

Lebbeus africanus spec. nov., a new shrimp (Crustacea, Decapoda, Caridea, Hippolytidae) from Mauritanian waters, with redescriptions of four other species in the genus

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A new species of hippolytid shrimp, *Lebbeus africanus* spec. nov. is described from the continental slope off Mauritania, eastern Atlantic. A comparison with related species is made. *Lebbeus bidentatus* Zarenkov, 1976, *L. carinatus* Zarenkov, 1976, *L. curvirostris* Zarenkov, 1976, and *L. saldanhae* Barnard, 1947, are redescribed and their taxonomic status is discussed.

Introduction

The 'Tyro' Mauritania-II Expedition was part of a large programme of multidisciplinary marine research in Mauritanian waters in the period of April to October 1988. The programme included two off-shore expeditions with the research vessel Tyro (Mauritania-I in May and Mauritania-II in June) and several research projects carried out in coastal waters. Research was concentrated on the Banc d'Arguin region, which includes coastal waters, the continental shelf and the upper slope in the center of the up-welling region off north-western Africa. The main object of the Mauritania-II expedition was to make a detailed study of the distribution and abundance of the benthos and demersal fauna of the shelf and the upper slope (down to 1500 m) and to study aspects of their ecology. In one haul with a 3.5 m Agassiz trawl at a depth of 1500 m, five specimens of a yet undescribed *Lebbeus* species were caught.

As descriptions of some related *Lebbeus* species show omissions, holotypes of *L. bidentatus* Zarenkov, 1976, *L. carinatus* Zarenkov, 1976, *L. curvirostris* Zarenkov, 1976, and *L. saldanhae* Barnard, 1947 are redescribed.

Abbreviations: pocl. = post orbital carapace length.

Descriptions

Lebbeus africanus spec. nov. (figs 1-29)

Material.— 1 ♀ holotype, pocl. 15.1 mm (RMNH D 47782); 1 ♂ allotype, pocl. 8.6 mm (RMNH D 47783); 3 ♀ paratypes, pocl. 12.6, 13.2, 13.2 mm (RMNH D 47784); sta. MAU.104; Mauritania, off Banc d'Arguin, 19°43'N 17°30'W; depth 1500 m; many fish (macrourids (Polychelidae), synphobranchids, sharks, *Chimaera*, *Halosaurus*), holothurians, echinoids, cirripeds (*Scalpellum* spec.), crabs (*Chaceon maritae* (Manning & Holthuis, 1981)), sea anemones, other shrimps (*Acantheephyra pelagica* (Risso, 1816); *Systellaspis debilis* (A. Milne Edwards, 1881); *Pasiphaea ecarina* Crosnier, 1969; *Glyphus marsupialis* Filhol, 1884; *Hymenopenaeus chacei* Crosnier & Forest, 1969); 3.5 m Agassiz trawl; 17.vi.1988.

Description of female holotype.— Rostrum reaching distal end of second segment of antennular peduncle. Dorsal rostral lamina slightly concave; five dorsal teeth at equal distances, two teeth postorbital. Just behind proximalmost tooth a small scar, possibly from a small articulating epigastric spine, is present. Median dorsal carina in anterior third of carapace, indistinct. Supraorbital ridge with supraorbital tooth, lateral carina indistinct. Ventral rostral lamina convex with two distal teeth of which the proximal tooth at level of distal dorsal rostral tooth. Orbit deeply incised posteriorly, inferior angle produced. Antennal spine robust, placed just below inferior orbital angle. Anterior margin of carapace sinuate. Pterygostomian tooth present, smaller than antennal spine.

Abdominal segments all rounded dorsally; third with posterior margin triangularly produced medially. Pleura of first four segments broadly rounded, fifth with ventral margin almost straight with sharp marginal posterior tooth. Sixth somite 1.5 time as long as fifth. Telson nearly 1.5 times as long as sixth abdominal segment, three times as long as wide. Dorso-lateral spines in distal half, two on left side, three on right side. Posterior margin of telson with five pairs of spines. Outer pair short but robust, mesial pair long and robust, central three pairs short and feathered. Several distal setae on dorsal posterior margin. Uropods slightly overreaching telson. Exopod with articulating and fixed latero-distal teeth.

Eye globular, eye-stalk conical. Median protuberance between eyes truncate dorsally, falling in shallow notch of ventral rostral lamina.

Antennular peduncle fails to reach end of scaphocerite. Basal segment half as long as scaphocerite, with strong tooth at 3/4 of ventro-mesial margin; dorso-lateral distal margin with two spines on right and three spines on left antennula. Stylocerite acute, reaching distal margin of basal segment; inner margin convex, outer margin almost straight. Second segment half as long as basal segment, with strong spine at dorso-lateral margin. Distal segment half as long as second segment, with strong disto-dorsal spine. Antennular flagella about as long as scaphocerite. Lower antennular flagellum slender. Proximal 23-25 articulations of upper antennular flagellum broad, with many

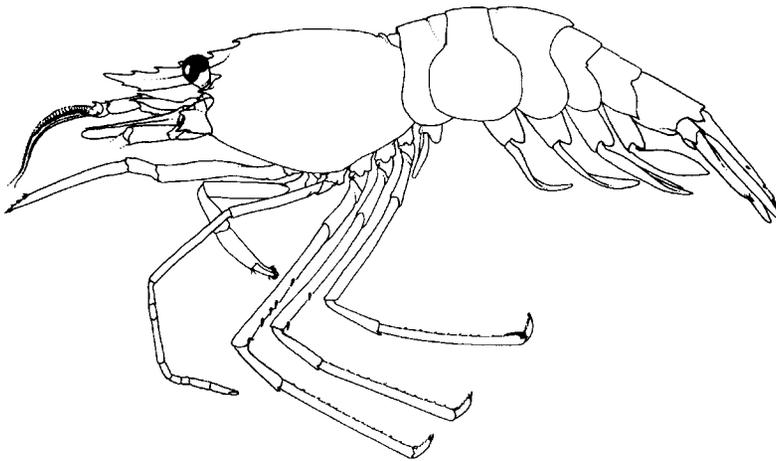
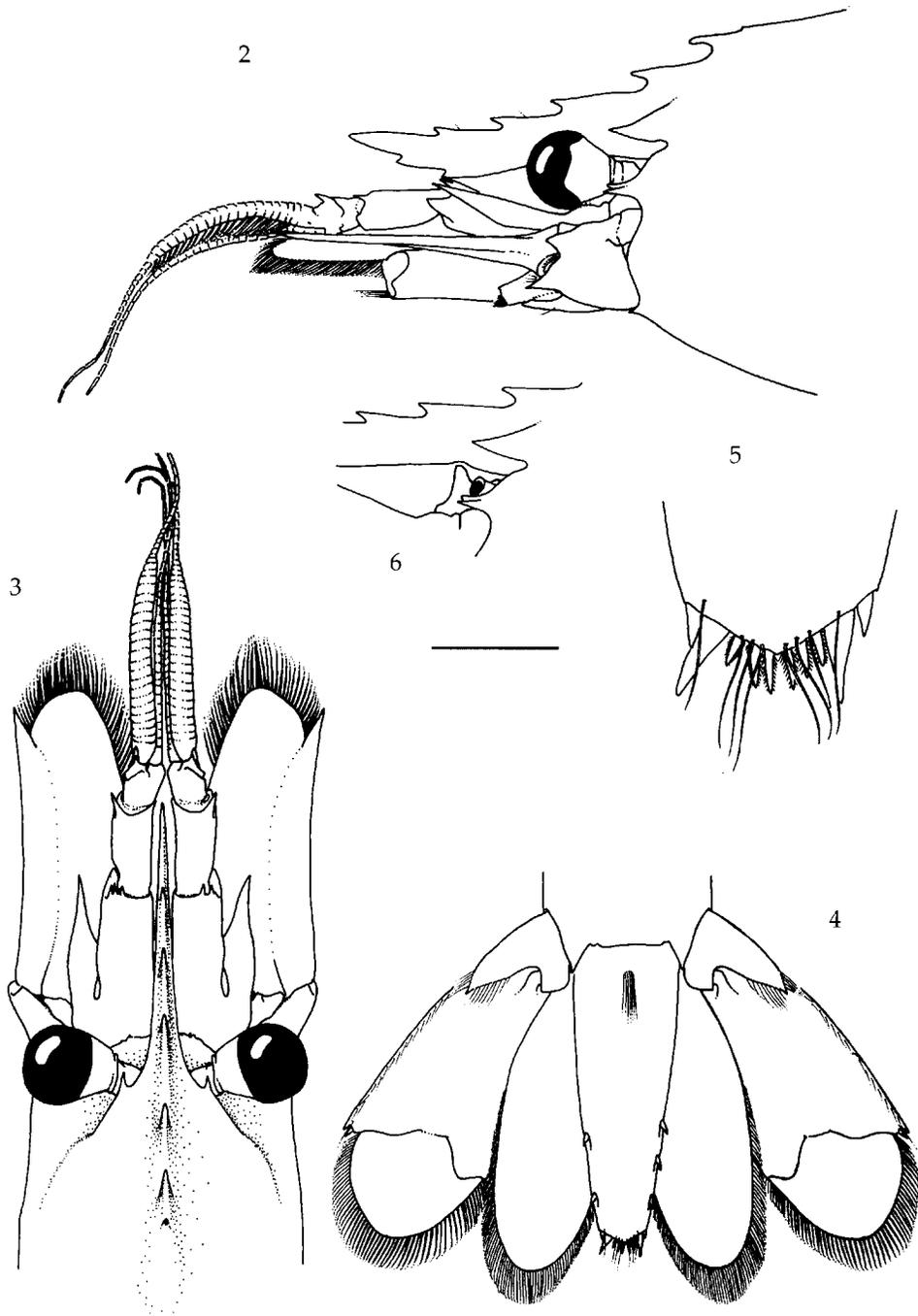


Fig. 1. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. Habitus.



Figs 2-6. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. 2, carapace and anterior appendages, lateral aspect; 3, anterior appendages, dorsal aspect; 4, telson and uropods, dorsal aspect; 5, distal part of telson, dorsal aspect; 6, anterior part with 'bec ocellaire', left eye removed, lateral aspect. (scale bar: 2, 3, 5, 6 = 4 mm; 4 = 1 mm).

slender aesthetascs; distal part slender, without aesthetascs, not biramous.

Antennal peduncle reaches beyond middle of scaphocerite. Strong disto-ventral spine present on basal segment. Scaphocerite more than three times as long as maximal width; outer margin almost straight, ending in distal tooth not overreaching distal lamina; inner margin proximally convex, distally straight.

Left mandible with slender incisor process ending in one large tooth and one small tooth. Molar process with two distal lobes and strongly setose area distally. Mandibular palp two-segmented; basal segment broad, with few short setae; distal segment oblong with many long setae. Molar process of right mandible with five lateral teeth of which one lobate, one central tooth, fringed by setae. Incisor process and palp as in left mandible.

First maxilla with lower and upper endite well developed, upper endite with series of short thick teeth; palp unsegmented, distally indistinctly bilobed with several distal setae.

Second maxilla with bilobed upper endite bearing many setae; lower endite reduced, with few long setae; palp well developed with long distal setae; scaphognathite well developed, with rounded posterior lobe.

First maxilliped with well developed endites bearing setae; palp two-segmented, basal segment broad, distal segment oblong bearing many setae; exopod with caridean lobe; epipod large, bilobed.

