

# ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN  
(MINISTERIE VAN CULTUUR, RECREATIE EN MAATSCHAPPELIJK WERK)

Deel 53 no. 20

5 december 1978

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## NOTES ON *STENOPUS SPINOSUS* RISSO AND *ENGYSTENOPUS SPINULATUS* HOLTHUIS (CRUSTACEA, DECAPODA, STENOPODIDAE)

by

**CH. LEWINSOHN**

Zoological Institute, University of Tel-Aviv, Israel

and

**L. B. HOLTHUIS**

Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands

With one text-figure

### INTRODUCTION

During recent explorations off the Mediterranean coast of Israel several specimens of *Stenopus spinosus* were collected. When studying this material it was thought to be of interest to compare the Israel specimens with those that had been reported from the Red Sea. Although *Stenopus spinosus* has repeatedly been reported from the eastern Atlantic and the Mediterranean, there is only a single record of the species from the Red Sea (Balss, 1914). Due to the kindness of Dr. G. Pretzmann of the Vienna Museum it was made possible for us to examine these Red Sea specimens. These proved not to be *Stenopus spinosus* but to belong to the poorly known *Engystenopus spinulatus*.

In the first part of the present paper the Israel *Stenopus* material is dealt with, in the second part a description of the Red Sea specimens of *Engystenopus* is provided.

#### I. *Stenopus spinosus*, a species new to the eastern Mediterranean

During 1977 a scientific investigation of the benthic fauna of the Mediterranean south of Tel-Aviv, Israel, sponsored by the Zoological Institute of the University of Tel-Aviv, was carried out by the first author (Ch. L.), ably assisted by Mrs. B. Galil of the Institute. Eleven stations at depths between

20 and 80 m were regularly sampled. One of the interesting finds here was that of *Stenopus spinosus*.

***Stenopus spinosus* Risso, 1827**

Material examined. — Off Palmahim, south of Tel-Aviv; Sta. 1, 31°56' N 34°36' E, 35 m deep; 3 May 1977, 1 juvenile, NS 16328.

Off Palmahim; Sta. 2, 31°56' N 34°35' E, 50 m; 30 June 1977, 1 ♂, NS 16323.

Off Palmahim; Sta. 3, 31°56' N 34°34' E, 80 m; 3 May 1977, 1 specimen, NS 16327.

Off Palmahim; Sta. 5, 31°55' N 34°39' E, 35 m; 24 October 1977, 1 ♂, 1 ovigerous ♀, NS 16322.

Off Palmahim; Sta. 6, 31°55' N 34°35' E, 50 m; 2 May 1977, 1 ♂, 1 juvenile, NS 16321; 30 June 1977, 1 ♂, NS 16320; 30 June 1977, 1 specimen, NS 16325.

Off Palmahim; 35 m; 1977, 1 ♂, 1 ♀, NS 16326.

Nizanim, 22 km south of Palmahim; Sta. 9, 31°44' N 34°31' E, 35 m deep; 26 October 1977, 1 ♀, NS 16324.

Size. — The total length of the examined specimens varied between 14 and 35 mm. The length of the ovigerous female is 35 mm.

*Stenopus spinosus* Risso, 1827, is a well known species, which until about 25 years ago had only been reported from the north-western Mediterranean (and the Red Sea). In 1952 the first record from the eastern Atlantic was published (Holthuis, 1952), viz., from West Africa; still later the species was reported also from the Azores, Madeira and the coast of Portugal. The records of "*Stenopus spinosus*" from the western Atlantic all pertain to *Stenopus scutellatus* Rankin, 1898. The two species have been extensively described by Holthuis (1946), who also provided the synonymies of both and a key to all then known species of *Stenopus*. Among more recent descriptions of *Stenopus spinosus* are those by Zariquiey Alvarez (1968) and Neves (1969); Neves' paper also contains very useful illustrations. Balss (1914, 1915, 1929) reported the species from the Red Sea, but examination of his material proved that it belongs to *Engystenopus spinulatus* Holthuis (see part II of this paper).

