

STUDIES ON INDO-WEST PACIFIC STENOPODIDEA, 1.
STENOPUS ZANZIBARICUS SP. NOV., A NEW SPECIES
FROM EAST AFRICA

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Collections over several years in the Indo-West Pacific region have provided some interesting specimens of new or little known stenopodidean shrimps from deep and shallow water habitats. It is proposed to report upon these specimens and their larvae in this series of notes.

Only two species of the genus *Stenopus* Latreille have so far been reported from the Indo-West Pacific region (Holthuis, 1946). These two species are both found in East African waters. *S. hispidus* (Olivier) is abundant on most coral or rocky reefs and the coastal fringing lagoons. The second species, *S. tenuirostris* De Man, has also been found in a number of localities. Both these species have striking and very characteristic colour patterns in life. The discovery of a single example of another species was facilitated by its distinctive colouration on capture. Numerous small morphological characters also distinguish this specimen from the other species of the genus and it is here described as new.

***Stenopus zanzibarius* sp. nov.**

Material examined. — 1 ♂. Mwemba Island, off N.E. Zanzibar Island, 5°46.6'S 39°23.5'E, depth 0.5 m (LWS), FRV "Manihine", Cr. 3 stn. 91; coll. A. J. Bruce, 17 September 1971.

Description. — A small shrimp with a subcylindrical body, generally covered with spinous processes.

The rostrum is short, not exceeding the basal segment of the antennular peduncle, horizontal and tapering gradually distally. The tip is rather blunt and the dorsal margin bears five uniformly well spaced acute teeth, which decrease in size distally. The ventral margin is mainly straight and without teeth. The lateral carinae are well developed, broad posteriorly and bear three large blunt spines on the right and four on the left.

The carapace is densely covered with small spines, most strongly developed and acute antero-dorsally, smallest over the lower and posterior branchiostegite and directed mainly anteriorly. The cervical groove is distinct, with about eight spines along its margin. The post-rostral region bears median and submedian pairs of spines, with a small tubercle behind the first spine. The orbit is feebly developed

but a large supra-orbital spine is present. The inferior orbital angle is scarcely produced but bears a very large spine. A smaller antennal spine is also present and a small hepatic spine is present at the lower end of the cervical groove. The antero-lateral angle of the carapace is not produced and the posterior angle of the branchiostegite is obtusely angled and strongly thickened.

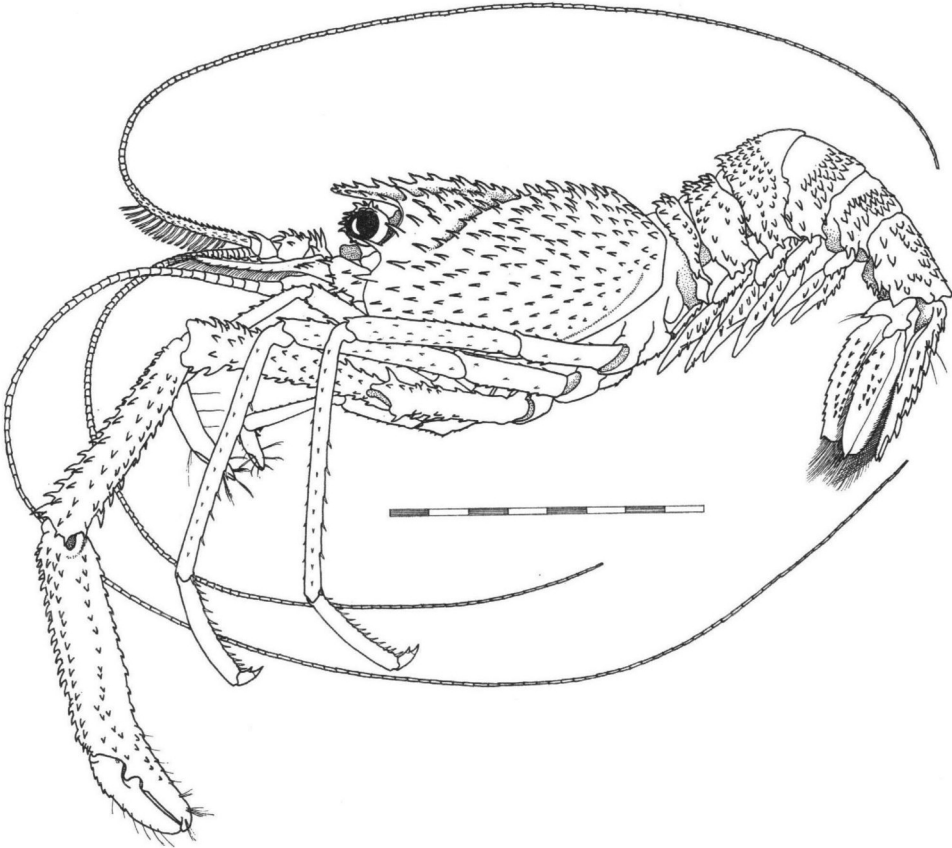


Fig. 1. *Stenopus zanzibaricus* sp. nov., holotype, male. Scale in mms.

