LYSMATA OLAVOI, A NEW SHRIMP OF THE FAMILY HIPPOLYTIDAE (DECAPODA, CARIDEA) FROM THE EASTERN ATLANTIC OCEAN*

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ARQUIPÉLAGO

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A new species of Hippolytidae, *Lysmata olavoi,* is described and figured. The species was found off Pico island, Azores and Salvage islands, Madeira archipelago in depths between 135 and 360 m.

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Descreve-se e ilustra-se a nova espécie de Hippolytidae, *Lysmata olavoi.* Esta espécie foi recolhida perto da costa da ilha do Pico, Açores, e das Ilhas Selvagens, Arquipélago da Madeira, em profundidades que variaram entre 135 e 360 m.

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INTRODUCTION

In October 1989 Helen R. Martins visited the Nationaal Natuurhistorisch Museum (Rijksmuseum van Natuurlijke Historie) in Leiden and showed Prof. L.B. Holthuis and the author three female specimens of an unknown *Lysmata*, collected in baited traps (see MARTINS & HARGREAVES 1991) set in deep water off the Azores during a trial fishery for shrimps carried out by the Secretariat of Agriculture and Fisheries of the Regional Government of the Azores with the M/V "Patrão Pedro" in 1988. An additional 21 specimens were caught during a similar survey in 1989 with M/V "Pérola do Faial". Two further specimens were obtained from The Natural History Museum (British Museum (Natural History)), also from the M/V "Patrão Pedro" survey in 1988. In the CANCAP-collections of the Nationaal Natuurhistorisch Museum three male specimens of the same species are present, they were found with deep water traps off the Salvage islands (Ilhas Selvagens). The CANCAP-project was a marine biological research project carried out in the CANarian - CAPe Verdian region of the North Atlantic Ocean from 1976 to 1987 (VAN DER LAND 1987). All these specimens are described below as a new species, *Lysmata olavoi*, named in honour of the late Olavo Amaral, assistant at the Department of Oceanography and Fisheries of the University of the Azores, who was on board the "Patrão Pedro" and "Pérola do Faial" to take subsamples of material for the University of the Azores.

Rijksmuseum van Natuurlijke Historie is abbreviated as RMNH; postorbital carapace length as pocl.

* CANCAP-Contribution 96.

Lysmata olavoi new species (Figs. 1-34)

Material. - RMNH D 38484: M/V Patrão Pedro Sta. 8; Azores, Pico, Ponta da Ilha, 38°25'00"N 27°59'10"W; depth 135 m; baited traps; 8.ii.1988; ovigerous female, pocl. 14.7 mm (holotype). - BMNH Crust. 1989:935:1: M/V Patrão Pedro Sta. 8; Azores, Pico, Ponta da Ilha, 38°25'00"N 27°59'10"W; depth 135 m; baited traps; 8.ii.1988; ovigerous female, pocl. 13.4 mm (paratype). - RMNH D 38485: M/V Patrão Pedro Sta. 6; Azores, Pico, Ribeiras, 38°24'20"N 28°08'00"W; depth 360 m; baited traps; 6.ii.1988; 2 ovigerous

females, pocl. 11.8 and 13.4 mm (paratypes). - BMNH Crust. 1989:933:1: M/V Patrão Pedro Sta. 4; Azores, Pico, Ribeiras, 38°24'20"N 28°08'00"W; depth 126/144 m; baited traps (string 5(2)); 3.ii.1988; 1 ovigerous female, pocl. 14.9 mm (paratype). - RMNH D 38487: M/V Peróla do Faial; Azores, Pico, Ribeiras; depth 160 m; 24.xi.1989; 3 males, 8 females of which 7 ovigerous, pocl. 9.9 - 17.3 mm (paratypes). - RMNH D 40156: M/V Peróla do Faial; Azores, Pico, Sta. Cruz das Ribeiras; depth 183 m; baited traps (string 6); 23.xi.1989; 1 male and 2 ovigerous females, pocl. 11.1 - 13.3 mm (paratypes). - RMNH D 40157: M/V Peróla do Faial; Azores, Pico, Ribeiras; depth 190 m; baited traps (string 1); 23.xi.1989; 1 male, pocl. 11.1 mm (paratype). - RMNH D 40155: M/V Peróla do Faial; Azores, Pico, Sta. Cruz das Ribeiras; depth 146 m; baited traps (string 5); 24.xi.1989; 3 males and 3 ovigerous females, pocl. 11.4 - 14.9 mm (paratypes). - RMNH D 38486: Sta. CANCAP 4.V08; Salvage islands, S of Selvagem Grande; 30°07'N 15°53'W; depth 260 m; fish-trap, shrimp-trap, 4 plastic snail-traps; overnight 26/27.v.1980; 3 males, pocl. 6.7, 9.2 mm (paratypes), and 9.2 mm (allotype).

