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Taxonomic and Geographical Range Data on Two Rare Species of *Okenia* (Gastropoda: Nudibranchia: Doridacea) from the Eastern Atlantic

by

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Abstract. The Atlantic species of *Okenia aspersa* Alder & Hancock, 1845, is redescribed from one specimen from southern Portugal collected during the International Marine Biological Expedition "ALGARVE-88." In addition, another rare species of *Okenia, O. mediterranea* (Ihering, 1886), is redescribed from specimens from southern Spain. Geographical range data for both species are included. Finally, we compare our specimens with the descriptions provided by other authors.

INTRODUCTION

Until now, the only species of the genus *Okenia* Menke, 1830, recorded from the Iberian Peninsula was *O. impexa* Marcus, 1957, found in the Cabo de Palos, Mediterranean (TEMPLADO, 1982). However, during the International Marine Biological Expedition "ALGARVE-88" (southern Portuguese coasts) (May–June 1988), organized by the MNHN of Paris (P. Bouchet) and the INIP of Portugal (L. Saldanha), one specimen of a species of *Okenia* not previously recorded from the Iberian coasts was collected: *O. aspersa* Alder & Hancock, 1845. In addition, during sampling along the southern Spanish coasts (El Portil, Huelva) in Spring 1989, 22 specimens of another species of *Okenia* that we had never seen were collected. We have concluded that these specimens belong to *O. mediterranea* (Ihering, 1886). In this paper, we present new taxonomic and geographical range data for both species.

Family GONIODORIDIDAE H. & A. Adams, 1854

Okenia Menke, 1830

Okenia aspersa Alder & Hancock, 1845

Material: One specimen, 8 mm in length, collected by SCUBA at 31 m depth in Sagres, Portugal (37°N, 8°55'W), 20 May 1988.

Description: The body bears spicules and a narrow pallial ridge with 16 simple appendages, of which the anterior 4 are elongate, while the remainder are shorter. The frontal velum is slightly bilobed (Figure 1A). The rhinophores, having 43 lamellae, are a little longer than the anterior appendages (Figure 1D). The branchial tuft has 11 unipinnate gills (Figure 1E). The spicules lie within the integument and up to the tips of the pallial ridge appendages (Figure 1C). The genital pore opens on the right of the anterior third of the animal's body.

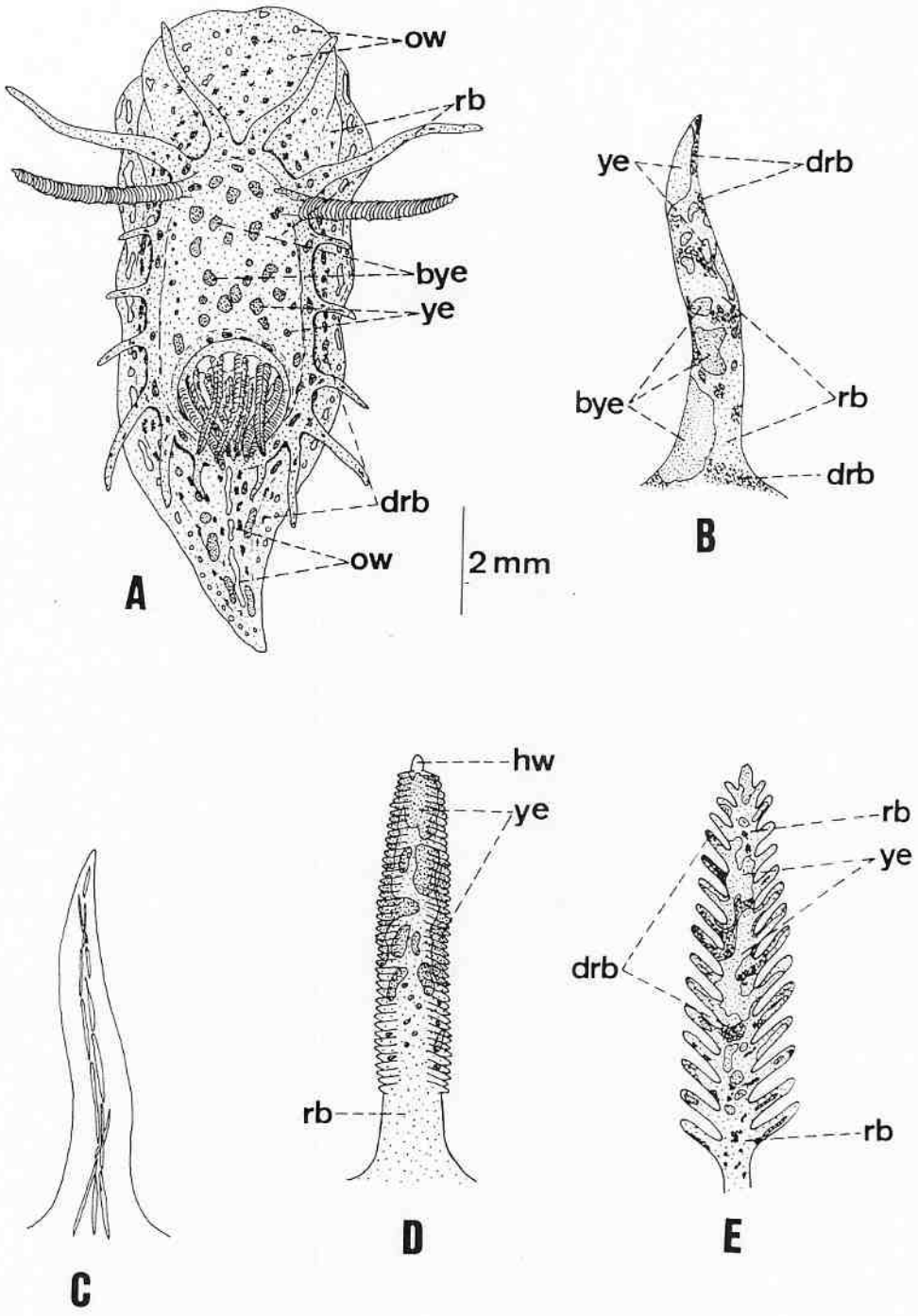


Figure 1

Okenia aspersa. A. Dorsal view of the specimen. B. Detail of one of the pallial ridge appendages. C. Arrangement of the spicules within these appendages. D. Detail of a rhinophore. E. Detail of a gill. Key: bye, bright yellow; drb, dark reddish brown; hw, hyaline white; ow, opaque white; rb, reddish brown; ye, yellow.