The abdominal segments are also densely provided with spines. The tergum of the third somite is triangularly produced posteriorly, where it is devoid of spines. The antero-dorsal region of the fourth segment is similarly without spines. The spines over the rest of the abdomen appear to radiate away from this base area, becoming erect, blunt, slender and finger-like anteriorly and depressed, acute and squamous posteriorly. The fifth abdominal segment is half the length of the sixth segment, which is about 1.4 times longer than deep. The pleuron of the first segment is slender with a well developed ventral process and a smaller posterior process. The pleura of the second to fifth segments are broad, rather truncated ventrally, with anterior, intermediate and posterior processes, all blunt

and of which the last is generally larger than the rest. The postero-lateral angle of the sixth segment is blunt but the posterior ventral angle is broadly acute.

The telson is equal to about 1.8 times the length of the sixth abdominal segment, and 2.6 times longer than the anterior width. The lateral borders are roundly expanded at about one quarter of the length, and converge posteriorly with an acute tooth at about half their length. The dorsal aspect of the telson bears two distinct longitudinal carinae, each with six stout, rather asymmetrical and terminating with two strong posterior marginal spines. The posterior margin of the telson is evenly rounded. A small anterior spine is present laterally at the base of the telson, with a pair of smaller submedian spines at the same level. The anterior half of the telson is also provided with scattered small spines in the median sulcus and on the lateral expansion. The posterior and lateral borders of the posterior half of the telson are densely provided with long plumose setae.

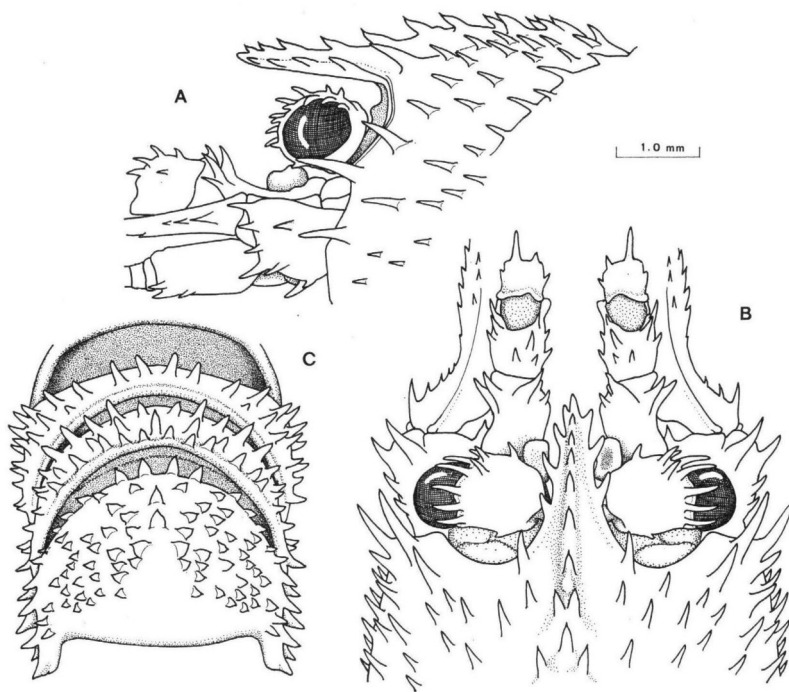


Fig. 2. *Stenopus zanzibarcus* sp. nov., holotype, male. A, anterior carapace and rostrum, lateral view; B, anterior carapace and rostrum, dorsal view; C, first to third abdominal tergites.

The antennular peduncle is short, extending only to the level of the middle of the scaphocerite. The basal segment is about twice as long as wide and slightly expanded distally. There is no statocyst but a small sub-rectangular process is present at the base of the medial side. A small acutely pointed stylocerite is present laterally, reaching almost to the middle of the segment. The disto-dorsal region bears two large medial spines and three smaller laterally, with several smaller

spines, particularly ventro-medially. The intermediate segment is slightly shorter than the basal segment, with several short spines dorsally, with three larger spines distally. The distal segment is short, about 0.3 of the length of the basal segment, with a single large disto-dorsal spine and a smaller medial spine. The upper flagellum is well developed and uniramous. The proximal portion, bearing twenty-