The twelve specimens obtained off the coast of Israel are relatively small (up to 35 mm total length) when compared with the length reported for the species in the literature. Holthuis (1946) mentioned total lengths between 51 and 73 mm, Karlovac (1953) between 50 and 72 mm. The maximum length of the species seems to be around 70 mm.

No detailed description of the species is provided here as the specimens agree well with the published accounts. The species is quite variable, especially in the number of the various spines, as will be shown by a few examples. The upper margin of the rostrum in our Israel specimens has 9 to 14 teeth, the lower margin 5 to 8 teeth. On the lateral carina of the rostrum there are 1 to 3 teeth; in one of the specimens there are no teeth at all on one side. The

number of teeth in the proximal part of the outer margin of the scaphocerite in our material varies from 2 to 4. We could not find any correlation between the number of teeth and the size or sex of the animals.

Colour. — In the original description Risso (1827: 66) described the colour as follows: "son corps est . . . d'un rouge doré . . . ; les rames caudales sont d'un rouge foncé". Riedl (1966, pl. 10 fig. b, opp. p. 320) published a coloured photograph of the species which shows part of the colour very clearly. The following description was made after live Israel specimens: The general colour of the body is golden yellow. The rostrum is orange. The telson is white with an orange basal part. The basal segments of the antennae and antennulae are orange, the flagella are white. The large chelipeds of the third pair show an orange colour, except for the basal part which is golden yellow and the tips of the fingers which are white. All other pereopods have the same colour as the body, golden yellow; however, they become lighter distally. The proximal part of the uropodal exopod has an orange colour, the rest is deep red. The uropodal endopod shows only a deep red colour near the outer margin. The general impression is that of a golden yellow animal with a red spot on the uropods. Some parts are somewhat darker, viz., more orange (especially at the larger chelipeds), while the distal parts of the various appendages are usually white.

Geographic distribution. — Most records are from an area which includes southern Italy (Sicily, e.g. Messina), the Italian west coast, the French Mediterranean coast and N.E. Spain (Cabo de Creus; Barcelona). In the eastern Atlantic the species has been reported from Portugal south of Lisbon (Neves, 1969), the Azores and Madeira (Figueira, 1959), off Cameroon (Crosnier, 1971), and Congo (Holthuis, 1952). A. Milne Edwards & Bouvier (1909: 263, 264) reported the species "de la Méditerranée et de l'Atlantique oriental", without any indication on what their record from the eastern Atlantic was based; it may refer to otherwise unpublished material.

As *Stenopus spinosus* is the only species of the genus known from the eastern Atlantic, another puzzling record might be referred to. This is Richard's (1904: 2) mention of "plusieurs *Stenopus atlanticus*, *Polycheles*, 1 *Geryon quinquedens* très petit" from Sta. 1450 of the "Princesse Alice", which is situated in the Bay of Biscay at 45°09' N 3°18' W, at a depth of 1804 m (24 July 1903). At first we thought that "*Stenopus atlanticus*" might be an error for *Stenopus spinosus*, but we changed that view, when we found that Bouvier (1917: 126, 127; 1922: 92, 93) reported from Sta. 1450 of the "Princesse Alice": *Nephropsis atlantica* Norman, *Polycheles sculptus* Smith, and *Geryon tridens* Kröyer. As at that station 6 specimens of *Nephropsis atlantica* were taken (Bouvier, 1917: 22), it seems quite certain that these

were intended by Richard when he mentioned "plusiers *Stenopus atlanticus*" and that the latter name just is a lapsus for *Nephropsis atlantica*, having nothing to do with Stenopodid shrimps.

