 and 37 mm carapace length, respectively.

Scaphocerite surpassing antennular peduncle, sometimes by as much as 0.15 of its own length, occasionally only reaching distal end. Antennal flagellum incomplete in all specimens examined.

Third maxilliped exceeding scaphocerite by at least half length of dactyl, and at most, by entire dactyl. First pereopod overreaching carapace by length of dactyl or, at most, by entire propodus. Second pereopod surpassing scaphocerite by propodus or by maximum of propodus and one-fourth of carpus. Third pereopod overreaching scaphocerite by propodus and at least two-fifths, and at most by two-thirds, of carpus. Fourth pereopod almost reaching, or exceeding scaphocerite at most, by dactyl and one-third of propodus. Fifth pereopod surpassing scaphocerite by dactyl and four-fifths of propodus or by maximum of dactyl, propodus, and tip of carpus. Last two podomeres of fourth pereopod broadened, flattened, and carinate along midline on both surfaces. Data above based on 16 well preserved specimens.

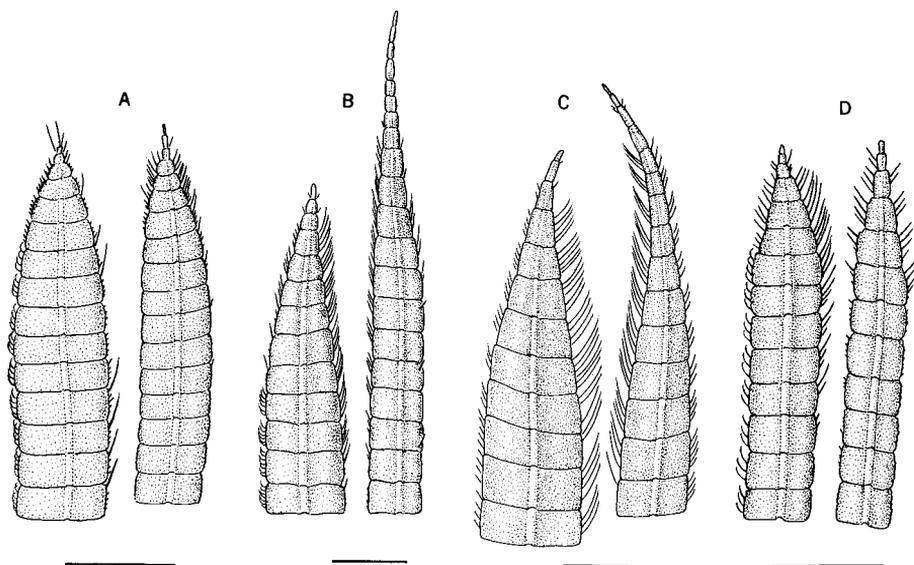


Fig. 3. Terminal parts of left antennular flagella: **A**, *Solenocera australiana* n. sp., paratype, USNM 173118, ♀ 26 mm cl, Melville I-Port Essington fishing grounds, Australia; **B**, *Solenocera melantho*, ♀ 29.5 mm cl, T'o-kou, T'ai-tung Hsien, Taiwan; **C**, *Solenocera melantho*, ♀ 33 mm cl, Pujada Bay, Mindanao, Philippines; **D**, *Solenocera halli*, ♂ 16.5 mm cl, off Pangkor, Strait of Malacca, Malaysia. Scales = 1 mm.

First pereopod armed with spine on basis and ischium, and second with one on basis. In female, coxa of fifth pereopod produced in long, slender, distomesial spine overreaching coxobasial articular membrane; in male, coxa bearing flattened, laterally curved, distomesial spine.

Abdomen bearing middorsal carina from third through sixth somites, carina low on third, keel-like and progressively higher along last three; sixth somite bearing small spine at posterior end of carina, and similar spine posteroventrally. Telson armed with small pair of fixed lateral spines. Mesial ramus of uropod falling short of, or slightly overreaching, apex of telson; lateral ramus slightly overreaching mesial one, with lateral rib extending to distal margin, there forming blunt spine.