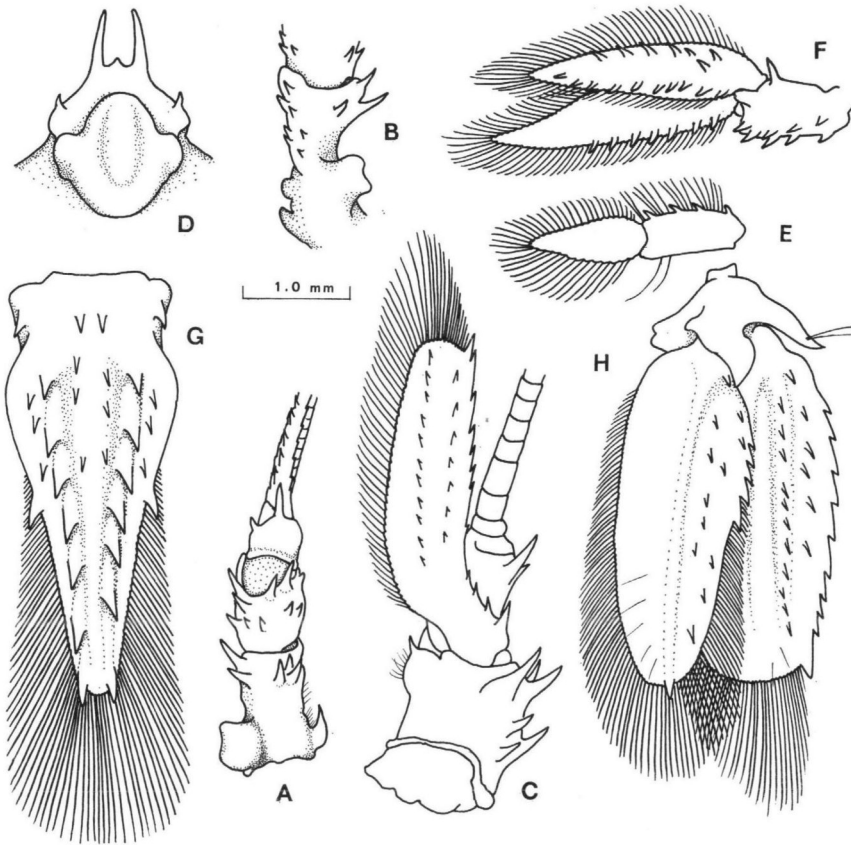


Fig. 3. *Stenopus zanzibarius* sp. nov., holotype, male. A, antennule, dorsal view; B, antennule, medial view; C, antenna; D, epistome and labrum, ventral view; E, first pleopod; F, second pleopod; G, telson.

two groups of aesthetascs, consists of fused segments, provided with numerous small spines dorsally and laterally. The distal seven eighths of the flagellum is normally segmented. The lower flagellum is also well developed and normally segmented throughout its length.

The antenna is normally developed with a robust basicerite bearing several large, acute distal, lateral and ventral spines. The carpocerite is slightly longer than the basicerite and more slender, not exceeding the antennular peduncle, and with some small disto-ventral spines. The scaphocerite is well developed and extends beyond the antennular peduncle by about half the length of the lamina. The

lateral border is deeply concave proximally and very slightly convex distally. The concave border bears four large teeth, with the largest proximally and decreasing in size while the distal margin bears about eight small teeth, increasing in size distally to the acute distal tooth, which extends well beyond the anterior margin of the lamina. The lamina is slightly tapering distally, with the greatest width at about half its length. The anterior margin is rounded and the medial border gently convex. The dorsal surface bears two slightly divergent rows of small spines. Anterior and medial margins are provided with plumose setae. The antennal flagellum is well developed and extends well beyond the tip of the telson.

The epistome is triangular anteriorly with two long slender submedian spines adjacent to the small median point. Two small spines are present laterally. The labrum is normally developed. The paragnath is deeply bilobed, with the lobes separated by a broad U-shaped notch and a small median fissure, bordered with short setae. The thoracic sternites are narrow and with conspicuous acute submedian processes on segments 4-6, with submedian multidentate plates on segments 7 and 8.

The mandible is stout, with short, partially fused molar and incisor processes. The molar surface is oval and without distinct teeth. The incisor process has a single short stout lateral tooth with a few small irregular teeth medially. The palp is well developed with three distinct segments. The proximal segment is the shortest, subcylindrical, twice as long as wide and without setae. The intermediate segment, 1.5 times longer than the proximal segment, subcylindrical, 3.2 times longer than wide and with a group of long simple setae disto-laterally. The distal segment is leaf-like, slightly longer than the intermediate segment and densely covered with setae along its anterior lateral and distal aspects.