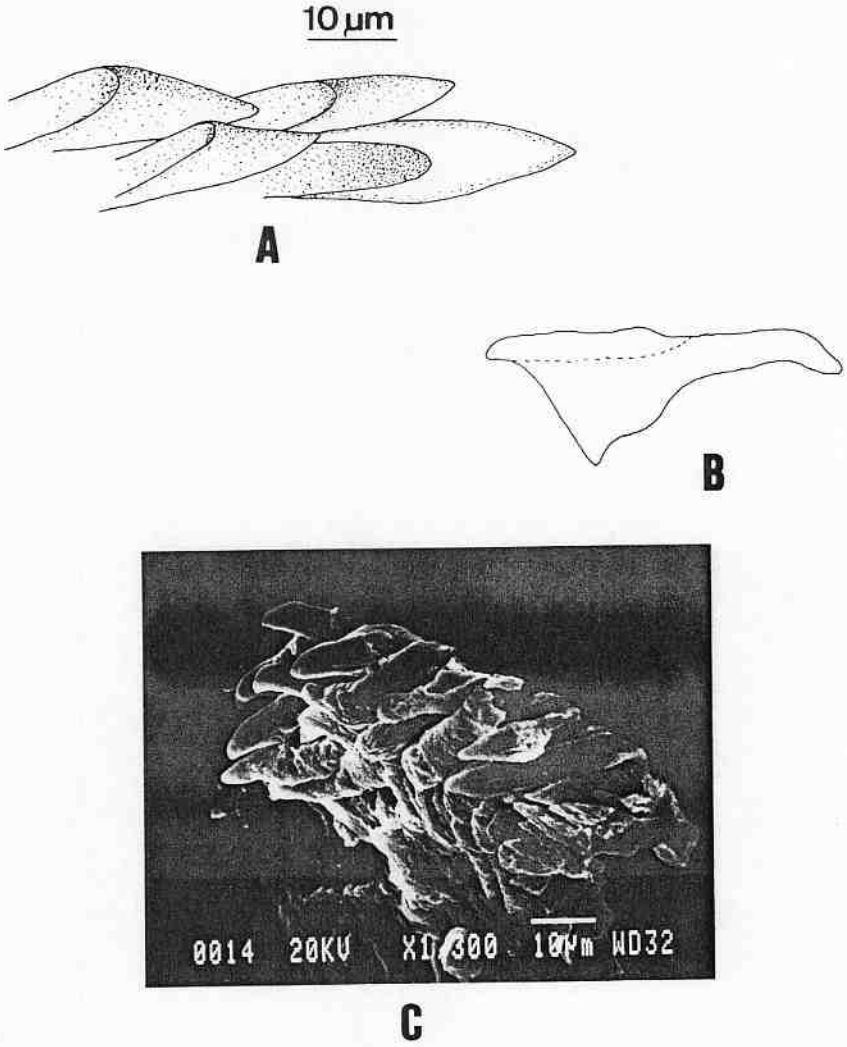


Figure 2

Okenia aspersa. A. Detail of some elements of the cuticular labial armature (drawn with a camera lucida). B. Lateral view of one of these. C. Scanning electron micrographs of these elements.

The ground color of the body, rhinophores, gills, and appendages is reddish brown. Small areas of the flanks, veil, and tail, as well as the rhinophores, gills, and appendages, display a darker color. Yellow patches, some brighter than others, exist on the rhinophores, gills, appendages, and the entire body, except the ventral surface of the foot. The tips of the rhinophores and appendages are hyaline white. Also present are small scattered opaque white spots on the flanks, veil, and tail. The tail has a white middle line from the gills to almost its tip (Figure 1A, B, D, E).

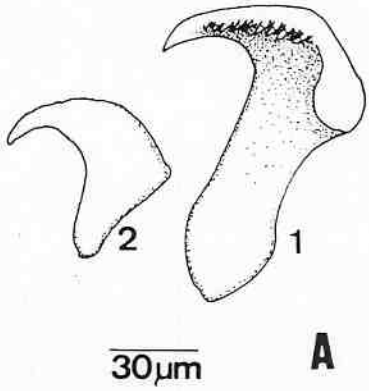
The labial cuticular armature is composed of two areas of elongate elements, which do not form a complete ring around the mouth. These elements have a single smooth cusp and a hole on which the posterior elements lie (Figure 2A, B, C). The radular formula of the specimen is 26 × 1·1·0·1·1. The innermost teeth bear 10–12 strong denticles on the cusp, while the outermost have a prominent smooth cusp (Figure 3A, B). The reproductive system (Figure 4A) has a white ampulla, slightly curved at its distal end. The elongate and flattened prostate forms a loop and connects with a long and folded duct that ends in an elongate penis with numerous penial spines (Figure 4B, C). The gametolytic gland is spherical and opens outwardly through a long and thin vaginal duct that forms a loop before it widens in its distal region. The thin allosperm

duct starts from the gametolytic gland close to the vaginal duct. The pyriform seminal receptacle enters the allosperm duct close to the gametolytic gland.

Geographical range: *Okenia aspersa* has been recorded in Norway (THOMPSON & BROWN, 1984; JUST & EDMUNDS, 1985; PLATTS, 1985), Denmark (JUST & EDMUNDS, 1985; PLATTS, 1985), Shetlands Isles (THOMPSON & BROWN, 1984; PLATTS, 1985), British Isles (THOMPSON & BROWN, 1984; PLATTS, 1985), Atlantic France (BOUCHET & TARDY, 1976, according to THOMPSON & BROWN, 1984), and Massachusetts, USA (MORSE, 1972). So, our specimen constitutes the most southern record of this species and the first record on the Iberian Peninsula.