Petasma (Fig. 4A-B) with ventromedian lobule extending distally slightly beyond dorsolateral lobule, latter both surpassing distally and extending over ventral costa. Terminal margin of petasma, except unarmed dorso-median lobule, bearing numerous outwardly directed spinules or short spines: ventromedian lobule with 15 to 26 spinules increasing in length laterally; dorsolateral lobule with 20 to 40 usually decreasing in length proximolaterally, but sometimes proximal spinules long; and ventral costa with strongly recurved distal part bearing 7 to 13 short spines. Distal part of

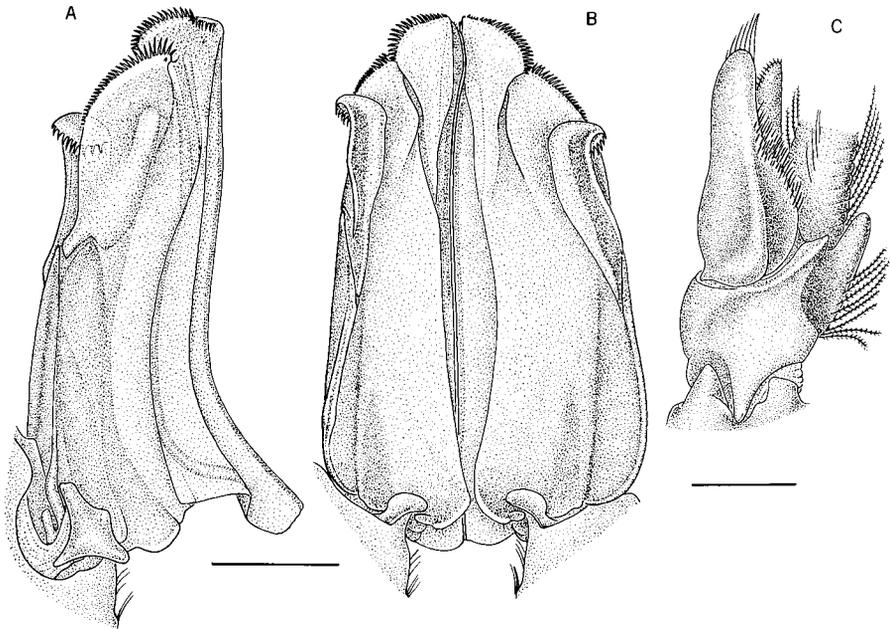


Fig. 4. *Solenocera australiana*, allotype, USNM 173117, ♂ 20.5 mm cl, Melville I–Port Essington fishing grounds, Australia: A, Left half of petasma, dorsolateral view; B, Ventral view of same; C, Right appendix masculina, dorsolateral view. Scales: A, B = 2 mm; C = 1 mm.

dorsolateral lobule roughly lanceolate, its lateral margin strongly convex, mesial margin slightly to markedly so, and bearing submesial rib, lateral edge of which is elevated above adjacent membranous area. Rib continuous proximally with broader thickening produced into short subrectangular projection reaching lateral margin. Junction of free distal and proximal parts of ventral costa marked by shallow emargination.

Appendix masculina (Fig. 4C) with basal part of longitudinal, dorsal ridge curved mesially; strongly concave lateral margin bearing long patch of closely set setae; and apical margin studded with row of long ones. Appendix interna falling slightly short of appendix masculina, strongly concave laterally, and bearing minute spinules along distomesial margin. Basal sclerite with marginal, distolateral ridge terminating in short projection at mesial base of blunt ventrolateral spur.

Thelycum (Fig. 5A–B) with subquadrangular posterior depression delimited by raised (ventrally) lateral margins of sternite XIV and transverse ridge situated at about base of anterior third of sternite; two pairs of setose protuberances situated immediately anterior to ridge: more mesial one rounded