The maxillula bears a slender tapering palp, about 5.5 times longer than wide, with several feebly plumose setae along its medial aspect. The upper lacinia is moderately broad, truncate distally with about 10 slender simple spines, and a few simple setae are present medially. The lower lacinia is similarly broad, rounded distally with short simple setae along the lateral border and longer setae along the median margin.

The maxilla is normally developed. The palp is long and slender, exceeding the anterior margin of the scaphognathite, with numerous filiform setae along its medial and distal borders. The basal and coxal endites are well developed. The basal endite is bilobed, the length of the lobe being approximately equal to half the length of the endite. The upper lobe is about twice as wide as the lower lobe, and both are rounded distally with numerous short simple setae. The coxal endite is simple, broadly rounded distally with numerous simple setae along the medial margin and along the ventral border. The scaphocerite is normally developed, narrow, about 4.4 times longer than broad, and of almost uniform width with numerous plumose marginal setae.

The first maxilliped bears a three segmented palp. The two proximal segments are flattened and with numerous long plumose setae along the lateral border. The

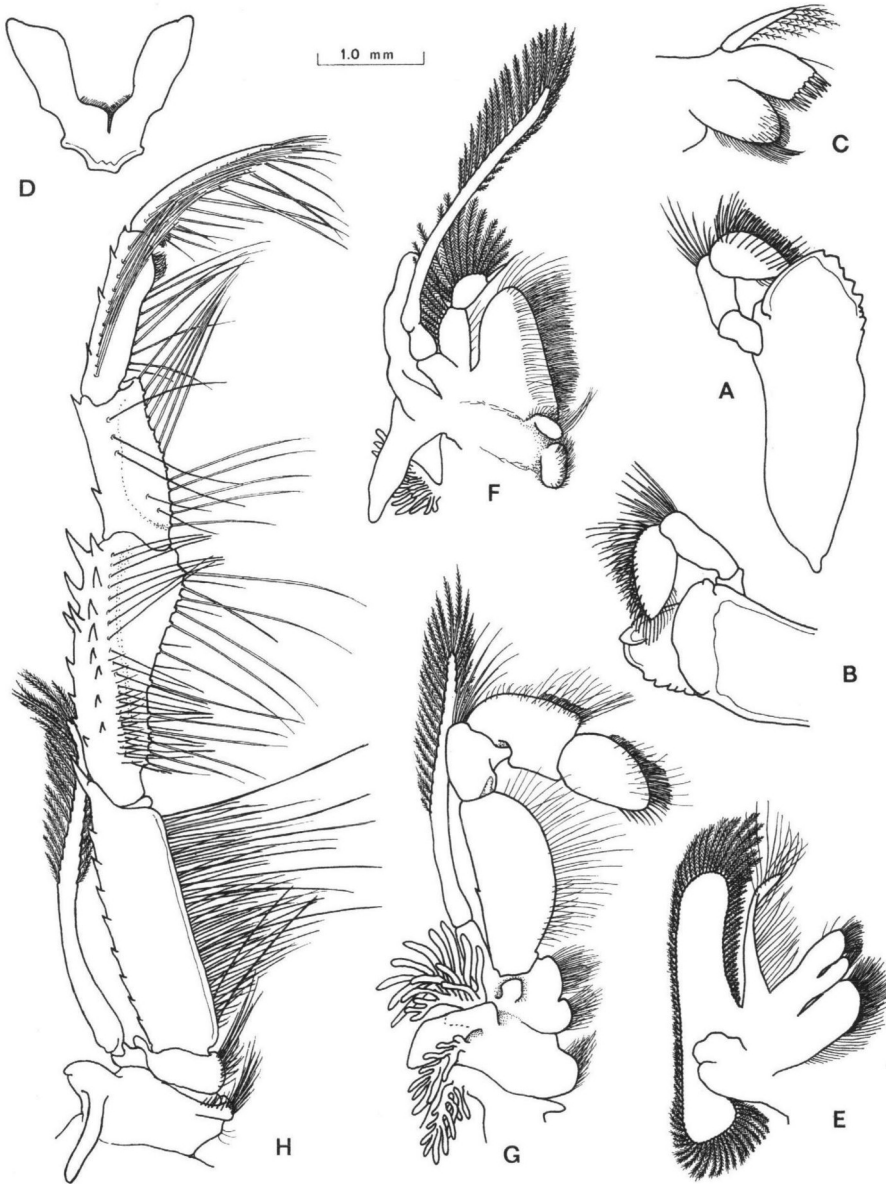


Fig. 4. *Stenopus zanzibarius* sp. nov., holotype, male. A, mandible, lateral view; B, mandible, medial view; C, maxillula; D, paragnath; E, maxilla; F, first maxilliped; G, second maxilliped; H, third maxilliped.