Description of female holotype. Rostrum (Figs. 1-3) reaching as far as second segment of antennular peduncle. Dorsal margin almost straight with six evenly spaced teeth, posterior three postorbital. Ventral margin with three prominent teeth. Lateral carina equidistant from each margin of rostrum, fusing with posterior margin of orbit. Antennal spine robust and sharp. Anteroventral margin with small pterygostomian tooth. Tegument pitted, with small scale-like hairs.

Abdomen (Fig. 1) with pleura of first three somites rounded, that of fourth blunt with a tiny tooth, fifth pleuron sharply acute. Sixth somite 1.5 times as long as fifth. Telson 1.3 times as long as sixth abdominal somite. Two pairs of dorsal spines on telson (Fig. 4); anterior pair at 0.43, posterior at 0.68 of the telson length. Lateral margins ciliated from level of posterior pair of dorsal spines to distal end. Posterior margin of telson (Fig. 5) with median tooth and two pairs of spines. Lateral pair of spines small, mesial pair five times as long as lateral pair; two long setae present between two mesial spines; four short setae present on both sides of median tooth of telson.

Eyes with well developed cornea; cornea broader than eyestalk and about as long. Between the eyes a protrusion is present ('bec ocellair') anteriorly pointed and with posterodorsal margin oblique, directed into concave posteroventral margin of rostral ventral lamina (Fig. 34).

Antennular peduncle (Figs. 2, 3, 6) with stylocerite tapering to sharp tip, not reaching end of basal segment, inner margin straight, outer margin slightly concave. Each antennular segment armed with one to three short distal dorsal spines. Basal segment longest, with small mesial ventral tooth near midlength. Second segment about half length of basal segment. Third segment about two thirds length of second segment. Antennular flagella equal in length, ca. 3.5 times the carapace length; left and right dorso-lateral flagellum with 53 and 55 articles respectively, in thickened, setiferous basal portion; distal setiferous article (Fig. 7) with vestigial accessory flagellum.

Scaphocerite (Fig. 8) about 4.5 times as long as wide; lateral margin concave; distal tooth sharp, overreaching distal margin of lamina. Antennal peduncle short, not reaching end of proximal fourth of scaphocerite; basal segment with outer lateral tooth near base of scaphocerite.

Mandibles simple, very unequal in form. Molar process of left mandible (Fig. 9) with three blunt lobes and an area with short setae. Right mandible (Figs. 10, 11) with six blunt lateral lobes and an area with short setae.

First maxilla (Fig. 12) with robust upper and lower endite; palp unsegmented, bilobed. Second maxilla (Fig. 13) with lower endite strongly reduced, upper endite divided into two lobes, upper better developed than lower; palp well developed. Scaphognathite with rounded posterior lobe.

First maxilliped (Fig. 14) with endites of basis and coxa separated by a notch; palp slender, three-segmented; caridean lobe well developed; epipod large, bilobed.

Second maxilliped (Fig. 15) with wide ultimate segment; penultimate segment oblong;

epipod with podobranch.

Third maxilliped (Fig. 16) long and slender reaching beyond first pereiopod; ultimate segment (Fig. 17) with nine spines in distal third; penultimate segment 0.6 times as long as ultimate segment; basal segment 2.5 times as long as penultimate segment; exopod short, about half length of basal segment; epipod well developed. Branchial formula as in Table 1.

Table 1. Branchial formula in *Lysmata olavoi*

	max.1	max.2	max.3	per.1	per.2	per.3	per.4	per.5
pleurobranchs	-	-	-	1	2	1	1	1
arthrobranchs	-	2	-	-	-	-	-	-
podobranchs	-	1	-	-	-	-	-	-
epipods	1	1	1	1	1	1	1	-
exopods	1	1	1	-	-	-	-	-

Four anterior pereiopods with well-developed epipods. First pereiopods (Fig. 18) reaching beyond scaphocerite by half propodus length; fingers half as long as palm, cutting edges (Fig. 19) entire; carpus slightly longer than chela, oblong, distal part with setiferous cleaning organ (Fig. 20); merus almost 1.2 times carpus length; ischium short with row of short spinules on posterior margin.

Second pereiopods (Fig. 21) subequal in shape and size, merus of right reaching to end of third maxilliped, merus of left reaching to distal end of antennular peduncle; chela minute, simple; carpus as long as merus + ischium, left composed of 34 articles and right of 35; merus longer than ischium, left composed of 18 articles and right of 22; ischium of left pereiopod with five articles and of right with three articles in distal part, both with row of curved flattened spinules on posterior margin; basis with three curved flattened spinules on posterior margin.

Third pereiopod (Fig. 22) overreaching scaphocerite by length of dactylus, propodus and half carpus; dactylus (Fig. 23) terminating in spine-like tooth continuous with extensor margin and stouter tooth on flexor side, with four movable spines on flexor margin; propodus 6.5 times as long as dactylus, armed with 14 slender spinules on flexor margin; carpus 0.9 times propodus length, armed with nine spinules on flexor margin; merus 1.75 times carpus length, armed with seven stout spines on ventral and lateral margins of left and eleven on right pereiopod; ischium short, 0.25 times merus length, without armature.

