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Author(s)	R.W.M. van Soest
Faculty	UvA: Universiteitsbibliotheek
Year	1973

FULL BIBLIOGRAPHIC DETAILS:

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SERIES OF MISCELLANEOUS PUBLICATIONS

INSTITUTE OF TAXONOMIC ZOOLOGY (ZOOLOGICAL MUSEUM)

UNIVERSITY OF AMSTERDAM

No. 273

Volume 21

August 1, 1973

A new species in the genus *Salpa* Forskål, 1775 (Tunicata, Thaliacea)

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ABSTRACT

Salpa younti nov. spec. is described from the Bermuda area. The new species is also reported from the South Atlantic and the Pacific. Its systematic position within the genus *Salpa* is discussed and general remarks are made on the taxonomic status of the known taxa of this genus.

Foxton (1961), in his study on *Salpa fusiformis* Cuvier, 1804, and related species, revived *Salpa aspera* Chamisso, 1819. The difference between the latter species and its sympatric relative *Salpa fusiformis* concerns the structure and the surface of the test (echinated or smooth), the fusion of the body muscles and the number of fibres of the body muscles. Foxton was able to demonstrate clear differences without overlap or intermediate characters between both species. Apart from reviving *S. aspera* he also described two new species of the genus *Salpa*, *S. thompsoni* and *S. gerlachei*, which have been reported only from antarctic and subantarctic waters, clearly allopatric as far as *S. aspera* and *S. fusiformis* are concerned. Foxton hardly considered the position of *Salpa maxima* Forskål, 1775, within the genus *Salpa*. This species seems to be distinctly separated from the four other species (known as *Salpa fusiformis* group): its size, the absence of fused body muscles in the solitary zooids, the peculiar fusion of the body muscles in the aggregate zooids, and the shape and size of the dorsal tubercle, all seem to justify the separation of a subgenus.

The echinated specimens of *Salpa maxima* described and pictured by Yount (1954: 300—304, figs. 13 and 14) were considered as specimens of *S. aspera* by Foxton (l.c.), as he had not seen any echinated *S. maxima* in his

Received: April 18, 1973.

material. However, the new species to be described below is considered identical with some of Yount's echinated *S. maxima*. Moreover, there are some indications to assume that Foxton did in fact see echinated *S. maxima* (= *S. younti* nov. spec.), but confused them with his *S. aspera* material. This is quite understandable in view of the great resemblance of the aggregate zooids of *S. aspera* and the new species.

Material was studied from various oceanic localities, collected by the Ocean Acre Project (financially supported by the U.S. Navy) in the Bermuda area, by the Dana Expeditions in the South Atlantic, and by the Siboga Expedition in the Indonesian Archipelago. Incidental samples studied were collected by the "Walther Herwig" in the Equatorial Atlantic, and by Owston near Misaki, Japan.

Acknowledgments: thanks are due to Dr. J. Knudsen of the Zoologiske Museum in Copenhagen, Dr. C. F. E. Roper and Dr. D. L. Pawson of the United States National Museum in Washington, and Miss Dr. A. M. Clark of the British Museum (Natural History) in London for the loan of material.

Salpa younti nov. spec.

?*Salpa maxima* fo. *tuberculata*; Sewell, 1953 : 8 (in part).

Salpa maxima echinate form; Yount, 1954 : 300, figs. 13 and 14.

?*Salpa aspera*; Foxton, 1961 : 10, table I (in part).

Type material. —

Holotype (fig. 1a-b, 2b): a solitary specimen collected by Ocean Acre Project Cruise 13, station 24 M (32°08'N, 63°47'W, 28-II-1972, 22.45—23.32 h, 0—1236 m.). Incorporated in the United States National Museum, reg.no. 12014.

