Redescription of the type species of the genus *Polymastia* Bowerbank, 1864 (Porifera, Demospongiae, Hadromerida)

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**ABSTRACT**  
The type species of the genus *Polymastia* Bowerbank, 1864 is *Spongia mamillaris* Müller, 1806. For almost two centuries the type specimen was ignored, but it was recently rediscovered in the Zoological Museum in Copenhagen (Denmark). This type specimen is here redescribed. It corresponds to specimens from the Swedish west coast collected recently close to the type locality and it does not correspond to the common *Polymastia* species from the NE Atlantic coast (North Sea, Channel Sea, British coasts) erroneously called "mamillaris" since Johnston (1842) and Bowerbank (1864). This common *Polymastia* corresponds to *Polymastia* (*Spongia*) *penicillus* (Montagu, 1818), according to a reexamination of a specimen from Montagu (BMNH 30.7.3.26 deposited in BMNH in the Dr Grant Cabinet). The main differences between *P. mamillaris* and *P. penicillus* are the number of layers of the cortex, the type of free spicules present in the choanosome which are intermediary tylostyles in *P. penicillus* versus ectosomal tylostyles in *P. mamillaris*, the shape of the spicules cylindrical in *P. penicillus* versus fusiform in *P. mamillaris* and the thickness of the spicules which vary from 4 to 12 µm in *P. penicillus* versus 8 to 24 µm in *P. mamillaris*.

**KEY WORDS**  
Porifera, *Polymastia*, Demosponges, Hadromerida, type specimen.
INTRODUCTION

The genus *Polymastia* was erected by Bowerbank in 1864. He designated *Halichondria mamillaris* “Johnston, 1842” as the type species and considered it “the best type of *Polymastia*”. In fact the species “mamillaris” was not described by Johnston but by Müller (1806) under the name *Spongia mamillaris*. Johnston (1842) transferred “mamillaris” from the genus *Spongia* to the genus *Halichondria* and also synonymized *Spongia mamillaris* Müller, 1806 with *Spongia penicillus* Montagu, 1818. Bowerbank followed this view and seems to have ignored the description of Müller as there is no mention of this author in any text of Bowerbank (1864, 1866, 1872-1876) concerning *Polymastia mamillaris*. Vosmaer (1882) followed by Levinsen (1886) and Fristedt (1887) considered both species as distinct mainly because of the presence of very long spicules around the margin of specimens of “*penicillus*”. In fact, as stressed by Topsent (1900) they had confused this species with *Trichostemma hemisphaericum* Sars, 1872 while the description of “*penicillus*” by Montagu is clearly not a *Trichostemma*.

All subsequent spongologists have only taken into account the view of Bowerbank. Many authors ignored the description of Müller and gave Johnston, 1842 as authorship for “*mamillaris*”. According to Vosmaer (1935), in fact “nobody has been able to see Müller’s original specimen”.

The type specimen of *Polymastia mamillaris* has recently been found in the Zoological Museum in Copenhagen (Denmark). That of *P. penicillus* (Montagu, 1818) is in Dr Grant Cabinet at the Natural History Museum, London (BMNH 30.7.3.26). “I have compared the specimens sent to me by Mr Hyndman, from Larne Lough, with the type of Montagu’s *Spongia penicillus*, in the possession of Dr Grant…” (Bowerbank 1866: 73).

In this paper we redescribe the type specimen of *Polymastia mamillaris* (Müller, 1806) and the common *Polymastia* species from the NE Atlantic coast erroneously called “*mamillaris*” since Johnston and Bowerbank.
SYSTEMATICS

*Polymastia* Bowerbank, 1864

*Polymastia* Bowerbank, 1864: 177; type species *Halichondria (Spongia) mamillaris* by original designation

*Pencillaria* Gray, 1867: 527; type species *Spongia mamillaris* by original designation

*Rinalda* Schmidt, 1870: 51; type species *Rinalda uberrima* by original designation

**DIAGNOSIS**

Polymastiidae, thickly encrusting, spherical or cushion-shaped, always with papillae. Skeleton composed of radial tracts of principal spicules between which free spicules are scattered. Cortex composed of at least two layers, the superficial layer is a palisade of small tylostyles, the lower layer is made of intermediary spicules, tangential, semi-tangential or perpendicular to the surface. Exotyles echinating the surface may be present. The principal spicules can be tylostyles, subtylostyles, styles, or strongyloxeas, intermediary spicules are most often tylostyles, and ectosomal spicules are always tylostyles.