Fourth pereiopod (Figs. 24, 25) overreaching scaphocerite by dactylus + propodus, similar in shape to third pereiopod; merus with eight stout spines on ventral and lateral margin of left and seven of right pereiopod.

Fifth pereiopod (Figs. 26, 27) overreaching scaphocerite by dactylus + one-half of propodus, similar in shape to third and fourth pereiopods; merus armed with one ventral distal stout spine; flexor margin of propodus distally setiferous, setae in oblique rows.

Distal end of lateral margin of outer branch of uropod armed with two fixed teeth flanking a single longer movable spine.

Many eggs, 1 x 0.5 mm.

Colour. The following colour notes were taken from a colour slide of material of Sta. Cruz das Ribeiras, Pico, Azores. Eyes black. Thoracic appendages bright red. Abdomen red with eight longitudinal white stripes, lateralmost two pairs of stripes extending halfway onto the yellowish brown carapace, becoming indistinct anteriorly. Posterior parts of abdominal tergites a deeper shade of red than anterior parts, forming a red transversely banded pattern superimposed upon the longitudinal pattern. Pleopods with red endopods and exopods, other parts white. Telson and uropods red. Eggs green.

Description of male allotype. General appearance as of female, slightly more slender (Fig. 28). Pleura of fourth abdominal segment with a more distinct posterior tooth. Endopod of first pleopod (Fig. 29) tapering to slender end-piece bearing cluster of coupling pads. Appendix masculina (Fig. 30) on endopod of second pleopod as long as appendix interna, armed with four distal setae.

Remarks. The specimens studied show minor variation (Table 2). In particular the dentation of the rostrum (Figs. 1, 2, 28, 31-33), the spination of the ambulatory pereiopods, and the number of articles composing the carpus, merus and ischium of the second pereiopods. The number of articles in the setiferous part of the dorso-lateral flagellum of the antennulae seems

Table 2. Variation in characters in *Lysmata olavoi* specimens.

Registration	*specimen number*	*sex**	*postorbital carapace length (mm)*	*postorbital rostral dorsal teeth*	*total rostral dorsal teeth*	*ventral rostral teeth*	*articles setiferous part left antennula*	*articles setiferous part right antennula*	*spines merus left third pereiopod*	*spines merus right third pereiopod*	*spines merus left fourth pereiopod*	*spines merus right fourth pereiopod*	*spines merus left fifth pereiopod*	*spines merus right fifth pereiopod*	*articles carpus left second pereiopod*	*articles carpus right second pereiopod*	*articles merus left second pereiopod*	*articles merus right second pereiopod*	*articles ischium left second pereiopod*	*articles ischium right second pereiopod*
RMNH D 38487	1	m	2	12.1	5	4	45	41	7	-	7	7	2	1	33	36	24	23	6	6
RMNH D 38487	2	m	2	12.9	5	3	42	43	-	7	6	7	2	1	34	33	27	19	6	5
RMNH D 38487	3	m	2	9.9	5	3	45	43	7	7	7	7	1	1	35	33	23	19	6	5
RMNH D 38487	4	fov	3	15.8	5	5	55	54	7	9	7	7	1	1	34	35	21	19	5	5
RMNH D 38487	5	fov	3	13.4	6	4	43	42	9	7	7	7	1	1	34	33	18	21	4	5
RMNH D 38487	6	fov	3	12.7	5	3	48	46	-	7	6	7	2	1	35	35	19	19	5	5
RMNH D 38487	7	fov	3	16.5	5	5	53	55	7	7	7	6	1	1	35	37	18	16	4	6
RMNH D 38487	8	f	3	16.2	5	3	36	52	9	8	7	7	1	1	32	39	19	20	5	5
RMNH D 38487	9	fov	3	17.3	5	4	38	57	8	7	7	6	1	1	33	40	18	21	4	4
RMNH D 38487	10	fov	2	14.4	5	5	51	50	7	7	6	6	1	2	36	33	20	24	4	6
RMNH D 38487	11	fov	3	15.2	6	3	49	47	8	6	6	7	1	1	32	32	21	18	6	4
BM1989:933:1	12	fov	2	14.9	5	3	48	53	5	-	7	6	1	1	35	34	23	22	6	5
BM1989:935:1	13	fov	2	13.4	5	4	45	42	-	7	-	6	1	1	-	40	-	20	-	5
RMNH D 38484	14	fov	3	14.7	6	3	53	55	8	11	7	7	1	-	35	34	22	18	6	4
RMNH D 38485	15	fov	3	13.4	-	-	43	52	7	9	7	8	1	1	34	33	19	20	-	-
RMNH D 38485	16	fov	2	11.8	5	4	-	-	6	-	-	6	1	-	-	-	18	-	-	-
RMNH D 38486	17	m	2	9.2	6	3	33	32	7	8	7	7	1	1	34	34	19	25	3	5
RMNH D 38486	18	m	2	9.2	6	3	34	35	7	7	7	7	1	1	34	33	24	23	4	5
RMNH D 38486	19	m	2	6.7	5	4	27	27	7	6	6	7	1	1	33	34	18	23	5	5

* m=male, f=female, fov= ovigerous female.

correlated with the size of the specimen. The second pereiopods are always subequal in size and no length dominance for the left or right pereiopod was apparent. Length and number of articles of the carpus of the second pereiopod is not correlated with size. The pleura of the fifth abdominal segment in females (especially ovigerous females) have a very indistinct posterior tooth, in males this tooth is more prominent.

