

as or slightly shorter than eye. Except for *P. coutierei*, moreover, their apex is always bifid. In *P. coutierei* the rostrum is triangular in dorsal view.

From *P. aequimana* (PAULSON) and its allied species, which have no spine on the fifth abdominal somite and subequal or equal second pair of pereiopods, *P. macrognatha* differs in having a small and simple rostrum and no antennal spine.

Size STIMPSON's type is 25.1 mm in length. The present material is 2.5 mm in carapace length and 0.4 mm in rostrum length.

Distribution Hong Kong, 8 fms (STIMPSON, 1860), S. of Saleyer, 8 m (DE MAN, 1920; present publication).

***Processa moana* YALDWYN, 1971**

Processa ? n. sp. RICHARDSON and YALDWYN, 1958, p. 34, fig. 32.

Processa moana YALDWYN, 1971, p. 91.

Definition Rostrum narrow, slender, apex bifid, exceeding slightly beyond eye. Antennal spine present. Pleuron of fifth abdominal somite rounded posteriorly. Second pereiopods equal, 1 meral and 13 carpal joints. Propodus of fifth pereiopod without any spine on posterior margin.

Size Length up to 1 inch (RICHARDSON and YALDWYN, 1958) and the male holotype is 6 mm in carapace length (YALDWYN, 1971).

Distribution The species has been recorded only from Bay of Plenty (RICHARDSON and YALDWYN, 1971).

***Processa molaris* CHACE, 1955**

(Figs. 29 and 30 a-d)

Processa molaris CHACE, 1955, p. 11, fig. 5 a-t.

Processa coutierei HOLTHUIS, 1958, p. 33, fig. 13 (not *Processa coutierei* NOBILI).

Processa molaris MANNING and CHACE, 1971, p. 13 (list).

Central Pacific

Namu Island, Bikini Atoll, reef at shore inside lagoon, April 3, 1946, M. JOHNSON leg. - 1 ovig. ♀ (one of the paratypes of *P. molaris*, USNM)

Siboga Expedition

Station 40, Anchorage off Pulu Kawassang, Paternoster Islands, depth 12 m, bottom coral reef, April 2, 1899 - 1 juv. (RMNH)

Red Sea

Golf van Akaba, Eylath, Israel, No. E 5517a, May 2, 1955, H. STEINITZE leg. - 1 ovig. ♀ (RMNH)

No. D 14287)

East Africa

Jadini, Kenya, lagoon pools at LWS, bottom sand and weed, September 14, 1973, A. J. BRUCE
leg. - 1 ovig. ♀ (EAMFRO)

Definition Rostrum narrow, simple. Antennal spine absent, but suborbital angle pointed. Pleuron of fifth abdominal somite rounded posteriorly. Lateral plate of sixth abdominal somite obtusely pointed. Stylocerite pointed. Basicerite of antennal peduncle without distinct spine. Third maxilliped without exopod. Second pereiopods subequal, with 1 or 2 meral and 6 carpal joints. Propodus of fifth pereiopod with four pairs of spines on posterior margin.

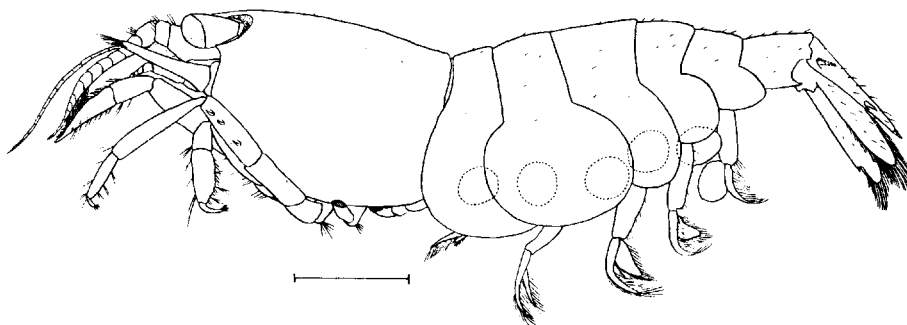


Fig. 29. *Processa molaris* CHACE, paratype, ovigerous female from Bikini Atoll. Scale represents 1.0 mm.

Remarks The species is closely related to *P. coutierei* NOBILI in having the carpus of the second pereiopod subdivided into 6 joints (Figs. 18 *f* and 30 *c*), in the unusually large mandible and in having a single outer spine on the ischium of the fifth pereiopod (Figs. 18 *i* and 30 *d*), which characters are unique in the family Processidae. The specific status of *P. coutierei* depends upon the present material from Mombasa, NOUVEL's redescription of the holotype and Dr. FOREST's kind reexamination of the mouthparts and branchial formula of the holotype. *P. molaris* and *P. coutierei* differ from each other by the following characters.

(1) *P. molaris* bears no exopod on the third maxilliped, while in *P. coutierei* the third maxilliped is provided with a distinct exopod, which is well developed, being as long as that of the second maxilliped. (2) The rostrum of *P. molaris* is shorter than the eye, *P. coutierei* has a long rostrum, extending beyond the distal end of eye. (3) The apex of the telson is pointed in the middle and flanked by three pairs of spines in *P. coutierei*, while in addition to three pairs of spines, each outer distal corner of the telson in *P. molaris* ends in a small sharply pointed spine, but is without the median spine.

P. molaris is comprehensively described and excellently figured by CHACE (1955). Through the courtesy of Dr. CHACE, one of the paratypes of that species could be re-examined. Three other specimens of the species are examined; the first was collected from East Africa, and kindly donated by Dr. BRUCE. The second was obtained from the Red Sea and forms part of the collection of the Rijksmuseum van Natuurlijke Historie. It was received through the courtesy of Dr. HOLTHUIS, and was referred to *P. coutierei* by HOLTHUIS (1958). The last is a very small specimen of the Siboga collection which was referred to *P. australiensis* by DE MAN (1920).

The Siboga material is rather different from the first three specimens but apparently differs from *P. australiensis* in the rounded pleuron of the fifth abdominal somite and the short and equal second pair of pereiopods, in which the merocarpal articulation does not reach the anterior margin of the carapace. It is too small to confirm some specific characters, such as the segmentation of the carpus of the second pereiopods and the spination of the basicerite. Moreover it has a rather long rostrum, reaching beyond the eyestalk and shows remains of a rudimental exopod on the third maxilliped and the first four pereiopods. However, it probably belongs to *P. molaris*, in having the unique shape of the rostrum, as in the adult females, and the pointed stylocerite.

The remaining three specimens agree well with one another in every respect but some minor variations are observed. They are all ovigerous females, and the paratype is 1.9 mm in carapace length but the other two specimens are rather larger, 2.7 and 3.1 mm. The eggs are comparatively large, measuring about 0.35 mm in the paratype, 0.49×0.24 mm in the Red Sea specimen and 0.71×0.63 mm in the East African specimen, while the number of eggs are comparatively few in the latter two specimens and in the former specimen only a few eggs are observed attached on the pleopods.