Paratypes: 7 solitary and 10 aggregate zooids, one of which has been pictured in fig. 1c. USNM reg.no. 12015, 1 sol; Acre 13-24M (same data as holotype); ZMA reg.no. TU.1361, 1 sol, Acre 13-22C (31°55'N, 63°51'W, 28-II-1972, ca 03.00 h, 150 m); ZMA reg.no. TU.1364, 1 sol, Acre 13-32B (32°28'N, 63°45'W, 1-III-1972, 15.15—16.30 h, 33 m); ZMA reg.no. TU.1362, 1 sol, Acre 13-5M (31°47'N, 64°20'W, 23-II-1972, 19.10—19.39 h, 0—229 m); USNM reg.no. 12018, 2 sol, Acre 13-2M (31°50'N, 63°52'W, 23-II-1972, 06.20—06.35 h, 0—40 m); ZMA reg.no. TU.1363, 1 sol, Acre 13-32M (32°28'N, 63°45'W, 1-III-1972, 16.45—17.30 h, 0—33 m); USNM reg.no. 12016, 1 greg (figured paratype), Acre 13-10C (32°20'N, 63°33'W), 25-II-1972, 04.10—05.10 h, 100 m); USNM reg.no. 12017, 4 greg, Acre 13-10C (same data as figured paratype); ZMA reg.no. TU.1365, 2 greg, Acre 13-10C (same data as figured paratype); ZMA reg.no. TU.1366, 3 greg, Acre 13-16M (32°02'N, 63°58'W, 26-II-1972, 17.15 h, 0—1600 m).

Description. —

Solitary zooids: Test flabby, elongately cylindrical, distinctly thickened posteriorly. On posterior part of the test are eight short longitudinal ridges of distinct serrations, which do not reach beyond the anterior margin of the