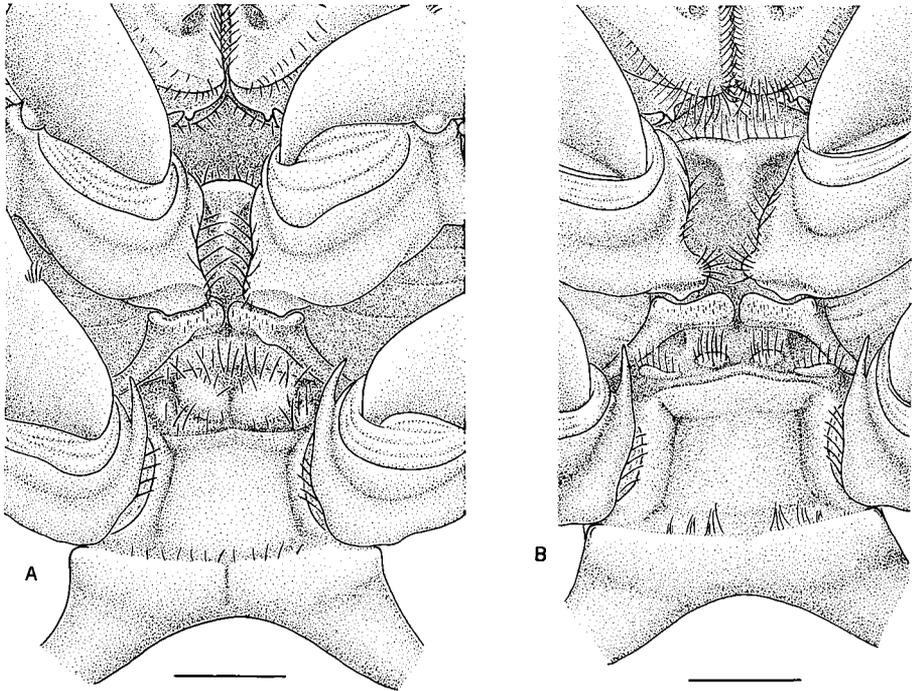


Fig. 5. Thelyca: *Solenocera australiana*: A, Holotype, USNM 173115, ♀ 40 mm cl, N of Groote Eylandt, Gulf of Carpentaria, Australia; B, paratype, USNM 173116, ♀ 42 mm cl, same locality. Scales = 2 mm.

or oval, variable in size but usually larger (often considerably so) than lateral pair; latter rounded to elongate subelliptical. Posterior part of sternite XIII with vertical shelf bearing pair of strong setose, broad thickenings separated by median slit; sternite XIII crossed by setose transverse elevation slightly anterior to midlength, elevation continuous posteriorly with median ridge. Posterior thoracic ridge with anterior border almost straight and sparsely set with setae; narrow short median groove often bisecting ridge.

Size.—Carapace lengths of males examined 11 to 25.5 mm, of females 10 to 42 mm.

Geographic and bathymetric ranges.—Thus far this species has been found only in waters adjacent to the Northern Territory: north of Groote Eylandt (western Gulf of Carpentaria), in Van Diemen Gulf, and immediately to the north of Melville I—Port Essington. It occurs at depths between 15 and 24 m on muddy bottoms with a mixture of rock, coral, and shell; with or without vegetation.

Affinities.—*Solenocera australiana* is closely allied to *S. halli* Starobo-

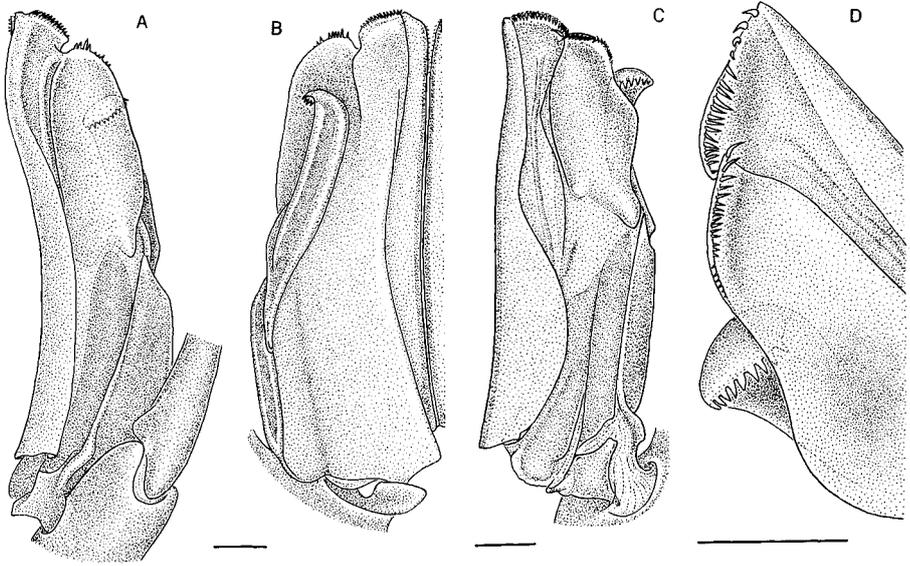


Fig. 6. Petasmata: A, *Solenocera melantho*, syntype, ZMA De. 102.477, ♂ 24 mm cl, E of Saleh Bay, north coast of Sumbawa, Indonesia, right half of petasma, dorsolateral view; B, Ventrolateral view of same; C, *Solenocera halli* ♂ 19 mm cl, off Pangkor, Strait of Malacca, Malaysia, dorsolateral view of right half of petasma; D, ♂ 21.5 mm cl, same locality, distal part of left half. Scales = 1 mm.

