

**On a new species of the family Triophidae (Gastropoda: Nudibranchia)
from the Mediterranean Sea**

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During fisheries research along the Tuscany coasts of Italy (Tyrrhenian Sea, Mediterranean Sea), a new species of sea slug, *Kaloplocamus filusus*, was collected at approximately 150 m depth. This species which is very close to *Kaloplocamus ramosus* (Cantraine, 1835), is described together with a discussion on the family Triophidae. This family contains few Mediterranean species and, on a worldwide basis, several seem to be doubtful and should be reviewed.

Key words: Gastropoda, Opisthobranchia, Nudibranchia, Triophidae, *Kaloplocamus*, taxonomy, Mediterranean.

INTRODUCTION

The phanerobranch family Triophidae (Nudibranchia: Doridina: Nonsuctoria) was created by Odhner (1941) who found it "convenient to remove from the original Polyceridae and to unite into a new fam. Triophidae all those genera which bear ramose or compound processes like *Plocamopherus*, *Caloplocamus*, *Triopha*, *Kalinga*." These arborescent or club-shaped processes, present along a reduced mantle margin, are strongly innervated and are important in the group's taxonomy because they reflect an inheritance from dendronotacean-like ancestors (Odhner, 1941).

Pruvot-Fol (1954), Burn (1967) and Ferreira (1977) considered this taxon only as a subfamily of the Polyceridae, but more recently it has been accepted as a full family by Schmekel & Portmann (1982) and Thompson & Brown (1984). Burn (1967) proposed a separation of the polycerid subfamilies which is here partially followed.

The distribution of the family is very wide, with some genera typical of cold-temperate waters (e.g. *Triopha*, *Holoplocamus*, *Crimora*) and others with a more circum-tropical distribution (e.g. *Kaloplocamus*, *Plocamopherus*, *Joubiniopsis*, *Kalinga*). In the Mediterranean Sea only two species were, until now, recorded (Schmekel & Portmann, 1982): *Crimora papillata* Alder & Hancock, 1862, and *Kaloplocamus ramosus* (Cantraine, 1835). Other species have been collected around the Mediterranean: *K. aureus* Odhner, 1932, from the Canary Islands; *K. atlanticus* (Bergh, 1892) from the Azores; the doubtful *Plocamopherus maderae* (Lowe, 1842), while *Plocamopherus ocellatus* Leuckart, 1828, was recently collected in the Suez Canal (Barash & Danin, 1982). Pruvot-Fol (1951) described a *Kaloplocamus* sp. from Banyuls, but her description is rather vague. Consequently it would be impossible to exclude the presence of these species in the Mediterranean basin.

Crimora papillata is quite common in coralligenous communities (Cattaneo-Vietti, 1986) on the bryozoan *Chartella tenella* (Hincks, 1887), while *K. ramosus* is frequent on

detritic and mud substrata along the continental slope (Verany, 1846; Vayssière, 1901; Misuri, 1917; Vicente, 1967).