In 1953 *Stenopus spinosus* was reported for the first time from the Adriatic: Karlovac (1953) dealt with eight specimens found in a wreck salvaged from the Zladin Channel north of Split on the Dalmatian coast of Jugoslavia. Pastore (1976) mentioned a specimen from the Gulf of Taranto. So far no records have been published of the species from the eastern Mediterranean or from the north coast of Africa. The easternmost record so far in the Mediterranean is Riedl's (1966: 166) mention of the species from Corfu, Greece. The present material from the Israel coast shows that the species certainly is not rare in the eastern Mediterranean.

Vertical distribution. — Most of the published records of this species do not mention any depth at which the material was taken. When depths are indicated these are mostly between 20 and 80 m, as follows: 15-80 m (Lo Bianco, 1909), 19-54 m (Karlovac, 1953), 70 m (Zariquiey Alvarez, 1968), 50 m (Crosnier, 1972), 27 m (Pastore, 1976), 35-80 m (present material). Extremes are the records by Holthuis (1952), 225 and 250 m, and by Riedl (1966: explanation pl. 10 fig. b) from only 1 m depth. The depths of 650 and 690 m which are often cited for the species are based on Balss' (1914, 1915) record from the Red Sea, which as shown in pt. II of this paper concerns a different species.

Habitat. — The available data (published and unpublished) indicate that the species is not confined to a definite type of habitat. Riedl (1966: 166) described the species from rocky caves and remarked: "Ferner führt . . . die Form auch noch im Dämmerlicht der Höhlen ein sehr verstecktes Dasein. Sie hält sich in finstersten Winkeln und Spalten auf, um erst nächstens im freien Höhlenraum hervorzutreten". Riedl remarked that the species has been observed in submarine caves near Marseilles, at Elba and Corfu. The same author (Riedl, 1966: 212, 213) when dealing with *Stenopus spinosus* and the Brotulid fish *Grammonus ater* stated: "Aber auch bei diesen handelt es sich nicht um ausschliessliche Höhlenbewohner, denn man kennt beide aus den tiefen Freiwassergebieten des Mediterran. Sie sind auf Fels- und Schlammböden mit Netzen, zweifellos also ausserhalb von Höhlen, gefischt worden, lange bevor sie in den seichten Grotten entdeckt wurden". This is confirmed by the animals from off the Mediterranean coast of Israel: the intensive exploration of the various stations showed that in none of them rocks or stones are present. At the depth of 35 m (Sta. 1, 5, 9) the bottom consists roughly of 65% sand and 35% finer sediments, at 80 m (Sta. 3) there is about 1% sand against 99% finer sediments. In the winter (March) the

temperature at all stations is around 17°C; in the summer (August, September) the temperature is 27°C at 35 m, 25°C at 50 m, and 20.6°C at 80 m depth (the figures given are monthly averages). A salinity of 38.5 to 38.8‰ is found at all stations in the winter; in the summer this salinity is found at the deeper stations (50 and 80 m), while at 35 m the salinity in the summer is 39.3‰. As nothing is known about the vagility of the animals, it is possible that in different seasons different depths are preferred.

## II. Redescription of *Engystenopus spinulatus* Holthuis, 1946

Balss (1914: 137; 1915: 33) reported "*Stenopus spinosus* Risso" from two stations in the Red Sea. This record is most unusual for two reasons: first, *Stenopus spinosus* at that time and since has only been reliably reported from the Mediterranean and the eastern Atlantic, and secondly Balss's animals came from depths of 650 and 690 m, while *Stenopus spinosus* usually is found between 20 and 80 m (see part I of the present paper). At our request Balss's specimens were kindly made available to us by Dr. Gerhard Pretzmann of the Naturhistorisches Museum in Vienna. An examination of this material shows that it is not *Stenopus spinosus* and even cannot be assigned to the genus *Stenopus*. The specimens prove to belong to *Engystenopus spinulatus*, a species known only from the mutilated holotype. Although the Red Sea specimens are not complete either (the important third pereopods are missing), it was thought useful to redescribe the species from this material so as to add to the scarce information available of the species.