Discussion: According to Lemche (see JUST & EDMUNDS, 1985) the differences that he observed between the specimen attributed to *Okenia aspersa* and those of ALDER & HANCOCK (1845–1855) are probably due to Alder & Hancock's inaccurate description. The specimen of *O. aspersa* of THOMPSON & BROWN (1976, 1984) agrees with Alder & Hancock's description. According to JUST & EDMUNDS (1985), *O. aspersa* is clearly identical with *O. ascidicola* Morse, 1972, from Massachusetts, and, further, Lemche thought that *O. pulchella* Alder & Hancock, 1854, was conspecific with *O. aspersa*. However, MORSE (1972) compared her material with *O. pulchella* and concluded that they are different. ALDER & HANCOCK (1845–1855) described *O. pulchella* with denticulate innermost radular teeth, while THOMPSON & BROWN (1984) described smooth innermost radular teeth in a specimen attributed to this species. In addition, some authors (PRUVOT-FOL, 1954; SCHMEKEL & PORTMANN, 1982) considered *O. aspersa* conspecific with *O. quadricolor* (Montagu, 1815), but THOMPSON & BROWN (1984) reached the opposite conclusion after scrutiny of Montagu's description.

Our specimen is quite similar to those of MORSE (1972) and Lemche (see JUST & EDMUNDS, 1985), although it lacks the mid-dorsal appendage before the branchial tuft that is present in these latter. MORSE's (1972) brief description of the reproductive system does not permit its comparison with ours.



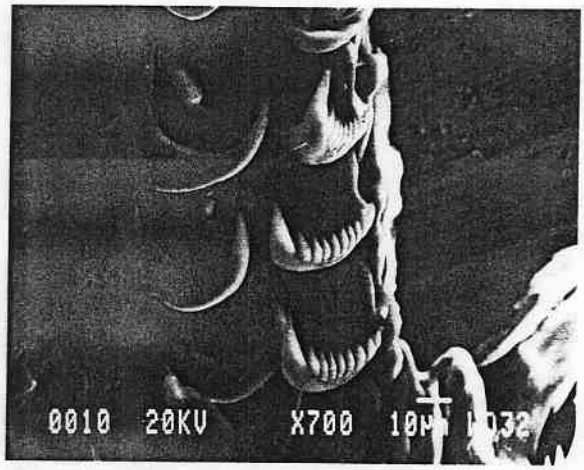


Figure 3

Okenia aspersa. A. Radular teeth of a half-row. B. Scanning electron micrographs of the same.

Okenia mediterranea (Ihering, 1886)

Material: (1) Seven specimens of 3.5–8.5 mm in length, collected intertidally, El Portil (Huelva, Spain) (37°12′40″N, 7°7′50″W), 6 April 1989. (2) Eleven specimens, 5–7.5 mm in length, collected intertidally, El Portil (Huelva, Spain), 23 April 1989. (3) Four specimens, 6 mm in length, collected intertidally, El Portil (Huelva, Spain), 6 May 1989.

All specimens have been deposited in the Laboratorio de Biología Marina, Departamento de Fisiología y Biología Animal, Universidad de Sevilla.

Description: The body bears spicules and a narrow pallial ridge with 18–24 appendages that are simple, except that the two most posterior appendages on each side join at their bases. The two most anterior appendages are elongate, the following two are slightly smaller, and the remaining are short and similar to each other in length. The frontal velum is slightly bilobed (Figures 5, 6A). The rhinophores have 12–20 lamellae and the two most anterior appendages are longer (Figure 6D, a and b). The branchial tuft has 5–9 unipinnate gills, which have 3–15 laminae (Figure 6E). The prominent anal papilla is located in the

