

## STYELA MAMMICULATA N.SP., A NEW SPECIES OF ASCIDIAN FROM THE PLYMOUTH AREA

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(Text-figs. 1 and 2)

*Styela mammiculata*<sup>1</sup> n.sp. is based on four specimens collected in the Plymouth area during the summer of 1953. The most noticeable external feature is the extensive mammillation of the test. The mammillae are much smaller than those of *Phallusia mammillata* and deserve to be called rather 'mammiculae'.

Of the four specimens, two were taken from Drake's Island buoy (National Grid Reference, 20/4753) in Plymouth Sound, growing about half a metre below the water line, and two from the oyster bed of the Lynher river estuary, near Antony Ferry (National Grid Reference, 20/4257), growing about 12 m. below low-tide mark attached to oyster shells. The largest specimen was from the latter locality and measured 111 mm. long in the contracted, fixed condition. The smallest, from Drake's Island buoy, was 54 mm. long.<sup>2</sup>

Each specimen (see Fig. 1) is attached by an enlarged plate of test substance from which arises a short stout pedicel, accounting for about one-third of the total length of the body. It is evident that the stalked condition is not dependent on habitat, as it is in *Styela plicata* (Lesueur), which develops the stalked condition only under conditions of crowding, for of the four specimens of *S. mammiculata* two were growing (on Drake's Island buoy) in crowded conditions among *Molgula* while the other two, from the Lynher oyster beds, were quite isolated, attached to oyster shells, and yet showed the same degree of stalk development. In all four specimens the stalk is bent through a right angle so that the body comes to lie parallel to the substrate with the ventrum outwards. The animals in the Lynher must therefore have been lying horizontally, and those on the buoy probably vertically. The curvature persisted in one specimen through 3 months in the aquarium, during which time the animal doubled in size. The basal 'holdfast' is rather sharply delimited from the pedicel which is transversely wrinkled at the base, even in living animals, but longitudinally wrinkled for the greater part of its length. The body is mammillated in the upper region and transversely wrinkled, when contracted, in the lower part. The entire test is pubescent. In colour the

<sup>1</sup> From Latin *mammicula*, a small breast or protuberance.

<sup>2</sup> Since writing this paper a fifth specimen, 47 mm. long, has been collected from a buoy in the Sound and a sixth, 129 mm. long, from West Wharf, Millbay docks.

animals are brown, with the mammillations a paler colour. The colour is retained in formalin for at least 3 months. The four-lobed atrial and buccal siphons are marked with longitudinal stripes of almost white and a rich chocolate brown, four of each. The brown stripes are rather wider than the white, and each one is divided by a central paler zone which does not quite reach to the edge of the siphon (see Fig. 1, inset). The same colour pattern is repeated on the inside of each siphon but does not continue very far in, fading to a whitish hue about 4-5 mm. down. When the siphons are open they are

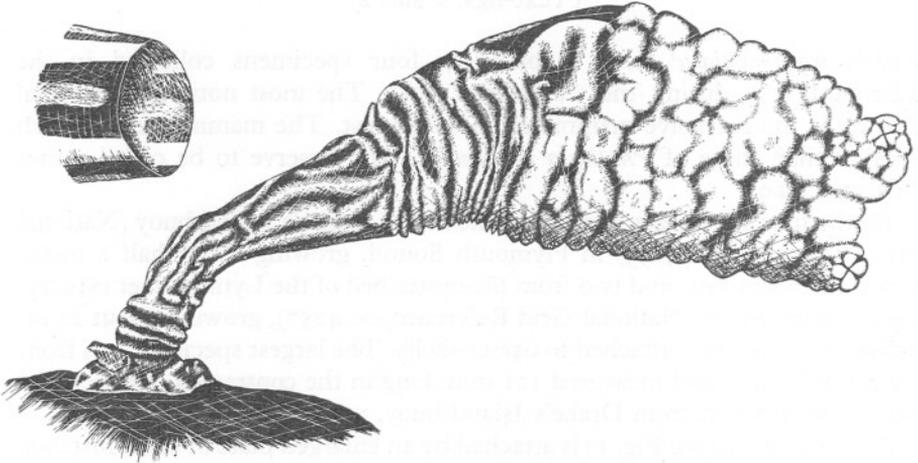


Fig. 1. Sketch of a contracted specimen of *S. mammiculata* from the left side; natural size. Inset: the buccal siphon open, showing the pattern of dark and light stripes;  $\times 3$ .

almost perfectly round, or at least there are no obvious angles. When they close the white stripes remain outwards, while the dark stripes bend to meet each other; the white stripes in the contracted condition show slight mammillations. An end view of a partly contracted siphon rim shows the pattern of a four-leafed clover with the sharpest angles inwards and rounded angles on the outside; this is the reverse of the more common condition in Styelidae and Pyuridae, where the partly closed siphon is frequently squarish in end view, with the most acute angles outwards.