We want to thank Dr. Pretzmann for making this important material available to us and so enable us to solve one of the intriguing zoogeographic problems that has bothered carcinologists since long: another "Tethys relict" falls by the wayside.

### ***Engystenopus spinulatus* Holthuis, 1946 (fig. 1)**

*Stenopus spinosus* - Balss, 1914: 137; Balss, 1915: 33; Balss, 1929: 25, 26, 27 (not *Stenopus spinosus* Risso, 1827).

? *Engystenopus spinulatus* Holthuis, 1946: 45, pl. 4 figs. a, b.

*Engystenopus spinulatus* - Burukovsky, 1974: 93.

Material examined. — Northern Red Sea, 26°40' N 35°33' E, 650 m deep, dredge; 23 February 1898; "Pola" Sta. 169. - 1 ♂, 1 ovigerous ♀ (Museum Vienna).

Description. — The rostrum is narrow, slender, and straight; it reaches almost to the end of the antennular peduncle. Dorsally the rostrum proper (before the posterior limit of the orbit) bears 8 teeth, a short distal part (1/4 of the length or less) being unarmed. The lower margin of the rostrum bears three teeth in the distal third (in the smaller, male specimen) or five teeth in the distal half (in the larger, female specimen); the anterior of these

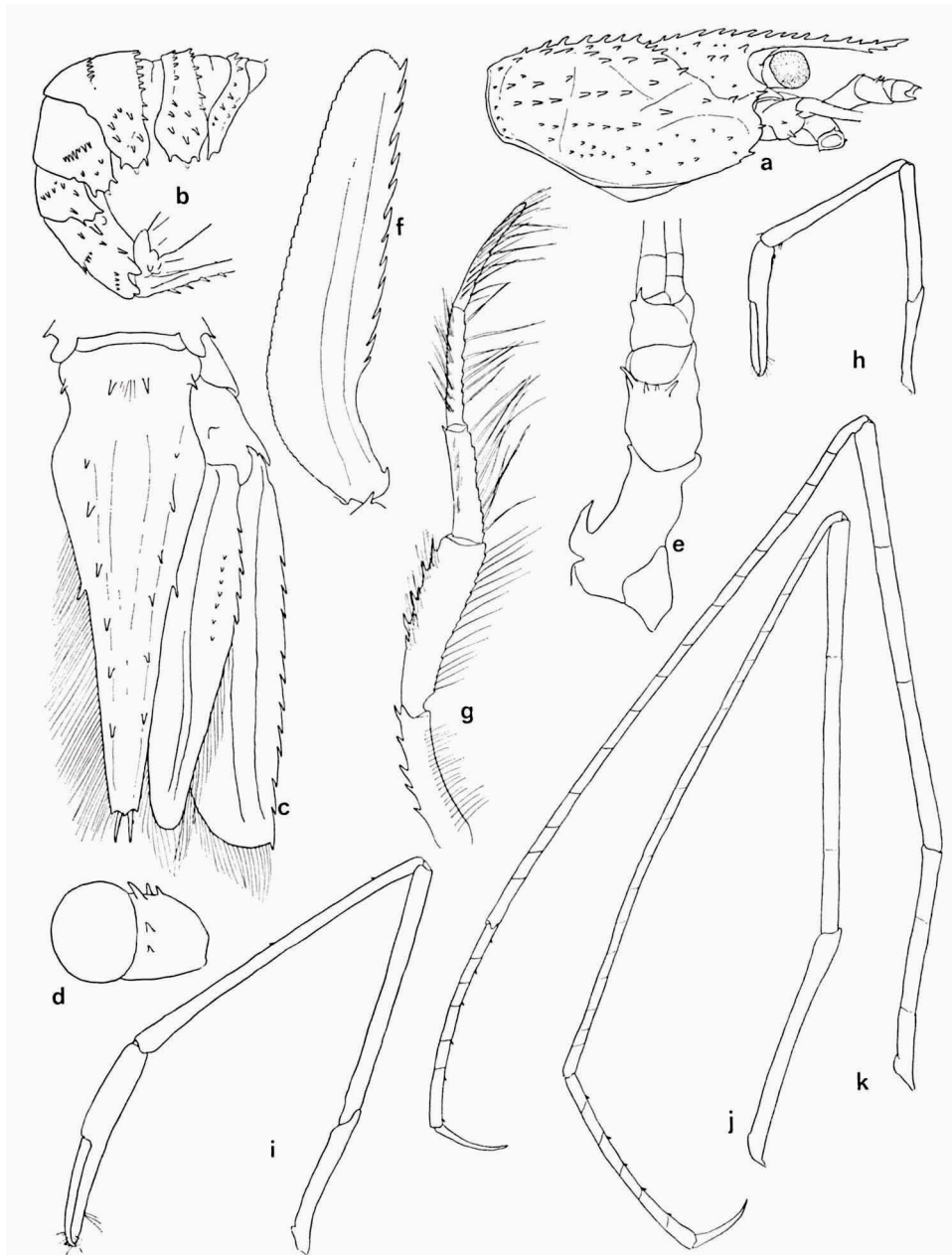


Fig. 1. *Engystenopus spinulatus* Holthuis, specimens from the Red Sea. a, b, male; c-k female. a, anterior part of body in lateral view; b, abdomen in lateral view; c, telson and right uropod in dorsal view; d, eye; e, antennula; f, scaphocerite; g, third maxilliped; h, first pereiopod; i, second pereiopod; j, k, third or/and fourth pereiopods.  
a, b, h-k,  $\times 6$ ; c-g,  $\times 12.5$ .

teeth being smallest. Behind the orbit the dorsal margin of the rostrum continues as a ridge as far as the cervical groove; this ridge bears six pairs of teeth. The teeth of each pair are placed side by side, and sometimes a pair is replaced by a single tooth. The lower orbital angle is about rectangular and is rounded at the apex. Some distance below the lower orbital angle a distinct antennal spine is placed on the anterior margin of the carapace. Below the antennal spine the anterior margin of the carapace first runs back and then forward to end in the widely rounded pterygostomial angle. A relatively small branchiostegal and a pterygostomial spine are present, behind the latter sometimes an additional spinule is visible.