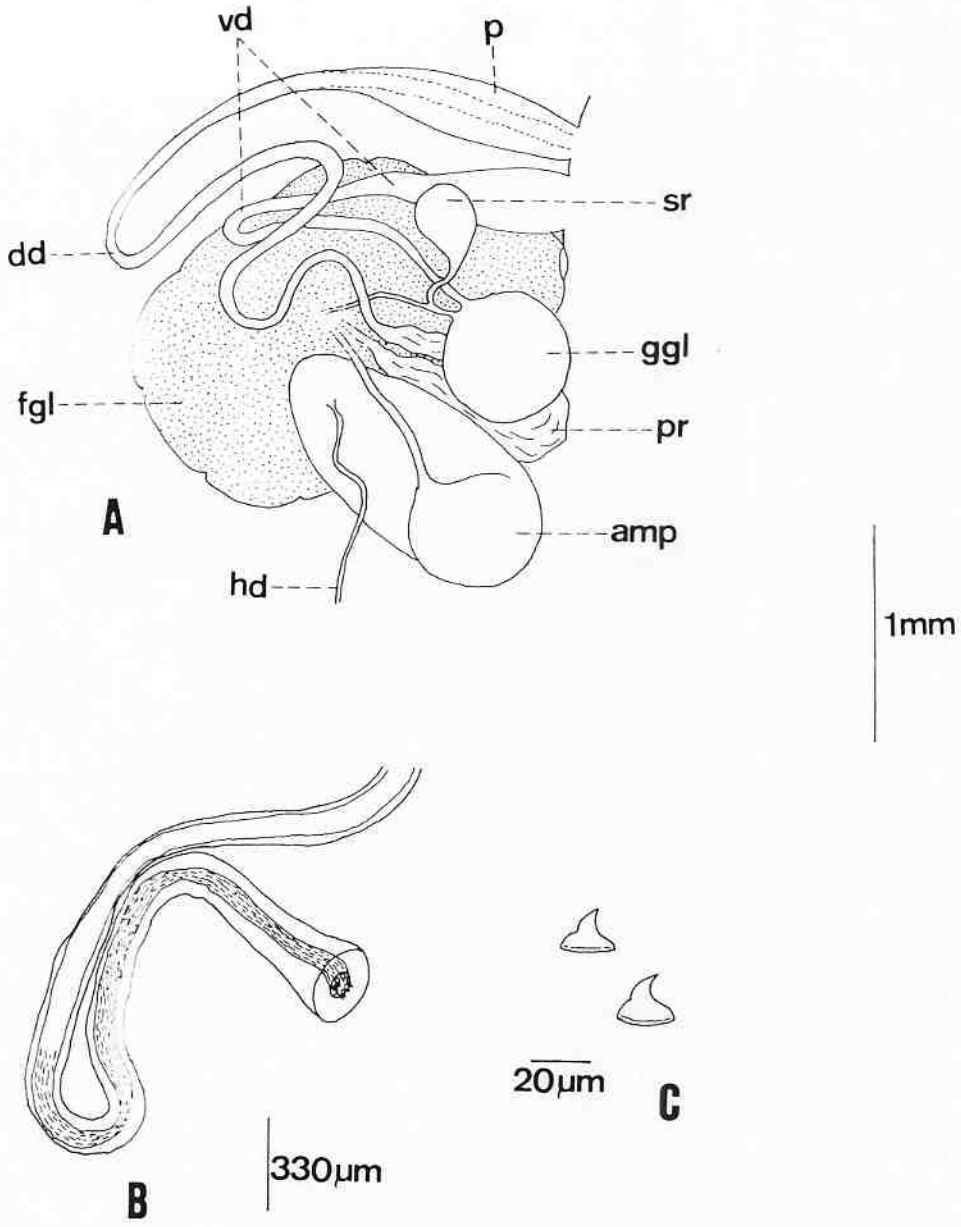


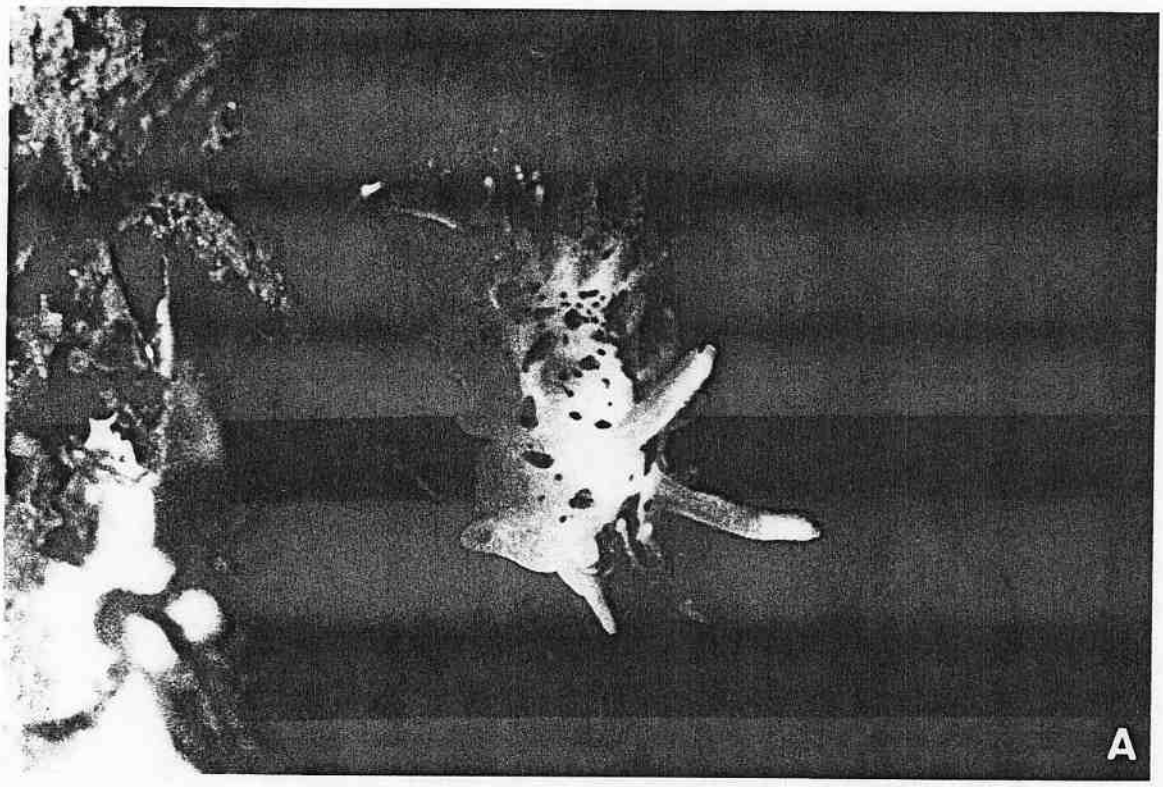
Figure 4

Okenia aspersa. A. Reproductive system. B. Detail of the penis. C. Detail of the penial spines. Key: amp, ampulla; dd, deferent duct; fgl, female gland; ggl, gametolytic gland; hd, hermaphroditic duct; p, penis; pr, prostate; sr, seminal receptacle; vd, vaginal duct.