The rostrum is short, extending as far forward as the end of the eyestalk and each lateral margin of the rostrum is elevated as low and thin keel in all specimens (Fig. 30 a). The postorbital carina is well developed in all specimens and the suborbital angle is sharply pointed in the East African specimen and not sharply pointed in the type and the Red Sea specimen (Fig. 30 b). The lateral plate of the sixth abdominal somite is triangular, the tip being rounded. The basicerite of the antennal peduncle bears two blunt processes on the outer distal margin with a thin projection below the lower process just inside, and one small process on the inferior margin in all specimens. The merus of the second pereiopod is indistinctly subdivided into two joints in the specimen from East Africa, but not subdivided in the two other specimens. The merus of the fifth pereiopod is armed with one or two outer spines on the East African and the Red Sea specimens (Fig. 30 d), while it is unarmed in the type series (CHACE, 1955, fig. 5 t). The fourth pereiopod is longer than the third and fifth pereiopods. CHACE's figures of the third (Fig. 5 r) and the fourth (Fig. 5 s) pereiopods seem to be interchanged.

Size According to CHACE (1955), the carapace length varies from 1.7 to 2.0 mm in the types and the entire animal in the holotype is 8.5 mm long. The Red Sea and the East African specimens are rather larger, 2.7 and 3.1 mm in carapace length, re-

spectively. The Siboga specimen is much smaller, 0.9 mm in carapace length.

Distribution. This is a littoral species, found mostly on coral reefs. Burok I., Rongelap Atoll, intertidal coral (CHACE, 1955), Namu I., Bikini Atoll, reef at inside lagoon (CHACE, 1955; present publication), Paternoster Is., 12 m (DE MAN, 1920; present publication), Eylath, Israel (HOLTHUIS, 1958; present publication), and Jadini, Kenya, lagoon pools at LWS (present publication).

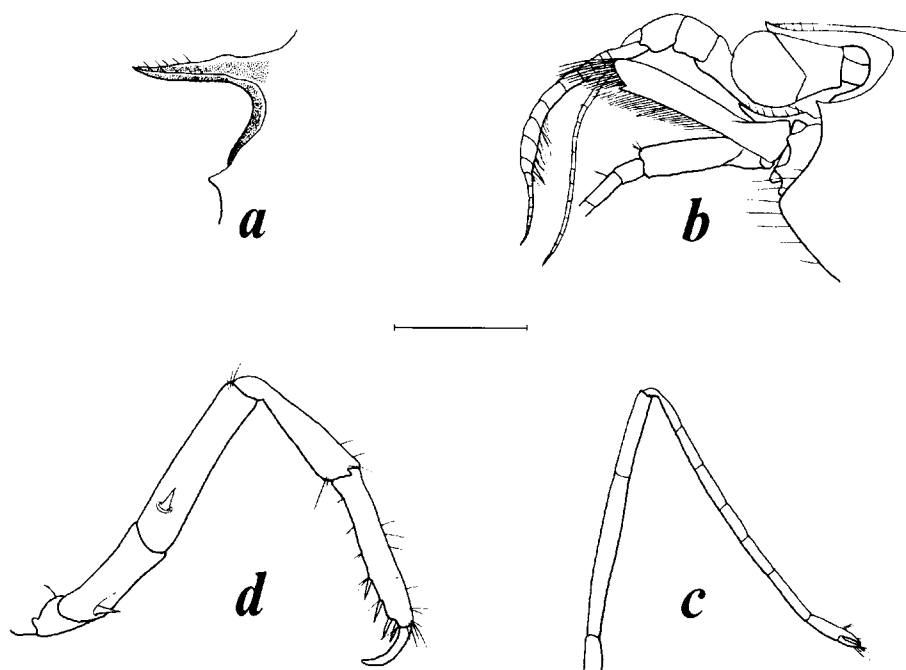


Fig. 30. *Processa molaris* CHACE, *a*, ovigerous female (2.7 mm in carapace length) from Eylath; *b-d* ovigerous female (3.1 mm) from Jadini.

a, rostrum, *b*, anterior part of body, *c*, right second pereopod, *d*, fifth pereopod. Scale represents 1.0 mm.

***Processa neglecta* sp. nov.**

(Figs. 31 and 32 *a-l*)

Processa sp. p.p. DE MAN, 1920, p. 203 pl. 17 fig. 52 o (not 52-52i=*Processa affinis* sp. nov.; 52 j -n = *Nikoides sibogae* DE MAN; 52p = *Processa demani* sp. nov.).

Processa aequimana DE MAN, 1922, p. 44, pl. 4 fig. 19-19f (not *Nika aequimana* PAULSON).

Siboga Expedition

Station 96, SE side of Pearl-bank, Sulu Archipelago, depth 15 m, bottom lithothamnion, June 27, 1899 - 1 ovig. ♀ (paratype, AM)

Station 104, Sulu harbour, Sulu Island, depth 14 m, bottom sand, July 2-3, 1899 – 1 ♀ (paratype, AM)

Station 181, Ambon-Anchorage, depth 54 m, bottom mud, sand and coral, September 5-11, 1899 – 3 ovig. ♀♀, 1 ♀, 2 spp. (paratype, AM)

Station 258, Tual-anchorage, Kei Islands, depth 22 m, bottom lithothamnion, sand and coral, December 12-16, 1899 – 1 ♂ (paratype, AM)

Ambon – 1 sp. (paratype, AM)

South Viet Nam

Station 77, Bay of Nha Trang, depth 11 m, bottom mud, January 20, 1960, V. A. GALLARDO leg. – 1 ♀ (paratype, RMNH)

Station 221, Bay of Nha Trang, depth 17 m, bottom sand, March 7, 1960, V. A. GALLARDO leg. – 1 sp. (paratype, RMNH)

Station 232 II, Bay of Nha Trang, depth 12 m, bottom sand, March 8, 1960, V. A. GALLARDO leg. – 1 sp. (paratype, RMNH)

Station 250, Bay of Nha Trang, depth 19 m, bottom sand, March 18, 1960, V. A. GALLARDO leg. – 1 ♀ (paratype, RMNH)

Station 251s, Bay of Nha Trang, depth 20 m, bottom sand, March 18, 1960, V. A. GALLARDO leg. – 1 ♂, 1 ovig. ♀ (paratypes, RMNH No. D 17053)

Station 260, Bay of Nha Trang, depth 17 m, bottom sand, March 18, 1960, V. A. GALLARDO leg. – 1 ♀ (paratype, RMNH No. D 17055)

Station 264, Bay of Nha Trang, depth 9 m, bottom sand, March 21, 1960, V. A. GALLARDO leg. – 1 ♂ (paratype, RMNH)

Station 265, Bay of Nha Trang, depth 11 m, bottom sand, March 21, 1960, V. A. GALLARDO leg. – 1 ovig. ♀ (holotype, RMNH)

Station 292, Bay of Nha Trang, depth 25 m, bottom sand, March 25, 1960, V. A. GALLARDO leg. – 1 ovig. ♀ (paratype, RMNH)

Station 297, Bay of Nha Trang, depth 20 m, bottom muddy sand, March 25, 1960, V. A. GALLARDO leg. – 1 ovig. ♀ (paratype, RMNH No. D 17056)

Station 303, Bay of Nha Trang, depth 15 m, bottom sand, March 30, 1960, V. A. GALLARDO leg. – 1 ♂ (paratype, RMNH)

Definition Rostrum narrow, slender; apex bifid. Antennal spine usually small. Pleuron of fifth abdominal somite rounded posteriorly. Lateral plate of sixth abdominal somite without spiniform process. Stylocerite usually without outer distal spine. Basicerite with developed spine. Third maxilliped with short exopod. Second pereopods subequal in length, with 3-5 meral and 12-13 carpal joints. Propodus of fifth pereopod with four spines on posterior margin.

