Pseudoplumaria gen. nov. a new Atlantic genus of the family Plumulariidae (Cnidaria: Hydrozoa)

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Description of a new genus of Hydroida (Hydrozoa, Cnidaria) from Atlantic seamounts in the eastern subtropical Atlantic (area between Cape São Vicente, Portugal, and Madeira). Description of the type of the genus and allocation to the new genus of a second species hitherto brought to *Plumularia* Lamarck, 1816.

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Introduction

A new genus of the family Plumulariidae was discovered amongst Atlantic hydroids collected by the French BALGIM and SEAMOUNT 1 expeditions.

Genus Pseudoplumaria gen. nov.

Diagnosis.— Colonies composed of a rigid, polysiphonic, occasionally forked axis (hydrocaulus), bearing side-branches that may rebranch again (till 3rd order). Side-branches alternate or opposite, polysiphonic almost till their end, originating from secondary tubules.

Hydrocladia not branched, alternately arranged along axis, springing from the primary tube and pointing alternately left and right, placed on an apophysis with a much developed, large 'mamelon' on its superior surface. Hydrothecae exclusively found on the hydrocladia, hydrothecal border smooth.

Mobile, immobile and reduced nematothecae two-chambered (bithalamic).

Gonothecae single, without protecting structures, but with a few nematothecae inserting on basal portion.

Discussion.— The new genus *Pseudoplumaria* resembles *Polyplumaria* G. O. Sars, 1874, in the structure of the strongly ramified, polysiphonic colonies and the presence of nematothecae on the gonotheca. The genera are differentiated by the fact that in *Pseudoplumaria* the hydrocladia are always unbranched while in *Polyplumaria* they are branched in a regular fashion.

Type: *Pseudoplumaria sabinae* spec. nov. Further species: *Pseudoplumaria marocana* (Billard, 1930) (= *Plumularia marocana* Billard, 1930). Gender: feminine.

Pseudoplumaria sabinae spec. nov. (figs. 1, 2)

Material.—SEAMOUNT 1 Stn DE 09*, Gorringe Bank, 36°31.5'N-11°38.0'W, 350-360 m, 23.ix.1987: single 35 high fragment, top part detached, without gonothecae. - Stn CP 11, Gorringe Bank, 36°26.4'N-11°40.2'W, 805 m, 23.ix.1987: four colonies 80-130 mm high without gonothecae. Detached fragment with empty gonothecae.- Stn CP 12, Gorringe Bank, 36°24.2'N-11°43.2'W, 1005-1040 m, 23.ix.1987: c. 15 colonies in bad state and many fragments, 100-150 mm high, with gonothecae.- Stn DW 15, Gorringe Bank, 36°33.4'N-11°28.8'W, 300-330 m, 24.ix.1987 (type locality): three large colonies 150 × 200 mm and numerous fragments, with gonothecae. A 180 mm high colony with repeatedly forked axis and many side-branches and gonothecae, is the holotype (MNHN Hy no. 1127). The remaining two colonies and the fragments are the paratypes (RMNH Coel. no. 26054) .- Stn DW 16, Gorringe Bank, 36°31.1'N-11°32.5'W, 255-265 m, 24.ix.1987: four colonies 70-130 mm high and many fragments, with gonothecae. - Stn CP 20, Gorringe Bank, 36°33.7'N-11°30.1'W, 305-320 m, 24.ix.1987: c. ten large colonies up to 350 mm high, with thick, polysiphonic base of seven mm diameter; also many fragments. With gonothecae. - Stn DW 21, Gorringe Bank, 36°34.9'N-11°28.4'W, 460-480 m, 24.ix.1987: ten colonies 50-140 mm high and various fragments; with gonothecae. - Stn DE 98, Ampère Bank, 35°03.2'N-12°55.4'W, 300-325 m, 12.x.1987: mutilated colony 80 mm high and several fragments; without gonothecae.- Stn CP 99, Ampère Bank, 35°03.8'N-12°55.4'W, 225-280 m, 12.x.1987: 12 colonies 20-175 mm high and numerous fragments; with gonothecae.- Stn CP 100, Ampère Bank, 35°03.6'N-12°55.3'W, 182-207 m, 12.x.1987: several mutilated colonies up to 160 mm high, with gonothecae. In addition eight fragments 6-35 mm high, of which two with gonothecae.