→

Figure 5

Okenia mediterranea. A. Specimen 6 mm in length, 6 April 1989. B. Seven specimens, one 8 mm, five 3 mm, and one 5 mm in length, 6 April 1989, on *Alcyonidium* cf. *mytili*; arrow indicates the spawn of the species.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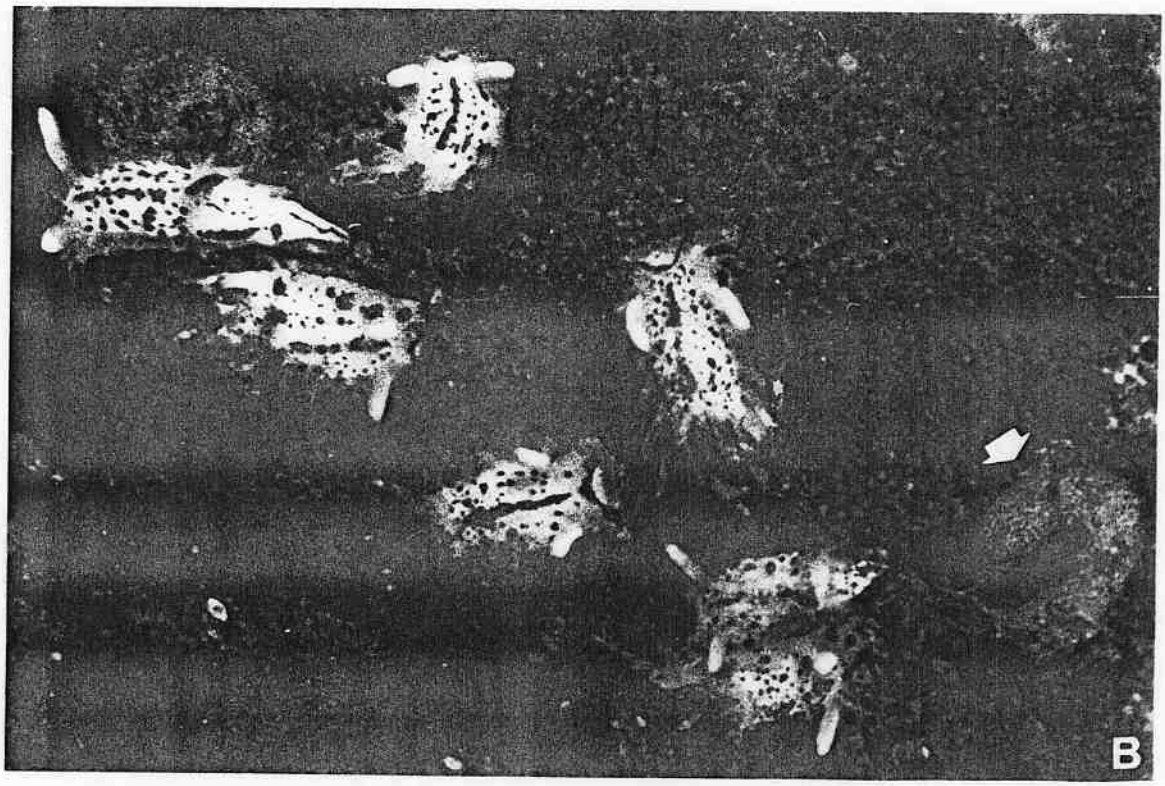
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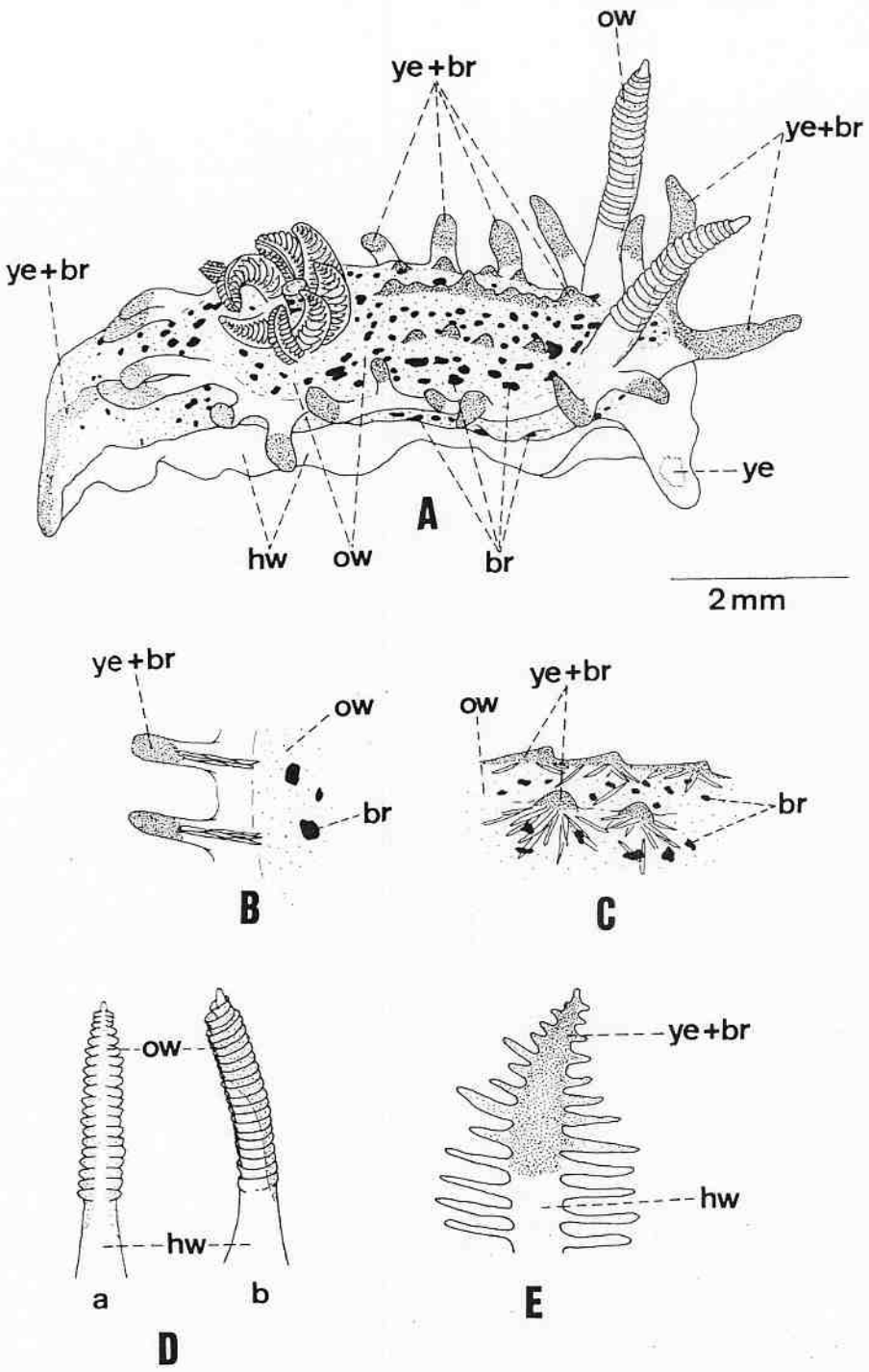


Figure 6

Okenia mediterranea. A. Dorsolateral view of one specimen. B. Arrangement of the spicules within the pallial ridge appendages. C. Arrangement of the spicules below the notal crests and elevations. D. Anterior (a) and lateral (b) view of a rhinophore. E. Detail of a gill. Key: hw, hyaline white; ow, opaque white; ye, yellow; ye + br, yellow + blood red.

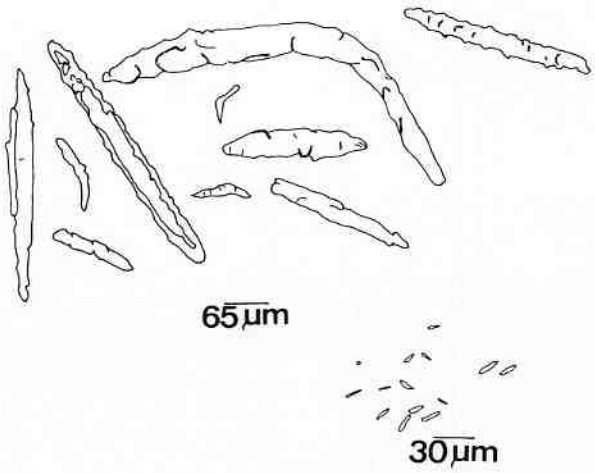


Figure 7

Okenia mediterranea. Different types of spicules observed in this species.

middle of the branchial tuft. A conspicuous keel-shaped crest formed by four elevations runs from the rhinophores towards the gills. In the same way, three or four elevations in a line (sometimes two) are usually present on both sides of this crest (Figure 6A). The spicules lie within the integument (Figure 7) and form a network in the foot and flanks of the animals. The spicules are also in the tips of the pallial ridge appendages (Figure 6B) and are arranged, in the same way, under the crest and the notal elevations (Figure 6C). The genital pore opens on the right flank of the animal, behind the rhinophoral level.