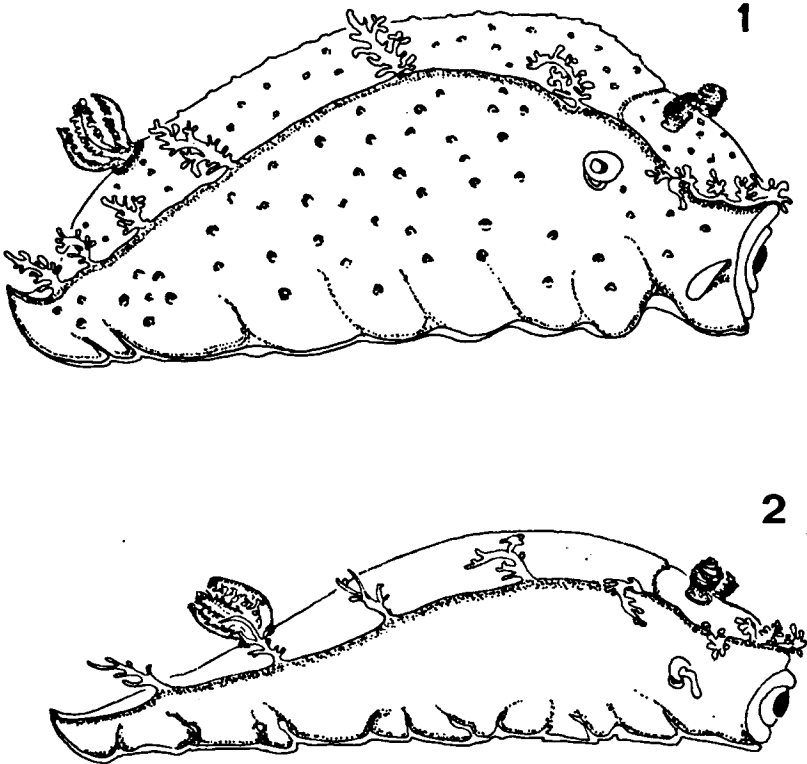
During fisheries research, numerous specimens of a new species of *Kaloplocamus* were collected by trawling areas off the Tuscany coast.

***Kaloplocamus filusus* n. sp.**

Type material. — The holotype and two paratypes are deposited in the Museo Civico di Storia Naturale, Genoa (Italy).

Locality. — Tyrrhenian Sea, off Tuscany, from Vada to Piombino at 100-150 m depth, in the biocoenosis of the shelf-edge detritic (DL) in which the characteristic species is the sea-lily *Leptometra phalangium* (Müller, 1841) with the presence of the sea pen *Funiculina quadrangularis* (Pallas, 1776), April 1985-1986.

Description. — The body is smooth and slender, generally 20-28 mm long, and is orange in colour with a rich darker spotting, while the foot is paler (fig. 2). Gills, appendages and rhinophores are also orange. The frontal veil bears 3-4 pairs of small appendages, while, along the body, 5-6 additional pairs are present. In preserved specimens these last appendages are long and slender. There are 15-18 leaflets on the



Figs. 1-2. *Kaloplocamus* species, 1. *K. ramosus* (Cantraine); 2. *K. filusus* n. sp.