Description.— Large colonies with polysiphonic, usually repeatedly forked axis bearing many side-branches. Basal part of axis with either reticulum of strong hydrorhiza fibres, attaching colony to firm substratum, or with mass of rooting stolons that may anchor the colony in softer bottoms.

Structure of axis can best be observed in monosiphonic distal parts of colony, where it appears to be divided into big segments by means of oblique nodes, each segment bearing a large but varied number of hydrocladia (fig. 1b). There are no axial hydrothecae; the hydrocladia rise from the primary axial tube and are placed on an apophysis; apophyses and hydrocladia alternately directed left and right, all arranged in same plane. Axial tube between apophyses with a row of bithalamic axial nematothecae, two to four between two successive apophyses. Moreover, each apophysis is flanked by two bithalamic nematothecae and bears a large 'mamelon' near its insertion on axis; this 'mamelon' has a large, circular apical aperture and represents a atrophied hydrotheca (fig. 1a). Basal portions of axial tube with numerous secondary tubules bearing many bithalamic nematothecae, identical with those on primary tube; communication between primary and secondary tubules by means of small, circular holes.

Hydrocladia homomerously segmented, first internode athecate, small, bearing a single bithalamic nematotheca, separated from apophysis by means of transverse node and from following, thecate internode by means of an oblique node (figs. 1b, 2a). All following (thecate) internodes separated by oblique nodes, each internode with one hydrotheca and seven or eight nematothecae. Hydrotheca on basal part internode, cylindrical, with more or less straight, nearly parallel ab- and adcauline walls. Adnate part adcauline hydrothecal wall slightly more than half its length; hydrothecal border circular, perpendicular to hydrothecal length axis (fig. 2a).

Nematothecae of thecate internodes are arranged as follows: one infracalycine median nematotheca; two slightly larger lateral nematothecae (one on each side),

^{*}For abbreviations see Ramil & Vervoort, 1992: 8. DE = 'Drague épibentique'; epibenthic dredge.

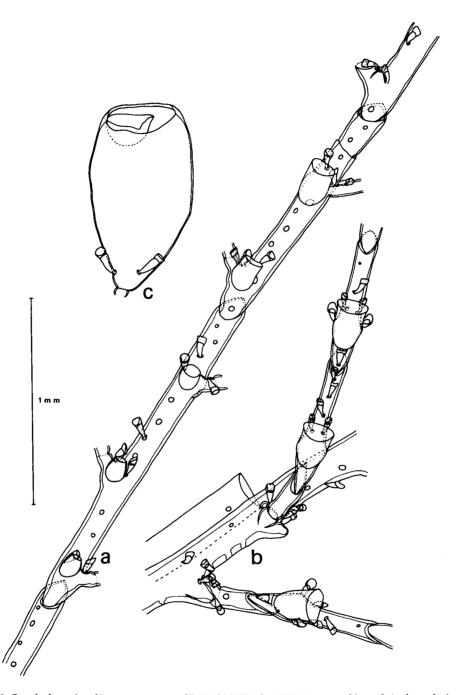


Fig. 1. Pseudoplumaria sabinae spec. nov. a, SEAMOUNT 1 Stn DW 16, part of branch in frontal view, showing transition of 'mamelon' at hydrocladial apophysis to axial hydrotheca. b, SEAMOUNT 1 Stn DE 09, part of primary axis with single secondary tube and insertion of two hydrocladia, of which basal portions figured; slightly oblique frontal view. c, paratype SEAMOUNT 1 Stn DW 15, gonotheca in lateral view.

placed on well developed apophyses halfway adcauline hydrothecal wall, just under the place where that wall becomes free; two lateral nematothecae inserting directly on wall of internode above first pair at level of hydrothecal border or slightly below, and two or three supracalycine median nematothecae on distal part of internode (fig. 2a). All nematothecae movable and bithalamic; adcauline part of rim with characteristic incision.