Systematic position. Ten species of *Lysmata* are known from the Atlantic: *L. anchisteus* Chace, 1972; *L. grabhami* (Gordon, 1935); *L. intermedia* (Kingsley, 1878); *L. moorei* (Rathbun, 1901); *L. nilita* Dohrn & Holthuis, 1950; *L. rathbunae* Chace, 1970; *L. seticaudata* (Risso, 1816); *L. stenolepis* Crosnier & Forest, 1973; *L. uncicornis* Holthuis & Maurin, 1952; *L. wurdemanni* (Gibbes, 1850).

L. anchisteus is known from Puerto Rico to Granada, western Atlantic in depths less than 3 meters. It differs from *L. olavoi* in the scaphocerite not overreaching the antennular peduncle; the presence of only one postorbital dorsal rostral tooth; the presence of only one ventral rostral tooth; the absence of a pterygostomian tooth; the pleura of the fourth abdominal pleura being posteriorly rounded. *L. olavoi* was compared with material of *L. anchisteus* from Curaçao, Carribean Sea (RMNH D 30376) and the type-description (CHACE 1972).

L. grabhami is known from tropical and subtropical regions in the western, central and eastern Atlantic in depths to about 60 m. It differs from *L. olavoi* by the scaphocerite not overreaching the antennular peduncle; the rostrum and antennular peduncle being longer in relation to the carapace length; in colouration: *L. grabhami* having two bright red dorsolateral longitudinal bands separated by a white dorsal band. *L. olavoi* was compared with specimens of *L. grabhami* from the Canary Islands (RMNH D 40154) and the type-description by GORDON (1935).

L. intermedia Kingsley, 1878 is a shallow water species known from depths to 22 m, originally described from the Dry Tortugas, Florida, and figured by Kingsley in 1883. The species is recorded in the western Atlantic from Bermuda to Brazil, in the central Atlantic from Ascension (MANNING & CHACE 1990: 23) and in the eastern Atlantic from the Azores (RATHBUN 1901: 116); in the eastern Pacific it was recorded from the Gulf of California to Peru. It differs from *L. olavoi* in having the accessory branch of the dorso-lateral antennular flagellum well developed; the stylocerite reaching nearly to, or beyond the distal margin of the basal segment of the antennular peduncle. *L. olavoi* was compared with material of *L. intermedia* from Aruba, Caribbean (RMNH D 4767) and the description and figures given by SIVERTSEN (1933). RATHBUN (1901: 116) recorded *L. intermedia* from Pim Bay, Fayal, Azores (Lewis Dexter coll.). The large female specimen was reexamined by MANNING & CHACE (1990: 23) and found to be correctly identified.

L. moorei (Rathbun, 1901) is known from the tropical western, central and eastern Atlantic occurring in tide-pools and the littoral zone. *L. moorei* differs from *L. olavoi* in having only one postorbital dorsal rostral tooth; in the absence of a pterygostomian tooth; in the shorter and more robust antennular peduncle; in having the accessory branch of the dorso-lateral antennular flagellum well developed. *L. olavoi* was compared with material of *L. moorei* from Aruba, Caribbean (RMNH D 4768) and the description and figures given by RATHBUN (1901).

L. nilita Dohrn & Holthuis, 1950 is known from the eastern Atlantic (Canary Islands) and the Mediterranean, occurring in shallow water. It differs from *L. olavoi* by the stylocerite overreaching the first segment of the antennular peduncle; by the accessory branch of the dorsolateral antennular flagellum being well developed; by the more robust ambulatory pereiopods; by the colourpattern composed of broad dark orange bands across the body. *L. olavoi* was compared with the holotype and paratypes of *L. nilita* from the western part of the Bay of Napels, Mediterranean (RMNH D 7258) and the description and figures of DOHRN & HOLTHUIS (1950).

L. rathbunae Chace, 1970 is known from eastern Florida to Yucatan, western Atlantic, in depths between 37 and 119 m. It differs from *L.*

olavoi by the rostrum overreaching the antennular peduncle; the pterygostomian tooth being usually absent; the stylocerite being less than half the length of the basal segment of the antennular peduncle; the pleura of the fourth abdominal segment being postero-laterally rounded. *L. olavoi* was compared with the type-description of *L. rathbunae* by CHACE (1970).