The ground color of the body (Figure 6A) is hyaline white suffused by an opaque white pigmentation that covers the dorsum and frontal veil. There is a yellow spot on the corner of each frontal velum. Yellow pigment is also on the mid-apical surface of all the appendages, the central crest, and the flanking elevations, as well as on the mid-apical surface of the gills and the middle line of the tail. Red pigment covers the yellow, except on the spots of the frontal velum. Both colors may combine to form orange. Scattered red spots of different sizes are also on the opaque white pigmentation of the dorsum, flanks, and tail of the animal. The yellow and red pigments of the two most anterior appendages almost cover their whole surface and the pallial edge that joins them, except in one 3.5-mm-long specimen. The rhinophores are hyaline white, but are covered by the above-mentioned opaque white pigmentation on their anterior faces, except on their bases, and apical third of the posterior faces (Figure 6D, a and b). The gills are hyaline white in those parts not covered by the yellow and red pigments (Figure 6E).

The internal anatomy of this species is represented in Figure 8. The labial armature is composed of two areas of elongate cuticular elements, which do not form a com-

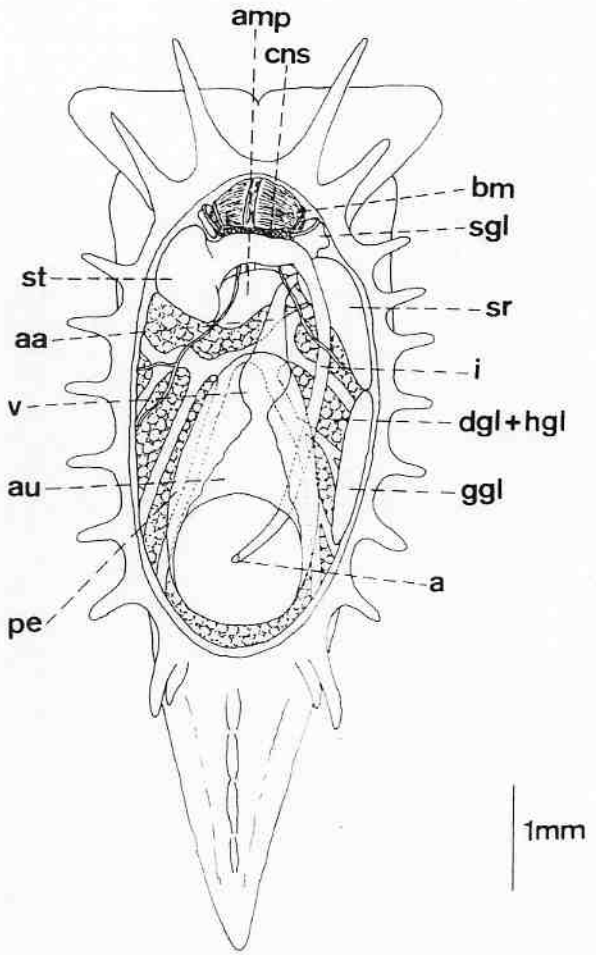


Figure 8

Okenia mediterranea. Internal anatomy. Key: a, anus; aa, anterior aorta; amp, ampulla; au, auricle; bm, buccal mass; cns, central nervous system; dgl + hgl, digestive gland + hermaphroditic gland; ggl, gametolytic gland; i, intestine; pe, pericardium; sgl, salivary gland; sr, seminal receptacle; st, stomach; v, ventricle.

plete ring around the mouth. Each element has an edge with 3–5 denticles (Figure 9A). The radular formula of one 8.5-mm-long specimen is 25 × 1·1·0·1·1. The innermost radular teeth have 28–31 small denticles on each cusp, while the outermost teeth lack denticles and possess a prominent cusp slightly hooked and curved inwards (Figure 9B, D). The reproductive system (Figure 10A) has a large, white ampulla. The prostate, elongate and flattened, forms a loop and connects with a long deferent duct that ends in an elongate, cylindrical penis with numerous penial spines (Figure 10B). The nacreous albumen gland connects with the mucous gland near the start of the prostate. The gametolytic gland is spherical and opens outwardly through a thin vaginal duct that forms two loops before widening in its distal part. The thin allosperm duct starts