gatov, 1972, and *S. melantho* De Man, 1907. *Solenocera halli* has been found off Madras, Bay of Bengal, in the Andaman Sea (Starobogatov, 1972), along the Strait of Malacca (Hall, 1961; 1962 [both under *S. melantho*, part]), and northwest of Borneo, South China Sea (Hall, 1962). *Solenocera melantho* occurs in the waters of southern Indonesian islands (De Man, 1907), off Taiwan (Maki and Tsuchiya, 1923), Japan (Balss, 1914 [part, fide Burkenroad, 1959]; Kubo, 1949; Starobogatov, 1972), and the Philippines (recorded herein). It also has been reported off east India by Muthu (1968) and the east coast of Australia by Schmitt (1926), but these two records need to be confirmed. Among the Indo-West Pacific *Solenocera* that lack branchiostegal and pterygostomial spines and in which the hepatic carina extends anteriorly (rather than recurving posteriorly) beyond the hepatic spine, these three species are unique in possessing a low postrostral carina which is only slightly depressed at the level of the cervical sulcus, i.e., not interrupted by a deep notch or incision. These three also bear a short, terminal spine on the marginal costa of the lateral ramus of the uropod.

The rostrum of the three is quite similar except that in *S. melantho* the ventral margin tends to be somewhat concave, instead of straight or slightly

convex along the middle third (De Man, 1907; 1913). Although the numbers of teeth (rostral plus epigastric) overlap in the three species, 8–10 in *S. australiana*, 8 or 9 in *S. halli* and 6–10 in *S. melantho*, we have found only one specimen of the latter with 10 whereas 20% of specimens of the former are so armed. Furthermore, in *S. australiana* the fifth tooth (rarely the fourth) is located opposite the orbital margin, whereas in the other two species the fourth (occasionally the third in *S. melantho*) occupies that position.

The median sulcus of the postrostral carina is very variable in the three shrimps. In *S. australiana* it is represented by a series of pits or by an elongate depression preceded and/or followed by pits disposed along the posterior part of the carina, in *S. melantho* it may be absent, or represented by very few pits, or by one or two depressions, plus a few pits. In *S. halli* the sulcus, better defined than in *S. australiana*, consists of two or more long depressions and numerous pits, and in most, but not all, specimens the posterior part of the carina is divided into two branches as Crosnier (1978) has noted.

In *S. australiana* the antennular flagella are subequal in length, and their terminal articles gradually narrow toward the distalmost minute 2 or 3, whereas in *S. melantho* (Fig. 3B–C) the mesial flagellum is distinctly or considerably longer than the lateral, the terminal part of both taper considerably, that of the lateral flagellum consists of about 8 articles and that of the mesial of about 12, the distal half of it forming a leash. In *S. halli* (Fig. 3D) the flagella are subequal, as they are in *S. australiana*, but their 5 or 6 terminal articles taper more rapidly.

The petasma of *S. australiana* may be distinguished from that of the other two species in that the distal part of the distolateral lobule is roughly lanceolate, its free lateral margin is strongly convex, the mesial margin variably so. In *S. halli* (Fig. 6C–D) the corresponding part is irregular in shape, its lateral margin sinuous (with a concavity preceding a terminal convexity) and the mesial margin slightly convex, and in *S. melantho* (Fig. 6A–B) the dorsolateral lobule is subelliptical. Also in *S. australiana* the dorsolateral lobule is supported by a submesial rib which is absent in that of the other two species, the lobule being flexible in *S. halli* and somewhat rigid in *S. melantho*. Furthermore, in *S. australiana*, as well as in *S. halli*, the terminal margin of the dorsolateral lobule bears numerous spinules (18 to 40) that increase in length proximolaterally (in *S. halli* occasionally a few long ones are present proximally), whereas in *S. melantho* the margin is unarmed or bears fewer (1 to 13) spinules that are variable in length. Finally, the junction between the mostly-free distal and the proximal parts of the ventral costa is marked by a shallow emargination in *S. australiana* and by a deep one in the other two species.