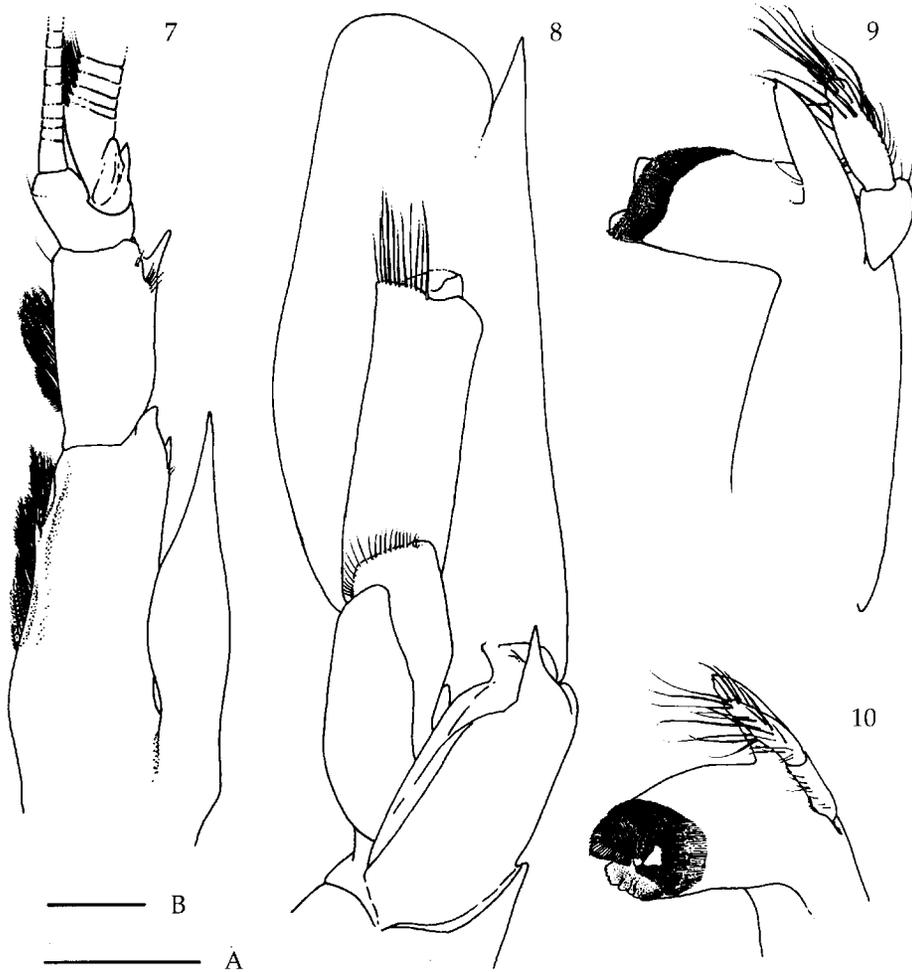
Second maxilliped with broad ultimate segment; carpal segment with lateral spine; ischial segment with excavated mesial margin; exopod well developed; epipod triangular, with podobranch.

Third maxilliped long, reaching with distal 2/3 of distal segment beyond scaphocerite; basal segment short, with epipod, without exopod; antepenultimate segment long, with disto-lateral and disto-ventral spine; penultimate segment 0.25 times as long as antepenultimate segment; ultimate segment as long as antepenultimate segment, mesially strongly setose, with eight apical and subapical black spines.

Branchial formula:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
Arthrobranchs	-	-	-	-	-	-	-	-
Pleurobranchs	-	-	-	+	+	+	+	+
Podobranchs	-	+	-	-	-	-	-	-
Epipods	+	+	+	+	+	+	-	-
Setobranchs	-	-	-	+	+	+	+	-
Exopods	+	+	-	-	-	-	-	-

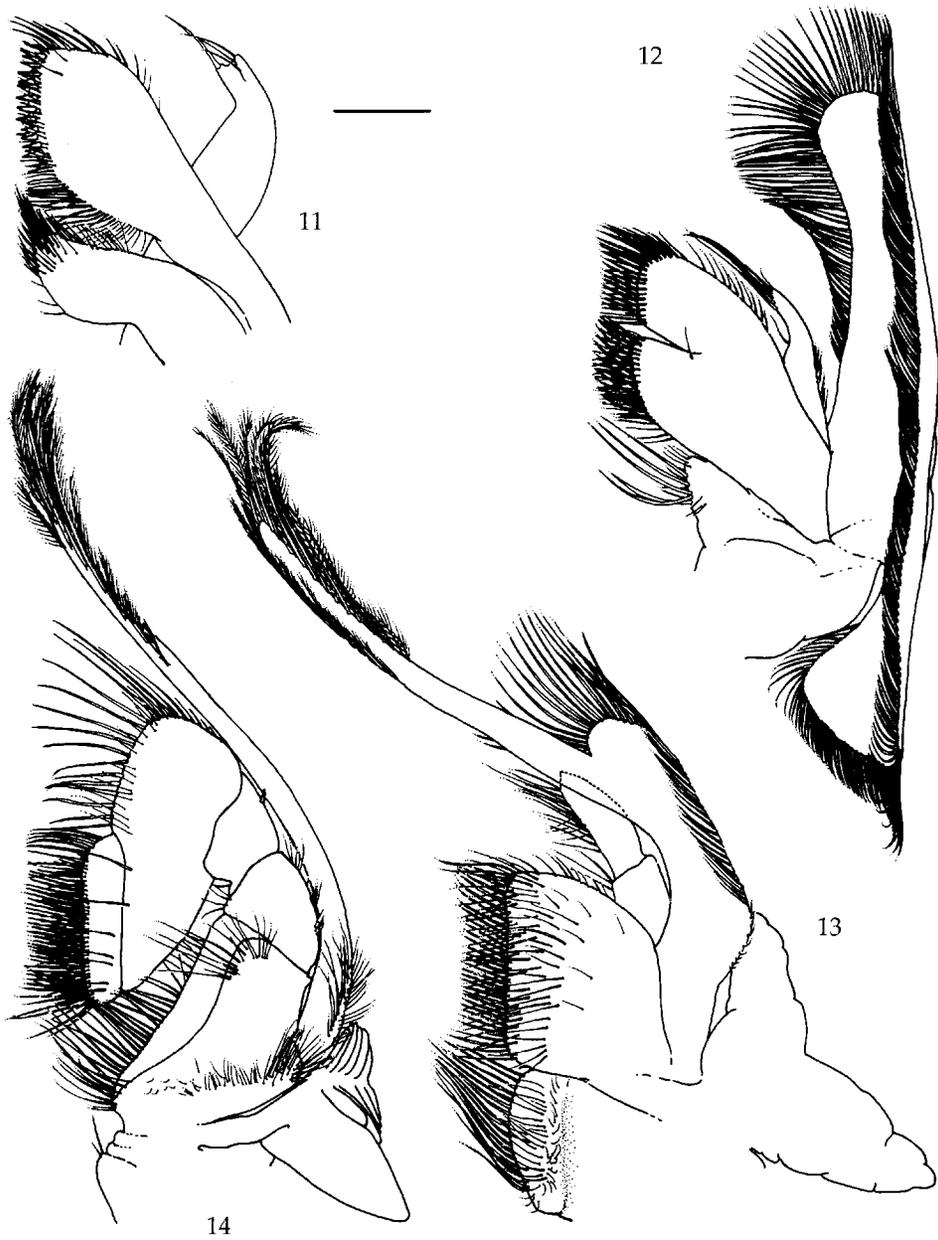
First pereiopod robust, short, just reaching tip of scaphocerite, without armature. Chela simple, fingers less than half the palm length; cutting edges entire; dactylus with two distal spines between which tip of fixed finger fits when chela is closed. Carpus as long as palm, with median setiferous cleaning organ. Merus 1.7 times carpus length. Ischium short. Epipod and setobranch present.



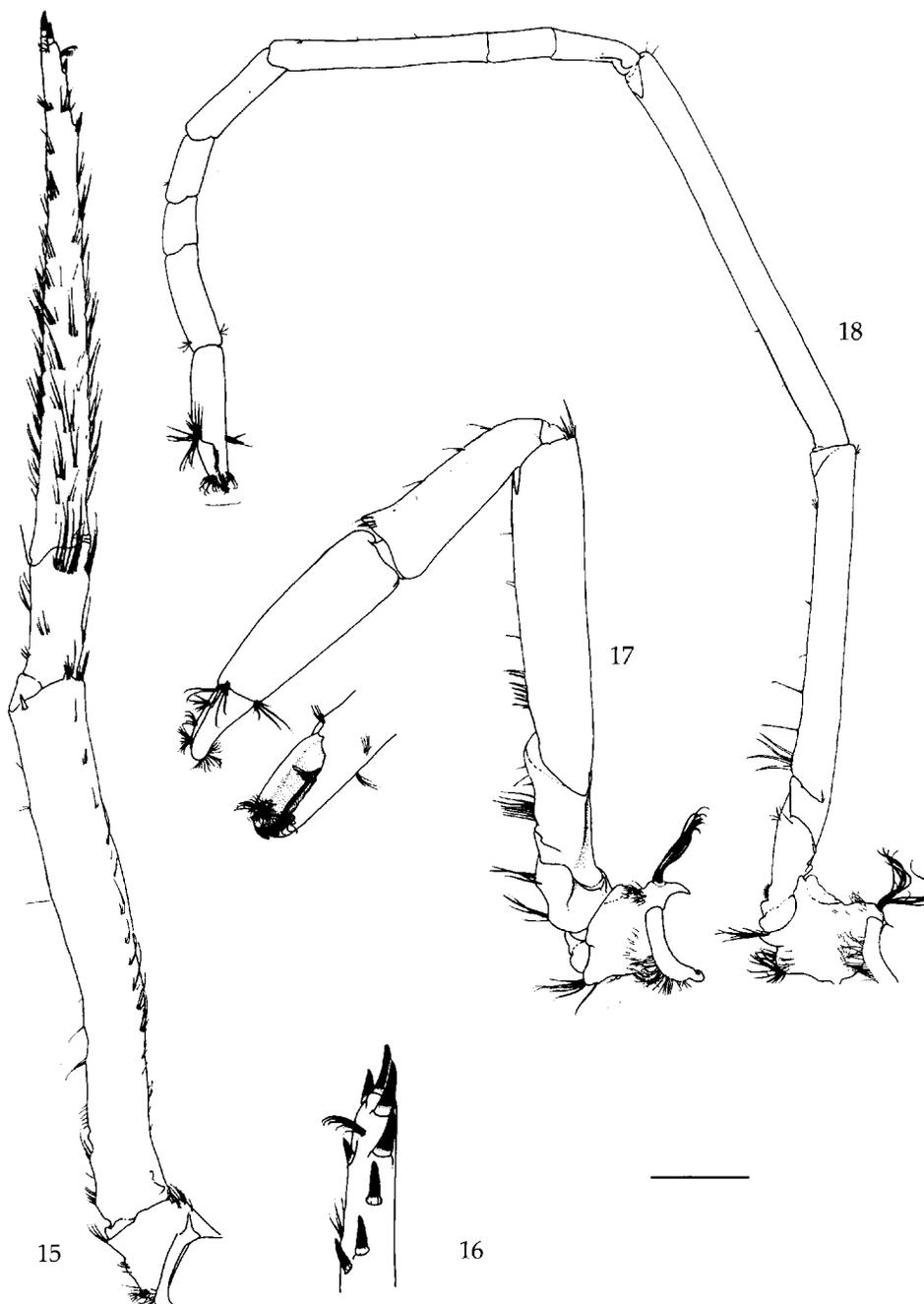
Figs 7-10. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. 7, left antennular peduncle, ventral aspect; 8, left antennal peduncle and scaphocerite, ventral aspect; 9, left mandible, ventral aspect; 10, right mandible, dorsal aspect. (Scale bar A: 7, 8 = 2 mm; scale bar B: 9, 10 = 1 mm).