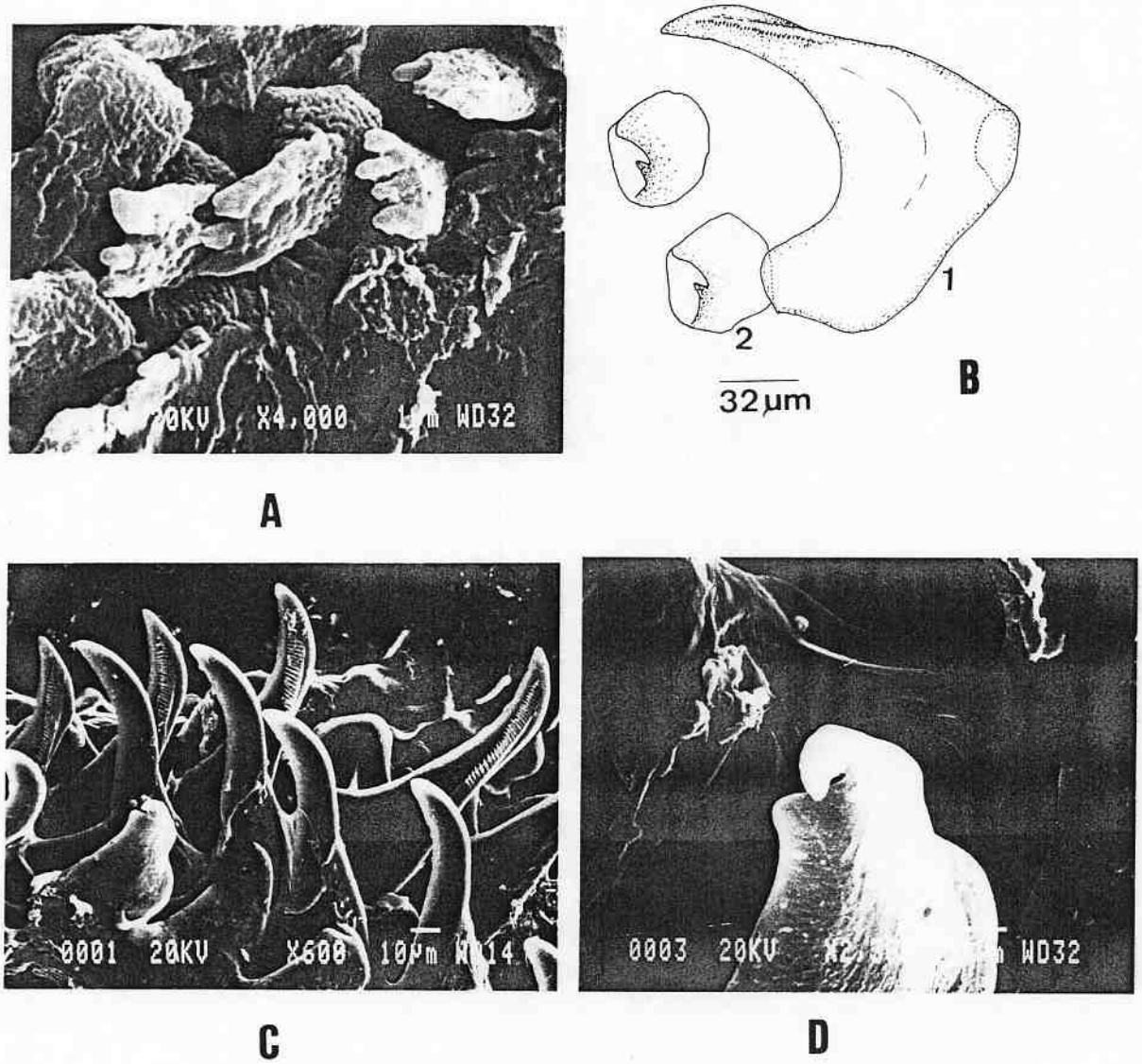


Figure 9

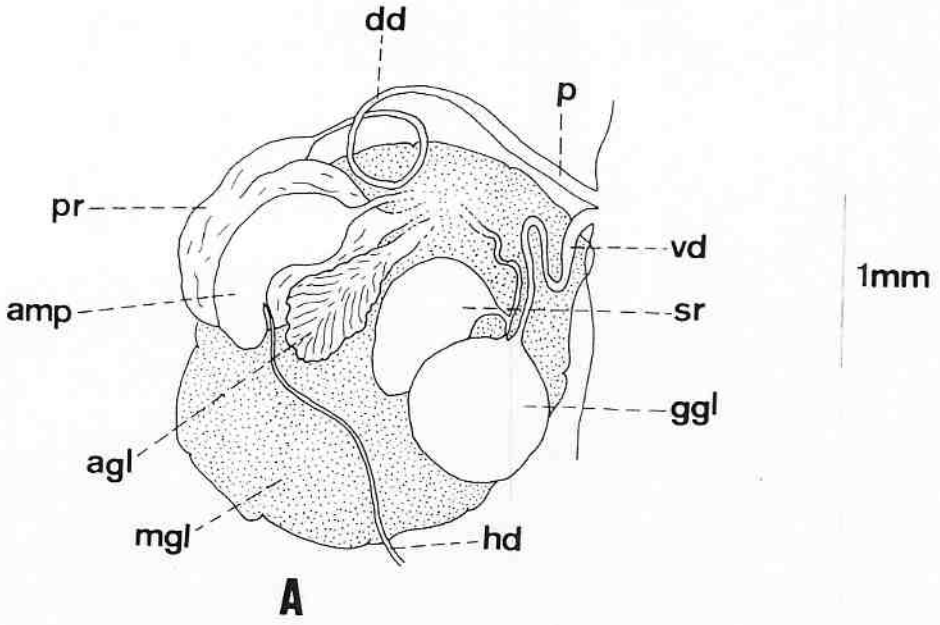
Okenia mediterranea. A. Scanning electron micrograph of some elements of the cuticular labial armature. B. Innermost (1) and outermost (2) radular teeth of a half-row (drawn with a camera lucida). C. Scanning electron micrograph of the radular teeth. D. Scanning electron micrograph of a detail of the cusp of an outermost tooth.

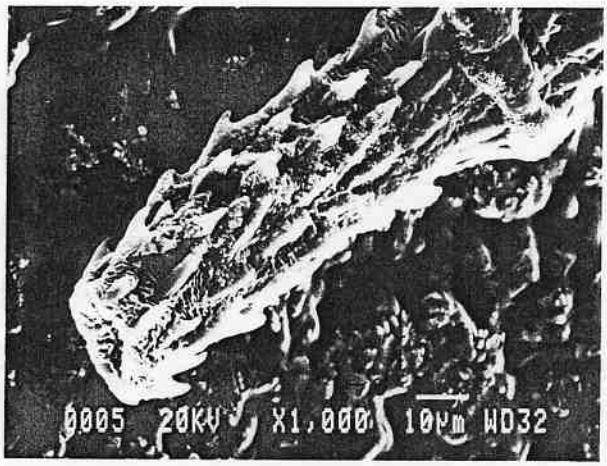
from the gametolytic gland close to the vaginal duct. The seminal receptacle joins the allosperm duct close to the gametolytic gland.

Biology: All specimens were found on the ctenostomate bryozoan *Alcyonidium* cf. *mytili* Dalyell, 1848. Some egg masses of this species were collected on this substrate and others were observed in the laboratory. The spawn is a semicircular string (Figure 5B), circular in section, and in some cases the spawn almost forms a ring. The diameter is about 1 mm and the strings have a length of 10–12 mm. Each capsule contains one egg. The eggs are almost spherical and white. The diameter of the capsules is 71.5–97.5 µm and that of the eggs is 58.5–78 µm.

Geographical range: *Okenia mediterranea* has previously been recorded at its type locality, Naples, Italy, in the Mediterranean (IHERING, 1886; SCHMEKEL, 1979; SCHMEKEL & PORTMANN, 1982). Our specimens constitute the first record of this species from the Atlantic Ocean and the Iberian Peninsula.