In the female of both *S. australiana* and *S. halli*, two pairs of protuberances are present anterior to the transverse ridge of sternite XIV. The size

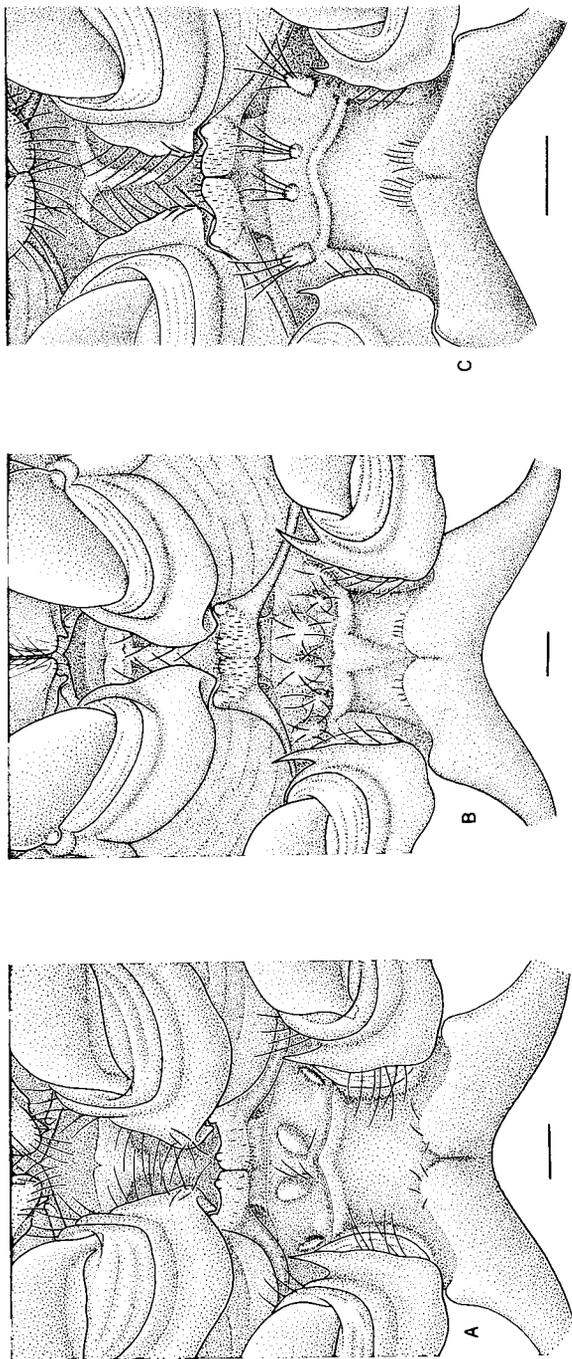


Fig. 7. Thelyca: A, *Solenocera melantho*, syntype, ZMA De. 102.476, ♀ 32.5 mm cl, E of Roti I, Indonesia; B, *Solenocera melantho*, ♀ 37.5 mm cl, Tabayas Bay, Luzon, Philippines; C, *Solenocera hallii*, ♀ 24.5 mm cl, off Pangkor, Strait of Malacca, Malaysia. Scales = 1 mm.

of the protuberances aid in the recognition of these shrimps for in *S. australiana* the submesial ones are as large as, or more often larger than, the lateral ones, whereas in *S. halli* the lateral protuberances are larger than the submesial (Fig. 7C).

In *S. melantho* four or six protuberances may be present, if four, the lateral ones are smaller than the submesial (Fig. 7A), but the latter are not so large as in many individuals of *S. australiana*. If six are present (Fig. 7B) this immediately distinguishes these females from those of the other two species. In the young of the three species the protuberances are weak or indistinct. Furthermore, the posterior thoracic ridge in *S. australiana* is almost straight anteriorly and smooth, or, in occasional specimens, bears a narrow median groove, whereas in *S. halli* and *S. melantho* it is bilobed, and the ridge is bisected by a groove that ends anteriorly in a deep, broad emargination. Finally, in females of *S. halli* the coxal spine of the fifth pereopod is short, hardly reaching the distomesial extremity of the coxobasial articular membrane; in *S. australiana* and *S. melantho* it is long and distinctly surpasses this level. It should be noted that the bathymetric range of *S. melantho* is different from that of *S. australiana* and *S. halli*: the former species occurs on the upper slope of the continental shelf whereas the latter two occupy shallow water.

Remarks.—It seems pertinent to add here a few notes concerning imprecise information in the literature pertaining to *S. halli* and *S. melantho*. Both in his key to Indo-West Pacific *Solenocera* and in his description of *S. halli*, Starobogatov (1972) cited as a feature of the female of this species the presence of a median groove in the posterior part of the trapezoidal plate of sternite XIV, a feature that is also clearly depicted in his illustration of the thelycum. The examination by us of specimens of this shrimp from the Strait of Malacca [those recorded by Hall (1962) as *S. melantho* and later identified as *S. halli* by Starobogatov from Hall's illustrations] demonstrated that although the posterior thoracic ridge is divided by a median groove, this does not extend anteriorly along the trapezoidal plate. Consequently, the presence of such a groove on the plate is not a diagnostic character.