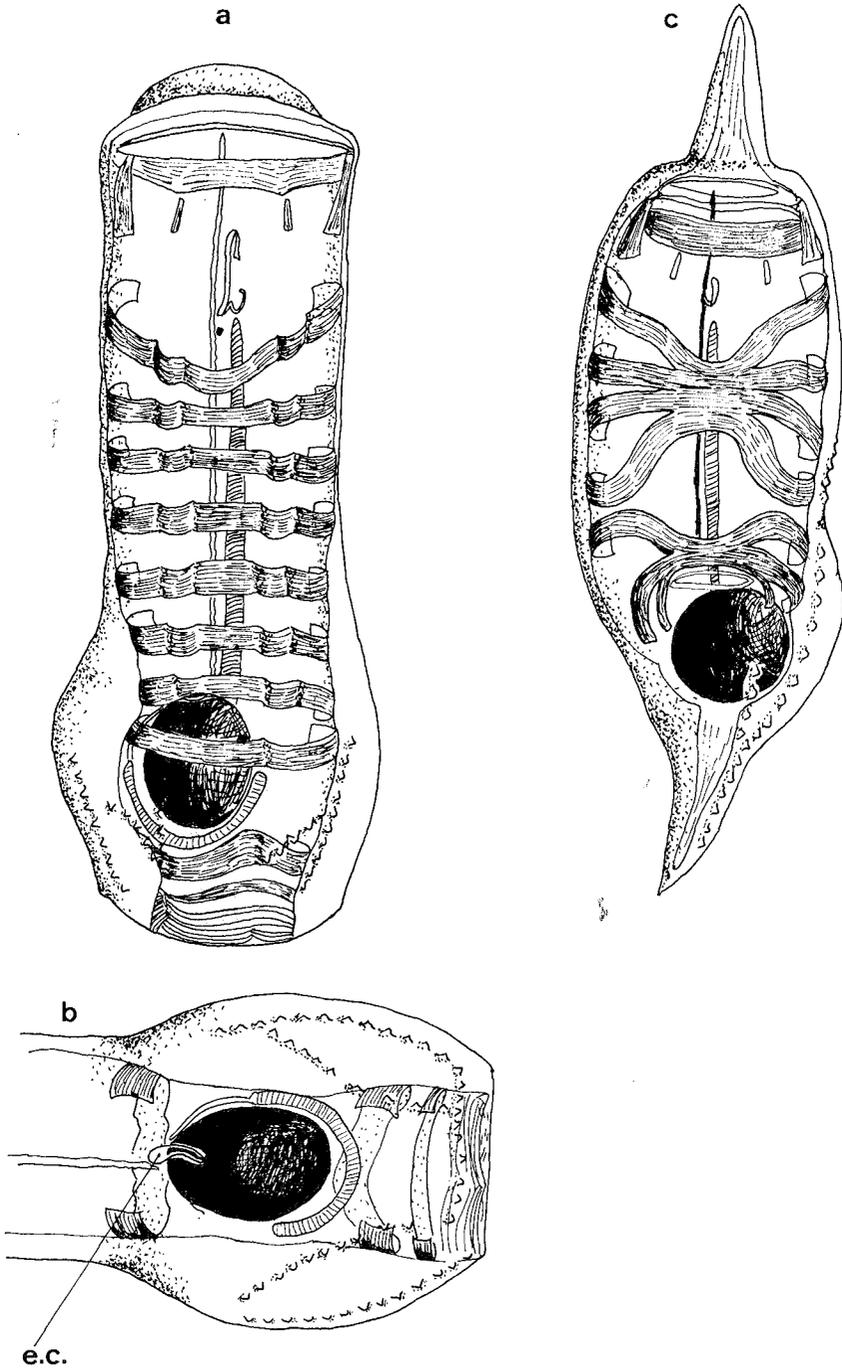


FIG. 1. *Salpa younti* nov. spec. a. Holotype (USNM reg.no. 12014), dorsal view of entire animal. b. Holotype, ventral view of posterior part (e.c. = rudimentary elaioblast cavity). c. Aggregate zooid (paratype, USNM reg.no. 12016), dorsal view of entire animal.

nucleus, and one or two transversal ridges of serrations ventral and dorsal to the atrial aperture. A "chin" ventral to and in front of the oral aperture seems to be present in the majority of the specimens. There are no apparent posterior projections.

Musculature: The first body muscle (M I) approaches the second (M II); M II—VIII run parallel; M IX approaches M VIII. The number of muscle fibres of M IV is 98 in the holotype, 85—105 in the holotype and seven paratypes.

Atrial musculature: 14—17 atrial retractors.

Dorsal tubercle (fig. 2b): a complicated loop, nearly identical to that of *Salpa maxima* Forskål, 1775 (fig. 2c).

Nucleus: Relatively big; a rudimentary elaioblast cavity present in older individuals (fig. 1b).

Stolon: Probably identical with that of *Salpa maxima*.

Size: Length of holotype 63.7 mm, length range of holotype and seven paratypes: 33.8—78.0 mm.

Aggregate zooids: Test flabby, fusiform, distinctly thickened unilaterally in the nucleus area. Two serrated ridges converging into one posterior to the nucleus. One short dorsal ridge runs to halfway across the nucleus, a second, lateral ridge reaches halfway the length of the animal. Distinct posterior and anterior projections; test constricted at transition from anterior projection to the body proper (as in *S. maxima* greg. and *S. fusiformis* greg.).

Musculature: Body muscles dorsally fused into two groups: M I—IV and M V—VI; body muscles IV and V near laterally but do not touch. M I—II and M III—IV not grouped separately as in *S. maxima* greg. The number of muscle fibres of M I—VI is 198 in the figured paratype; the range of ten paratypes is 193—204.

Oral musculature: of the *S. maxima*-type (see Yount, 1954: fig. 15).

Dorsal tubercle: L-shaped, larger than in *S. fusiformis* and *S. aspera* (fig. 2a), smaller than in *S. maxima* (fig. 2c).

Nucleus: Relatively big, bulging.

Embryo: Situated as in the other species of *Salpa*. In one of the paratypes (ZMA reg.no. TU.1366) the embryo could be identified as the solitary *Salpa younti*.

Distribution (fig. 3). —

Apart from the Bermuda area the species has been found in the South Atlantic at Dana Exp. st. 3978 (VII, VIII and IX). The samples from this station contained 2 sol. and 4 greg. The number of muscle fibres in the solitary zooids conformed with that in the type specimens: M IV = 105—110. In the aggregate zooids the number of fibres of M I—VI was somewhat higher: 226—238. At Dana Exp. st. 3999 III, 3998 XI, 3997 III and 3996 V (03°—15°S, 10°—05°W) aggregate zooids were found with a muscle fibre number of 127—166 (n = 17). As *Salpa aspera* greg. appeared to have a number of muscle fibres of 80—110 (n = 48) in this area, it is assumed that the specimens with the higher number of muscle fibres belong