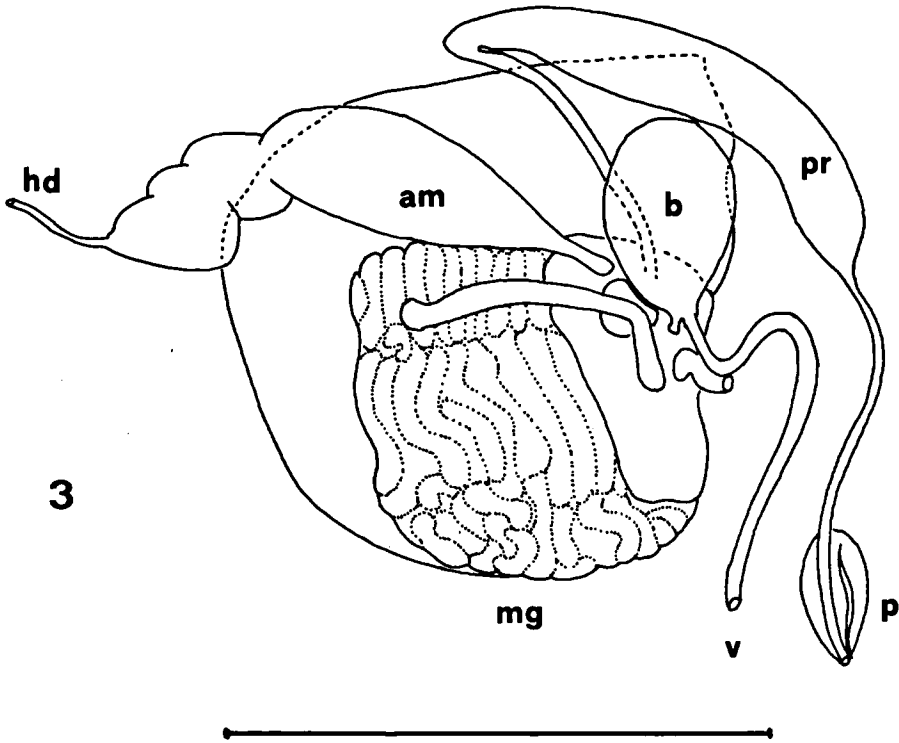


Fig. 3. *Kaloplocamus filosus* n. sp., genital mass. Abbreviations: am = ampulla, b = bursa copulatrix, hd = hermaphrodite duct, mg = mucus gland, p = penis, pr = prostate, v = vagina. Scale 10 mm.

retractile rhinophores which have no sheaths. The unretractable gill possesses five, mostly tripinnate, plumes of which the central, anterior one, is longest. The gill contains a small number of spicules, 230-500 μm long, generally with small branches at the midpoint (fig. 4).

In the radula, formula 18-24 \times (14-17).3.0.3.(14-17), only the three innermost lateral teeth are bicuspid; the following ones are flat and gradually diminish in size to the margin (figs. 7-8). The rachis is very broad (fig. 10). The jaws, which are small and triangular, consist of very fine rodlets (fig. 9).

The genital papilla lies under the first ramified projection on the right side. The genital mass is illustrated in fig. 3. The penis is armed (figs. 11-12).

Diet. — In the alimentary tract of different specimens, branch segments of the bryozoan *Scrupocellaria incurvata* Waters, 1896, and fragments of ophiuroids were found. In *Kaloplocamus ramosus*, collected in the same area, fragments of *Scrupocellaria incurvata* and *S. cf. reptans* (L., 1758) are also present. The food preference of this genus for cellariid bryozoans is confirmed by Marcus (1979), while Bergh (1884) found, in *Euplocamus pacificus*, mainly bryozoans “remining one of *Crisidia* Milne Edwards”, a genus quite similar, in external shape, to *Scrupocellaria*.