Description Body slender (Fig. 31). Rostrum slender, falling far or slightly short of end of eye; apex distinctly bifid, lower tooth longer than upper tooth; upper margin straight; lower margin convex posteriorly and a little concave at middle, curved upward at tip in adults (Fig. 32 *a*) and upper and lower margins straight in some young specimens (Fig. 32 *b*). Carapace 2.5-3.5 times as long as rostrum; suborbital angle slightly pointed; antennal spine small and in some specimens absent; postorbital region feebly concave (Fig. 32 *a*, *b*, *h*).

Pleura of first five abdominal somite rounded. Pleuron of sixth somite pointed but

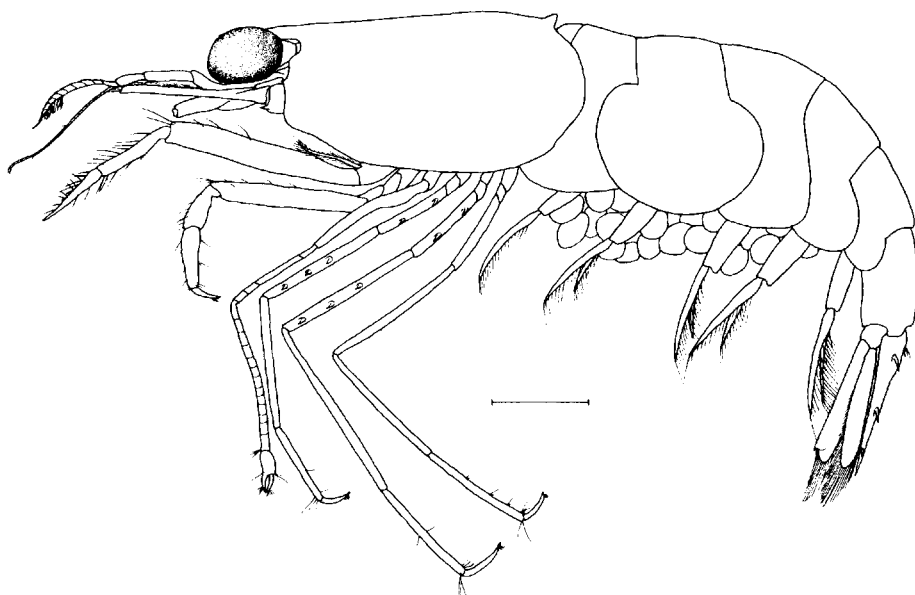


Fig. 31. *Processa neglecta* sp. nov., holotype, ovigerous female from Bay of Nha Trang. Scale represents 1.0 mm.

not acute; lateral plate not pointed (Fig. 32 *d, e*). Telson 1.3-1.6 times as long as sixth somite, with two pairs of dorsal spines, anterior pair placed on anterior fifth of telson, posterior pair on three-fifths of telson; posterior margin with a very small spine at middle, flanked by three pairs of spines (Fig. 32 *f*).

Eye moderate in size and slightly depressed. Antennular peduncle as long as antennal scale; basal segment longer than distal two segments combined; stylocerite obliquely truncated and with a very small spine on outer distal angle in most specimens (Fig. 32 *c*) but entirely quadrate on outer distal angle in a few specimens (Fig. 32 *g*); second segment about 1.5 times as long as third segment; outer flagellum thickened in basal 7-10 joints in females and 10-12 joints in males, of which the distal 2 or 4 joints in females and about all in males with setae; inner flagellum slender. Antennal scale 5.6-6.5 times as long as broad; outer spine exceeding slightly beyond lamellar part; basicerite with a well developed spine (Fig. 32 *a, h*); carpoperite reaching distal third of scale; flagellum more than twice as long as body.

Third maxilliped extending beyond antennal scale by ultimate segment or ultimate and distal half of penultimate segment; antepenultimate segment longer than distal two segments combined, which are equal in length (Fig. 32 *i*). First pair of pereiopods more slender in males than in females, reaching just end of scale. Second pair of pereiopods equal in length (Fig. 32 *j, k*); merocarpal articulation reaching beyond eye; merus obscurely subdivided into 3-5 joints; carpus into 12-13 joints; palm slightly longer than