*Polymastia mamillaris* (Müller, 1806)

(Figs 1; 2D-F)

*Spongia mamillaris* Müller, 1806: 44. – transferred by Bowerbank 1864: 177.


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Fig. 1. — *Polymastia mamillaris* (Müller, 1806); drawing of a transversal section of the main body. Abbreviations: p, palisade of ectosomal tylostyles; c, middle collagenous layer; l, tangential layer of intermediary tylostyles; i, free intermediary spicules; e, groups of ectosomal spicules. Scale bar: 170 µm.
TYPE LOCALITY. — North Atlantic coast: Sweden coast 58°15’, 11°50’E.

DESCRIPTION
External characters
The type specimen is a fragment of a cushion-shaped, attached sponge approximately $35 \times 18 \times 7$ mm thick. The upper surface is hispid. The surface of the sponge traps silt and the colour is only discernible on the papillae. The color is cream in alcohol. The specimen has 26 inhalant papillae and one exhalant. The mean length of the inhalant papillae is $8 \times 2$ mm in diameter. The exhalant papilla is $11$ mm long and approximately $4$ mm in diameter.

Skeleton (Fig. 1)
The ectosomal skeleton is about 400 µm thick and composed of three layers: the upper layer is a dense palisade ($\approx 300$ µm thick) of fusiform tylostyles, the middle layer is collagenous ($\approx 20$ µm thick) and the lower layer is a tangential layer ($\approx 80$ µm thick) made of intermediary spicules.

Choanosomal tracts of principal spicules are 53-106 µm thick. These tracts are divided into two to three smaller ones below the ectosome. They cross the ectosome and echinate the surface by approximately 875 µm. Groups from two to five ectosomal spicules are scattered between the choanosomal tracts. They are particularly abundant below the tangential layer of the ectosome, shape of the ectosomal tylostyles (101-182/5.2-11.7, mean 148/8.4 µm, N > 50) and of the principal choanosomal spicules (strongyloxeas 461-1320/10.6-26.5, mean 853/20 µm, N > 50).

On the other hand, the type specimen of Polymastia mamillaris does not correspond with what is commonly called $P$. mamillaris in the North East Atlantic (Channel, North Sea, Irish Sea). The North East Atlantic common Polymastia has a two-layered cortex, free intermediary tylostyles in the choanosome and the shape of spicules is not fusiform (detailed description in Boury-Esnault 1974, 1987).

Polymastia penicillus (Montagu, 1818)
(Figs 2A-C; 3)
Spongia penicillus Montagu, 1818: 93

HOLOTYPE. — BMNH 30.7.3.26 from a specimen of Montagu in the Dr Grant Cabinet.

OTHER SPECIMENS. — From the South coast of the Channel Sea (Aber Benoit, intertidal zone NBE coll.) and Irish coast (CM coll.).

TYPE LOCALITY. — Precise type locality unknown. The specimen was obtained by dredging on the coast of Devon (Great Britain).

DESCRIPTION
External characters
The type specimen is whole dry and is a small piece with few papillae. This does not allow to

Principal spicules are straight, fusiform strongyloxeas, 742-1378/8-32 µm (mean 1052-24.5 µm, N > 50).

REMARKS
We have the opportunity, thanks to our colleague Ole Tendal, to reexamine specimens of Polymastia from the Swedish west coast collected between 76 and 225 m deep. These specimens correspond to the type of Müller: ectosomal skeleton composed of three layers, groups from two to five ectosomal spicules scattered between the choanosomal tracts and particularly abundant below the tangential layer of the ectosome, shape of the ectosomal tylostyles (101-182/5.2-11.7, mean 148/8.4 µm, N > 50) and of the principal choanosomal spicules (strongyloxeas 461-1320/10.6-26.5, mean 853/20 µm, N > 50).
The type species of Polymastia Bowerbank

Fig. 2. — A-C, Polymastia penicillus Montagu, 1818; A, ectosomal tylostyles; B, intermediary tylostyles; C, principal tylostyles; D-F, Polymastia mamillaris (Müller, 1806); D, ectosomal tylostyles; E, intermediary tylostyles; F, principal tylostyles. Scale bar: 17 µm.
give a description of the external characters. Montagu (1818) described this specimen as yellowish and gave a drawing of the external shape (Montagu 1818: pl. 13, fig. 7).