proximal segment is twice as long as broad, with straight medial and convex lateral margins. The intermediate segment is of similar shape, about 1.8 times longer than broad and 0.75 times the length of the basal segment. The distal segment is slender, tapering distally, about five times longer than wide, and 0.6

times the length of the intermediate segment, with a single simple terminal seta. The basal endite is large and produced anteriorly. The anterior margin is rounded and the medial border is straight with a dense fringe of long simple setae. The coxal endite is distinctly separated by a small notch from the basal endite and bears two robust medial processes, separated by a deep groove. The distal process is smaller than the proximal process and bears a small group of long simple setae medially. The proximal process is covered generally with short simple setae. The exopod is well developed, the flagellum arising from a short peduncle and bearing many long densely plumose setae on the distal half. A large epipod is present with slender, elongated anterior and posterior lobes.

The second maxilliped is normally developed, with a stout endopod consisting of five segments. The dactylar segment is suboval, flattened, 1.6 times longer than broad, with a dense fringe of short setae along its disto-dorsal margin. The disto-ventral region bears a few stouter setae. The propodus is about 1.2 times the length of the dactylus, quadrate distally, with the dactylus attached terminally. The disto-dorsal region is setose, with both short and long setae. The ventral margin is non-setose. The carpus is short and stout, about 0.7 times the length of the propodus, with five long simple setae arising from the disto-dorsal angle. The merus is flattened, almost 1.9 times the length of the dactylus and 2.2 times longer than broad. The lateral border is straight, with a single small acute spine at about half its length. The medial border is strongly convex with numerous long fine simple setae. The ischium and basis are fused, but their line of junction is indicated by a deep notch in the medial margin which is thereby separated into larger distal and smaller proximal rounded lobes, each of which is densely provided with setae medially. The ventral aspect of the ischio-basis bears a distinct lateral knob, and the lateral aspect carries a well developed exopod, with numerous long plumose setae on the distal three fifths of its length. The coxal segment is short and wide, about twice as broad as long with a large rounded setose process proximally on the medial margin. The lateral border bears a small epipod, of which the distal half is membranaceous, with a small podobranch on its dorsal aspect. A small pre-coxal segment, with a slender median process is also present, together with a small arthrobranch.

The third maxilliped is robustly developed. The endopod consists of six distinct segments. The distal segment is slender, tapering and about 6.5 times longer than wide and with rows of long strong simple setae along the ventral and dorso-medial aspects. The propodus is subequal to the length of the dactylus, and 4.0 times longer than wide. The lateral border bears three acute spines and a small distal spine, and the medial border bears a row of long simple setae. A well developed setiferous organ is present at the junction of the dactylus and propodus. The carpus is subequal to the length of the propodus, and is about 2.5 times longer than wide. The medial portion is flattened and its margin bears a row of long simple setae. The lateral border bears a single spine proximally and also a distal spine. A few ventral setae are also present. The merus is robust, 1.6 times the

length of the carpus, expanded distally where it is 2.7 times longer than wide. The lateral border bears a row of seven stout spines, which increase in size distally and a row of eight smaller spines is present ventro-laterally. The ventral and concave medial borders are setose, similarly to the more distal segments. The ischium is flattened, 1.1 times the length of the merus, of almost uniform width, and about 3.4 times longer than broad. The medial border is almost straight and densely fringed with long slender simple setae, which are absent from the ventral aspect. The lateral margin bears a row of eight small spines and the disto-lateral angle is produced into an acute tooth. The basis is short and broad with a rounded setose medial border. The lateral aspect bears a small knob and a well developed