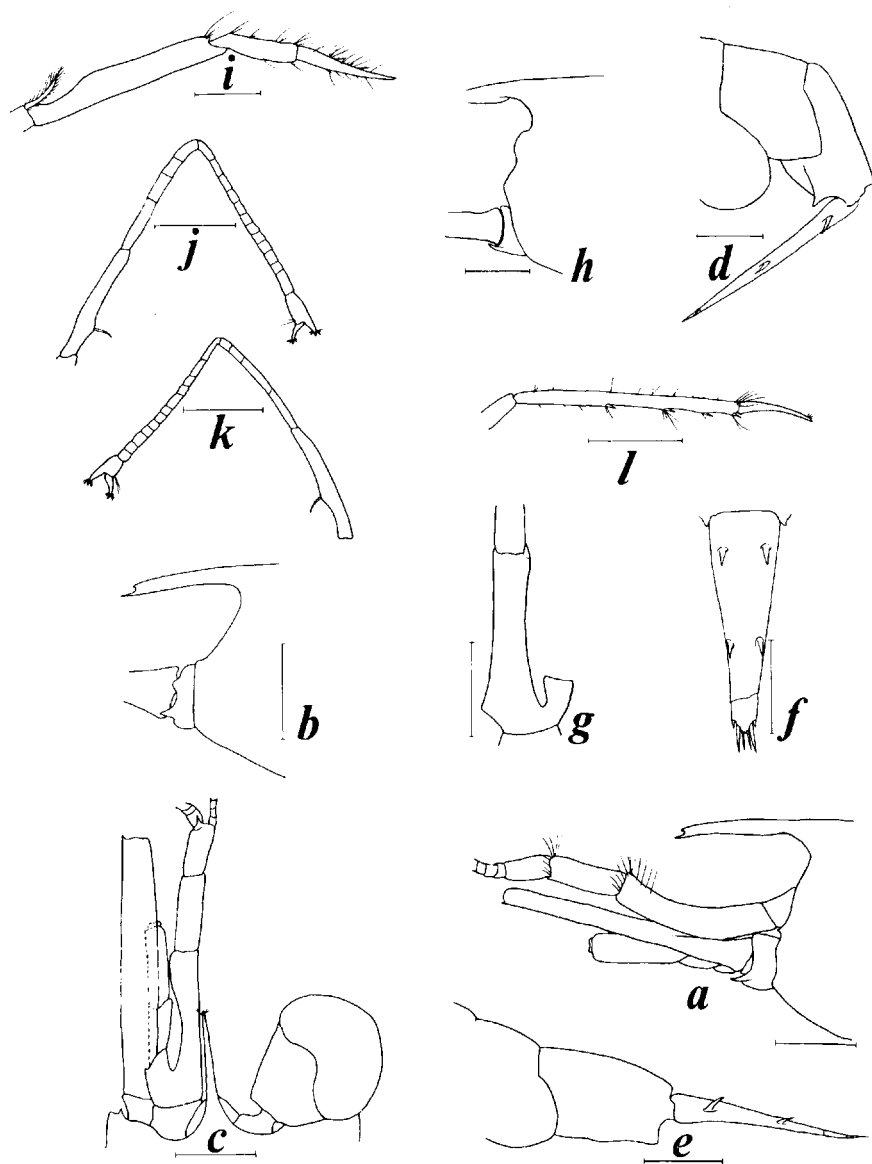


Fig. 32. *Processa neglecta* sp. nov., paratypes, *a*, female (2.4 mm in carapace length), *b*, *c*, *i-l*, female (2.0 mm), *e*, *f*, male (1.9 mm) from Bay of Nha Trang; *d*, *g*, *h*, ovigerous female (2.8 mm) from Sulu Archipelago.

a, *b*, anterior part of body, *c*, same in dorsal view, *d*, *e*, posterior part of body, *f*, telson, *g*, basal segment of antennular peduncle, *h*, anterior margin of carapace and basicerite, *i*, third maxilliped, *j*, right second pereiopod, *k*, left second pereiopod, *l*, dactylus and propodus of fifth pereiopod. Scales represent 0.5 mm.

fingers. Third pereiopod reaching with dactylus and propodus or these two segments and half carpus beyond antennal scale; ischium always with two spines; merus with three or four spines. Fourth pereiopod reaching with dactylus, propodus and half or two-thirds length of carpus beyond antennal scale; spinations of ischium and merus similar to those of the third pereiopod. Fifth pereiopod reaching with distal two segments beyond antennal scale; propodus with four spines on posterior margin (Fig. 32 1).

Endopod of first male pleopod slightly notched at end, inner lobe with some retinacula. Fifth abdominal sternite with a median keel; sixth sternite with a preanal spine. Eggs comparatively large and rather numerous, 0.35×0.44 mm in diameter.

Remarks The present new species, *P. neglecta*, was considered to be identical with *P. aequimana* PAULSON, and described fully under that name by DE MAN (1922). It is distinguished from *P. aequimana* by having four spines on the propodus of the fifth pereiopod, 3-5 meral and 12-13 carpal joints of the second pair of pereiopods and the unarmed lateral plate of the sixth somite, as already mentioned in the remarks of *P. aequimana*. On the other hand, *P. neglecta* is most closely allied to *P. dimorpha* sp. nov. and the distinctions between them are mentioned in the account for the latter species.

While *P. neglecta* somewhat resembles to two Atlantic species, *P. hemphilli* MANNING and CHACE and *P. parva* HOLTHUIS in having the antennal spine, the rounded pleuron of the fifth abdominal somite and equal second pereiopods. They, however, are more closely related to *P. dimorpha* than *P. neglecta* and therefore, separated apparently from *P. neglecta* by such characters distinguishing *P. dimorpha* from *P. neglecta* as the developed antennal spine, the pointed stylocerite and two or three spines on the posterior margin of the propodus of fifth pereiopod.

A single male from Siboga station 258, which was treated as *P. australiensis* by DE MAN (1920), was small (2.1 mm in carapace length) and rather broken and mutilated. It, however, does not belong to *P. australiensis*, because of the rounded pleuron of the fifth abdominal somite. Judging from the shape of the styloceite, of the basicerite and of the pleuron of the sixth abdominal somite and the comparative length of the second and third antennular segments, it probably identical with the present new species.

P. neglecta represents some morphological variations in the important specific characters. The antennal spine is generally small, but a single ovigerous female from Siboga station 96 and four small specimens from Ambon (Siboga material) and the Bay of Nha Trang, South Viet Nam, bear no spine on the anterior margin of the carapace. Even in this case the antennal angle is more or less produced. In addition, the outer distal angle of the stylocerite is armed with a small but distinct spine in some specimens from the Bay of Nha Trang, for example, a female from station 221. It is pointed but very indistinct in one specimen from station 260 and is entirely quadrate in an ovigerous female from station 292. These variations seem not to be correlated with growth rate or sex.

Size The holotype is about 10 mm in body length, the carapace is 2.65 mm and the rostrum is 0.95 mm in length. Oviparous females are 2.4-2.7 mm and males are 1.9-2.8 mm in carapace length. The largest specimen is a non-oviparous female, 3.1 mm in carapace length.

Distribution Kei Island, 22 m (DE MAN, 1920; present publication), Sulu Is., 14-15 m (DE MAN, 1920; present publication), Ambon, 54 m (DE MAN, 1920 and 1922; present publication), Bay of Nha Trang, 9-25 m (present publication).

***Processa processa* (BATE, 1888)**

(Fig. 33 a-b)

Nika processa BATE, 1888, p. 527 (not pl. 95 fig. 1).

Nika processa HENDERSON, 1893, p. 445.

? *Processa processa* NOBILI, 1903, p. 8.

not *Processa processa* RATHBUN, 1906, p. 912, pl. 22 fig. 6 (= p.p. *Nikoides maldivensis* BORRA-DAILE and *Nikoides danae* PAULSON or *N. gurneyi* sp. nov.).

Processa processa DE MAN, 1920, p. 199 (list).

not *Processa processa* EDMONDSON, 1946, p. 247, (= ? *Nikoides danae* PAULSON).

? *Processa processa* JOHNSON, 1961, p. 54.

not *Processa processa* FUJINO and MIYAKE, 1970, p. 257 (= *Nika kotiensis* YOKOYA).

Processa processa MANNING and CHACE, 1971, p. 13 (list).

Definition Rostrum narrow, slender, bifid at apex. Antennal spine absent. Pleuron of fifth abdominal somite rounded posteriorly. Lateral plate of sixth somite truncated, Stylocerite obliquely truncated. Basicerite without spine. Third maxilliped with exopod. Right second pereopod with 20 or more carpal joints, left second pereopod with about 10 or more joints. Ischium of these second pereopods not subdivided and subdivision of merus of these pereopods obscure.