Second pereiopod long, reaching beyond third maxilliped with distal three segments of carpus. Chela simple, slightly longer than seventh carpal segment; fingers half the palm length; cutting edges entire. Carpus seven-articulated; first segment longer than second; third longer than first and second together; fourth about half the third, as long as fifth and sixth together; seventh as long as fourth. Merus slightly longer than ischium. Epipod and setobranch present.

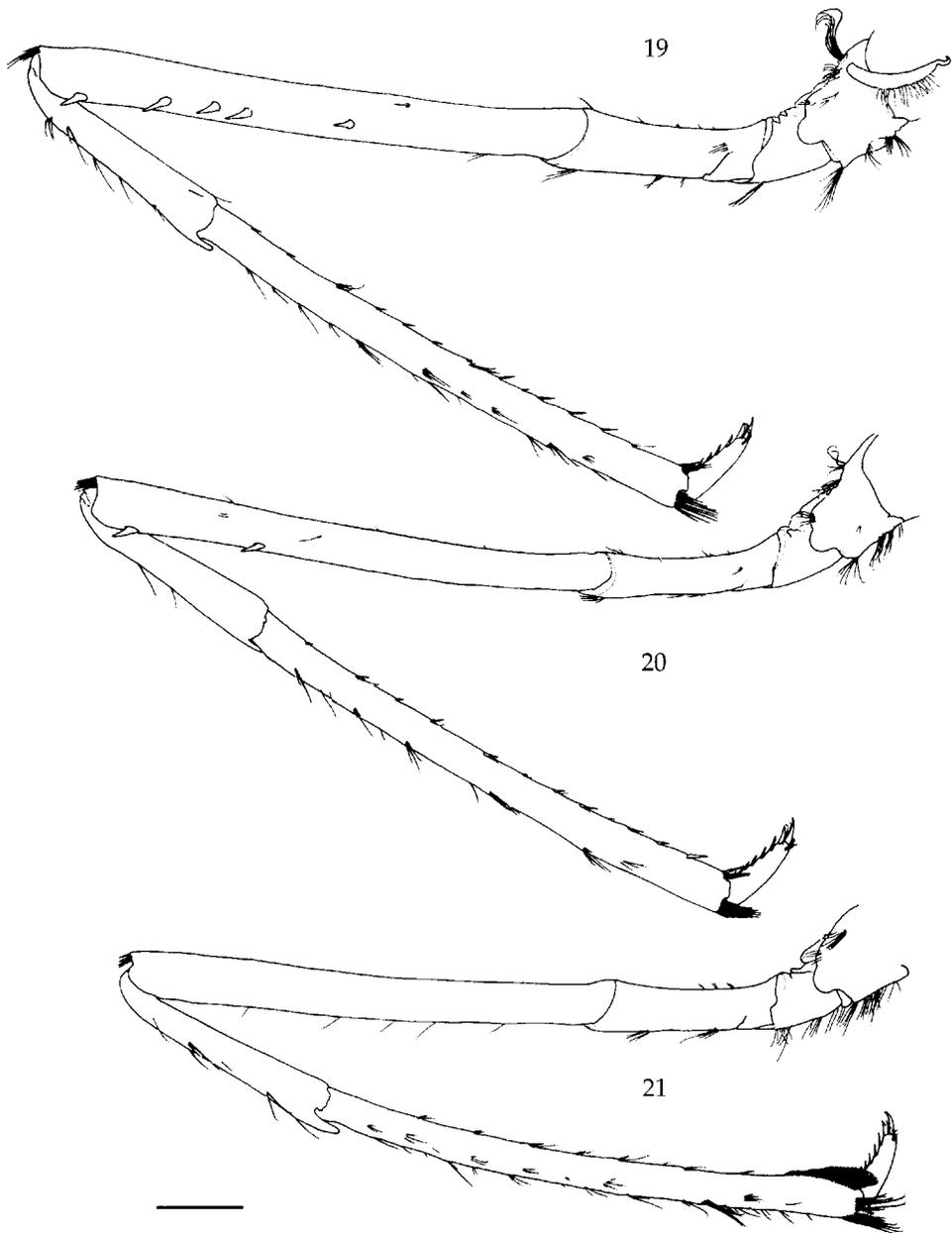
Ambulatory pereiopods long, equal in length; relative lengths of dactylus, propodus, carpus, merus and ischium similar; dactylus 0.2 times propodus length; propodus more than twice as long as carpus; merus as long as propodus; ischium with basis as long as carpus; propodi with posterior movable spines. Third pereiopod with epipod and setobranch, five meral spines and six ventral dactylar spines. Fourth per-



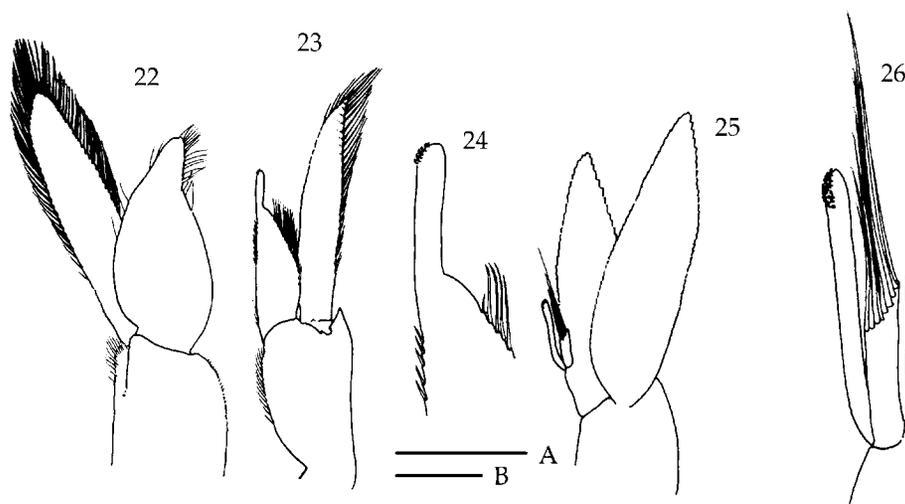
Figs 11-14. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. 11, left first maxilla, ventral aspect; 12, left second maxilla, ventral aspect; 13, left first maxilliped, ventral aspect; 14, left second maxilliped, ventral aspect. (Scale bar = 1 mm).



Figs 15-18. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. 15, left third maxilliped, ventral aspect; 16, distal part of left third maxilliped, dorsal aspect; 17, left first pereopod; 18, left second pereopod. (Scale bar: 15, 17, 18 = 2 mm; 16 = 1 mm).



Figs 19-21. *Lebbeus africanus* spec. nov., female holotype, cl. 15.1 mm. 19, left third pereopod; 20, left fourth pereopod; 21, left fifth pereopod. (Scale bar = 2 mm).



Figs 22-26. *Lebbeus africanus* spec. nov. 22, female holotype, cl. 15.1 mm. 22, left first pleopod. 23-26, male allotype, cl. 8.6 mm. 23, right first pleopod; 24, right first pleopod, distal part of endopod; 25, right second pleopod; 26, right second pleopod, appendix masculina and appendix interna. (Scale bar A: 22, 23, 25 = 2 mm; scale bar B: 24, 26 = 0.4 mm).

eiopod without epipod, with reduced setobranch, two meral spines and seven ventral dactylar spines. Fifth pereiopod without epipod, setobranch, and meral spines, ventral dactylar margin with seven spines; distal 1/7 of propodus densely setose.

First pleopod with broad short endopod; distal part with few setae.

Description of male allotype.— Rostrum broken off. Basal segment of antennular peduncle with three disto-dorsal spines on left and two on right antennula.

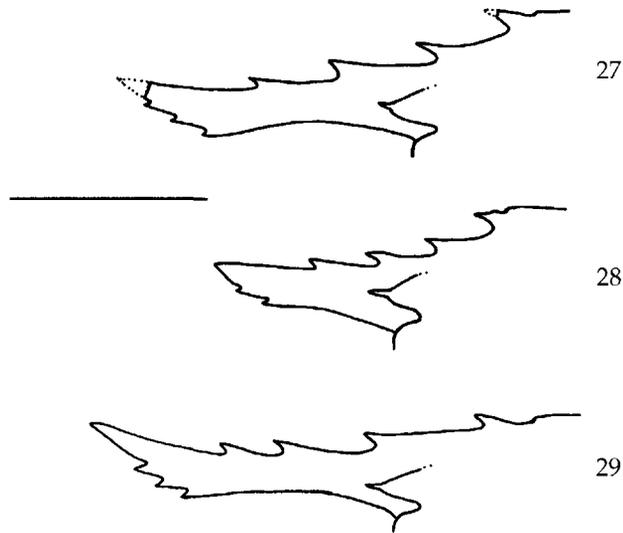
Endopod of first pleopod with finger-like produced distal part. Endopod of second pleopod with short, distally setose, appendix masculina; appendix interna twice as long as appendix masculina.

Variation.— The female paratypes show some variation in the dentation and size of the rostrum. In the smaller female the distal spines on the first antennular segment number two while three to five on the larger specimens. The spines on the dactylar flexor margin of pereiopod 3-5 vary between five and nine. The meral spines vary between four and five on the third, between none and three on the fourth, and between none and two on the fifth pereiopods. The dorsal spines on the telson are two on the left and three on the right in the holotype (2/3), 3/4 in the large paratype (cl. 13.2 mm), and 4/4 in the paratype (cl. 12.6 mm).

Etymology.— The species is named for Africa.

Systematic position.— Grouping of species within the genus according to the number of epipods was first applied by Rathbun (1904), later updated by Holthuis (1947) and Hayashi (1992). *L. africanus* belongs in the group of species with epipods on the first three pereiopods. Differences between all other species in this group and *L. africanus* are discussed below:

L. antarcticus (Hale, 1941). Rostral dentation similar to *L. africanus*. The main dif-



Figs 27-29. *Lebbeus africanus* spec. nov., paratype females, rostrum. 27, cl. 12.6 mm; 28, cl. 12.6 mm; 29, cl. 13.2 mm. (Scale bar = 4 mm).

ference is found in the length of the stylocerite which reaches halfway the basal segment of the antennular peduncle in *L. antarcticus* while in *L. africanus* it overreaches the basal segment of the antennular peduncle. The telson of *L. antarcticus* has six pairs of dorsal spines while two to four in *L. africanus*. *L. antarcticus* is known from off Terre Adélie and Wilkes Land, Antarctica, in depths between 548 and 920 m.

L. bidentatus Zarenkov, 1976. Fourth abdominal segment with a marginal posterior tooth on the pleura while this pleura is rounded in *L. africanus*. The species is known from the west coast of Peru, off Callao, caught at a depth of 1680 m.

L. carinatus Zarenkov, 1976. Fourth abdominal segment with a posterior tooth on its pleura while this feature is absent in *L. africanus*. The rostrum is short, not reaching beyond the basal antennular segment while reaching the distal end of the second antennular segment in *L. africanus*. *L. carinatus* is known only from its holotype male: off Peru, depth 1680-1860 m.