The cervical groove of the carapace is very deep, especially dorsally where it traverses the dorsum of the carapace. Laterally it runs obliquely forward and down, to end with a forward curve near the antennal spine. Behind the antennal spine a second spine is placed just below the cervical groove. In the triangle between the dorsal margin of the carapace, the orbit, and the cervical groove there is a distinct postorbital spine, a few (2 or 3) slightly smaller spines and several spinules. On the central part of the posterior rim of the cervical groove there are 4 or 5 strong spines in each half. On the median dorsal margin of the carapace behind the cervical groove there is a double row of 6 spines, behind which, just before the posterior margin of the carapace, a single median spine is present. The spines on the lateral surface of the carapace are not very closely placed and are arranged in a number of longitudinal rows; the spines of the upper part of the lateral surface being stronger than those of the more ventral parts. Before the posterior margin, the carapace bears in each half a transverse row of about 6 or 7 spinules.

The first abdominal somite shows a transverse groove, behind which, in each half, there are about 7 or 8 spines of various size. A few tubercles are visible in front of the groove. The pleuron of the somite ends in a tooth with a rounded or rectangular lobe in front. Also the second and third somites show a transverse groove, behind the median part of which a row of blunt spines is present; such a row of spines is also placed on the anterior margin of either of these somites. In the larger specimen a row of 4 spines is visible in the median area just before the transverse groove, and a single median spine is present before this row. In the smaller specimens these additional spines are absent. The pleura of the second and third somites also have various spines on the dorsal surface. The distal margin of these pleura ends in a blunt median point (or perhaps in a tooth, which in the present specimens is broken), with at either side a slender spine. The fourth somite has the pleura similar to those of the second and third, but on the tergum there are no spines, apart from an oblique row just above the base of the pleuron; no