Remarks The specific status of *Processa processa* (BATE) has been very obscure. GURNEY (1937), for instance, considered this species to be a species incerta, as it was never adequately described and as the figures of the species in BATE's report were made after a specimen of the European *Nika edulis*. Recently Dr. INGLE of the British Museum (Natural History) kindly reexamined the type of *Nika processa*, and informed several important characters of it as follows: "Antennal spine absent. Pleuron of fifth abdominal somite rounded. Lateral plate of sixth somite truncate. Stylocerite truncate. Basicerite of antennal peduncle without a spine. Third maxilliped with an exopod. Segmentation of right second pereopod - the pereopods 1-2 detached, the longest (2nd) is shown in the figure (Fig. 33 a), the segmentation of the carpus is indistinct but seems to have 20-21 segments. This pereopod seems to reach to about 1/2 way along antennal scale. The segmentation of 2nd left pereopod is shown in figure (Fig. 33 b), the carpus is indistinctly segmented. The 3rd and 4th pereopods are detached and are not readily identifiable, but none of the detached pereopods have

spines on their segments; a bunch of setae is present of the distal propodal margin of each peraeopod. The 5th peraeopods are detached and not easily identifiable, the segments are without spines, but the distal propodal margins are setosed."

Judging from this replay, BATE's figures of *Nika processa* were not made after its type specimen as mentioned by GURNEY (1937). The most remarkable difference between the type specimen and BATE's figures is the absence of the antennal spine. Although some authors were referred their specimens to *Processa processa* (BATE), thus, all of them seem to be misidentified, beside RATHBUN (1906) whose *P. processa* is partly *Nikoides maldivensis* BORRADAILE and partly *N. danae* PAULSON or *N. gurneyi* sp. nov. as mentioned above. DE MAN (1920) thought the specimen from Sanana Bay of Siboga station 193, belonging to *P. processa*. In his publication of 1922 he confirmed his earlier statement by considering the specimen belonging to *P. processa* indeed. After the direct examination of this specimen, however, it proves not to belong to the true *P. processa*, but to the new species, *P. affinis* described herewith. FUJINO and MIYAKE (1970) recently reported *P. processa* from East China Sea, but their species is referred to *P. kotiensis* (YOKOYA).

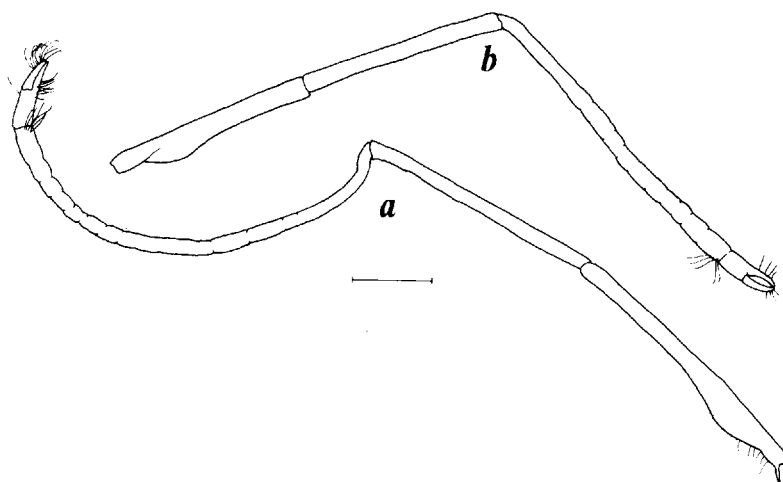


Fig. 33. *Processa processa* (BATE), holotype, female from Amboina.

a, right second pereopod, *b*, left second pereopod; after camera lucida sketches by Dr. INGLE. Scale represents 1.0 mm.

Considering the absence of the antennal spine, the unequal second pair of pereopods and the rounded pleuron of the fifth abdominal somite, *P. processa* is easily distinguished from the other Indo-West Pacific species of this genus and closely related to the Atlantic species, *Processa bermudensis* (RANKIN). Distinctions between these two species are only the segmentations of the second pair of pereopods and the armature of the third and fifth pereopods.

Size The holotype is a female, 26 mm in length (BATE, 1888).

Distribution The species is very rare and no additional material is found. Ambon, 15 fms (BATE, 1888).

***Processa sulcata* sp. nov.**

(Fig. 34 a-o)

Processa australiensis p.p. DE MAN, 1920, p. 199, pl. 17 fig. 51k-m (not *Processa australiensis* BAKER, 1907).

Processa australiensis GURNEY, 1937, p. 88, pl. 1 figs. 11-15 (not *Processa australiensis* BAKER, 1907).

Processa sp. KENSLEY, 1969, p. 172, fig. 14 a-g

Japan

Japan, P. F. von SIEBOLD leg. - 1 sp. (syntype of *Nika japonica*, RMNH No. D 991).

Off Asamushi, Aomori Bay, Aomori Prefecture, *Sargassum* and *Zostera* belts, small Danish seine, September 2-3, 1960, H. SANDO leg. - 2 ♂♂, 1 ovig. ♀, 1 ♀ (paratypes, ZLKU No. 13890)

Off Akashi, Sea of Setonaikai, March 15, 1958, J. YASUDA leg. - 1 ♂, 1 ovig. ♀, 1 ♀ (paratypes, ZLKU); Kurushima Strait, depth 52 m, bottom sand, gravel, December 10, 1967 - 1 ♀ (paratype ZLKU)

Sea of Genkai, Ainoshima Island, Fukuoka Prefecture, Danish seine, July 18, 1967, night, S. MATSUURA leg. - 1 ovig. ♀ (holotype, ZLKU No. 13900), 2 ♂♂, 1 ovig. ♀ (paratypes, ZLKU No. 13901)

Off Yoshimi, Yamaguchi Prefecture, depth 13-23 fms, November 11, 1966, night I. MURATA and H. KISHIMOTO leg. - 1 ovig. ♀ (paratype, ZLKU No. 13899)

Tomioka Bay, Amakusa Islands, Kumamoto Prefecture, *Zostera* belt, small Danish seine, April 24, 1959, night, T. KIKUCHI leg. - 16 ♂♂, 14 ovig. ♀♀ (paratypes, ZLKU No. 13860); June 21, 1959, night, T. KIKUCHI leg. - 7 ♂♂, 4 ovig. ♀♀, 6 ♀♀ (paratypes, ZLKU No. 13843)

Tomioka, Amakusa Islands, gill net, depth 35 fms, October 6, 1966, A TAKI leg. - 1 ♂, 1 ovig. ♀, 1 ♀ (paratypes, ZLKU No. 13896)

Station 4, Chijiwa Bay, Nagasaki Prefecture, dredge, 1961, T. KIKUCHI leg. - 1 ♂, 1 ovig. ♀, (paratypes, ZLKU No. 13894)

Siboga Expedition

Station 7, east reef of Batjumat, Java, 7°55.5'S, 114°26'E, March 11, 1899 - 1 ♂, 1 ♀ (paratypes, AM).

South Viet Nam

Station 303, Bay of Nha Trang, depth 15 m, bottom sand, March 30, 1960, V. A. GALLARDO leg. - 1 ♀ (paratype, RMNH).

South Africa

24°53'S, 34°56'E, depth 55 m, 1964, Anton Brunn - 1 ovig. ♀ (SAM Cat. No. PED 16 x-y).

Definition Rostrum narrow, bifid apex. Antennal spine present. Pleuron of fifth abdominal somite pointed. Lateral plate of sixth abdominal somite truncated or triangular. Stylocerite rounded. Basicerite without any spine or process. Third maxilliped with well developed exopod. Right second pereopod with 10-14 meral and 21-

30 carpal joints, left second pereopod with (3) 5-7 meral and 10-14 carpal joints. Propodus of fifth pereopod with 10-13 spines on posterior margin.