L. catalepsis Jensen, 1987. This species differs in having a very short rostrum without teeth on the dorsal or ventral lamina while the rostrum bears teeth on both dorsal and ventral margins in *L. africanus*. *L. catalepsis* has the second segment of the antennular peduncle shorter than the third segment and the stylocerite overreaching this second segment, while in *L. africanus* the second segment is longer than the third and the stylocerite as long as the basal antennular peduncle. *L. catalepsis* is a small species with a maximum carapace length of about 5 mm in adults, while it is about 15 mm in *L. africanus*. *L. catalepsis* is known from the low intertidal in the Strait of Juan de Fuca, Washington, U.S.A, northeastern Pacific.

L. fasciatus (Kobjakova, 1936). Pleura of the fourth abdominal segment with a marginal posterior tooth while this pleura is rounded in *L. africanus*. The rostrum has 7-9 dorsal and 3-5 ventral teeth while in *L. africanus* it has 4-5 dorsal, and 2-3 ventral

teeth. *L. fasciatus* is a small littoral species known from the Bering Sea, Sakhalin and Akkeshi Lake (Hokkaido) in depths between 4 and 32 m.

L. groenlandicus (Fabricius, 1775). All abdominal pleura with 1-3 teeth while *L. africanus* has only one tooth on the pleura of the fifth abdominal segment. Telson with 9 pairs of dorsal spines. *L. groenlandicus* is known from arctic and subarctic waters between 0 and 600 m depth.

L. indicus Holthuis, 1947. Rostrum long, overreaching the antennular peduncle, upcurved and with a truncate tip, while in *L. africanus* the rostrum is short, not overreaching the antennular peduncle and has the tip pointed. The only two specimens known of *L. indicus* were caught at 1018 m depth in the Bali Sea.

L. lagunae Schmitt, 1921. Rostrum reduced to a spine and has three teeth on the carapace. The fourth abdominal segment has a marginal posterior tooth which is absent in *L. africanus*. *L. lagunae* is a small-sized species known from shallow water along the California coast, eastern Pacific.

L. microceras (Krøyer, 1841). Rostrum short, not reaching beyond the first antennular segment, with 4 or 5 dorsal teeth of which two are postorbital, and none or one ventral tooth; in *L. africanus* the rostrum overreaches the basal segment of the antennular peduncle and it has 2 or 3 teeth on the ventral lamina. *L. microceras* has the fourth abdominal segment with a marginal posterior tooth on the pleura which is absent in *L. africanus*. The species is known from northern cold temperate waters in depths between 8 and 80 m.

L. miyakei Hayashi, 1992. Rostrum short, not reaching the distal end of the basal antennular segment, with two dorsal and one ventral teeth, while *L. africanus* has the rostrum reaching the distal end of the second antennular segment and has 4 or 5 dorsal, and 2 or 3 ventral teeth. In *L. miyakei* the distolateral tooth of the scaphocerite clearly overreaches the lamella while it does not in *L. africanus*. *L. miyakei* is a small littoral species exclusively known from the type-locality: Sea of Genkainada, near Oronoshima Island, Fukuoka Prefecture, Japan, caught at a depth between 30 and 40 m.

L. profundus (Rathbun, 1906). Rostrum short and slender, not reaching beyond the basal antennular segment, with two dorsal and one ventral teeth; in *L. africanus* the rostrum overreaches the basal antennular segment, it bears 4-5 dorsal and 2-3 ventral teeth. The species is only known from the type-locality: Hawaiian Islands, Central Pacific, in depths between 1340-1800 m. The description of *L. profundus* (Rathbun, 1906) is rather brief. From this description no reliable features could be found to discriminate it from *P. saldanhae*. Rathbun noted that the carpus of the second pereopods is 9-jointed. This must be an error, as all *Lebbeus* species have a 7-jointed carpus; unfortunately her figure 10 on plate 24 does not show the carpal segments.

L. saldanhae Barnhard, 1950. Rostrum short and slender, the ventral lamina not developed, neither overreaching the basal antennular segment nor the eye, with three dorsal teeth of which one postorbital and one ventral teeth. *L. africanus* has the rostrum overreaching the basal antennular segment and the eye, and has 4 or 5 dorsal, and 2 or 3 ventral teeth. The third carpal segment of the second pereopod is shorter than the first and second together; in *L. africanus* it is distinctly longer. *L. saldanhae* seems to be a smaller-sized species (only the holotype specimen known, with cl. 5.4 mm): the 5 specimens of *L. africanus* have carapace lengths between 8.6 and 15.1 mm. Type-locality: off Constable Hill, Saldanha Bay, South Africa, in 145 fms depth.

L. schrenckii (Brashnikov, 1907). The rostrum is short, not reaching beyond the basal segment of the antennular peduncle, with 2-5 dorsal teeth of which one or two postorbital, and one ventral tooth. *L. africanus* has the rostrum overreaching the basal antennular segment, has 4-5 dorsal, and 2-3 ventral teeth. The stylocerite of *L. schrenckii* reaches the distal end of the second segment of the antennular peduncle. In *L. africanus* it reaches the distal end of the basal antennular segment. The fourth abdominal segment of *L. schrenckii* has a marginal posterior tooth on the pleura which is absent in *L. africanus*. *L. schrenckii* is a small species (cl. 12 mm) known from the Sea of Japan, Sea of Okhotsk, Alaska to British Columbia, northern Pacific in depths between 12 and 183 m.

L. speciosus (Urita, 1942). Rostrum long, reaching beyond the antennular peduncle, with about 8 dorsal teeth; in *L. africanus* the rostrum is not overreaching the antennular peduncle, and a maximum of five dorsal teeth has been found. In *L. speciosus*, the fourth abdominal segment has a marginal posterior tooth on the pleura which is absent in *L. africanus*. *L. speciosus* is known from shallow water in the Sea of Japan, northern Pacific.

L. spinirostris (Kobjakova, 1936). Rostrum very short, not reaching beyond the eyes, without ventral teeth; in *L. africanus* the rostrum overreaches the eye, and 2-3 teeth are present on its ventral margin. The fourth abdominal segment has a marginal posterior tooth on the pleura which is absent in *L. africanus*. The telson bears six pairs of dorsal spines, while 2-4 in *L. africanus*. *L. spinirostris* is known from its type-locality: Okhotsk Sea, caught at a depth of 182 m.

L. ushakovi (Kobjakova, 1936). Rostrum with about nine dorsal and about four ventral teeth while *L. africanus* has 4-5 dorsal and 2-3 ventral rostral teeth. *L. ushakovi* is known from its type-locality: Sea of Okhotsk, caught at a depth of 185 m.

L. washingtonianus (Rathbun, 1902). Rostrum slender, not reaching beyond the basal segment of the antennular peduncle, while in *L. africanus* it clearly overreaches the basal antennular segment. The stylocerite reaches about 2/3-3/4 of the basal segment of the antennular peduncle, while it reaches the distal end in *L. africanus*. The fourth abdominal segment has a weak marginal posterior tooth on the pleura which is absent in *L. africanus*. A small species known from the North Pacific coast of the U.S.A., caught in depths between 820 and 1808 m.

L. zebra (Leim, 1921). Rostrum short, not reaching beyond the first antennular segment, with 4-5 dorsal teeth of which two postorbital, and none or one ventral tooth; in *L. africanus* the rostrum overreaches the basal segment of the antennular peduncle and has 2 or 3 teeth on the ventral lamina. *L. zebra* has the fourth abdominal segment with a marginal posterior tooth on the pleura which is absent in *L. africanus*. *L. zebra* could be conspecific with *L. microceras* as indicated by Rathbun (1929: 13) and Squires (1965, 53) who noted some differences between the colour pattern between the two. *L. zebra* is also very similar to *L. schrenckii* and could be conspecific as stated by Butler (1964: 55) and Wicksten & Méndez (1982: 118). The only difference found between the two species is the absence of the dorsal furrow in the second abdominal segment in *L. zebra*.

Lebbeus bidentatus Zarenkov, 1976
(figs 30-32)

Lebbeus bidentatus Zarenkov, 1976: 13, fig. 5; Wicksten, 1979: 629-630; Wicksten & Mendez, 1982: 117, 117; Hayashi, 1992: 109 table 1.

Material.— 1 ♂ holotype, cl. 15.3 mm (Ma 4046): R/V "Akademik Kurchatov" sta. 276, off Chile; depth 1680 m; 24.x.1968.

Redescription of the male holotype.— Rostrum distally broken, in complete condition probably reaching distal end of second segment of antennular peduncle. Dorsal rostral lamina almost straight, slightly turning upward distally; four dorsal teeth at equal distances, one tooth postorbital. Median dorsal carina on anterior part of carapace indistinct. Supraorbital ridge with supraorbital acute tooth, lateral carina indistinct. Ventral rostral lamina convex with at least four distal teeth of which proximal tooth situated between distal two dorsal teeth. Orbit deeply incised posteriorly, inferior angle produced. Antennal spine robust, situated somewhat below the antero-ventral angle of the orbit. Anterior margin of carapace strongly sinuate. Pterygostomian tooth present, smaller than antennal spine.

Abdominal segments all rounded dorsally; third with posterior margin triangularly produced medially. Pleura of first three segments broadly rounded; fourth and fifth pleura with ventral margin almost straight, with acute postero-marginal tooth. Sixth somite 1.5 times as long as fifth. Telson nearly 1.5 times as long as sixth abdominal segment, three times as long as wide. Four pairs of dorsolateral spines at 0.45-0.68-0.80-0.90 of telson length. Posterior margin of telson with five pairs of spines. Outer pair short but robust, mesial pair long and robust, central three pairs short and feathered. Several distal setae on dorsal posterior margin. Uropods slightly over-reaching telson. Exopod with both articulating and fixed laterodistal teeth.

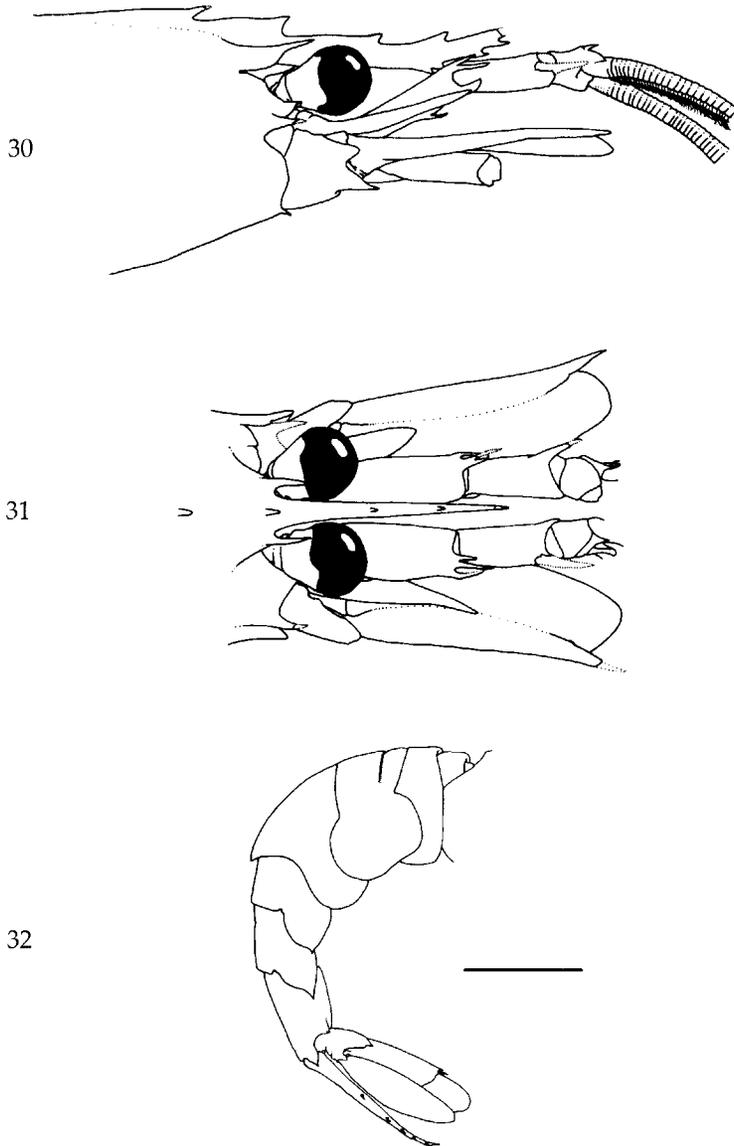
Eye globular, eye-stalk conical. Median protuberance between eyes truncate dorsally, falling in shallow notch of ventral rostral lamina.