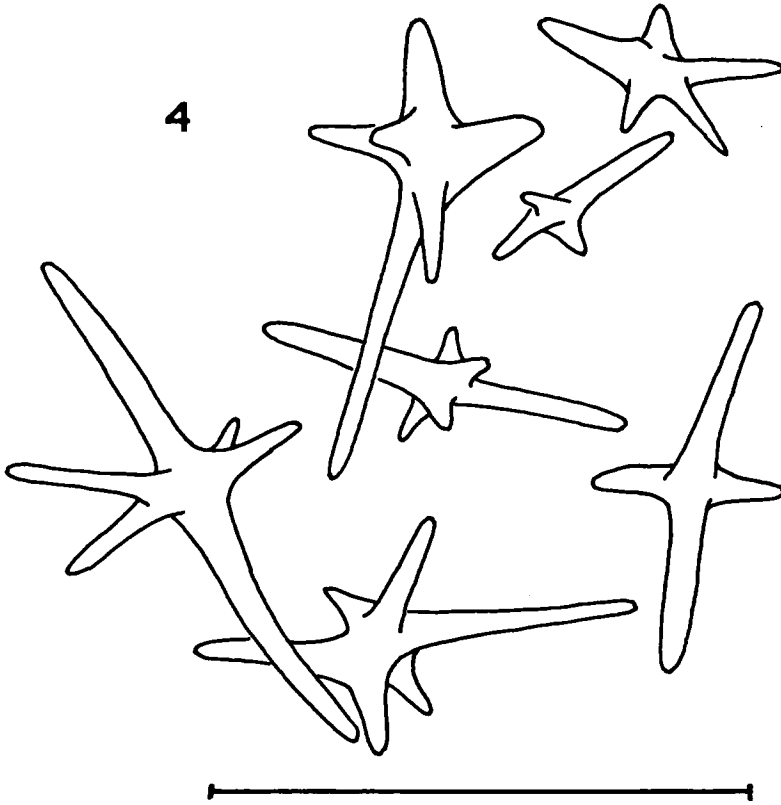


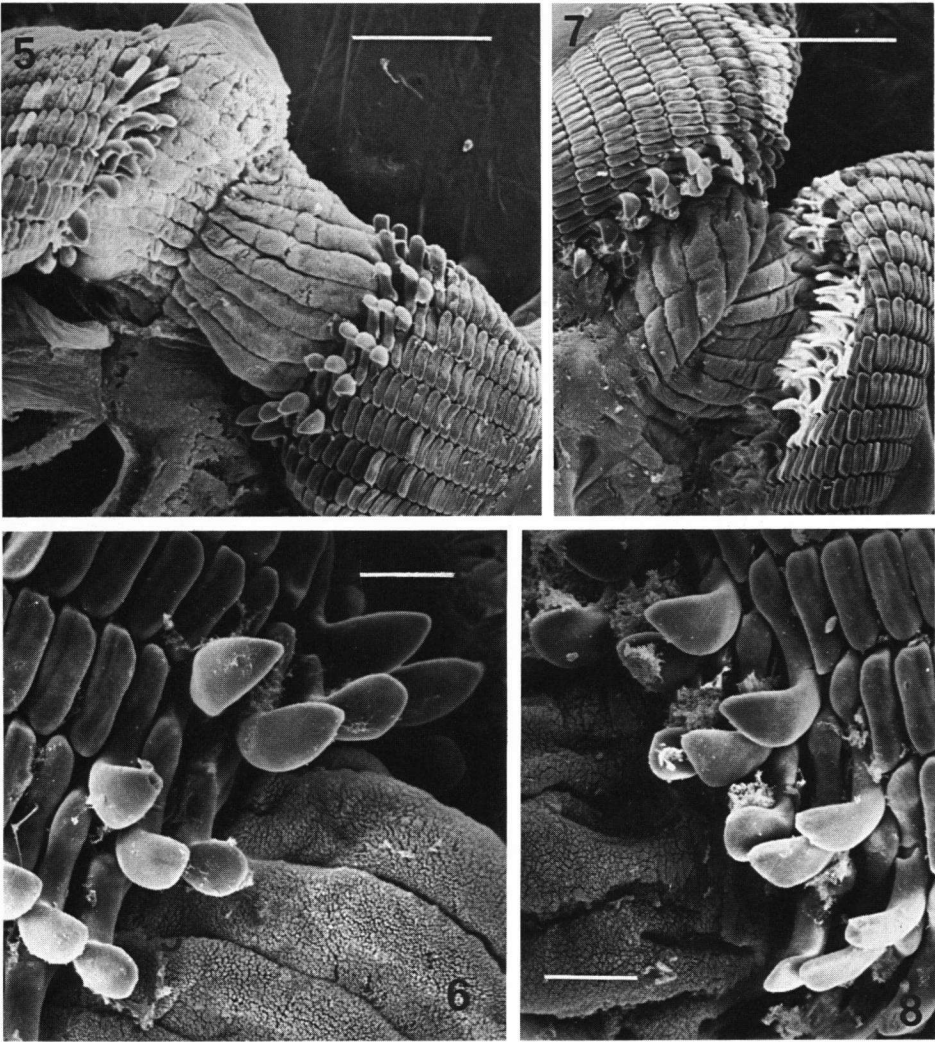
Fig. 4. *Kaloplocamus filosus* n. sp., gill spicules. Scale 450 μ m.

Etymology. — The specific name *filosus* means tape-shaped and refers to the lateral appendages of the species.

DISCUSSION

In table 1 the genera of the family Triophidae are reported. We have excluded *Colga* Bergh, 1880 (sensu Just & Edmunds, 1985), *Limacia* O.F. Müller, 1781, and *Laila* MacFarland, 1905, which are closer to polycerids because they do not have ramose or compound processes. In Barbados Edmunds & Just (1985) recently found a polycerid species which presents characters intermediate between the two families.