Description Body rather robust (Fig. 34 *a*). Rostrum reaching scarcely beyond end of eyestalk; apex distinctly bifid (Fig. 34 *b, c*). Carapace 4.5-5.1 times as long as rostrum; suborbital angle not produced, continuous with a pointed antennal spine; postorbital region distinctly hollowed (Fig. 34 *c*).

First four abdominal pleura smooth; fifth and sixth somites with sharply pointed pleura; lateral plate of sixth somite truncated or rectangular at tip (Fig. 34 *d*). Telson 1.7-1.9 times as long as sixth somite, sulcated dorsally; dorsal surface with two pairs of spines; posterior margin ending in a median spine, flanked by three pairs of unequal spines (Fig. 34 *e*).

Eye as long as broad, dorsally flattened and ventrally rounded. Antennular peduncle and flagellum similar to those of *P. zostericola* sp. nov. Antennal scale 4.5 times as long as broad, reaching nearly end of antennular peduncle; lamellar part obliquely truncated at tip, slightly overreaching outer terminal spine; basicerite bearing smooth outer margin without any process; carpocerite reaching distal extremity of second segment of antennular peduncle.

Third maxilliped extending beyond antennal scale by distal two segments. Right first pereopod with well-developed chela; propodus about 1.4 times as long as dactylus (Fig. 34 *f*). Left first pereopod simple; propodus 2.5 times as long as dactylus; merus 2.8 times as long as carpus as in right pereopod (Fig. 34 *g*). Right second pereopod long, reaching with merocarpal articulation beyond end of swollen part of antennular flagellum; ischium as long as merus, carpus 1.7 times as long as merus; palm about twice as long as broad; ischium with 2 or 3 joints, merus with 10-14 joints and carpus with 21-30 joints (Fig. 34 *h*). Left second pereopod usually reaching with merocarpal articulation beyond eye; ischium as long as merus; carpus 1.5 times as long as merus; ischium undivided, merus with (3) 5-7 joints and carpus with 10-14 joints (Fig. 34 *i*). Third pereopod reaching with dactylus, propodus and half carpus beyond antennal scale; merus with four or five, mostly four, outer spines (Fig. 34 *k*). Fourth pereopod much longer than third pereopod, reaching with dactylus, propodus and more than half carpus beyond antennal scale; merus bearing 3 or 4 outer spines (Fig. 34 *l*). Fifth pereopod reaching with dactylus and propodus beyond antennal scale; propodus with 10-13 spines on posterior margin (Fig. 34 *m*).

Endopod of first pleopod in male bluntly pointed, bearing some retinacula on inner distal margin (Fig. 34 *o*). Fifth abdominal sternite with a median spine. Uropod similar to those of *P. zostericola*. Eggs small and numerous.

Ecology The present species is common in *Zostera* belt of Tomioka Bay, Amakusa Islands and collected together with *P. zostericola*. In the Aomori Bay, northern extremity of the Main Island of Japan, *P. sulcata* is collected from *Sargassum* and *Zostera* belts. While outside the Tomioka Bay, this species is collected from sea weeds or sessile

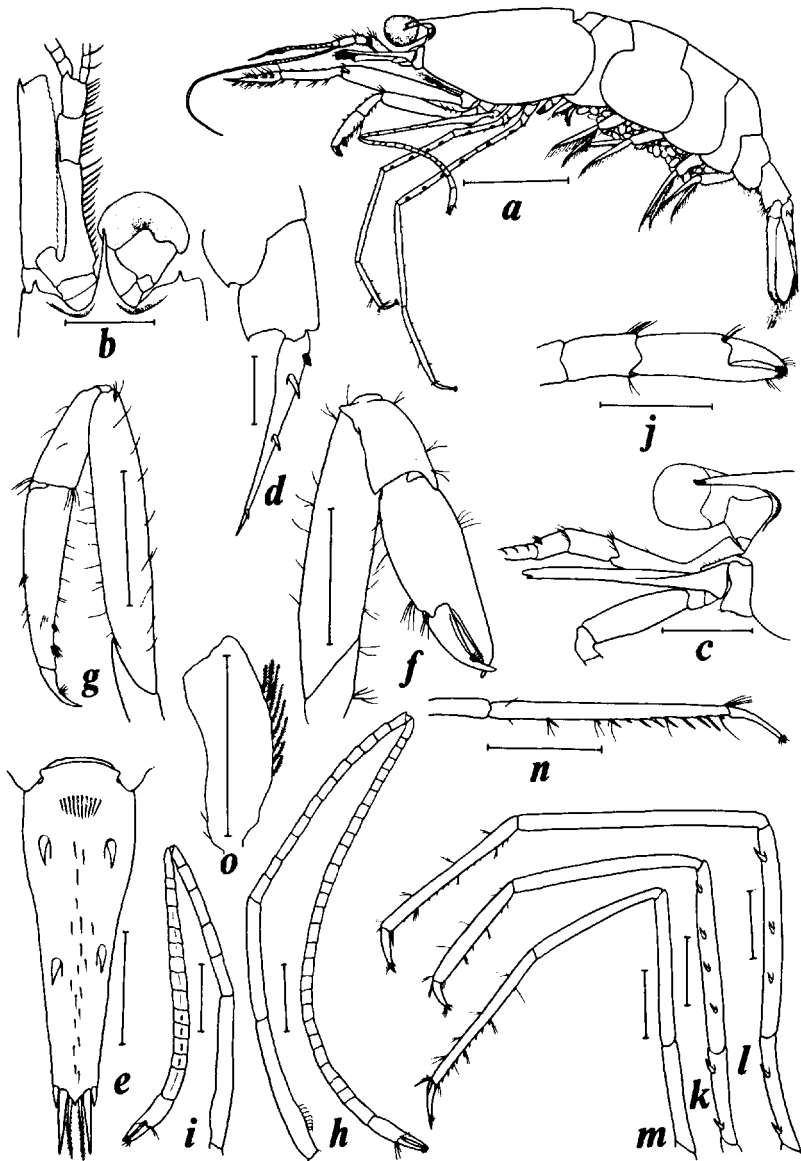


Fig. 34. *Processa sulcata* sp. nov., paratypes; *a, e*, ovigerous female (4.6 mm in carapace length) from Yamaguchi Pref.; *b-d, f, g, n*, ovigerous female (3.7 mm) from Ainoshima Is.; *h-j* ovigerous female (4.5 mm), *k-m* female (4.2 mm), *o*, male (3.7 mm) from Amakusa Is.

a, animal in lateral view, *b*, anterior part of body, *c*, same in lateral view, *d*, posterior part of body, *e*, telson, *f*, right first pereiopod, *g*, left first pereiopod, *h*, right second pereiopod, *i*, left second pereiopod, *j*, chela of left second pereiopod, *k*, third pereiopod, *l*, fourth pereiopod, *m*, fifth pereiopod, *n*, dactylus and propodus of fifth pereiopod, *o*, endopod of first pleopod. Scale for *a* represents 4.0 mm and scales for *b-o* represent 1.0 mm.

marine invertebrates that get entangled in gill nets for spiny lobster, and from dredge samples.