Antennular peduncle falls short of end of scaphocerite. Basal segment half as long as scaphocerite, with strong tooth at 3/4 of ventromesial margin; dorsolateral distal margin with two long acute teeth of which lateralmost longest. Stylocerite acute, reaching beyond distal margin of basal segment, inner margin convex, outer margin almost straight. Second segment half as long as basal segment, with strong oblong tooth at dorsolateral margin. Distal segment half as long as second segment, with strong distodorsal spine. Upper and lower antennular flagella longer than carapace, broken off. Upper antennular flagellum with swollen setiferous part comprising proximal 40 joints. Lower antennular flagellum also swollen.

Antennal peduncle reaches beyond middle of scaphocerite. Strong distoventral spine present on basal segment. Scaphocerite about three times as long as maximum width; outer margin almost straight, slightly concave distally, with disto-lateral tooth as long as lamina; inner margin proximally convex.

Left mandible absent. Right mandible with slender incisor process ending in one large tooth and one small tooth. Molar process with 11 lateral tooth. Mandibular palp two-segmented; basal segment broad, with few short setae; distal segment oblong with many long setae.

Maxillula with lower and upper endite well developed, upper endite with series



Figs 30-32. *Lebbeus bidentatus* Zarenkov, 1976, male holotype, cl. 15.3 mm. 30, anterior appendages, lateral aspect; 31, anterior appendages, dorsal aspect; 32, abdomen, lateral aspect. (Scale bar: 30, 31 = 4 mm; 32 = 8 mm).

of short thick teeth; palp unsegmented, distally indistinctly bilobed with several distal setae.

Maxilla with bilobed upper endite bearing many setae; lower endite reduced, with few long setae; palp well developed with long distal setae; scaphognathite well developed, with rounded posterior lobe.

First maxilliped with well developed endites bearing setae; palp two-segmented,

basal segment broad, distal segment oblong bearing many setae; exopod with caridean lobe; epipod large, bilobed.

Second maxilliped with broad ultimate segment; carpal segment with lateral spine; ischial segment with excavated mesial margin; exopod well developed; epipod triangular, with podobranch.

Third maxilliped long, reaching with distal 2/3 of distal segment beyond scaphocerite; basal segment short, with epipod, without exopod; antepenultimate segment long, with disto-lateral tooth and disto-ventral spine; penultimate segment 0.25 times as long as antepenultimate segment; ultimate segment as long as antepenultimate segment, mesially strongly setose, with nine apical and subapical black spines.

Branchial formula:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
Arthrobranchs	-	-	-	-	-	-	-	-
Pleurobranchs	-	-	-	+	+	+	+	+
Podobranchs	-	+	-	-	-	-	-	-
Epipods	+	+	+	+	+	+	-	-
Setobranchs	-	-	-	+	+	+	+	-
Exopods	+	+	-	-	-	-	-	-

First pereiopod robust, short, just reaching tip of scaphocerite, without armature; chela simple, fingers less than half palm length; cutting edges entire; dactylus with two distal spines between which tip of fixed finger falls; carpus as long as palm, with median setiferous cleaning organ; carpus 0.55 times merus length. Ischium short.

Second pereiopod long, reaching distal tip of third maxilliped with distal end of carpus. Chela simple, slightly longer than seventh carpal segment; fingers half palm length, cutting edges entire. Carpus seven-articulated; first segment longer than second; third longer than first and second together, fourth about half as long as third, as long as fifth and sixth together; seventh as long as fourth. Merus slightly longer than ischium.

Ambulatory pereiopods incomplete, fifth missing, fourth missing propodus and dactylus, third missing part distal to merus. Merus of third pereiopod with six spines, ischium unarmed. Merus of fourth pereiopod with four spines, ischium unarmed. Endopod of first pleopod with finger-like produced distal part, curled outward. Endopod of second pleopod with short, distally setose, appendix masculina; appendix interna twice as long as appendix masculina.

Remarks.— In figure 4 of Zarenkov (1976), the pleura of the fourth abdominal segment is drawn rounded; in the holotype a marginal posterior tooth is present. This feature separates *L. bidentatus* from *L. africanus*. Wicksten & Méndez (1982) suggested a close relationship between *L. bidentatus* and *L. washingtonianus* (Rathbun, 1902) and that: "*Lebbeus bidentatus* may represent a southern race of *L. washingtonianus*". The differences between the only specimen known of *L. bidentatus* and the few specimens described as *L. washingtonianus*, such as the slightly longer rostrum and stylocerite in *L. bidentatus* are minor. To be more conclusive about the relation between *L. bidentatus* and *L. washingtonianus*, more material should become available.

Lebbeus carinatus Zarenkov, 1976
(figs 33-46)

Lebbeus carinatus Zarenkov, 1976: 9, fig. 2; Wicksten, 1979: 629-630; Wicksten & Méndez, 1982: 119; Newman, 1985: 232.

Not *Lebbeus carinatus* de Saint Laurent, 1984: 355, 356.

Material.— 1 ♂ holotype, cl. 8.5 mm (Ma 3936): R/V "Akademik Kurchatov" sta. 290, off Peru, depth 1680-1860 m; 30.x.1968.

Redescription of the male holotype.— Rostrum reaching distal end of basal segment of antennular peduncle. Dorsal lamina straight; four dorsal teeth at equal distances, two teeth postorbital. Median dorsal carina in anterior half of carapace, indistinct. Supraorbital ridge with acute supraorbital tooth. Ventral rostral lamina straight with four distal teeth. Orbit deeply incised posteriorly, inferior orbital angle produced. Antennal spine robust, situated somewhat below inferior orbital angle of orbit. Anterolateral angle of carapace roundly produced. Pterygostomian tooth present, much smaller than antennal spine.

Abdominal segments rounded dorsally; third with posterior margin triangularly produced medially. Pleurum of first three segments broadly rounded, fourth and fifth with ventral margin sinuous, posterior margin in acute marginal tooth. Sixth somite 1.5 times as long as fifth. Telson broken, only 2 pairs of dorsal spines present. Exopod of uropod with articulating and fixed laterodistal teeth.

Eye globular, eye-stalk conical. Median protuberance between eyes truncate dorsally, no notch in ventral lamina rostrum.

Antennular peduncle falls short of end of scaphocerite. Basal segment not reaching half of scaphocerite, with strong subdistal ventromesial tooth; dorsolateral distal margin with two acute teeth of equal length. Stylocerite acute, reaching distal margin of basal segment, inner margin convex, outer margin almost straight, slightly concave distally. Second segment half as long as basal segment, with strong oblong tooth at lateral margin. Distal segment half as long as second segment, with strong distodorsal spine. Upper and lower antennular flagella broken off.

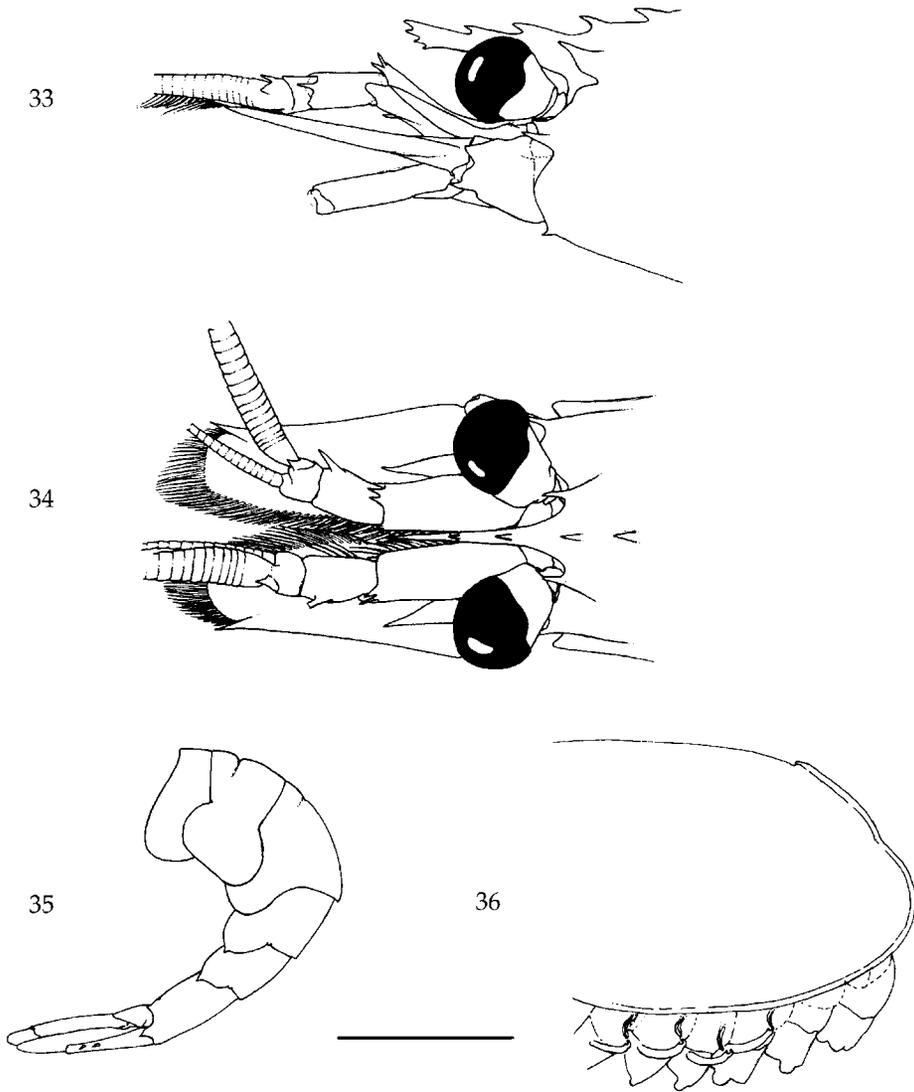
Antennal peduncle reaches beyond middle of scaphocerite. Strong distoventral spine present on basal segment. Scaphocerite about three times as long as maximum width; outer margin almost straight, slightly concave distally, with disto-lateral tooth not reaching distal end of lamina; medial margin proximally convex.

Mandible damaged; incisor process broken off. Molar process of left and right mandible dissimilar. Molar process of left mandible with two distal lobes and strongly setose area distally. Mandibular palp two-segmented; basal segment broad, with few short setae; distal segment oblong with many long setae. Molar process of right mandible with six lateral teeth.

Maxillula with lower and upper endite well developed, upper endite with series of short thick spines; palp unsegmented, distally bilobed with several distal setae.

Maxilla with bilobed upper endite bearing many setae; lower endite reduced, with few long setae; palp well developed with long distal setae; scaphognathite well developed, with rounded posterior lobe.