transverse dorsal groove is present either on this or the next somite. The pleuron of the fifth somite narrows distally and ends into two teeth, while a spine is present on its posterior margin. A few spines are found on the surface of the pleuron, while an oblique row of spines is present on the tergum above the base of the pleuron. The sixth somite is about twice as long as the fifth. It bears a transverse groove over the middle, before which there is a transverse row of posteriorly directed spines. A similar transverse row of spines, which are smaller, is present before the posterior margin. A strong spine is placed in the lower anterior part of the sixth somite just behind the pleuron of the fifth somite; a few smaller spinules are placed nearby. The pleuron of the sixth somite ends in a rather blunt triangular tooth over the base of the uropod; a spine is placed anterior to the base of the pleuron. The median part of the posterior margin of the sixth somite shows an incision at either end.

The telson is 1.5 times as long as the sixth abdominal somite. It is lance-shaped, having the greatest width at the end of the basal fourth. Each lateral margin bears a distinct tooth in the middle. A hairy fringe surrounds the distal  $3/5$  of the telson. The posterior margin of the telson ends in two distinct teeth between which the margin is somewhat convex and probably has a small median denticle; two strong spines are implanted on the posterior margin, but it is impossible, because of the condition of the specimens, to find out whether more than those two spines originally were present (in the smaller specimen the telson is broken, in the larger it is complete, with the exception of the posterior margin, part of the armament of which may have been lost). The dorsal surface of the telson shows two strong longitudinal carinae, each of which bears six teeth which are rather regularly spaced. The basal part of the telson carries two submedian and two lateral spines.

The eyes are well developed. The cornea is globular and pigmented. The dorsal surface of the stalk shows a few spines near the base of the cornea, the anterior of these spines being the largest. The anterior margin of the stalk bears two more spines, which are distinct.

The first segment of the antennular peduncle has a short but acute stylocerite, which reaches about to the middle of the basal antennular segment. The second segment is slightly shorter than the first and bears a few spinules in the dorsal part of the anterior margin. The third segment is short and shows a distal dorsal spine.

The scaphocerite reaches distinctly beyond the antennular peduncle, it is more than four times as long as wide. The outer margin is serrate over the full distal  $3/4$  of its length: about 12 teeth are placed behind the final tooth. A small but distinct spine is placed on the outer base of the scaphocerite. The



upper surface of the lamella shows two shallow carinae, but no spinules. The end of the antennal peduncle fails by far to reach the middle of the scaphocerite. Some spinules are present on the basicerite.

The mouth parts have not been dissected so as not to damage the specimens more than they already were.

The branchial formula is the usual one:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	1	1	1	1	1	1	1
arthrobranchs	—	1	2	2	2	2	2	—
podobranchs	—	1	—	—	—	—	—	—
epipods	1	1	1	1	1	1	1	—
exopods	1	1	1	—	—	—	—	—

None of the third maxillipeds or pereiopods are still attached to the body, the ones here described and figured are presumably of the larger (female) specimen.

The last three segments of the third maxilliped are slender and of about the same length. The ultimate segment is the narrowest, the antepenultimate broadest. All three have no spines or spinules, but show long hairs, some of which are arranged in tufts. The merus is longer and broader than either of the ultimate three segments, it bears some strong spines and spinules on the outer margin. The next segment also has spines on the outer margin. The exopod is well developed.