L. seticaudata is known from the Mediterranean and the eastern Atlantic from Morocco to the British Isles, occurring in depths to about 15 m. It differs from *L. olavoi* in the stylocerite overreaching the basal segment of the antennular peduncle; in having the accessory branch of the dorso-lateral antennular flagellum well developed; in the scaphocerite being twice as long as the antennular peduncle; in the colour-pattern composed of longitudinal red stripes on the body. *L. olavoi* was compared with material from the Bay of Naples, Mediterranean (RMNH D 14274).

In 1973 CROSNIER & FOREST described *L. stenolepis* from deep water off São Tiago, Cape Verde Islands. One male (pocl 4.5 mm) was caught at a depth between 275 and 150 m by the Talisman in 1883. The specimen differs from *L. olavoi* in the dentation of the rostrum. In *L. stenolepis* the rostrum is almost without ventral lamina and bears only one small ventral tooth. In the material of *L. olavoi* males and females of different sizes have three to five ventral rostral teeth. The number of fused segments of the antennule dorso-lateral flagellum number 17 in *L. stenolepis*, much fewer than in *L. olavoi*. This however could be correlated with body size. The pleura of the fourth abdominal segment in *L. stenolepis* have a more acute postero-lateral apex than in *L. olavoi*. The specimen of *L. stenolepis* is incomplete, all ambulatory pereiopods are missing, and it is of much smaller size which makes comparison with *L. olavoi* difficult. More material of *L. stenolepis* from the type-locality has to be collected to establish the variability of the various characters.

L. uncicornis is known from the eastern Atlantic from Morocco to Congo, occurring in shallow waters. *L. uncicornis* differs from *L. olavoi* in the absence of the pterygostomian tooth; the absence of the postero-lateral tooth on the fourth abdominal pleura; the broader scaphocerite. *L. olavoi* was compared with the holotype and paratypes of *L. uncicornis* from the harbour of Casablanca, Morocco (RMNH D 7812), and the type-description of HOLTHUIS & MAURIN (1952).

L. wurdemanni (Gibbes, 1850) is known from the western Atlantic from Virginia to Estado de São Paulo, Brazil, occurring in depths to 30 m. *L. wurdemanni* differs from *L. olavoi* in having the pleura of the fourth abdominal segment postero-laterally rounded; in the absence of the pterygostomian tooth; in having the ambulatory pereiopods more robust. *L. olavoi* was compared with material of *L. wurdemanni* from French Guyana (RMNH D 12643).

Lysmata olavoi is a deep water species. The other Atlantic *Lysmata*, except *L. stenolepis*, seem littoral or sublittoral but have not been found deeper than about 120 m.