First maxilliped with well developed endites bearing setae; palp two-segmented,

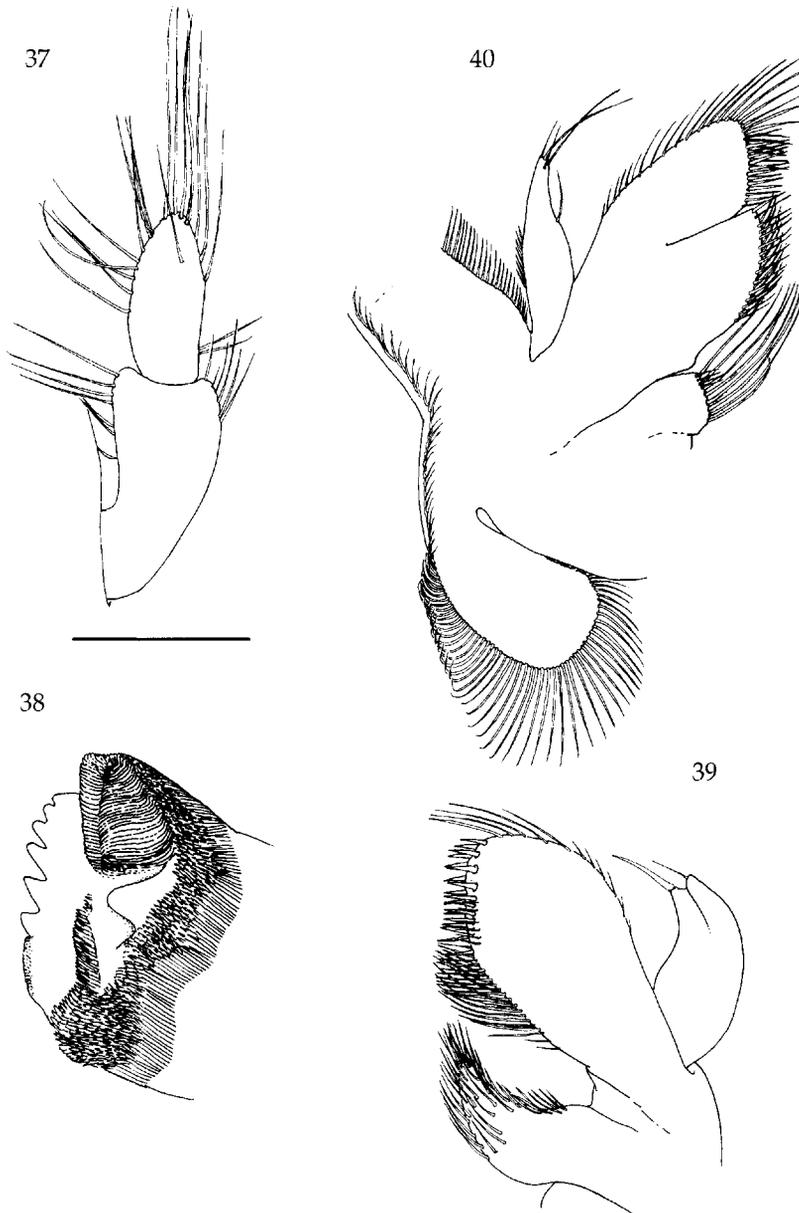


Figs 33-36. *Lebbeus carinatus* Zarenkov, 1976, male holotype, cl. 8.5 mm. 33, anterior appendages, lateral aspect; 34, anterior appendages, dorsal aspect; 35, abdomen, lateral aspect; 36, lateral aspect of posterior parts of last six thoracic appendages showing epipodites. (Scale bar: 33, 34, 36 = 4 mm; 35 = 8 mm).

basal segment broad, distal segment oblong bearing many setae; exopod with caridean lobe; epipod large, bilobed.

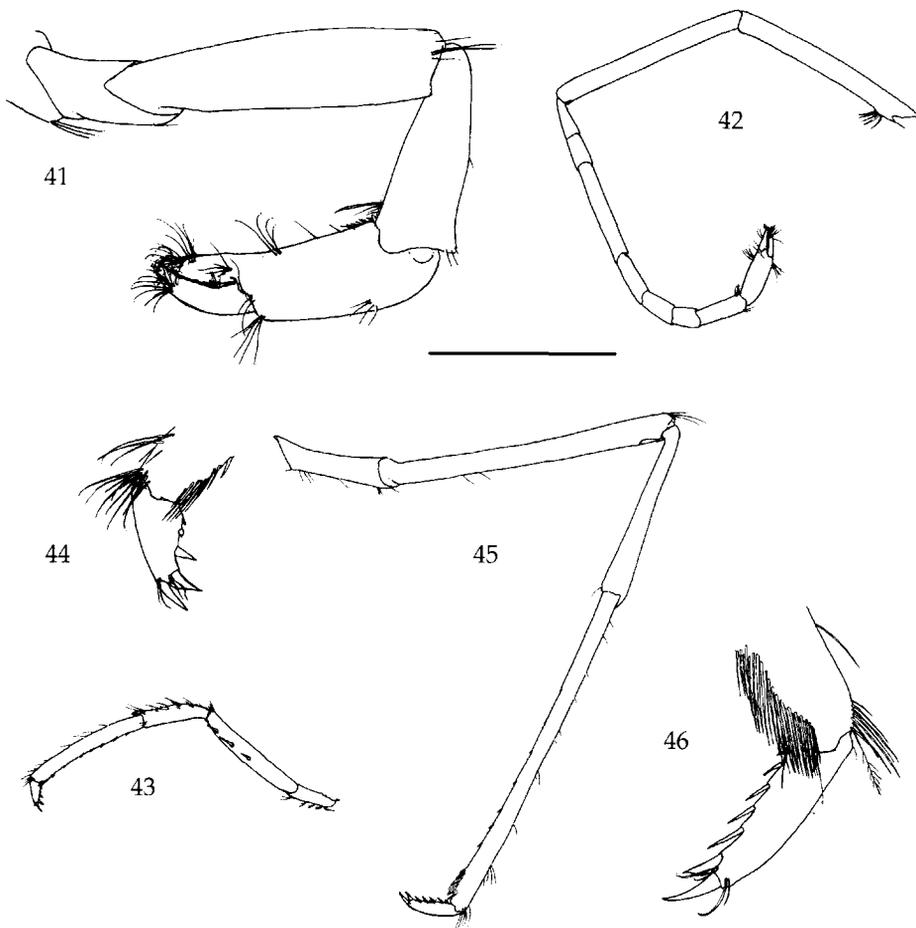
Second maxilliped with broad ultimate segment; carpal segment with lateral spine; ischial segment with excavated mesial margin; exopod well developed; epipod triangular, with podobranch.

Third maxilliped long, reaching just beyond scaphocerite; basal segment short, with epipod, without exopod; antepenultimate segment long, with disto-lateral tooth



Figs 37-40. *Lebbeus carinatus* Zarenkov, 1976, male holotype, cl. 8.5 mm. 37, right mandibular palp, ventral aspect; 38, distal part of molar process of right mandible, dorsal aspect; 39, left maxillula, ventral aspect; 40, left maxilla, ventral aspect. (Scale bar = 1 mm).

and disto-ventral spine; penultimate segment 0.25 times as long as antepenultimate segment; ultimate segment as long as antepenultimate segment, mesially strongly setose, with 10 apical and subapical black spines.



Figs 41-46. *Lebbeus carinatus* Zarenkov, 1976, male holotype, cl. 8.5 mm. 41, first pereiopods; 42, second pereiopod; 43, ? third pereiopod; 44, ? third pereiopod, dactylus; 45, fifth pereiopod; 46, fifth pereiopod, dactylus. (Scale bar: 41 = 2 mm; 42, 43, 45 = 4 mm; 44, 46 = 1 mm).

Branchial formula:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
Arthrobranchs	-	-	-	-	-	-	-	-
Pleurobranchs	-	-	-	+	+	++	+	+
Podobranchs	-	+	-	-	-	-	-	-
Epipods	+	+	+	+	+	+	-	-
Setobranchs	-	-	-	+	+	+	+	-
Exopods	+	+	-	-	-	-	-	-

First pereopod robust, short, just falling short or tip of scaphocerite, without armature. Chela simple, fingers slightly more than half palm length; cutting edges entire; dactylus with two distal spines between which tip of fixed finger falls. Carpus as long as palm, with median setiferous cleaning organ; carpus 0.6 times as long as merus. Ischium short.

Second pereopod long. Chela simple, slightly longer than seventh carpal segment; fingers half the palm length, cutting edges entire. Carpus seven-articulated; first segment longer than second; third longer than first and second together, fourth about half as long as third, slightly shorter than fifth and sixth together; seventh as long as fourth. Merus about as long as ischium.

One fourth pereopod present on specimen proper; two detached pereopods present in tube. Fourth pereopod long; merus with five lateral spines in distal half; propodus with small spines along ventral margin; dactylus with six spines on flexor margin, increasing in size distally. Detached pereopod (probably fifth pereopod) resembling fourth pereopod; merus with only one subdistal spine; propodus with small spines along ventral margin and many distoventral setae; dactylus with six spines on flexor margin, increasing in size distally. Other pereopod much shorter (possibly not from same specimen or even from other hippolytid) with three lateral spines in distal part of merus; dactylus short, with only four spines on flexor margin.

Endopod of first pleopod with finger-like produced distal straight part. Endopod of second pleopod with short, distally setose, appendix masculina; appendix interna 1.5 times as long as appendix masculina.

Remarks.— In the original description of the species Zarenkov (1976) states that epipods are present on the first four pereopods. The present examination of the holotype reveals that epipods are present on the first three pereopods only. It is therefore compared with species from the group with epipods on the first three pereopods. The specimen seems most similar to *L. bidentatus* and *L. washingtonianus*. It differs from *L. bidentatus* in having the rostrum not overreaching the basal antennular segment. Differences between the type of *L. carinatus* and *L. washingtonianus* are very minor. The sylocerite in *L. washingtonianus* is shorter reaching 2/3 to 3/4 of the basal antennular segment length while reaching its distal end in *L. carinatus*. As so little material is available I hesitate to synonymize *L. carinatus* with *L. washingtonianus*.

L. carinatus de Saint Laurent, 1984 is a junior homonym of *L. carinatus* Zarenkov, 1976. A new name should be given to the species of de Saint Laurent, 1984.

Lebbeus curvirostris Zarenkov, 1976

(figs 47-49)

Lebbeus curvirostris Zarenkov, 1976: 12 fig. 4; Wicksten, 1979: 629-630; Wicksten & Méndez, 1982: 117; Hayashi, 1992: 110.

Material.— ♀ holotype, cl. 16.5 mm (Ma 4045): R/V "Akademik Kurchatov" sta. 290, off Peru, depth 1680-1860 m; 30.x.1968.

Redescription of female holotype.— Rostrum longer than antennular peduncle. Dorsal rostral lamina upcurved; three dorsal teeth at equal distances of which two postorbital. Median dorsal carina in anterior 2/3 of carapace. Small supraorbital spine present, no ridge, lateral carina indistinct. Ventral rostral lamina with five teeth all in

front of level of distal dorsal rostral tooth. Orbit not deeply incised, inferior orbital angle not produced. Antennal spine robust. Anterior margin of carapace almost straight. Pterygostomian tooth present, smaller than antennal spine.

Abdominal segments all rounded dorsally; second with shallow dorsal furrow; third with posterior margin triangularly produced medially. Pleurum of first four segments broadly rounded, fifth with ventral margin sinuate and sharp marginal tooth. Sixth somite 1.5 time as long as fifth. Telson broken. Exopod of caudal fan with articulating and fixed laterodistal teeth.