The first pereiopod is the shortest and smallest of the two chelipeds that are still present in this material. The chela is slender (about 6 times as long as high), and the fingers are longer than the palm. The cutting edges show minute rounded denticles, almost granules, which are placed at regular distances over the entire edge. The carpus is slender, it is  $5/4$  longer than the chela and has an anterodorsal spine; it is about 8 to 9 times as long as wide. The merus is about as long as the chela. The second leg is about as slender as the first, but is longer (about 1.8 times). The chela is also about 6 times as long as high. The fingers are of about the same length as the palm and show a dentition of the cutting edges which is similar to that of the first leg. The carpus is about 1.5 times as long as the chela and about 15 times as wide. A few small spinules are visible in the proximal half of the dorsal margin. The merus is unarmed and somewhat longer than the chela. The third legs, which, judging by the size of the coxae, are much larger and more robust than any of the other legs, are missing in both specimens.

Only two complete pereiopods of the fourth and fifth pair are present, both are detached, and both belong to the larger, female, specimen. These two legs

are very similar and it cannot be made out to which pair they belong, or whether they belong to the same or different pairs. The dactylus is simple, slender and sharply pointed; it measures about  $1/3$  of the length of the propodus. The propodus is subdivided into about 6 articulations, which are difficult to distinguish. The posterior margin of the propodus bears about 5 small spinules. The carpus is very long, being about three times as long as the propodus, it is subdivided into 15 to 18 indistinct segments. The merus is about  $2/3$  as long as the carpus, it is wider and more robust, and shows 3 indistinct subdivisions. The ischium is somewhat more than half as long as the merus. The coxae of the pereopods show a small spinule on the median surface.

The thoracic sternum between the first three pereopods is rather narrow, but it suddenly widens posteriorly, the widened part being situated between the fourth and fifth legs; especially in the female this widening is distinct. The posterior margin of each of the thoracic sternites shows two lobiform plates. These two plates are separated from each other by a narrow gap in the median line of the sternite. The plates in the narrow part of the sternum are relatively higher than those in the wide part. In the males these plates are rather high and curved forwards, each armed with 2 or 3 spines. In the females they are much lower and unarmed.

In the male the sternites of the first five abdominal somites bear a median spine, which spines are absent in the female.

The exopod of the uropod has the outer margin serrate up to the apex; the distal tooth of the outer margin overreaches the lamella. The dorsal surface of the exopod carries two low longitudinal carinae, but no spinules. The endopod has a very sharp and distinct dorsal carina, on the inner side of the distal part of which a much less strong second carina can be seen. A row of spinules is placed in the outer part of the dorsal surface of the endopod; this row is distinct and consists of several spinules in the female, in the male it is indistinct. The basal part of the outer margin of the endopod shows a serration of about 5 teeth.

Size. — The carapace length (including the rostrum) of the ovigerous female is 11 mm, that of the male 9 mm. The carapace length of the holotype must have been also about 9 mm (the rostrum is broken so that an accurate measurement is not possible). The eggs are numerous and small, being about 0.5 to 0.6 mm in diameter.

Remarks. — The absence of the third pereopod both in the holotype and in the present specimens makes the description incomplete in an essential point. However, in the other characters the present specimens agree so well with the description of ?*Engystenopus spinulatus* provided by Holthuis

(1946), that there is no justification not to assign the Red Sea material to that species. It is most unfortunate that all three known specimens of the species are incomplete.

Distribution. — Red Sea and Indonesia, 247-690 m. Balss (1915: 33) mentioned two stations in the northern Red Sea for this species: Sta. 169 at 26°40' N 35°33' E, 650 m, and Sta. 174 at 26°45' N 34°28' E, 690 m. Of only the first station (Sta. 169) we examined the material. The reference by Balss to the second station (Sta. 174) is rather peculiar: although he listed the male and the ovigerous female from Sta. 169, no material was mentioned by him for Sta. 174, and Dr. Pretzmann informed us that no such material was ever entered in the records of the collection of the Vienna Museum.

The holotype of this species was taken in Lobetobi Strait, E. of Flores, Lesser Sunda Islands, Indonesia, 8°27' S 122°54' E, depth 247 m, bottom sandy mud.

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