Regarding the morphological features of *S. melantho*, De Man (1907; 1911) in his description of the female noted that "between the anterior vertical plate and the quadrangular, horizontal, sternal plate [of sternite XIV] are situated two small, oblong tubercles, in the middle, near one another." One of the two large syntypic females, and the three females from Taiwan available to us bear four "tubercles" or protuberances: in addition to the two submesial ones, two other smaller (slender) lateral protuberances are present, situated at the angular corner between the transverse ridge and the raised lateral margins of sternite XIV. The other large female possesses a barely distinct tubercle between the submesial and lateral ones, and in-

intermediate tubercles are clearly developed in the specimen the thelycum of which was illustrated by Starobogatov (1972, pl. 2-8d) as well as in all the specimens from the Philippines examined by us.

Starobogatov, in discussing his conclusion that *S. prominentis* Kubo (1949) is a synonym of *S. melantho*, indicated that two tubercles are present posterior to the vertical shelf in the thelycum of this species, but in his illustration six are depicted, as noted above. This discrepancy cannot be explained on the basis of the females studied by us, none of which possess two.

Finally, the statement by Crosnier (1978) that *S. halli* differs from *S. melantho* and *S. koelbeli* De Man, 1911, by the presence of a longitudinal groove on the trapezoidal plate of sternite XIV in the former and of a carina in the latter two, is applicable to *S. koelbeli*, but not to *S. halli* (see above), and not always to *S. melantho*. Although most specimens of the latter from the Philippines examined by us bear such carina, a few exhibit only a broad, barely perceptible elevation, while in some it is absent as is, apparently, the case in those from Japanese waters examined by Kubo (1949), and in the females from Taiwan recorded below. Kubo made no reference to it in his description of *S. prominentis* [= *S. melantho*] and did not depict it in the illustration of the thelycum. Curiously, he neither represented the anterior thelycal protuberances on sternite XIV in the latter illustration nor noted their presence in the text. In spite of this omission, all other features discussed by him leave little doubt, as Starobogatov (1972) and Crosnier (1978) pointed out, that his specimens belonged to *S. melantho*.

The notes above on the morphological features of *S. halli* and *S. melantho* and discussions of their relationships with *S. australiana* are based on the following specimens.

Solenocera halli: Malaysia—8 ♀, BMNH and 3 ♂ 2 ♀, USNM, off Pangkor, Strait of Malacca, 48 m, 26 February 1956, *Manihine* stn C 7-33. 1 ♂, BMNH, off Langkawi Is, Strait of Malacca, 75 m, 21 February 1956, *Manihine* stn C 7-26.

Solenocera melantho: Indonesia—2 ♂ 2 ♀, ZMA, E Saleh Bay, north coast of Sumbawa, 8°19'S, 117°41'E, 274 m, 14 February 1900, *Siboga* stn 312. 9 ♂ 6 ♀, ZMA, E Lobetobi Strait, 8°27'S, 122°54.5'E, 247 m, 8 February 1900, *Siboga* stn 306. 1 ♀, ZMA, E Roti I, 10°27.9'S, 123°28.7'E, 216 m, 2 February 1900, *Siboga* stn 302. [All Indonesian material constituting syntypic series.] Philippines—1 ♂, USNM, Batangas Bay, Luzon, 183 m, 8 June 1908, *Albatross* stn 5266. 1 ♂ 2 ♀, USNM, Tabayas Bay, Luzon, 274 m, 24 February 1909, *Albatross* stn 5372. 1 ♀, USNM, Tabayas Bay, Luzon, 357 m, 24 April 1908, *Albatross* stn 5222. 2 ♂ 3 ♀, USNM, off Limbujan, Masbate, 245 m, 15 March 1909, *Albatross* stn 5397. 2 ♂ 3 ♀, USNM, Pujada Bay, Mindanao, 393 m, 14 May 1908, *Albatross* stn 5241. 1 ♀ juv., USNM, off Jolo I, Sulu Archipelago, 209 m, 15 September 1907, *Albatross*

stn 5545. Taiwan—2 ♀, USNM, Kao-hsiung, Kao-hsiung Shih, 26 April 1923, M. Maki. 1 ♀, USNM, T'ò-kou, T'ai-tung Hsien, 20 April 1920, M. Oshima.

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