Gonothecae inserting on hydrocladial apophyses, globular, slightly swollen. Basal portion narrowed, with four nematothecae; apical part flattened, with circular lid (figs. 1c, 2b, c). Total number of basal nematothecae difficult to observe, being composed of two pairs of opposite members, occasionally at a different level.

Side-branches originating from secondary tubules, polysiphonic almost until the end, usually alternately arranged and pointing left and right, in same plane with axis, re-branching till fourth order. One of secondary tubules (from main axis) functions as primary axis of branch and bears hydrocladia. Secondary branches originating from secondary tubes of branch, etc. In arrangement of hydrocladia, segmentation, place and arrangement of hydro- and nematothecae branches agree with main axis (hydrocaulus).

Variability.— In the material examined there are a few colonies in which some of the basal internodes of the hydrocladia have two nematotheca (one being normal) and/or the hydrothecate internodes have only one distal (supracalycine) nematotheca (two or three being normal). Many of the gonothecae observed have one, two or three nematothecae, which in our opinion is due to the fact that the gonothecal nematothecae are easily detached. The development of hydrocladia from the basal part of damaged gonothecae has also been observed; such hydrocladia should not be considered as ramifications of the primary hydrocladia, as is the case in *Polyplumaria flabellata* G.O. Sars, 1874, in which species the secondary hydrocladia originate from the first

Table 1. Pseudoplumaria sabinae spec. nov. Measurements in µm.

SEAMOUNT 1 Stn DW	
Hydrocladium, length of basal internode	275-360
diameter of basal internode	80-110
length of hydrothecate internode	520-600
diameter of hydrothecate internode at node	100-140
Hydrotheca, total depth	210-230
length free part adcauline wall	40-60
diameter at rim	140-160
First pair lateral nematothecae, length	105-130
diameter at rim	55-65
Second pair of lateral nematothecae, length	70-90
diameter at rim	30-40
Median infracalycine nematotheca, length	100-120
diameter at rim	40-60
Median supracalycine nematothecae, length	85-110
diameter at rim	30-40
Gonotheca, maximal length	850-1006
maximal diameter	400-550
Gonothecal nematothecae, length	130-165
diameter at rim	50-65

hydrothecate internode of the hydrocladium. Here the regenerating hydrocladium develops from the apophysis at the place where the gonotheca inserts and is basally surrounded by the rest of the damaged gonotheca. This type of regeneration has also been observed in *Kirchenpaueria bonnevieae* (Billard, 1906) and *Plumularia falcicula* Ramil & Vervoort, 1992 (Ramil & Vervoort, 1992: 153, 181).

Gradual transformation of the 'mamelon' on the hydrocladial apophysis into a hydrotheca has been observed in a single branch of a colony from SEAMOUNT 1 Stn DW 16 (fig. 1a). In the basal part of this branch there is still a normal 'mamelon', but the size of the 'mamelon'

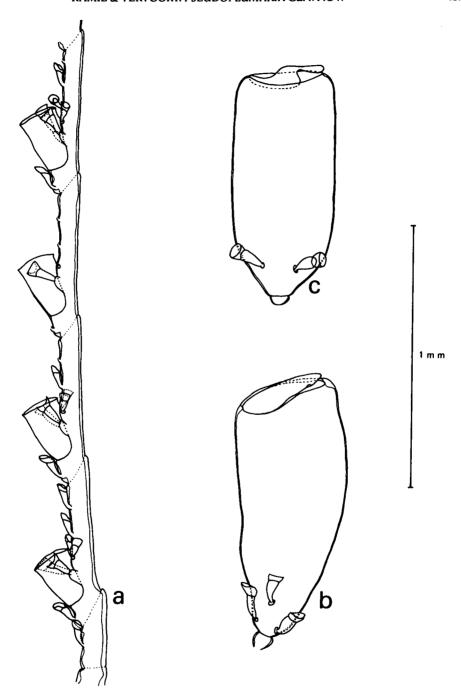


Fig. 2. *Pseudoplumaria sabinae*, holotype, SEAMOUNT 1 Stn DW 15. a, hydrocladium in lateral view; b, c, gonothecae in lateral view.

increases distally and is gradually transformed into a more or less normal hydrotheca. Finally the branch shows a rupture just above that 'hydrotheca' and continues as a branch with well developed 'mamelons'.