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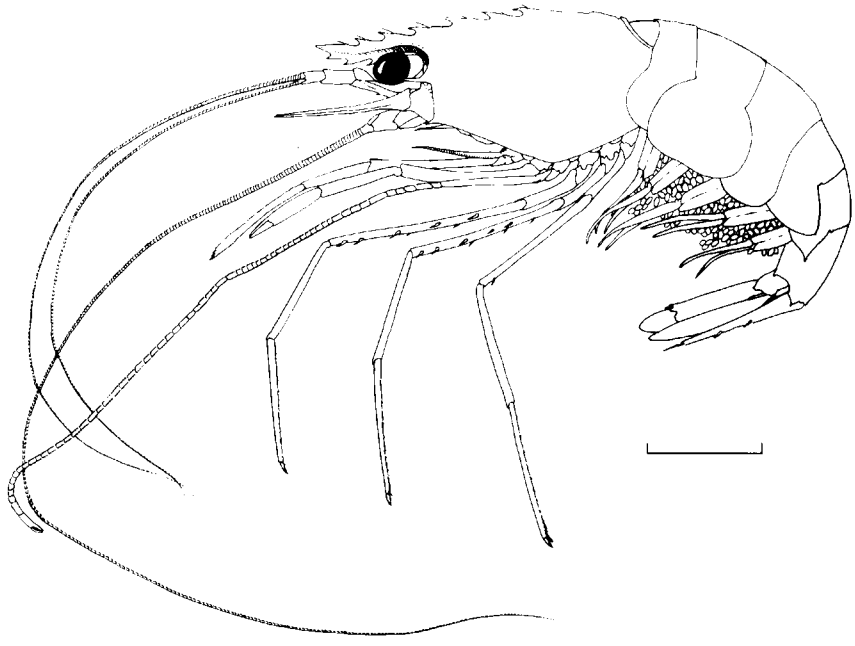
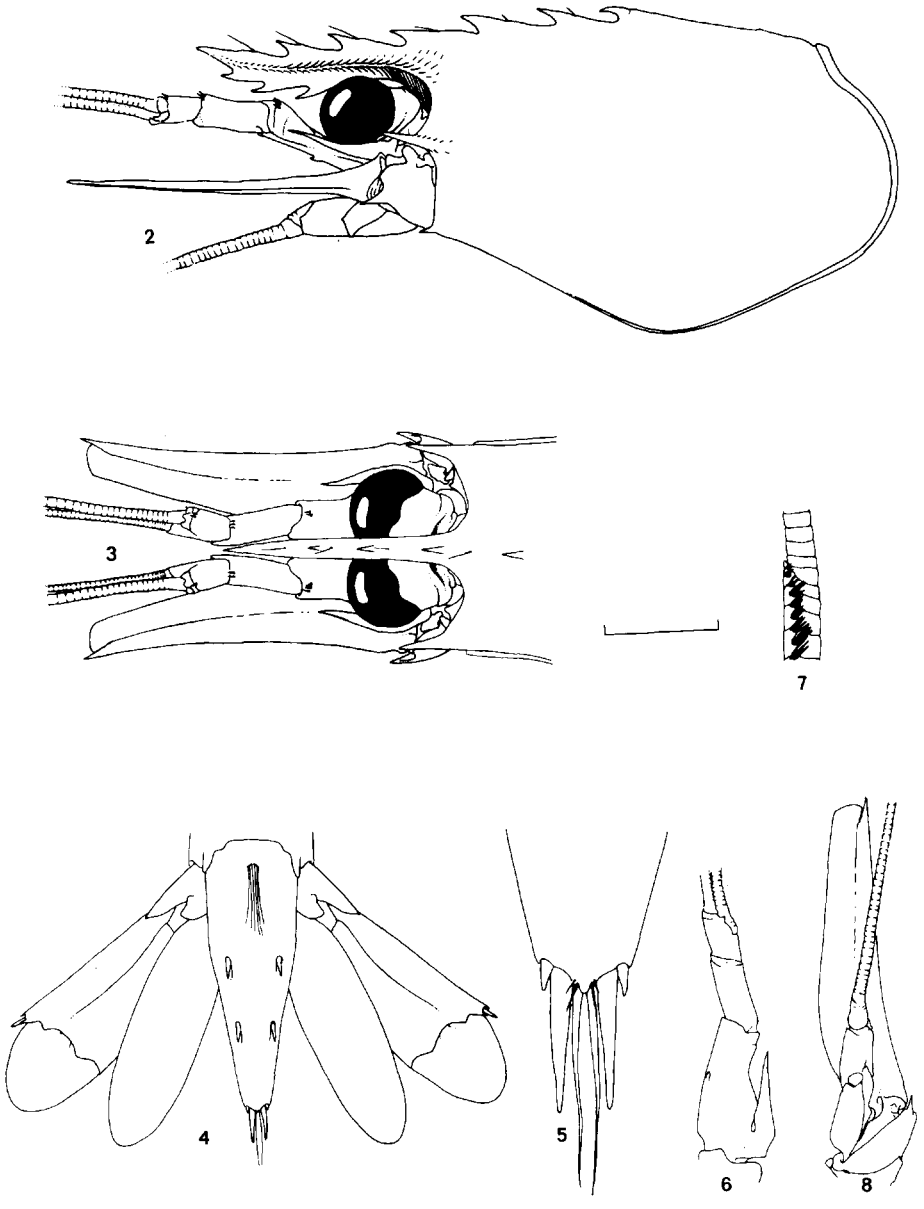
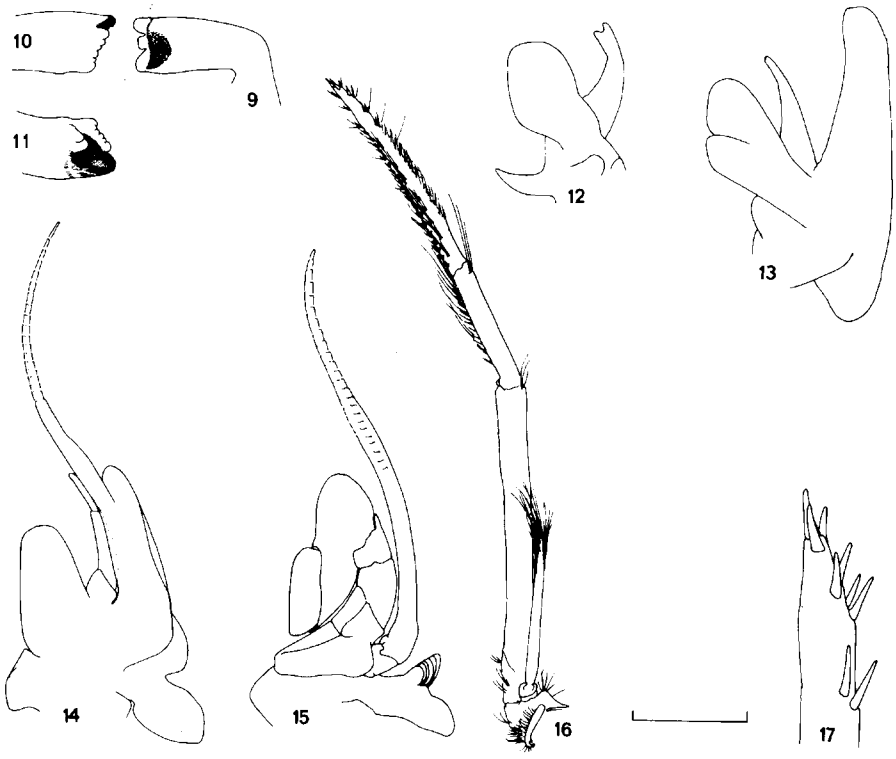