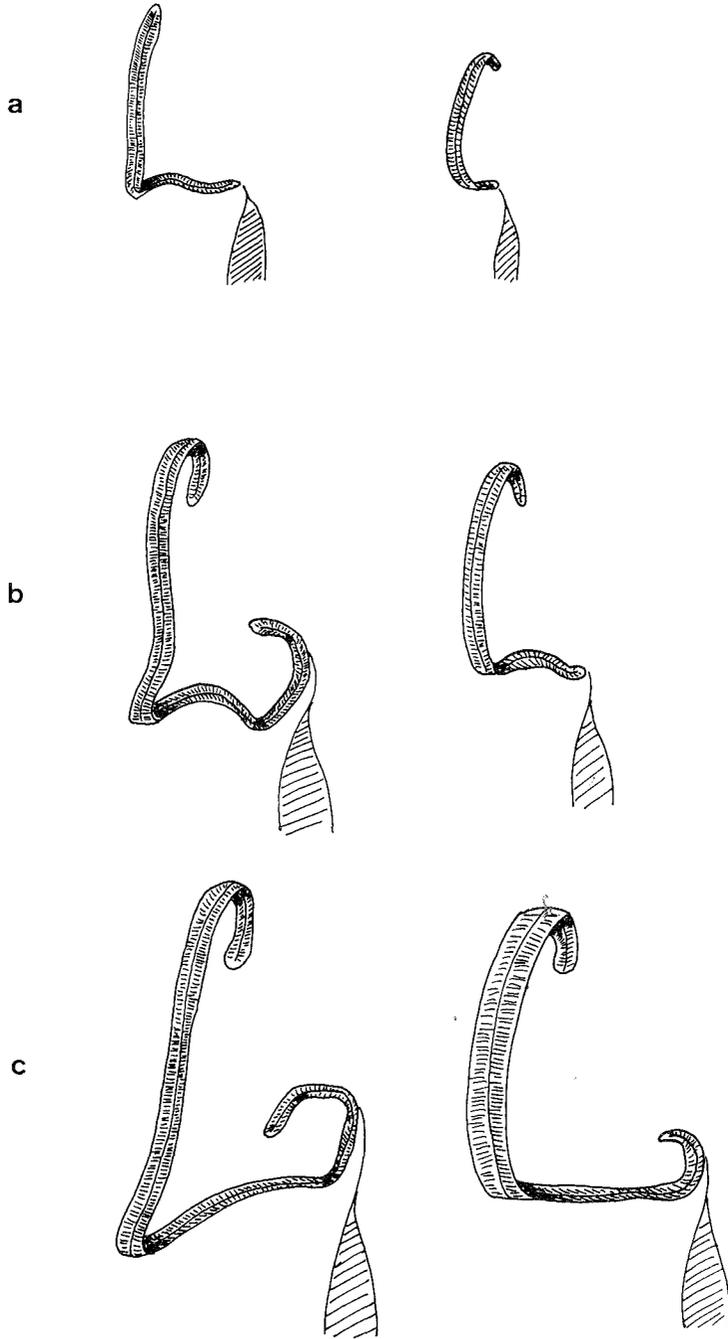


FIG. 2. Dorsal tubercle (in oblique dorsolateral view) in three species of the genus *Salpa*; left column—solitary zooids, right column—aggregate zooids. a. *Salpa aspera* Chamisso, 1819. b. *Salpa younti* nov. spec. c. *Salpa maxima* Forskål, 1775.

to *Salpa younti*. The number of muscle fibres has been found to vary clinally in *Salpa fusiformis* (see van Soest, 1972) and apparently also in the other species of *Salpa*. One specimen of the aggregate generation was found in a sample collected by the "Walther Herwig" in May 1970 at 01°N, 18°W (st. WH-478).

Next to the specimens reported by Yount (1954) from the Central Pacific, a further Pacific record can be mentioned. Numerous aggregate specimens were collected by Owston near Misaki, Japan (BMNH reg.no. 1907.9.1-34). Several specimens of the same generation occurred at Siboga st. 201 and 280 (03°03'S, 125°59'E and 08°17'S, 127°30'E); a big released embryo from st. 201 also belonged to this species. The muscle fibre number of the Siboga aggregates varied from 199—213 (n = 6).