Skeleton (Fig. 3).
The ectosomal skeleton is about 500 µm thick and composed of two layers. The external one is a palisade (≈ 170 µm thick) of ectosomal tylostyles perpendicular to the surface and which lays directly on the internal tangential layer (≈ 340 µm thick) of intermediary tylostyles. The choanosomal skeleton consists of multispicular tracts of principal tylostyles perpendicular to the surface which they pass through. Free intermediary tylostyles are scattered between these tracts. The principal skeleton of the papillae is composed of longitudinal tracts of principal tylostyles. They are the extension of the tracts from the choanosome. From the outside to the inside, the skeleton of the papillae is composed of a palisade of ectosomal tylostyles, a tangential layer of intermediary tylostyles which are in continuity with that of the main body, and the longitudinal tracts.

Spicules (Fig. 2A-C)
Ectosomal tylostyles straight or slightly bent with a well-marked head: 154-201/1.5-4 µm (mean 175/2.5 µm, N > 50).
Intermediary tylostyles straight or slightly bent with a head more or less marked: 300-715/8-11 µm (mean 507/10 µm, N > 50).
Principal tylostyles straight or slightly bent with a head more or less marked: 874-1543/8-12 µm (mean 1080/10 µm, N > 50).

Remarks
The studied specimen of *P. penicillus* is the specimen BMNH (30.7.3.26) from Montagu collection in the Dr Grant Cabinet. We formally
The type species of *Polymastia* Bowerbank 333

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**TABLE 1.** — Discriminating characters for the species of *Polymastia* from the Atlantic area, reported by Boury-Esnault (1987) and Boury-Esnault et al. (1994). Abbreviations: b, bent; e, ectosomal spicule; f, fusiform; I, intermediary spicule; P, perpendicular; p, polytylote; S, strongyloxea; s, straight; St, style; T, tylostyle; t, tangential.

<table>
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<td>N° of layers</td>
<td>Foreign bodies</td>
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designed this specimen as the type specimen of *Polymastia penicillus*. The common *Polymastia* species from the NE Atlantic coast corresponds exactly with this species (Boury-Esnault 1974, 1987; personal collections of the authors from Irish coast and Channel Sea) and with the specimens (BMNH 1910.1.1.8 and BMNH 1930.7.3.3) from the Bowerbank collection and identified by Bowerbank as *P. mamillaris*.

**DISCUSSION**

*Polymastia mamillaris* and *P. penicillus* considered as synonymous since Johnston (1842) are in fact two valid species. The main differences between *P. mamillaris* and *P. penicillus* are the number of layers of the cortex, the type of free spicules present in the choanosome which are intermediary in *P. penicillus* versus ectosomal in *P. mamillaris*, the shape and size of the spicules particularly the thickness of the three types of spicules which vary from 2 to 12 µm in *P. penicillus* versus 11 to 24 µm in *P. mamillaris*.

The redescription of the characters of *Spongia mamillaris* Müller, 1806 does not modify the definition of the genus *Polymastia* as it is presently understood and accepted (Boury-Esnault 1987; Boury-Esnault et al. 1994; Kelly-Borges & Bergquist 1997). Consequently the type species of *Polymastia* is *Spongia mamillaris* Müller, 1806, misidentified as *Halichondria mamillaris* “Johnston, 1842” in the original designation by Bowerbank, 1864.

In order to compare the different species of *Polymastia* found in the Atlantic Ocean, we have completed a comparative table made by Boury-Esnault (1987) with further data found in Boury-Esnault et al. (1994) (Table 1). No other *Polymastia* known from the Atlantic area corresponds with the true *Polymastia mamillaris* Müller (1806). On the other hand, the type of *P. penicillus* corresponds perfectly with the *Polymastia* species from the NE Atlantic coast erroneously called “*mamillaris*” since Johnston and Bowerbank. This common species is accordingly to be called *P. penicillus* (Montagu, 1818).

In future work, a great attention has to be paid to the geographic distribution of both species. *Polymastia mamillaris* is presently known from the Swedish west coast, the type locality being 58°15’N, 11°50’E. *Polymastia mamillaris* has a more northern distribution than *P penicillus*. The apparently large geographical distribution of *P. mamillaris* over the whole North Atlantic as well as South Atlantic (Burton 1926) is in fact due to an overconservative taxonomy as it has been demonstrated for many over complex of sponge species (Boury-Esnault et al. 1999; Klautau et al. 1999). Once more it is necessary to point out the necessity to return to the type specimen, to carefully verify the skeletal characters and to observe the morphological similarities even for a well-known species.

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