Discussion: Although our specimens differ slightly from the specimens of *Okenia mediterranea* from Naples





B

Figure 10

Okenia mediterranea. A. Reproductive system. B. Scanning electron micrograph of the penis. Key: amp, ampulla; agl, albumen gland; hd, hermaphroditic duct; mgl, mucous gland; p, penis; pr, prostate; sr, seminal receptacle; vd, vaginal duct.

(IHERING, 1886; SCHMEKEL, 1979; SCHMEKEL & PORTMANN, 1982), we prefer provisionally to consider our specimens as belonging to this species. SCHMEKEL (1979) corrects her own record of specimens of *O. amoenula* Bergh, 1907 (SCHMEKEL, 1968), which really correspond to *O. mediterranea*, and discusses the differences between the two species. SCHMEKEL (1979) reports the differences between her specimens of *O. mediterranea* and those described by IHERING (1886), emphasizing the contradictions of this author when he described the species: for example, Ihering wrote that the mantle was smooth, but drew two tubercles on each side of the median crest. However, IHERING (1886)

did not mention the unpaired ceras located behind the gills that was described by SCHMEKEL (1979). We agree with Schmekel that the specimen attributed to this species by PRUVOT-FOL (1951, 1954) corresponds neither to *O. amoenula* nor *O. mediterranea*.

The descriptions of the *Okenia mediterranea* specimens from Naples do not specify clearly whether the body pigmentation is white hyaline suffused by an opaque white or whether the body lacks this latter. Moreover, the arrangement of the red pigmentation of the notum of our specimens is slightly different from that on the specimens of Naples. The red and yellow colors of the appendages of Atlantic specimens cover at most the apical half, while in the Mediterranean specimens they cover almost their entire length. These latter specimens have rhinophores that are completely opaque white, while ours do not. Other differences between the Mediterranean specimens and ours are the presence of three or four elevations in a line on both sides of the median crest and the absence of the unpaired ceras behind the gills observed in some of the specimens of SCHMEKEL (1979) and SCHMEKEL & PORTMANN (1982). The base of the innermost radular teeth of our specimens is broader than in Schmekel's specimens. This variability could be due to the observation of the radular teeth with a little variation in their arrangement (for instance, see the differences that can be observed between the radular teeth of the same specimen of *Okenia aspersa* in Figure 3A, B).

The incomplete description of the reproductive system of Schmekel's specimens (SCHMEKEL, 1979), as well as the absence of drawings in Ihering's and Schmekel's descriptions of this system do not permit a good comparison with that described in this paper.

SCHMEKEL (1979) points out that the situs of this system in her specimens "corresponds in the main features with the situs of *Okenia amoenula* Bergh, 1907 (MACNAE, 1958: fig. 23)," and she does not find differences between the reproductive systems of the two species. However, comparing the reproductive system of our specimens with that of *O. amoenula*, differences can be observed: the prostate of our specimens is broader and shorter than in *O. amoenula*, the joint of the seminal receptacle with the allosperm duct is closer to the gametolytic gland in our specimens, and the seminal receptacle of our animals is different in size (larger) and shape (not pyriform).

In addition to having these differences in the reproductive system, *Okenia amoenula* has smooth elements on the labial armature (BERGH, 1907) and different coloration. Thus, we conclude that our material belongs to a different species. Despite the impossibility of comparing the reproductive system of our specimens with that of the material from Naples, we consider them both provisionally as *O. mediterranea*.

ACKNOWLEDGMENTS

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LITERATURE CITED

ALDER, J. & A. HANCOCK. 1845–1855. A Monograph of the British Nudibranchiate Mollusca. Ray Society: London. Part 1 (1845); Part 2 (1846); Part 3 (1847); Part 4 (1848); Part 5 (1851); Part 6 (1854); Part 7 (1855).

BERGH, L. S. R. 1907. The Opisthobranchiata of South Africa. Transactions of the South African Philosophical Society 17(1): 1–144, pls. 1–4.

BOUCHET, P. & J. TARDY. 1976. Faunistique et biogéographie des nudibranches des côtes françaises de l'Atlantique et de la Manche. Annales de l'Institut Océanographique 52(2): 205–213.

IHERING, H. VON. 1886. Beiträge zur Kenntnis der Nudibranchien des Mittelmeeres. II. 4. Die Polyceraden. Malakozoologische Blätter N.F. 8:12–48.

JUST, H. & M. EDMUNDS. 1985. North Atlantic nudibranchs (Mollusca) seen by Henning Lemche. Ophelia supplement 2:1–150.

MACNAE, W. 1958. The families Polyceridae and Goniodorididae (Mollusca, Nudibranchiata) in Southern Africa. Transactions of the Royal Society of South Africa 35(4):341–373.

MORSE, P. 1972. Biology of *Okenia ascidicola* spec. nov. (Gastropoda: Nudibranchia). The Veliger 15(2):97–101.

PLATTS, E. 1985. An annotated list of the North Atlantic Opisthobranchia (excluding Thecosomata and Gymnosomata). Ophelia supplement 2:150–170.

PRUVOT-FOL, A. 1951. Étude des nudibranches de la Mediterranée. Archives de Zoologie Experimentale et Génerale 88:1–80.

PRUVOT-FOL, A. 1954. Mollusques Opisthobranches. Fauna de France. 58:1–460. Paul Lechevalier: Paris.

SCHMEKEL, L. 1968. Ascoglossa, Notaspidea und Nudibranchia im litoral des Golfes von Neapel. Revue Suisse de Zoologie 75(6):103–155.

SCHMEKEL, L. 1979. First record of *Okenia impexa* Marcus, 1957 from the Western Atlantic in the Mediterranean. The Veliger 21(3):355–360.

SCHMEKEL, L. & A. PORTMANN. 1982. Opisthobranchia des Mittelmeeres. Springer-Verlag: Berlin. 410 pp., pls. 1–36.

TEMPLADO, J. 1982. Datos sobre los opistobranquios del Cabo de Palos (Murcia). Bollettino Malacologico 18(9–12):247–254.

THOMPSON, T. E. & G. H. BROWN. 1976. British Opisthobranch Molluscs. Synopses British Fauna (N.S.) 8:1–203. Academic Press: London.

THOMPSON, T. E. & G. H. BROWN. 1984. Biology of Opisthobranch Molluscs. Vol. II. Ray Society: London. 229 pp.