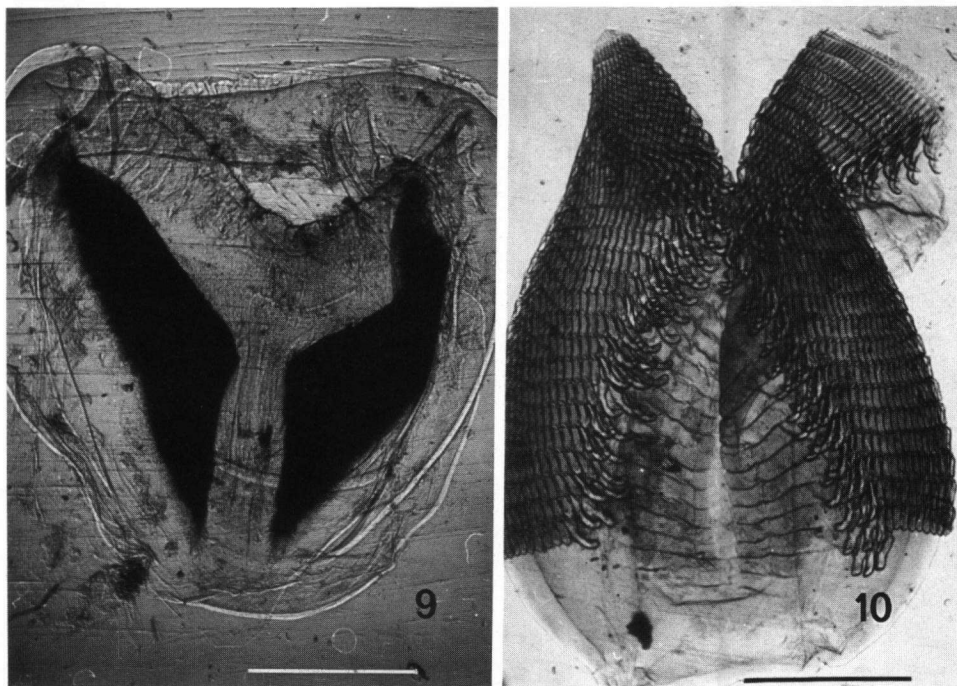
Generally speaking the genera belonging to the family Triophidae are well defined. *Kaloplocamus* Bergh, 1879, and *Plocamopherus* Leuckart, 1828 (= *Plocamophorus* Rüppell & Leuckart, 1831), are differentiated mainly by the presence, in *Plocamopherus*, of club-shaped luminescent pallial line appendages near the gills and a "swimming" keel on the tail (Barnard, 1927; Thompson, 1975).



Figs. 5-8. Radulae of *Kaloplocamus* species (SEM photographs), 5-6. *K. ramosus* (Cantraine), 7-8. *K. filiosus* n. sp. Scale 500 μm (5 and 7) or 100 μm (6 and 8).

Thompson (1975) and Marcus (1979) listed the known species belonging to *Plocamopherus* while those belonging to the genus *Kaloplocamus* are reported in table 2 together with the most important morphological characters of each species.

Therefore the generic status of several species remains unresolved. For example, *Kaloplocamus pacificus* (Bergh, 1884) "has a dorsal keel" while in *K. atlanticus* (Bergh, 1892) "la queue, assez longue et pointue, presente une carene mediane". But Bergh