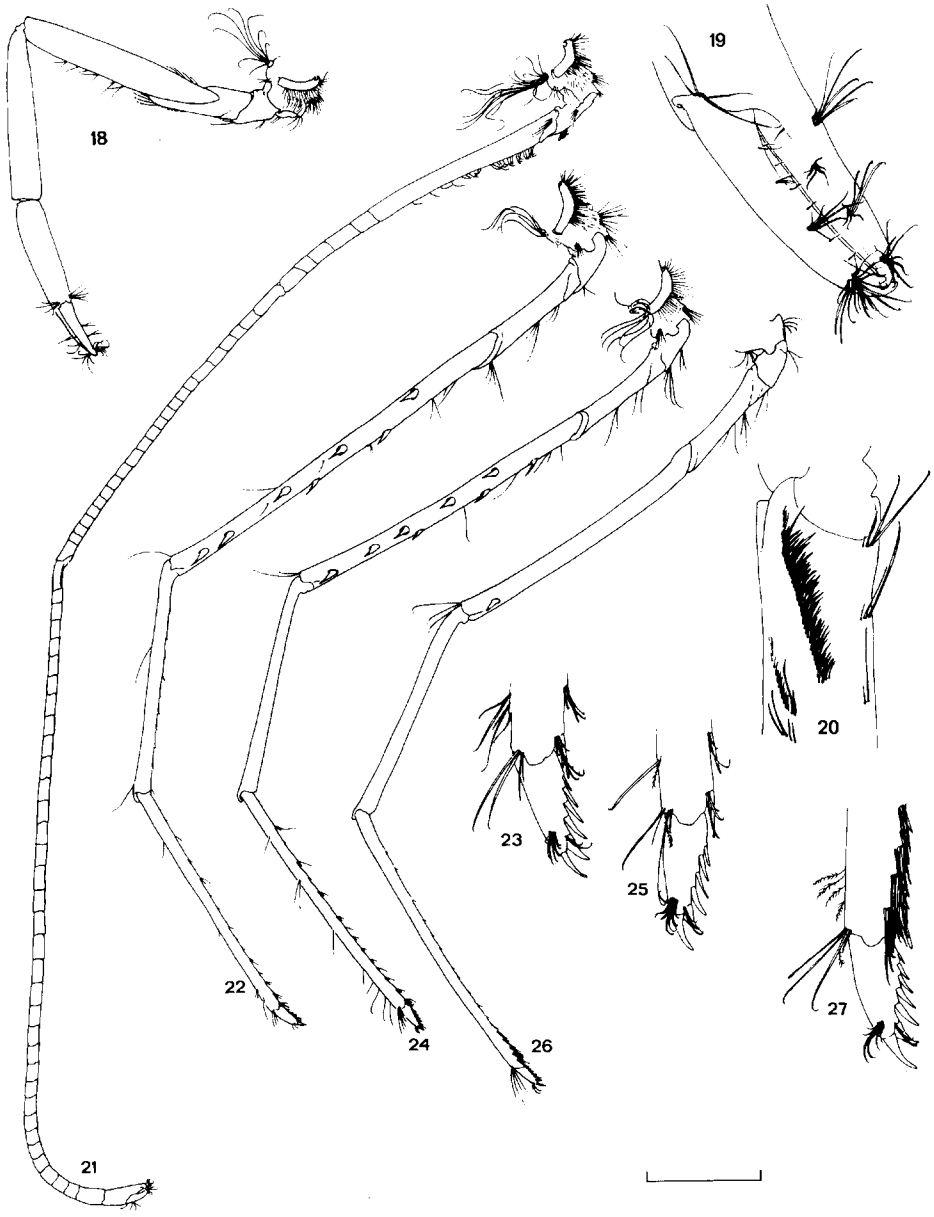
Fig. 1. *Lysmata olavoi* new species, habitus female holotype, pocl. 14.7 mm. Scale 8 mm.