Remarks The present species is closely related to *P. zostericola* sp. nov., and differences between them are explained in the remarks of that species.

The Atlantic species, *Processa macrophthalma* NOUVEL and HOLTHUIS, somewhat resembles the present species. The two species are readily distinguished from each other by the length of the second pair of pereopods. The merus of the right pereopod is subdivided into 14-20 joints in *P. macrophthalma* and 10-14 joints in *P. sulcata*. The carpus of the right pereopod is subdivided into 38-49 joints in *P. macrophthalma* and 21-30 joints in *P. sulcata*.

The syntype of *Nika japonica* DE HAAN is well preserved in spirit at the Rijksmuseum van Natuurlijke Historie. It belongs to *P. sulcata*, as shown by the presence of a well developed exopod on the third maxilliped, two pairs of distinct spines on the telson, the slender and bifid rostrum and the unarmed basicerite of the antennal peduncle. Two specimens of the Siboga material reported as *P. australiensis* by DE MAN (1920), and GURNEY's (1937) specimens of *P. australiensis* from the Red Sea are also identical with the present new species, as already mentioned in the remarks of that species. KENSLEY (1969) reported a single specimen from South East Africa, under the name *Processa* sp. and gave a short description and remarks. Fortunately this specimen could be examined, and proves to belong to the present species.

Size The holotype is 4.4 mm in carapace length and 16 mm in entire length. The carapace length of ovigerous females varies from 3.4-6.3 mm. The largest specimen is a non-ovigerous female measuring 7.6 mm in carapace length and 26 mm in entire length. The largest male is 4.7 mm in carapace length.

Distribution Japan, 0-35 fms: off Asamushi, Aomori Prefecture; off Yoshimi, Yamaguchi Pref.; off Akashi and Kurushima Strait, Sea of Setonaikai; Ainosima I., Fukuoka Pref.; Chijiwa Bay, Nagasaki Pref.; Tomioka Bay, Amakusa Is., Kumamoto Pref. (present publication), Bay of Nha Trang, South Viet Nam, 15 m (present publication), Butjulmati, Java (DE MAN, 1920; present publication), South Arabian coast (GURNEY, 1937) and South East Africa, 55 m (KENSLEY, 1969; present publication).

***Processa zostericola* sp. nov.**

(Fig. 35 a-l)

Japan

Off Asamushi, Aomori Bay, Aomori Prefecture, *Sargassum* and *Zostera* belts, small Danish seine, September 2-3, 1960, H. SANDO leg. - 4 ♂♂, 15 ♀♀ (paratypes, ZLKU No. 13824).

Tomioka Bay, Amakusa Islands, Kumamoto Prefecture, *Zostera* belt; small Danish seine, April 24, 1959, night, T. KIKUCHI leg. - 1 ovig. ♀ (holotype, ZLKU No. 13791), 12 ♂♂, 4 ovig. ♀♀, 3 ♀♀

(paratypes, ZLKU No. 13792); June 21, 1959, night, T. KIKUCHI leg. - 9 ♂♂, 3 ovig. ♀♀, 2 ♀♀ (paratypes, ZLKU No. 13810).

Definition Rostrum narrow, bifid at apex. Antennal spine present. Pleuron of fifth abdominal somite pointed. Lateral plate of sixth abdominal somite truncated or triangular. Stylocerite usually unarmed. Basicerite of antennal peduncle with rounded process on lower distal angle. Third maxilliped with well developed exopod. Right second pereiopod with 7-11 meral and 19-25 carpal joints, left second pereiopod with 5-6 meral and 13-15 carpal joints. Propodus of fifth pereiopod with 10-12 spines on posterior margin.

Description Body rather robust (Fig. 35 *a*). Rostrum directed slightly downward, extending only to line between eyestalk and cornea; apex bifid, upper tooth much shorter than lower tooth (Fig. 35 *c*). Carapace smooth, about 3.7-4.6 times as long as rostrum. Suborbital angle not pointed, continuous with a small antennal spine; distinct suborbital groove present (Fig. 35 *b, c*).

Pleura of fifth and sixth abdominal somite posteriorly pointed. Lateral plate of sixth abdominal somite truncated or triangular (Fig. 35 *d*). Telson about 1.7 times as long as sixth somite; dorsal surface shallowly grooved, with two pairs of dorsal spines; posterior margin ending in a very small median spine and with three pairs of spines (Fig. 35 *e*).

Eye moderate, rather longer than wide. Antennular peduncle long and rather robust; basal segment slightly longer than distal two segments combined, which are subequal in length; stylocerite truncated at tip in most specimens (Fig. 35 *b*), but in a few specimens its outer margin ending in a small spine (Fig. 35 *f*). Outer flagellum thickened in basal 16-20 joints; in males all thickened joints setose, but in females basal 6-7 joints bearing no setae; distal part of outer flagellum also slender. Antennal scale about 4.8 times as long as broad, reaching nearly end of antennular peduncle; lamellar part truncated at tip and as long as stout outer spine. Outer lower part of basicerite produced to a small obtuse, not spiniform, process; carpoplite reaching to or beyond distal end of second segment of antennular peduncle; flagellum about twice as long as body.

Third maxilliped exceeding antennal scale by distal two segments. First pereiopods chelate on right and simple on left side. Second pair of pereiopods unequal, right longer than left. Merocarpal articulation of right second pereiopod reaching, at most, end of antennular peduncle; merus with 7-11 joints and carpus with 19-25 joints (Fig. 35 *h*). Merocarpal articulation of left second pereiopod reaching distal end of eye; merus with 5 or 6 and carpus with 13-15 joints (Fig. 35 *h*). Palm of both right and left second pereiopods about 1.5 times as long as broad (Fig. 35 *i*). Ischium of third and fourth pereiopods with two spines on outer surface; merus of these pereiopods with usually three outer spines (Fig. 35 *j*). Fifth pereiopod with no outer spines but 10-12 small spines on posterior margin of propodus (Fig. 35 *k*).