Eye globular, eye-stalk conical. Median protuberance between eyes truncate dorsally, falling in shallow notch of ventral rostral lamina.

Antennular peduncle about as long as scaphocerite. Basal segment half as long as scaphocerite, with strong tooth at $3/4$ of ventromesial margin; dorsolateral distal margin with one long strong tooth. Stylocerite acute, overreaching distal margin of basal segment, inner margin convex, outer margin almost straight. Second segment half as long as basal segment, with strong spine at dorsolateral margin. Distal segment half as long as second segment, with strong distodorsal spine. Antennular flagella about as long as scaphocerite. Lower antennular flagellum slender. Proximal 27 articulations of upper antennular flagellum broad, with aesthetascs; distal part slender, without aesthetascs, not biramous.

Antennal peduncle reaches beyond middle of scaphocerite. Strong distoventral spine present on basal segment. Scaphocerite less than three times longer than maximum width; outer margin almost straight, ending in distal tooth reaching tip of distal lamina; inner margin proximally convex, distally straight.

Mandible, maxillula and maxilla not studied.

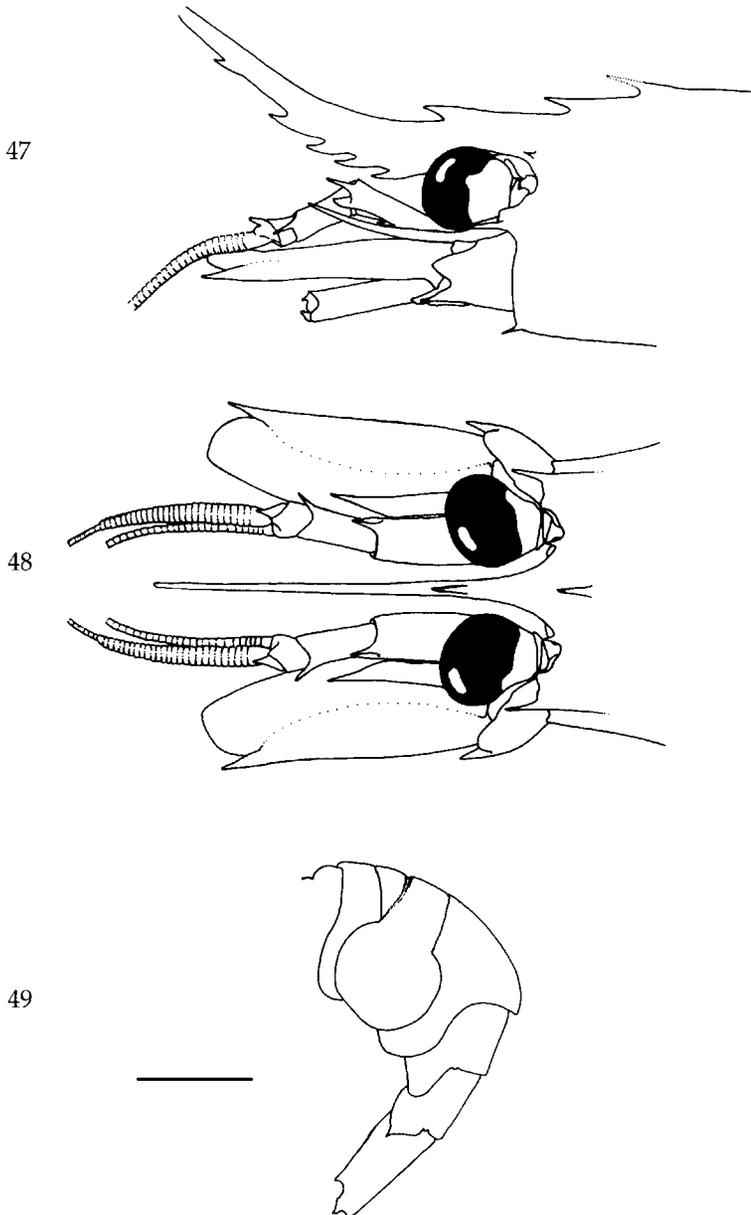
First maxilliped with well developed endites bearing setae; palp two-segmented, basal segment broad, distal segment oblong bearing many setae; exopod with caridean lobe; epipod large, bilobed.

Second maxilliped with broad ultimate segment; carpal segment without lateral spine; ischial segment with excavated mesial margin; exopod well developed; epipod triangular, with podobranch.

Third maxilliped long, reaching with distal third of distal segment beyond scaphocerite; basal segment short, with epipod, without exopod; antepenultimate segment long, with distal ventral spine; penultimate segment 0.25 times as long as antepenultimate segment; ultimate segment as long as antepenultimate segment, mesially strongly setose, with nine apical and subapical black spines.

Branchial formula:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
Arthrobranchs	-	-	-	-	-	-	-	-
Pleurobranchs	-	-	-	+	+	+	+	+
Podobranchs	-	+	-	-	-	-	-	-
Epipods	+	+	+	+	-	-	-	-
Setobranchs	-	-	-	+	+	-	-	-
Exopods	+	+	-	-	-	-	-	-



Figs 47-49. *Lebbeus curvirostris* Zarenkov, 1976, female holotype, cl. 16.5 mm. 47, anterior appendages, lateral aspect; 48, anterior appendages, dorsal aspect; 49, abdomen, lateral aspect. (Scale bar: 47, 48 = 4 mm; 49 = 8 mm).

Right first pereopod broken off. Left first pereopod robust, short, just reaching tip of scaphocerite, without armature. Chela simple, fingers less than half the palm length; cutting edges entire; dactylus with two distal spines between which tip of fixed finger falls. Carpus as long as palm, with median setiferous cleaning organ. Epipod and setobranch present. Second pereopods broken off. No epipod on coxa. Left third pereopod broken off. Right third pereopod broken at carpal-propodal articulation; carpus unarmed; merus with six lateral spines; ischium unarmed. Left fourth pereopod broken off. Right fourth pereopod broken at carpal-propodal articulation; carpus unarmed; merus with seven lateral spines; ischium unarmed. Left fifth pereopod broken at meral-carpal articulation; merus with one disto-lateral spine. Right fifth pereopod complete; dactylar ventral margin with five spines; propodus with about nine small spines on flexor margin, distal part densely setose; carpus unarmed; merus with one disto-lateral spine, ischium unarmed.

First pleopod with broad short endopod tapering distally; exopod oblong, about as long as endopod.

Remarks.— Apparently by mistake Zarenkov marked the gills on the pereopods as arthrobranchs which would indicate that the species should be transferred to the genus *Nauticaris* Bate, 1888, as was suggested by Wicksten & Méndez (1982: 117). The holotype female clearly shows the branchia to be pleurobranchs so it was correctly assigned by Zarenkov to the genus *Lebbeus*.

In figure 4A of Zarenkov (1976: 12) the dorsal furrow in the second abdominal segment is incorrectly drawn as its anterior margin.

Zarenkov indicated in his table on the branchial formula that the epipod on the first pereopod is present on the left side and absent on the right side. The epipod on the right side however is present, although folded under the pleurobranch, which probably is why it was overlooked.

The merus of the third pereopod has six lateral spines, the distal two are still present, the other four are broken off. The scars however are clearly visible.

L. curvirostris seems most related to *L. scrippsi* Wicksten & Mendez, 1982, and *L. splendidus*. It differs from *L. scrippsi* in having the rostrum much longer, overreaching the antennal peduncle, and in having the stylocerite overreaching the basal antennular segment while it is falling short in *L. scrippsi*. It differs from *L. splendidus* in having one distolateral spine on the basal antennular segment while there are two in *L. splendidus*. In the holotype of *L. curvirostris* only three dorsal rostral teeth are present while in all the *L. splendidus* specimens known to date (11 specimens) there are 4-5 dorsal teeth.

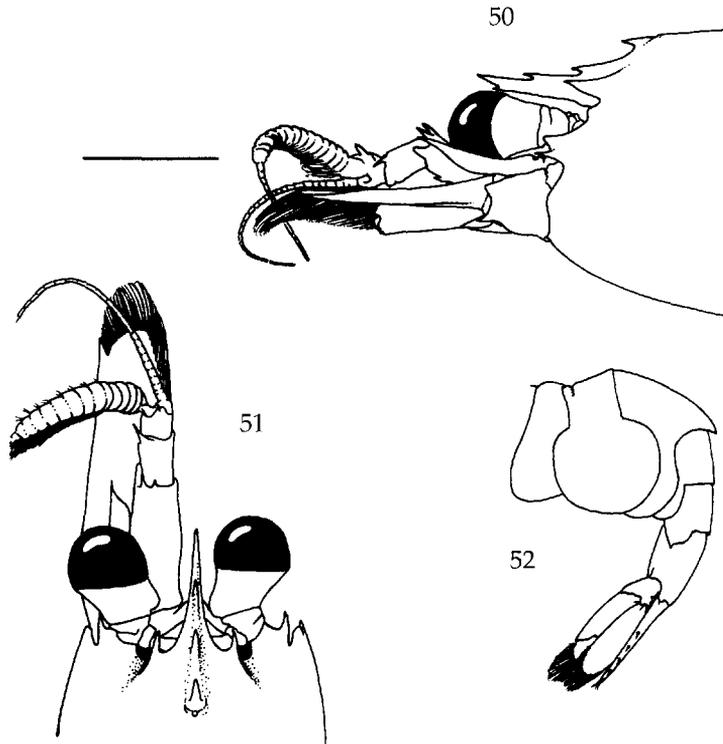
Lebbeus saldanhae (Barnard, 1947)
(figs 50-62)

Spirontocaris saldanhae Barnard, 1947: 385; Barnard, 1950: 698-698, fig. 1291-n.

Lebbeus saldanhae: Kensley, 1974: 72; Hayashi, 1992: 109.

Material.— ♀ holotype, cl. 5.4 mm (SAM A 8446): SS "Pieter Faure" sta. PF 14737, South Africa, Saldanha Bay, off Constable Hill, 20 mls; depth 145 fms; shrimp trawl; 15.iii.1902. On original label: *Spirontocaris (saldanhae* n. sp.) in Barnards handwriting.

Description of female holotype.— Rostrum reaching 2/3 of basal segment of



Figs 50-52. *Lebbeus saldanhae* (Barnard, 1947), female holotype, cl. 5.4 mm. 50, anterior appendages, lateral aspect; 51, anterior appendages, dorsal aspect; 52, abdomen, lateral aspect. (Scale bar: 50, 51 = 2 mm; 52 = 4 mm).

antennular peduncle, nearly as long as eyes. Dorsal rostral lamina straight; three dorsal teeth at equal distances, one tooth postorbital. Just behind proximalmost tooth a scar, possibly of a small articulating epigastric spine. No median dorsal carina on carapace. Supraorbital ridge with supraorbital tooth; lateral carina distinct. Ventral rostral lamina straight with one distal tooth placed in front of distalmost dorsal tooth. Orbit deeply incised posteriorly; inferior orbital angle produced, obtuse. Antennal spine robust, placed just below inferior orbital angle. Anterior margin of carapace sinuate. Pterygostomial tooth present, much smaller than antennal spine.

Abdominal segments all rounded dorsally; third with posterior margin produced medially. Pleurae of first four segments broadly rounded, fifth with ventral posterior margin with acute tooth. Sixth somite 1.5 times as long as fifth. Telson 1.25 times as long as sixth abdominal segment, three times as long as wide. Four lateral dorsal spines on left and three on right side of telson. Posterior margin of telson with five pairs of spines. Outer pair short but robust, mesial pair long and robust, central three pairs short and feathered. Several distal setae on dorsal posterior margin. Uropods slightly overreaching telson. Right exopod of uropod with two articulating and one fixed disto-lateral teeth. Left with one articulating and one fixed disto-lateral teeth.