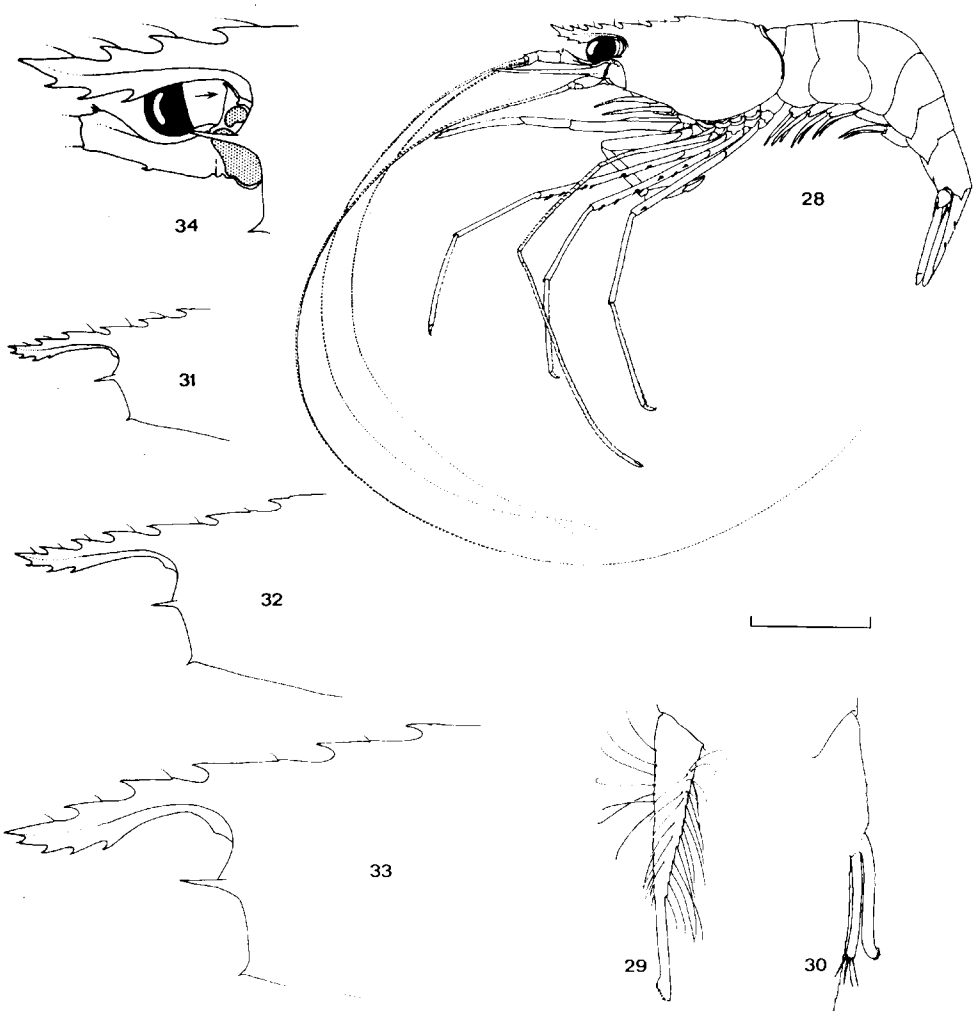
Figs. 2-8. *Lysmata olavoi* new species, female holotype, pocl. 14.7 mm. 2, carapace and anterior appendages, lateral aspect; 3, anterior appendages, dorsal aspect; 4, telson and uropods, dorsal aspect; 5, distal part telson, dorsal aspect; 6, left antennular peduncle, ventral aspect; 7, distal end of setiferous part left antennular dorsolateral flagellum; 8, antennal peduncle and scaphocerite, ventral aspect. (Scale: 2-4, 6, 8 = 4 mm; 5, 7 = 1 mm).



Figs. 9-17. *Lysmata olavoi* new species, female holotype, pocl. 14.7 mm. 9, left mandible; 10, right mandible, ventral aspect; 11, right mandible, dorsal aspect; 12, first maxilla; 13, second maxilla; 14, first maxilliped; 15, second maxilliped; 16, third maxilliped; 17, first maxilliped, distal part. (Scale 9-15 = 2 mm; 16 = 4 mm; 17 = 1 mm).



Figs. 18-27. *Lysmata olavoi* new species, female holotype, pocl. 14.7 mm. 18, first left pereiopod; 19, first left pereiopod, chela; 20, first pereiopod, setiferous cleaning organ on distal part carpus; 21, second left pereiopod; 22, third left pereiopod; 23, third left pereiopod, dactylus; 24, fourth left pereiopod; 25, fourth left pereiopod, dactylus; 26, fifth left pereiopod; 27, fifth left pereiopod, dactylus. (Scale: 18, 21, 22, 24, 26 = 4 mm; 19, 20, 23, 25, 27 = 1 mm).



Figs. 28-34. *Lysmata olavoi* new species. 28-30, male allotype, pocl. 9.2 mm. 28, habitus; 29, endopod of first right pleopod; 30, appendix masculina and appendix interna of second right pleopod; 31, paratype male, pocl. 6.7 mm, rostrum, lateral aspect; 32, paratype male, pocl. 9.2 mm, rostrum, lateral aspect; 33, paratype female, pocl. 11.8 mm, rostrum, lateral aspect; 34, holotype female, pocl. 14.7 mm, anterior part, lateral aspect - 'bec ocellaire', left eye and left antennula dissected. (Scale: 28 = 8 mm; 29, 30 = 1 mm; 31-34 = 2 mm).