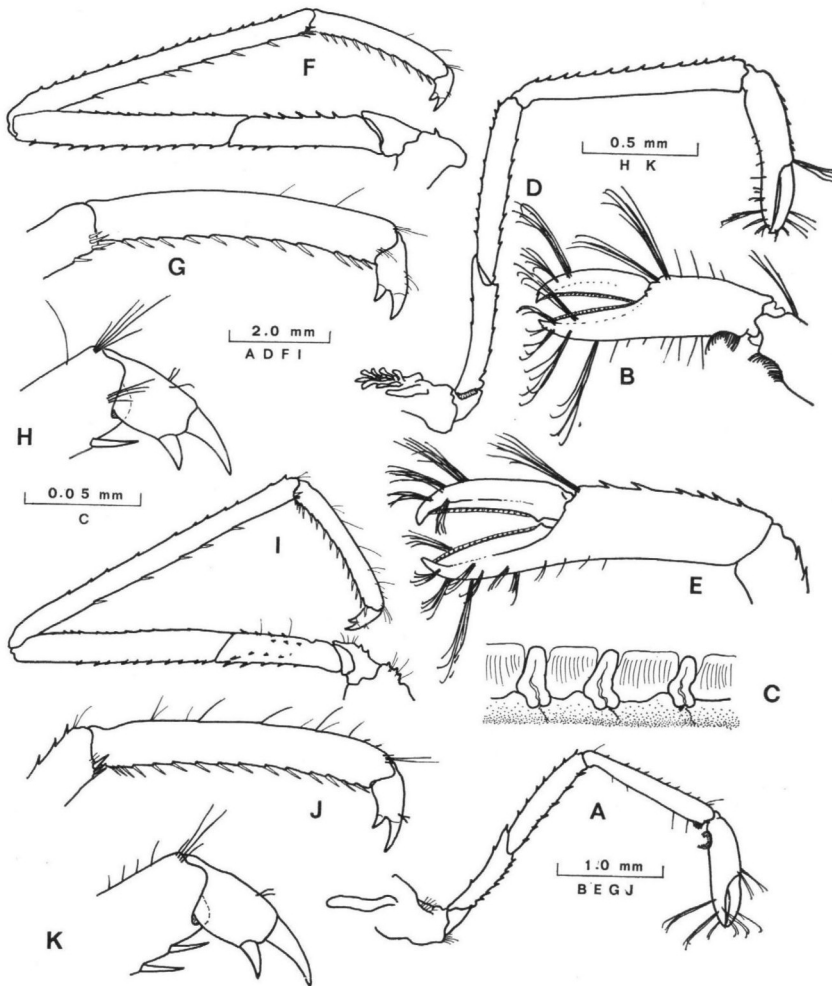


Fig. 5. *Stenopus zanzibaricus* sp. nov., holotype, male. A, first pereiopod; B, chela of first pereiopod; C, cutting edge of fingers of first pereiopod; D, second pereiopod; E, chela of second pereiopod; F, third pereiopod; G, propod and dactyl of fourth pereiopod; H, dactyl of fourth pereiopod; I, fifth pereiopod; J, propod and dactyl of fifth pereiopod; K, dactyl of fifth pereiopod.

exopod. The coxal segment is robust with a small setose lobe distally on the medial border. Laterally a small eminence bears a rudimentary epipod.

The first pereopods are small and slender, extending beyond the tip of the scaphocerite by the fingers of the chela. The palm of the chela is subcylindrical, about twice as long as wide and unarmed. The dactylus is equal to about 0.9 times the length of the palm. The fingers are slightly compressed and feebly spatulate, with slightly hooked tips. The cutting edges are distinct and are provided with about 18-22 small, stout, peg-like teeth separated by subquadrate chitinous lamellae. The fingers and the disto-dorsal extremity of the palm also bear groups of long setae. The carpus is about 1.3 times the length of the chela, slightly expanded distally, where it is about 6.3 times longer than wide. The dorsal margin bears a row of small spinules and a well developed setiferous cleaning organ is present at the carpo-propodal junction ventrally. The merus is equal to 0.9 times the length of the carpus, about 5.6 times longer than wide, subcylindrical with small spines along the dorsal border and larger spines along the ventral border. The ischiomerall junction is markedly oblique. The ischium is about 0.8 times the length of the merus and increases slightly in width distally. The disto-lateral extremity is slightly produced and bears a small spine. Two similar small spines are also present along the ventral border. The basis is short and unarmed. The coxa is stout, unarmed and without any medial process, but with a small epipod.

The second pereopod is generally similar to the first but is longer and more robust. There is no setiferous organ present. The palm of the chela is subcylindrical, about three times longer than wide, with several small spinules along the dorsal border. The fingers are equal to 0.7 of the length of the palm. The tips are slightly more strongly hooked than in the first pereopods and the cutting edges each bear a small tooth proximally, that of the dactylus being in advance of that on the fixed finger, but are otherwise similar, with small peg-like teeth separated by chitinous lamellae. The carpus is 1.4 times the length of the chela, 7.0 times longer than wide distally and with 12-14 small spines along the dorsal border. The ventral margin is unarmed. The merus is about 0.8 times the length of the carpus and the ischium is 0.7 of the length of the merus and both resemble the equivalent segments of the first pereopods, as do also the basis and coxa. A small epipod is also present.