Distribution.— Obtained from seven stations at the Gorringe Bank and three localities at the Ampère Bank, in the subtropical eastern Atlantic between Cape São Vicente (Portugal) and Madeira. Depth records are between 182 and 1040 m.

Discussion.— Pseudoplumaria sabinae spec. nov. is characterized by the large and strongly branched colonies, the large 'mamelon' on the hydrocladial apophysis and the arrangement of the seven or eight nematothecae on the hydrothecate internodes (one median infracalycine, two or three median supracalycine and two pairs of laterals, the first and largest pair on a conspicuous apophysis halfway the adcauline hydrothecal border and a second and smaller pair at the hydrothecal rim). The gonothecae have basal nematothecae. In its large colonies and the presence of gonothecal nematothecae the new species reminds of Polyplumaria flabellata G.O. Sars, 1874, from which it differs by the constantly unbranched condition of the hydrocladia, the arrangement of the nematothecae on the hydrothecate internodes and the large 'mamelon' on the hydrocladial apophyses.

From *Pseudoplumaria marocana* (Billard, 1930) the new species differs primarily in the mode of ramification: in *P. sabinae* the branches are alternately arranged and in *P. marocana* in opposite pairs. The nematothecae in *P. sabinae* are all bithalamic and movable; in *P. marocana* only the (single) pair of laterals flanking the hydrothecal aperture are such, all the remaining nematothecae being bithalamic and immovable, some of them are much reduced. There are also differences in the arrangement of the remaining nematothecae on the hydrothecate internodes. In *P. sabinae* there are two pairs of laterals and there is no reduced nematotheca behind the free part of the adcauline hydrothecal wall as occurs in *P. marocana*. In the former there are two or three supracalycine, movable nematothecae; in the latter there are no such nematothecae, though the occasional presence of a single immovable supracalycine nematotheca has been described.

The transformation of the apophysal 'mamelon' in a hydrotheca seems to indicate that such 'mamelons' represent atrophied hydrothecae, a supposition previously expressed by Bedot (1921) in his description of *Polyplumaria billardi* var. *deloni* Bedot, 1921, a variety characterized by a well developed 'mamelon'; this variety has been doubtfully included into the synonymy of *Pseudoplumaria marocana* by Ramil & Vervoort (1992: 186, as *Plumularia marocana*). Bedot (1921) states that the large size of the 'mamelon', when inspecting the colony in lateral aspect, made him think of atrophied axial hydrothecae but that later on the presence of a small apical aperture in the thickened apical part induced him to interpret these structures as modified nematothecae. Our present observation supports the suggestion that the large apophysal 'mamelon' represents an atrophied hydrotheca rather than an atrophied nematotheca.

Gonothecal nematothecae in Plumulariidae are restricted to the genera *Pseudo-plumaria* gen. nov. and *Polyplumaria* G.O. Sars, 1874, but are a constant feature in the family Halopteridae; in this respect both genera take an intermediate position. This intermediate position is strengthened by presence of large 'mamelons' and the (occasional) transformation of apophysal 'mamelons' in (atrophied) axial hydrothecae, as in Halopteridae there are axial hydrothecae.

Etymology.—The specific name, *sabinae*, has been chosen as a tribute to Mrs Sabine Sanders, wife of the junior author.

Pseudoplumaria marocana (Billard, 1930) (fig. 3)

Plumularia marocana Billard, 1930: 79, fig. 1; Patriti, 1970: 54-55, fig. 76; Van Praët, 1979: 926, fig. 99; Ramil & Vervoort, 186-191, figs. 48b-d, 49a, b.

?Polyplumaria Billardi var. deloni Bedot, 1921: 17-18, pl. 1 figs. 7, 10-11; Patriti, 1970: 56, fig. 79. Polyplumaria flabellata p.p. Gili, Vervoort & Pagès, 1989: 91-92, fig. 19.