Endopod of first pereiopod in large male deeply notched at end, outer lobe rounded,

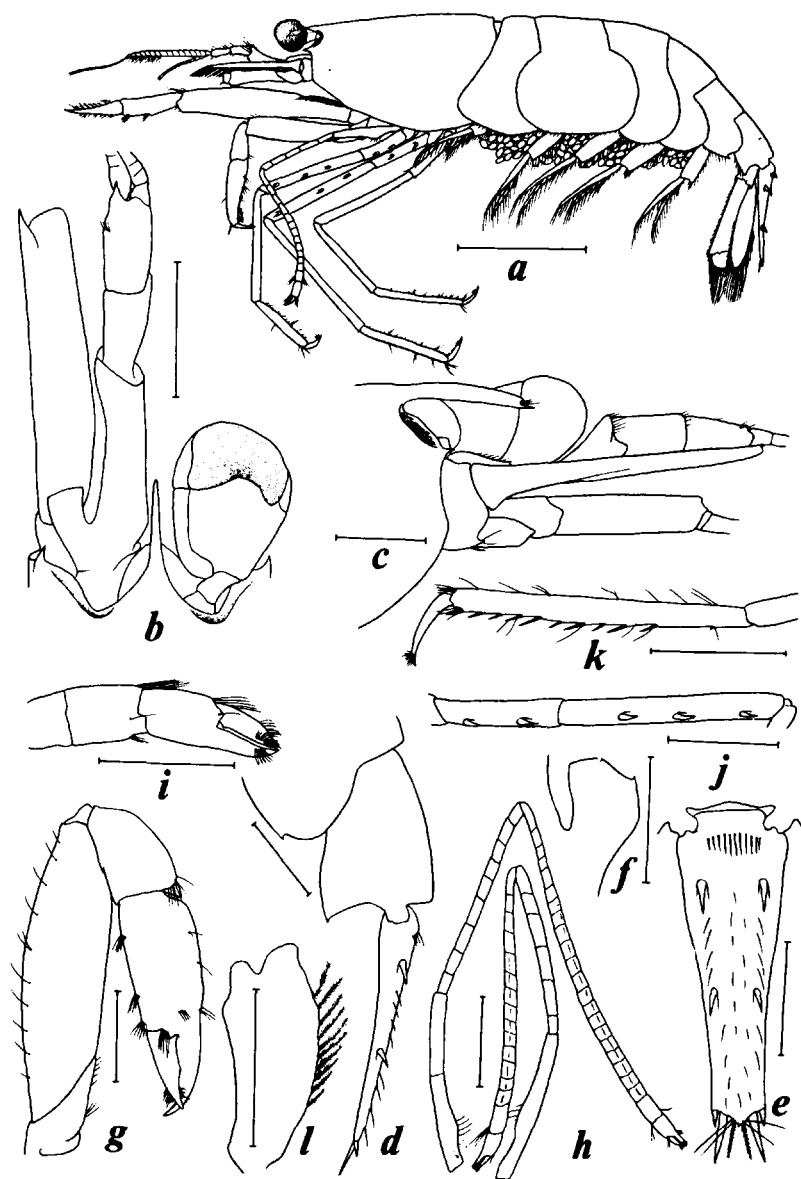


Fig. 35. *Processa zostericola* sp. nov., a, holotype, ovigerous female (5.9 mm in carapace length), b, d, e, j, k, paratype, male (3.4 mm), c, g, i, paratype, ovigerous female (5.5 mm), f, paratype, male (3.6 mm), h, paratype, male (4.3 mm), all from Amakusa Is. a, animal in lateral view, b, anterior part of body, c, same in lateral view, d, posterior part of body, e, telson, f, stylocerite, g, right first pereiopod, h, second pair of pereiopods, i, chela of left second pereiopod, j, merus and ischium of third pereiopod, k, dactylus and propodus of fifth pereiopod, l, endopod of first pleopod. Scale for a represents 4.0 mm, scales for b-e, g-l represent 1.0 mm and scale for f represents 0.5 mm.

inner lobe bearing some retinacula (Fig. 35 I). First abdominal sternite with a median spine. Uropod longer than telson; outer margin of exopod straight, ending in two spines, outer small and fixed, inner longer and movable. Diaeresis distinct, bearing two broad triangular teeth.

Abnormality A single ovigerous female (ZLKU No. 13804) collected from *Zostera* belt of the Tomioka Bay, Amakusa Islands, Japan is highly remarkable. Although the specimen is 5.5 mm in carapace length and its general shape is very similar to the other specimens collected together with it, in its first and second pereopods the right and left are entirely reversed. The proportional length of each segment of these two pereopods and the segmentation of the merus and carpus of the second pereopod agree well with those of the opposite side of the normal specimens. The left first pereopod is a normal chela and stouter than the right, which ends in a simple claw. The left second pereopod is longer than the right, and reaches with the merocarpal articulation beyond the second segment of the antennular peduncle; the merus is subdivided into 7 joints and the carpus into 22 joints. The right second pereopod reaches with its merocarpal articulation beyond the end of the eye; the merus is subdivided into 5 joints and the carpus into 14 joints.

Ecology In Japan the present species is abundant in littoral weed belts. KIKUCHI (1962 and 1966) reported that the species under the name *Processa* sp. was one of "year round residents" in *Zostera* belts of Tomioka Bay, Amakusa Islands and it had two generations in those belts. After the reexamination of a small part of his material, his *Processa* sp. proves to contain, at least, three species, *P. kотиensis* (YOKOYA), *P. sulcata* sp. nov and *P. zostericola* sp. nov. Of these *P. kottiensis* is not so common as the other two species. *P. sulcata* is collected from sea weed and sessile marine invertebrates, which get entangled in the gill nets used for fishing spiny lobsters outside the Tomioka Bay; no specimens of *P. zostericola* are known to be obtained in this way. Thus *P. zostericola* probably corresponds to the true "year round resident" of KIKUCHI's *Processa* sp. and consequently it is thought to show two generations in *Zostera* belts. However, in the present small samples collected in April and June, *P. zostericola* appears in about the same quantity as *P. sulcata* and both have a few ovigerous females of about equal size, so that it is impossible to draw any conclusion here.

Remarks The present new species is very closely related to *Processa sulcata* sp. nov. as well as to *P. australiensis* BAKER. As the distinctive characters from *P. australiensis* are mentioned in the account for that species, only the differences between *P. zostericola* and *P. sulcata* are mentioned here.

(1) The rostrum is shorter in *P. sulcata* than in *P. zostericola* and the apex is more distinctly bifid in the former than in the latter. (2) The telson is longer in *P. sulcata* than in *P. zostericola*; namely it is 1.7-2.0 times as long as the sixth abdominal somite in the former and 1.6-1.8 times in the latter. (3) In *P. zostericola* the lamellar part

of the antennal scale is straightly truncated and is as long as the outer terminal spine, while in *P. sulcata* it is obliquely truncated and reaches with its inner tip beyond the outer distal spine. Furthermore in the former species the basicerite is provided with a small obtuse process which is entirely absent in the latter. (4) In *P. sulcata* the second pereopods are strongly unequal. The right is much longer and reaches with the merocarpal articulation, at least, beyond the antennal scale. The palm of the chela of the second pereopods is slender and twice as long as broad. In *P. zostericola* the second pereopods are slightly unequal; the merocarpal articulation of the right pereopod reaches, at most, the end of the antennal scale. The palm of both sides of the second pereopod is about 1.5 times as long as broad.

From the Atlantic species, *P. macrophthalma* NOUVEL and HOLTHUIS, to which *P. zostericola* is related, it is distinguished by the length of the second pair of pereopods, a character which also distinguishes *P. sulcata* from *P. macrophthalma*.

Size The holotype is 5.8 mm in carapace length. The ovigerous females vary from 5.3-7.5 mm and the largest male is 4.5 mm in carapace length.

Distribution The species is known from the littoral weed belts in Japanese waters. Aomori Bay and Tomioka Bay (present publication).

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