The third pereopod is present only on the left side and is in the process of regeneration on the right. The limb is large and strongly calcified and extends beyond the scaphocerite by the length of carpus and chela. The palm of the chela is oval in section and subcylindrical, about 3.9 times longer than deep. The dorsal border bears a row of uniform short acute spines, about 15 in number and a similar dorso-lateral row is also present. The lateral aspect bears a less distinct row, with several scattered spines in the region of the hinge. The ventral margin also bears a row of about 11 smaller, more widely separated spines. The fingers are equal to about one half of the length of the palm, and are compressed with stout, bluntly hooked tips. The dorsal margin of the dactylus bears six small spines

along the proximal half, with a few long setae. The cutting edge bears a single large triangular tooth on the proximal third, and the distal two thirds are entire. The fixed finger also bears a few small acute spines proximally, continuous with the ventral palmar row, with further scattered spines around the hinge. The cutting edge bears a large blunt tooth proximally, which opposes into a depression on the lateral aspect of the dactylus. A small triangular tooth is present more distally and the distal cutting edge is entire. The carpus is about equal to the length of the palm and is subcylindrical, about 5.5 times longer than wide distally, and decreasing in size slightly proximally. Several longitudinal rows of spines are present. The dorsal and ventral rows are the best developed, with 15 and 9 spines respectively, increasing gradually in size and acuteness distally. Similar rows of smaller spines are present in dorso-lateral, lateral, ventro-lateral and subventral positions, with upper and lower rows on the medial aspect. The merus is slightly shorter than the carpus and palm and is nearly twice as wide distally as proximally. The dorsal and ventral borders are strongly spinulate, with the spines increasing in size distally, but the lateral aspect bears irregularly scattered spines. The disto-ventral angle is rounded. The ischium is about 0.6 times the length of the merus and slightly expanded distally, where it is about 5 times longer than wide. The dorsal and ventral border are irregularly spinulate, with a large disto-dorsal spine. The basis is short and stout and without spines. The coxa is robust with a pair of small spines medially and an epipod laterally. The fourth and fifth pairs of ambulatory pereiopods are long and slender and are very similar. The dactylus of the fourth pereiopod is distinctly biunguiculate. The corpus of the dactylus is compressed, about 1.8 times longer than deep. The unguis is clearly separated, slender, slightly curved, 2.5 times longer than wide, and about 0.6 of the length of the palm. The accessory spine is similar, but shorter and stouter, equal to half the length of the unguis. The propod is about 6.3 times longer than broad, slightly bowed and of uniform width, without clear indication of segmentation. The ventral border bears 11 evenly spaced mobile spines. The propod is also 3.5 times the length of the dactylus. The carpus is slender, straight, of uniform width, about 13 times longer than wide and 2.3 times the length of the propod. Eight spines are irregularly spaced, present along the ventral border and the dorsal border bears about 18 small spinules. There is no trace of segmentation. The merus is 0.7 times the length of the carpus and slightly more robust, with numerous small spinules along the dorsal and ventral margins, the dorsal series being more robust than the ventral. The ischium is of similar width to the merus and equal to about slightly less than half the length of the carpus. The ventral margin bears five stout spinules and the distal dorsal margin bears five smaller spinules. The basis is short and stout, 0.4 times the length of the ischium and unarmed. The coxa is robust, with a median process and a single short spine ventrally. The fifth pereiopod has a similar dactylus to the fourth, but the propod is slightly longer and more slender, with more numerous spines, fifteen in number, ventrally. The merus is of similar length but less heavily spinose dorsally and ventrally. The

ischium is also relatively less heavily spinose, and distinctly shorter. The basis bears two small spinules ventrally and the coxa three.

The first pleopod is uniramous and the second to fifth are biramous. All lack any appendices. The first pleopod is the smallest, with the exopod approximately equal to the length of the basipodite, which bears four spines along its lateral border. The ramus is devoid of spines. The rami of the second pleopod are about twice the length of the basipodite which bears two rows of four spines laterally and has a single distal medial spine. The ventral surfaces of the rami are also spinulate, with a single lateral row of seven spines on the exopod and median and lateral rows, with six and ten spines respectively on the endopod. The third to fifth pleopods are generally similar but decrease in size and spinulation posteriorly.

The uropods are well developed and the endopod exceeds the tip of the telson. The protopodite is robust with an elongated acute lateral process, and a smaller acute process dorsally. The exopod has a moderately convex lateral border with nine acute teeth along its length, and terminating in a larger acute tooth. The dorsal surface bears two feeble carinae, of which the lateral bears a row of about eleven small spines and a further six spines are distributed over the lateral dorsal aspect. The endopod exceeds the tip of the exopod and bears a single unarmed dorsal carina. The proximal half of the lateral border bears five acute teeth, but the distal half is unarmed. A dozen small spines are distributed over the lateral dorsal aspect. The unarmed margins of exopod and endopod are densely provided with long plumose setae.