The mantle separates readily from the test and is moderately stout and muscular. It extends the whole way down the pedicel, which is hollow, but not into the 'holdfast' which is solid. This character is shared with *S. montereyensis* (Dall) and *S. barnharti* Ritter & Forsyth, the stalked species of the Californian coast.

The branchial siphon has a single ring of about forty simple tentacles which are winged (Fig. 2D), but not distinctly keeled, and all of one order of size—about 4.5 mm. in the largest specimen. The dorsal tubercle is about 2 mm.

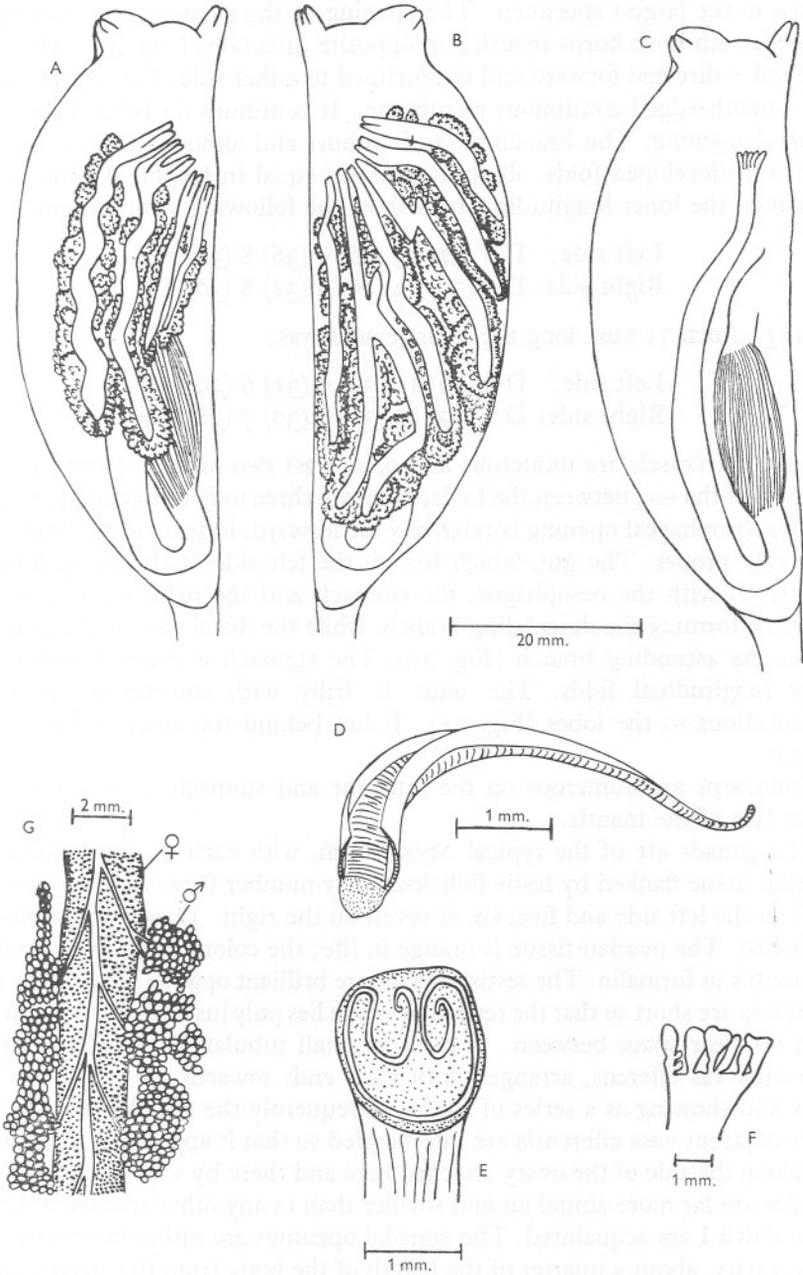


Fig. 2. Anatomical details of *S. mammiculata*. A, zooid removed from test, drawn from the left side; B, the same from the right side; C, the zooid from the left side with the mantle and gonads removed to show the course of the gut; D, an oral tentacle showing the 'wings'; E, the dorsal tubercle; F, the anus; G, a portion of a gonad.

across in the largest specimen. The opening of the ciliated pit is horseshoe-shaped, with both horns incurled in opposite directions (Fig. 2E). The open interval is directed forward and not inclined to either side. The dorsal lamina is a smooth-edged continuous membrane. It continues far behind the oesophageal opening. The branchial sac is robust and almost opaque. It bears four well-developed folds, all approximately equal in height. In the largest specimen the inner longitudinal bars show the following arrangement:

Left side: D 8 (32) 13 (36) 9 (36) 8 (30) 7 V  
 Right side: D 7 (30) 12 (36) 9 (32) 8 (30) 6 V

In a specimen 71 mm. long the arrangement was:

Left side: D 6 (29) 11 (30) 9 (31) 6 (29) 5 V  
 Right side: D 6 (29) 10 (31) 9 (30) 7 (28) 5 V

Transverse vessels are numerous and of at least two orders of size. On the flat part of the sac, between the folds, there are three to five stigmata per mesh.