Sewell (1953) records *Salpa maxima* fo. *tuberculata* Metcalf, 1919, from the Arabian Sea. From Sewell's description of what he assumes to be the unknown solitary zooid of this form, it seems likely he had in reality specimens of *Salpa younti* at hand.

Etymology: named after Dr. J. L. Yount who described and pictured specimens of the species, but did not separate these from *S. maxima*.

Discussion. —

Foxton (1961), in his description of *Salpa aspera*, mentions a mean number of muscle fibres of the aggregate zooids of 194. Examination of material of *Salpa aspera* from the northern and southern Atlantic (39°N-27°S) by the present author revealed a mean number of muscle fibres of

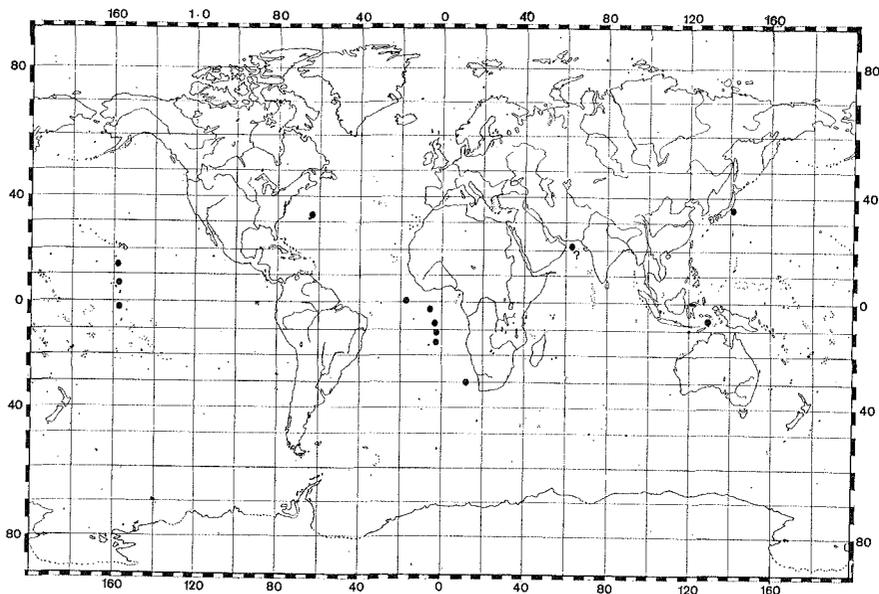


FIG. 3. Distribution of *Salpa younti* nov. spec., partly after literature data. Question mark indicates uncertain record.

Salpa aspera greg. of about 150 in the northern Atlantic (30°—40°N) and about 95 in the Central South Atlantic, due to clinal variation. The mean number of muscle fibres of *Salpa younti* greg. from the type locality is 200. In view of the great resemblance of both species as far as the aggregate zooids are concerned it seems likely to suppose Foxton did include some specimens of *Salpa younti* greg. in his countings.

Salpa younti links the species of the *Salpa fusiformis* group (*S. fusiformis*, *S. thompsoni*, *S. gerlachei* and *S. aspera*) to *Salpa maxima*. The aggregate zooid is barely distinguishable from *S. aspera* greg. and the solitary zooid differs only slightly from *Salpa maxima*.

Four of the species of the genus *Salpa* are sympatric in temperate and tropical waters of the Atlantic: *S. fusiformis*, *S. aspera*, *S. younti* and *S. maxima*. Oceanic samples containing two or even three species simultaneously are not rare. On the one hand this provides a strong argument for the specific status of the taxa of the genus *Salpa*, on the other hand it raises serious questions about the possible way in which the speciation within the genus *Salpa* has taken place. It is relevant to point out the great resemblance in characters of taxonomic significance both in the genus *Salpa* and the genus *Thalia* Blumenbach, 1789 (see van Soest, 1973). In both genera the species differ in the echinations (serrations) of the test, the manner of fusion of the body muscles and the number of muscle fibres.

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