Eye globular, eye-stalk baso-medially produced. Median protuberance between



Figs 53-56. *Lebbeus saldanhae* (Barnard, 1947), female holotype, cl. 5.4 mm. 53, right mandible, dorsal aspect; 54, right maxillula, ventral aspect; 55, right maxilla, ventral aspect; right first maxilliped, ventral aspect. (Scale bar = 0,4 mm).

eyes obsolete, not reaching ventral lamina of rostrum.

Antennular peduncle fails to reach end of scaphocerite. Basal segment half as long as scaphocerite, with strong subdistal tooth on ventro-mesial margin; dorso-lateral distal margin with two teeth on right and three on left antennula. Stylocerite acute, reaching distal margin of basal segment, inner margin convex, outer margin slightly concave. Second segment half as long as basal segment, with strong spine at dorso-lateral margin. Distal segment half as long as second segment, with strong disto-dorsal spine. Antennular flagella about as long as scaphocerite. Lower antennular flagellum slender. Proximal 14 articulations of upper antennular flagellum broad, with many slender aesthetascs; distal part slender, without aesthetascs, not biramous.

Antennal peduncle reaches beyond middle of scaphocerite. Strong distoventral

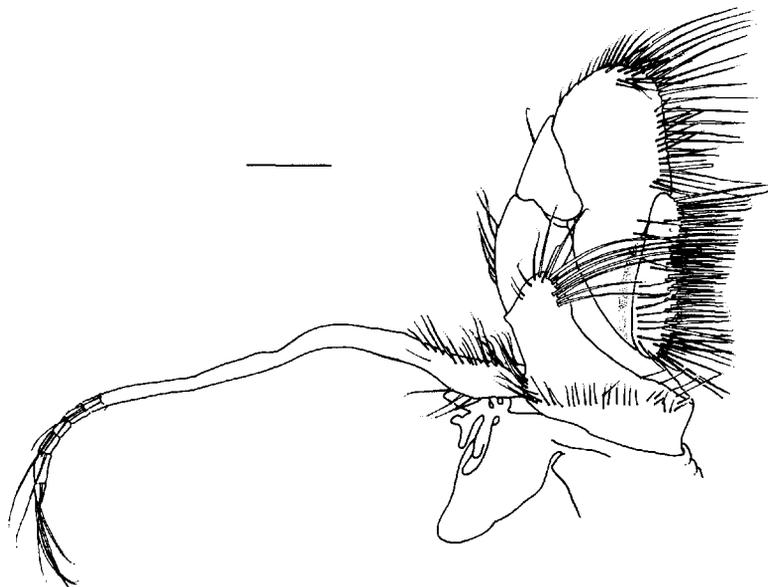


Fig. 57. *Lebbeus saldanhae* (Barnard, 1947), female holotype, cl. 5.4 mm, right second maxilliped, ventral aspect. (Scale bar = 0.4 mm).

spine present on basal segment. Scaphocerite more than three times longer than maximum width; outer margin almost straight, ending in distal tooth not overreaching distal lamina; inner margin proximally convex, distally straight.

Mandible with slender incisor process ending in one large and two small blunt teeth. Molar process of left mandible with one central blunt tooth and a lobulate margin and a strongly setose area distally. Molar process of right mandible with about seven lateral lobes. Mandibular palp two-segmented; basal segment broad, with few short setae; distal segment oblong with many long setae.

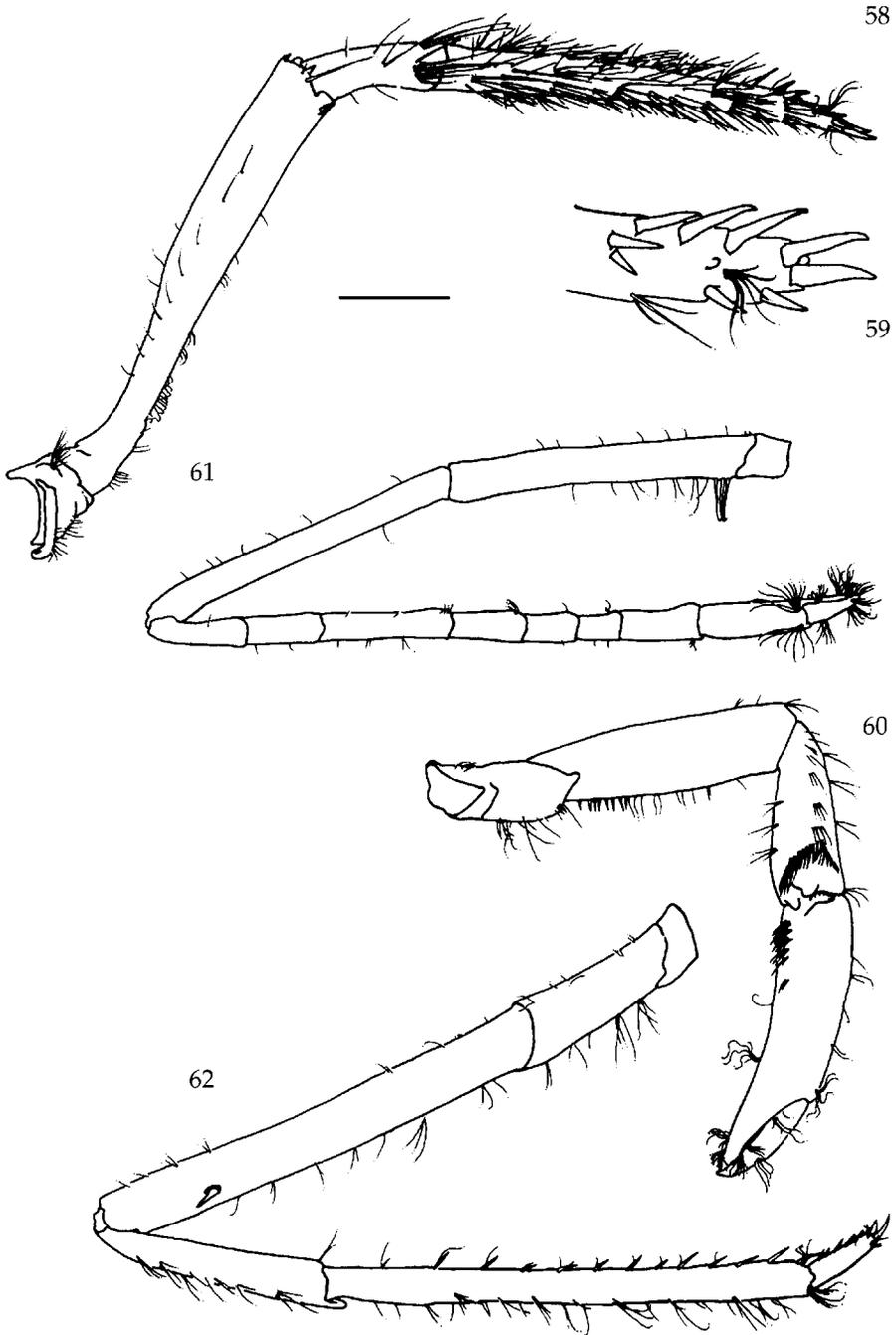
Maxillula with lower and upper endite well developed, upper endite with series of short thick teeth; palp unsegmented, distally distinctly bilobed, both lobes with strong apical seta.

Maxilla with bilobed upper endite bearing many setae; lower endite reduced, with few long setae; palp well developed with long distal setae; scaphognathite well developed, with rounded posterior lobe.

First maxilliped with well developed endites bearing setae; palp two-segmented, basal segment broad, distal segment oblong bearing many setae; exopod with caridean lobe; epipod large, bilobed.

Second maxilliped with broad ultimate segment; carpal segment with lateral spine; ischial segment with excavated mesial margin; exopod well developed; epipod triangular, with podobranch.

Third maxilliped long, reaching with distal segment beyond scaphocerite; basal segment short, with epipod, without exopod; antepenultimate segment long, with disto-lateral and disto-ventral spine; penultimate segment 0.25 times as long as antepenultimate segment; ultimate segment as long as antepenultimate segment, mesially



Figs 58-62. *Lebbeus saldanhae* (Barnard, 1947), female holotype, cl. 5.4 mm. 58, right third maxilliped, ventral aspect; 59, tip of right third maxilliped, dorsal aspect; 60, first pereopod; 61, second pereopod; 62, third pereopod. (Scale bar: 58, 60-62 = 1 mm; 59 = 0.4 mm).

strongly setose, with eight apical and subapical spines.

Branchial formula:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
Arthrobranchs	-	-	-	-	-	-	-	-
Pleurobranchs	-	-	-	+	+	+	+	+
Podobranchs	-	+	-	-	-	-	-	-
Epipods	+	+	+	+	+	+	-	-
Setobranchs	-	-	-	+	+	+	+	-
Exopods	+	+	-	-	-	-	-	-

First pereiopod robust, short, just reaching tip of scaphocerite, without armature. Chela simple, fingers half the palm length; cutting edges entire; dactylus with two distal spines between which tip of fixed finger fits when chela is closed. Carpus somewhat shorter than palm, with median setiferous cleaning organ. Merus 1.7 times the carpus length. Ischium short. Epipod and setobranch present.

Second pereiopod long, reaching beyond third maxilliped. Chela simple, slightly longer than seventh carpal segment; fingers half palm length, cutting edges entire. Carpus seven-articulated; first segment longer than second; third slightly shorter than first and second together, fourth about half the third, fifth 2/3 of fourth, sixth 2/3 of fifth, seventh twice sixth. Merus slightly longer than ischium. Epipod and setobranch present.

Ambulatory pereiopods long, equal in length; relative lengths of dactyli, propodi, carpi, meri and ischia similar; dactylus 0.2 times propodus length; propodus more than twice as long as carpus; merus as long as propodus; ischium with basis as long as carpus; propodi with posterior movable spines. Third pereiopod with epipod and setobranch, one distal meral spine and six ventral dactylar spines on left pereiopod, right missing. Fourth pereiopod without epipod, with reduced setobranch, one meral spine, three ventral dactylar spines on right and six on left pereiopod. Fifth pereiopod without epipod, and setobranch, with one distal meral spine, ventral dactylar margin with seven spines on right pereiopod, dactylus on left not present; distal 1/7 of propodus densely setose.

First pleopod with broad short endopod; distal part with few setae.

Remarks.— Differences with *L. africanus* as noted under that species.

Discussion

Of many of the species of the genus *Lebbeus* only few specimens are known. Differences between certain species which now seem apparent could fade away when more material becomes available. This means that certain characters might be unreliable for discriminating between species, e.g. number of teeth on the rostrum, length of the rostrum, number of distal teeth on the basal segment of the antennular peduncle and number of pairs of dorsal spines on the telson.

Although the present study cannot be decisive on the taxonomic status of the species due to lack of material, the detailed description of the type-material could help future researchers in clarifying the taxonomic status of some *Lebbeus*-species.

Acknowledgements

Dr V. Spiridonov and Dr N.A. Zarenkov from the Zoological Museum of the Moscow Lomonosov State University are thanked for the loan of holotype material of *L. curvirostris*, *L. bidentatus* and *L. carinatus*. Mrs van der Merwe of the South African Museum, Cape Town, is acknowledged for the loan of the holotype of *L. saldanhae*.

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