The branchial formula is:

	Maxillipeds			Pereiopods				
	I	II	III	I	II	III	IV	V
Pleurobranch	—	+	+	+	+	+	+	+
Arthrobranch	+	+	2	2	2	2	2	—
Podobranch	—	+	—	—	—	—	—	—
Mastigobranch	+	+	+	+	+	+	—	—
Exopod	+	+	+	—	—	—	—	—

N.B. in fig. 4, the pleurobranch of the second maxilliped has remained attached to the first maxilliped F, and that of the third maxilliped is attached to the second maxilliped G.

Size (in mm). — Total length, approx. 2.1; total carapace length, 7.5; post-orbital carapace length, 5.7; chela of third pereiopod, 8.7 mm.

Colouration. — The carapace, rostrum, eyestalk, antennular and antennal peduncles and the proximal part of the scaphocerite are a striking golden yellow colour. The antennal flagella are all completely deep red. The distal part of the scaphocerite, the third maxilliped, and the proximal part of the merus, with ischium and basis of the five pereiopods are a translucent white. The chelae, carpus and distal part of the merus of the first and second pereiopods are opaque white. The third pereiopod has the proximal sixth of the palm and the fingers and articular region white. The central region of the palm consists of two nar-

rower bands of red separated by a broader zone of yellow. The proximal and distal fourths of the carpus are white and the central two fourths deep red. The distal fourth of the merus is white, the penultimate fourth deep red and the antepenultimate fourth white. The dactylus and tip of the propod of the fourth and fifth pereopods are white. The greater part of the propod, whole of the carpus and distal end of the merus are deep red. The abdomen is largely white, most marked on the dorsal aspect of the third abdominal segment and on the sixth. Large oval red patches are present laterally on the second and fifth segments. The caudal fan is a dense white, with a broad band of red extending transversely near the anterior margin.

Type. — The only specimen available is designated as the holotype and is deposited in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, catalogue number D. 29610.

Habitat. — The single specimen was found beneath a large block of dead coral rock on the exposed reef flat at extreme low water spring tide level.

Remarks. — The new species, *Stenopus zanzibaricus*, conforms closely to the definition of the genus *Stenopus* Latreille, as given by Holthuis (1946). It is most closely related to *S. tenuirostris* De Man, but the three Indo-West Pacific species may be conveniently separated by the following key:

1. Rostrum exceeding antennular peduncle, with 3-9 ventral teeth. Carapace in life purplish blue *Stenopus tenuirostris* De Man
- Rostrum not exceeding intermediate segment of antennular peduncle, without ventral teeth 2
2. Rostrum exceeding proximal segment of antennular peduncle; abdomen with sparse, erect, cylindrically acute spines; third segment without bare area postero-dorsally. Carapace in life white, antennal flagella also white *Stenopus hispidus* (Olivier)
- Rostrum not exceeding proximal segment of antennular peduncle; abdomen with numerous, flattened, acutely squamous spines; third segment with large bare area postero-dorsally. Carapace in life golden yellow, antennal flagella red *Stenopus zanzibaricus* sp. nov.

In addition to the features mentioned in the key, *S. zanzibaricus* differs from *S. tenuirostris* in a number of other characters: (1) the spines of the carapace are comparatively sparse, less erect, and less slender and curved; (2) the spines of the abdominal segments are more flattened and squamose; (3) a large bare area present postero-dorsally on the third abdominal segment; (4) the cervical groove is well developed; (5) the distal lateral border of the scaphocerite and the lateral border of the exopod and endopod of the uropod are provided with fewer and coarser teeth.

Stenopus tenuirostris is moderately common on western Indian Ocean reefs and is generally found in pairs, often in cavities in large sponge covered boulders. Specimens for comparison with *S. zanzibaricus* have been available from Zanzibar Harbour, Unguja Ukuu and Pungume Reef on Zanzibar Island and also from Fungu Tongoni, near Tanga, Tanzania, and from Shimoni, Kilindini, Vipengo and Ungwana Bay, Kenya. The bathymetric range extends from low water springs to 25 fms. The only previous record of *S. tenuirostris* in the western Indian Ocean is that given by Borradaile (1910) from Coetivy in the Seychelle

Islands. Yaldwyn (1968) has recently added the Solomon Islands to the numerous Indonesian localities reported by Holthuis (1946). De Man's original record was from Ambon (De Man, 1888).

RÉSUMÉ

Stenopus zanzibaricus, une nouvelle espèce de crevette provenant de l'île Mwemba, Zanzibar, est décrite et figurée. *S. zanzibaricus* est considéré comme très proche de *S. tenuirostris*, dont il peut être facilement distingué par les différences du rostre et la spinulation du corps. *S. zanzibaricus* se distingue aussi par la couleur or de son corps et par ses antennes rouges.

Une clef est fournie pour l'identification des trois espèces de *Stenopus* de la région indo-ouest pacifique.

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