The oesophageal opening is relatively far forward, in front of the middle of the body proper. The gut, which lies on the left side of the body, forms a simple U, with the oesophagus, the stomach and the proximal part of the intestine forming the descending branch, while the distal part of the intestine forms the ascending branch (Fig. 2C). The stomach is pleated with about forty longitudinal folds. The anus is frilly with sometimes secondary ramifications to the lobes (Fig. 2F). It lies behind the anterior end of the gonads.

Endocarps are numerous on the intestine and stomach as well as on the inner face of the mantle.

The gonads are of the typical *Styela* form, with each a central strand of ovarian tissue flanked by testis follicles. They number three or four (possibly five) on the left side and five, six or seven on the right. One or more may be branched. The ovarian tissue is orange in life; the colour fades over a period of months in formalin. The testis follicles are brilliant opaque white. The vasa efferentia are short so that the testicular tissue lies only just beyond the ovarian, with no clear space between. A mass of small tubular testis follicles opens into each vas efferens, arranged with their ends towards the outside of the mass and showing as a series of circles. Frequently the follicles from two or more adjacent vasa efferentia are intertangled so that it appears as if the testis ran along the side of the ovary attached here and there by vasa efferentia. The tubules are far more abundant and smaller than in any other species of *Styela* with which I am acquainted. The gonadal openings are rather far back in the atrial cavity, about a quarter of the length of the body from the atrial siphon, as an average. Those on one side are arranged along an arc of a circle.

There can be no doubt that this is a species of *Styela*. *S. mammiculata* is clearly different from any European species of *Styela* in the large number of

gonads on the left side. In certain respects it approaches the Mediterranean *S. plicata*, notably in the number and macroscopic form of the gonads of the right side, but it differs in the number of gonads of the left side (2, occasionally 3, in *S. plicata*), in the arrangement of bars on the branchial folds (*S. plicata* has fewer bars and the ventral fold is smaller than the rest), in the form of the tentacles (which are usually keeled in *S. plicata*, and of more than one order of size), in the smaller number of stigmata per mesh, in the smaller, more numerous testis follicles and in the stalk. *S. mammiculata* is nearest to Van Name's (1945) description of the South Californian species of *S. barnharti* Ritter & Forsyth, but rather more different from the description of this species given by Ritter & Forsyth (1917). It differs from van Name's description of this species in the following points:

(i) The pattern of furrowing of the body is distinct. (ii) *S. mammiculata* has only about forty oral tentacles compared with 'at least seventy in large examples' of *S. barnharti*. (iii) The fourth branchial fold has only two to four less bars than the others in *S. mammiculata*, while in a specimen of *S. barnharti* of about the same size as the specimen whose bar-numbers are given above the fourth bar has thirteen to fifteen less bars than the others. (iv) The dorsal tubercle is more complex in *S. mammiculata*. (v) *S. barnharti* tends to have rather more gonads on the right side than *S. mammiculata*. (vi) The vasa efferentia of *S. mammiculata* are relatively shorter. (vii) The testis follicles are smaller and more numerous in *S. mammiculata*. (viii) In *S. barnharti* the gonads have never been reported to branch, a character found in three of my four specimens. (ix) The course of the gut is more circuitous in *S. barnharti* and the stomach is the hindmost part of the loop, whereas in *S. mammiculata* part of the intestine forms the posterior end of the gut loop. (x) The gonadal apertures and the anus are farther back in *S. mammiculata* than in *S. barnharti*.

*S. mammiculata* does not approach the Japanese species *S. elsa* Hartmeyer (1906) which Ritter & Forsyth regarded as nearest to *S. barnharti*.

*S. mammiculata* appears to be a new arrival in Plymouth waters, for an animal so conspicuous and of such large size is not likely to have been overlooked. Moreover, Mr T. R. Tozer, the Senior Scientific Assistant in charge of the specimen room at this laboratory, brought the first specimen to my notice because he had never seen anything like it in the course of his 20 years in that department. It is of course possible but rather improbable, that it may have been overlooked. It is likely that it has been imported with oysters.

The type specimen has been deposited in the British Museum (Natural History).

I wish to thank Dr R. H. Millar for his helpful criticisms of the manuscript.

## SUMMARY

*Styela mammiculata* is a new species of ascidian from the Plymouth area. It is stalked and characterized from the remaining European species of the genus by possessing more than two gonads on the left side. Of previously described species of *Styela* it is nearest to *S. barnharti* Ritter & Forsyth from southern California.

## REFERENCES

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