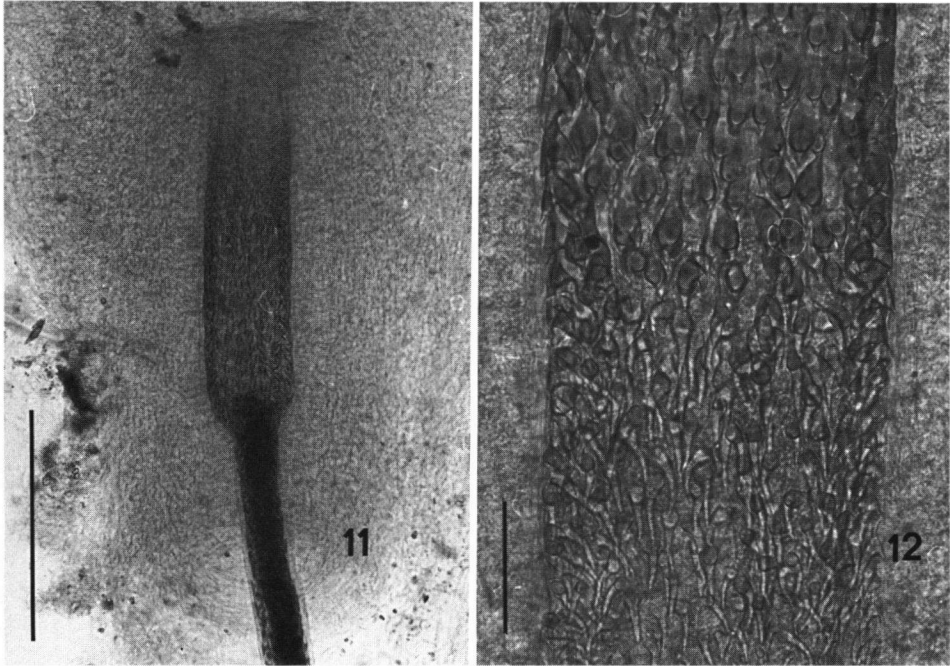


Figs. 9-10. *Kaloplocamus filosus* n. sp., 9. Jaws; 10. General view of the radula. Scale 1 mm.

himself (1899), in a later paper, considered this latter species very close to *K. ramosus* and did not further mention a dorsal keel. Both these species must be considered to belong to *Kaloplocamus* because they do not have luminescent organs (R. Burn, personal communication) and lack club-shaped papillae near the gills (Gosliner, 1987). On the other hand, *Plocamopherus gulo* Marcus, 1979, which lacks luminescent organs and a well defined metapodial keel, belongs to *Kaloplocamus*.

In the genus *Kaloplocamus* the recognition of the different species seems to be very difficult because the radular formulae all appear to be similar with negligible differences, if we exclude the unusual *K. atlanticus*. Also the number of digitations on the oral veil and laterally is quite similar in the different species. Therefore many species that are very rare or badly described should be reviewed. Only *K. ramosus*, *K. japonicus*, *K. maculatus* and *K. yatesi* (? = *K. acutus* Baba, 1955) seem to be well defined species.

The distribution of *K. ramosus* remains uncertain and its presence in Japan and Australia (Baba, 1949; Burn, 1957, 1969) seems to be unlikely and should be confirmed. Barnard (1927) considered *K. ramosus* var. *capensis* not valid, while Macnae (1958) considered this variety and *K. japonicus* as synonyms of *K. ramosus*. More likely, as Eliot (1913) realized, *K. ramosus* var. *capensis* is really a synonym of *K. japonicus* (both have a similar number of rhinophoral leaflets, 40-50; it is a well defined species, distinguished from the Mediterranean *K. ramosus* which has a significantly lower number of leaflets,



Figs. 11-12. *Kaloplocamus filusus* n. sp., penis. Scale 350 μ m (11) or 50 μ m (12).

about 18-23. Recently Gosliner (1987) published a good photograph in colour of *K. ramosus* from Southern Africa.

K. filusus n. sp. seems to be close to *K. ramosus*. The radulae are similar (figs. 5-8) even though, in the latter species, it is possible to find unusual formulae, e.g. $18 \times 11.5.0.5.11$ (Schmekel & Portmann, 1982).

K. filusus can be easily differentiated by its orange body and the longer and tape-shaped lateral appendages, different from the branched appendages present in *K. ramosus*. The skin is always smooth, while in *K. ramosus* numerous small tubercles are sometimes present, as reported in the original description.

Mazzarelli (1903) described an *Euplocamus croceus* and, two years later (1905) published a good colour drawing. Probably those individuals, collected in the Bay of Naples, should be referred to the new species.