Material.—SEAMOUNT 1 Stn DW 97, Ampère Bank, 35°05.5′N-12°54.1′W, 204-250 m, 12.x.1987: single 90 mm high colony, top part separate, and some detached plumes. With gonothecae.

For a description of this species we refer to Ramil & Vervoort, 1992 (: 186-191, figs. 48b-d, 49a, b). The (male) gonothecae, as in *Pseudoplumaria sabinae*, insert on the hydrocladial apophyses and have the same shape, being globular and slightly swollen with a flattened apical part with a circular lid (fig. 3). Two types of nematothecae occur on the narrowed, basal portion of the gonotheca. There are three to six reduced, more or less scale-shaped nematothecae of slightly different size basally and six to nine elongated, tube-shaped nematothecae inserting above the reduced ones (fig. 3a, b); these elongated nematothecae have a fine diaphragm delimiting a small apical chamber and cover two-thirds of the total length of the gonotheca (fig. 3d). The total number of nematothecae varies between 10 and 13 in the four (male) gonothecae inspected and their distribution on the basal part of the gonotheca is slightly irregular. Actual transitions between the scale-shaped type and the elongated nematothecae have not been observed.

Distribution.— The geographical distribution of this species has recently been discussed by Ramil & Vervoort (1992) and comprises the eastern Atlantic Ocean between Cape São Vicente (Ramil & Vervoort, 1992) and the coast of Guinea Bissau (Gili,

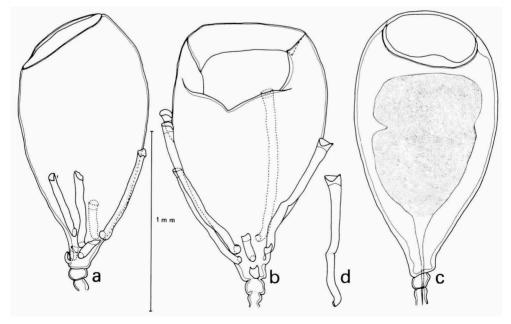


Fig. 3. Pseudoplumaria marocana (Billard, 1930), SEAMOUNT Stn DW 97. a-c, male gonotheca in lateral aspect; nematothecae have been omitted in fig. 3c; d, isolated gonothecal nematotheca.

Table 2. *Pseudoplumaria marocana* (Billard, 1930). Measurements of the gonothecae in μm.

SEAMOUNT 1 Stn I	
Gonotheca, maximal length	1440-1470
maximal diameter	750-870
Gonothecal nematothecae, small type, length	80-150
diameter at rim	50-60
Gonothecal nematothecae, elongated type, length	650-840
diameter at rim	60-90

Vervoort & Pagès, 1989, as Polyplumaria flabellata). The present material originates from Ampère Bank, subtropical eastern Atlantic between Cape São Vicente (Portugal) and Madeira, depth 204-250 m.

Discussion.— Pseudoplumaria marocana was first described by Billard (1930).

The description was supplemented by Ramil & Vervoort, 1992, from the type material and material collected in the Ibero-Moroccan Gulf. Re-inspection of the material proved that at least part of the colonies recorded by Gili, Vervoort & Pagès (1989) from Guinea Bissau belongs to this species. The gonotheca, so far unknown, has now been described from the SEAMOUNT 1 material and is characterized by the presence of nematothecae, excluding it from the genus *Plumularia* Lamarck, 1816. From *Polyplumaria* G.O. Sars, 1874, it differs by the absence of ramified hydrocladia. The strongly polysiphonic axis, the mode of ramification, the presence of a well developed 'mamelon' on the hydrocladial apophyses, the unbranched hydrocladia and the gonothecal nematothecae are shared with *Pseudo-plumaria sabinae* spec. nov. and indicate that the species also belongs in *Pseudoplumaria* gen. nov. The differences between both species have been enumerated above.

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For a more complete review of the literature on subtropical eastern Atlantic hydroids we refer to Ramil & Vervoort, 1992.

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