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	Radular formula	Jaws	Gills	Rhinoph. sheath	Distribution	References
Subfam. Triophinae Odhner, 1968: body not depressed, two teeth differentiated in radula, jaws (if present) triangular, penis armed (<i>Joubiniopsis</i> excluded)						
<i>Triopha</i> Bergh, 1880	n.(3-4).2.0.2.(3-4).n	+	5 tripinnate	short	North Pacific	Ferreira, 1977
<i>Crimora</i> Alder & Hancock, 1862	n.4.3.0.3.4.n	-	3 uni-bipinnate	short	North Atlantic Mediterranean California Australia Japan	Thompson & Brown, 1984 Schmckel & Portmann, 1982 Marcus, 1961 Willan & Coleman, 1984 Baba, 1949 see table 2
<i>Kaloplocamus</i> Bergh, 1879	n.(2-5).0.(2-5).n	+	5 tripinnate	short	warm and tropical waters	
<i>Plocamorpherus</i> Leuckart, 1828	n.(3-6).0.(3-6).n	+	5 tripinnate	short	Red Sea, Indo-Pacific	Thompson, 1975
<i>Joubiniopsis</i> Risbec, 1928	7.3.0.3.7	+	5 bipinnate	long	New Caledonia	Risbec, 1928, 1953
<i>Holoplocamus</i> Odhner, 1926	10.2.0.2.10	-	5 tripinnate	short	Magellan Sound	Odhner, 1926
Subfam. Kalinginae Odhner, 1968: body depressed, all similar tricuspidate teeth, no jaws, penis armed						
<i>Kalinga</i> Alder & Hancock, 1864	n.0.n.	-	5	long	Indo-Pacific	Thompson, 1975

Table 1. Genera of the family Triophidae.

Species	Colour	Radular formula	Oral veil digitations	Pairs of lat. digitations	Rhinoph. leaflets	Distribution
<i>ramosus</i> (Cantraine, 1835)	yellow to orange with white spots	(16-35).3.0.3.(16-35) 11.5.0.5.11	5-7	5	18-23	Mediterranean Japan? Australia? South Africa?
<i>yatesi</i> (Angas, 1864)	orange apricot	(11-15).3.0.3.(11-15)	8	4	16	Australia
= <i>racutus</i> Baba, 1955	with white spots	(8-10).2.0.2.(8-10)	6	4	10-12	Japan
<i>japonicus</i> (Bergh, 1880)	whitish and yellow	38.(3-5).0.(3-5).38 (14-18).3.0.3.(14-18)	6-7	4-5	40-50	Japan
= <i>capensis</i> Bergh, 1905	yellow to green with red spots	(18-22).3.0.3.(18-22)	8	4	40	South Africa
<i>principiswalliae</i> (Collingwood, 1881)	pale orange-yellow	?	8	5	?25	China
<i>pacificus</i> (Bergh, 1884)	?	6.2.0.2.6	8-10	5	50	Kermadec Is.
<i>atlanticus</i> (Bergh, 1893)	?	(19-20).9.0.9.(19-20)	5	6	30-40	Azores
<i>maculatus</i> (Bergh, 1898)	white with dark spot-lines	6.3.0.3.6	8	3	9	Chile
<i>longicornis</i> (Bergh, 1905)	?	(13-14).3.0.3.(13-14)	4	5	?	Philippines
<i>tristis</i> (Bergh, 1905)	?	(6-7).3.0.3.(6-7)	6	3	?	Indonesia
<i>orientalis</i> Thiele, 1925	?	21.3.0.3.21	6	5	?	Tanzania
<i>aureus</i> Odhner, 1932	yellow saffron	12.4.0.4.12	8	4	11	Canary Is.
<i>gulo</i> (Marcus, 1979)	?	(17-18).3.0.3.(17-18)	5	4	?7	Brazil
<i>fiosus</i> n. sp.	pale orange with darker spots	(14-17).3.0.3.(14-17)	7-8	4	13-15	Italy

Table 2. Known species of the genus *Kaloplocamus* Bergh, 1879 (= *Euplocamus* Philippi, 1836, nec Latreille, 1809; syn. *Heteroplocamus* Olivier, 1915, and *Caloplocamus* Misuri, 1917).

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