Stepanjants, S.D. 1973

Revision of the subfamily Galettinae (Diphyidae, Siphonophora)

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Summary

As a result of revision the subfamily Galettinae has proved to include two genera that differ in the presence or absence of basal teeth on the nectophores and the size of the nectophore (it is smaller in *Galetta* than in *Sulculeolaria*). The presence of commissural canals connecting the lateral radial canals to the ventral one is a transient feature, but in all of the representatives of the genus *Sulculeolaria* commissures were found whereas inn *Galetta* they may be present or absent. 3 species are known within the genus *Sulculeolaria*; the status of one *S. brintoni* being doubtful. In the genus *Galetta*, 6 species have been described that are closely related but distinctly differ in the detailed structure of the upper and lower nectophores. The Galettinae is a typical tropical subfamily. Most of the species are widespread in the tropics. They dwell in superficial waters. Most of them were found mainly within the 200 to 0 m horizon.

The most widespread family of siphonophores of the suborder Calycophorae – the Diphyidae includes five subfamilies: Monophyinae, Galettinae, Chuniphyinae, Diphyinae and Dimophyinae representatives of which differ distinctly in the structure of the anterior and posterior nectophores of the polygastric colonies (fig. 1). Galettinae are the most primitive amongst them (Totton, 1965; Stepanjants, 1967) since representatives of this subfamily do not undergo a permanent separation from the colonies of free-swimming monogastric stages, although cormidia are formed on the siphosome each of which is covered by a bract in the form of a protective hood (fig. 1, Б, 3). In contrast other subfamilies of Diphyidae are characterised by the presence of eudoxid (or ersea) stages (fig. 1, А, 2, В, 3, Г, 3, Д, 3).

Despite the presence of sufficiently distinct features allowing this or that siphonophore to be accurately attributed to the Galettinae it is not always possible to ascertain to which species a specimen belongs, because of the absence of distinct species criteria within this subfamily. Various authors have, and still do, attribute varying importance to the structural elements of the nectophores. The resulting confusion applies not only to defining the boundaries between species and genera, but also to their respective naming.

The following is an attempt based on old and new material collected in the equatorial waters of the Pacific to establish a system for the subfamily.

Galettinae Stechow, 1921.

Diphyidae with two definitive nectophores lying one beneath the other. The anterior is conical, the posterior more cylindrical. Both are flattened laterally, smooth and have no ridges. The base of the subumbrella of both nectophores either has or lacks teeth. Each nectophore carries at its base a special mouthplate – a lamella that is an outgrowth of the central of the bell. The mouth-plate may be either continuous or divided into two, with or without teeth. The anterior nectophore has no hydroecium, its somatocyst may be very small, almost inconspicuous, or represented by a long, slender tube. The somatocyst of the posterior nectophore is reduced. The longitudinal axis of both nectophores is slightly curved giving the nectosac a very characteristic mitre shape. The walls of the subumbrella have arched, curved lateral radial canals

that, in the case of the anterior nectophore, may be joined to the ventral canal by means of commissures. Free-swimming eudoxids, or ersea, are not known.

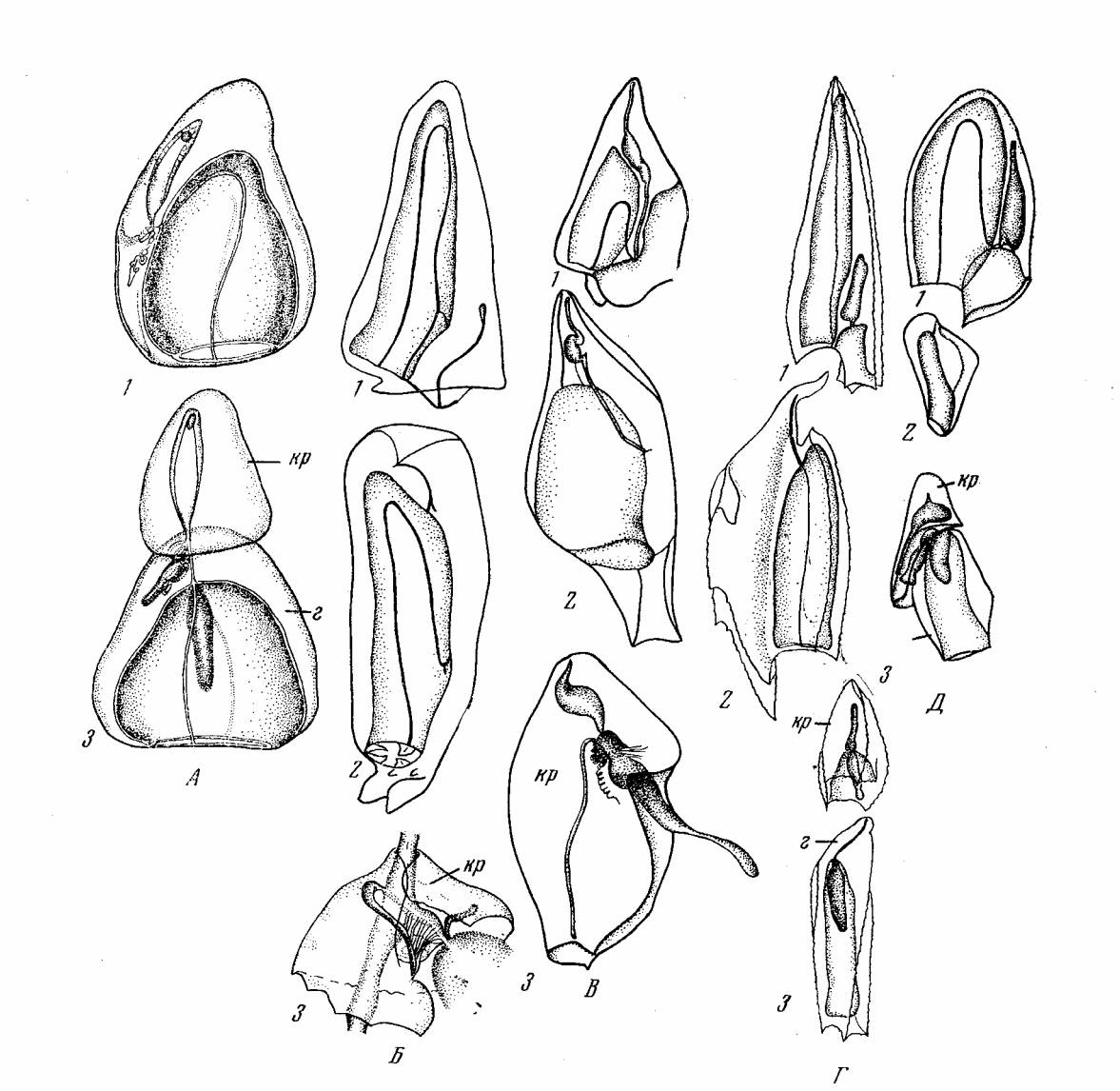

Fig. 1. Schematic representation of the structure of nectophores and monogastric stages in various subfamilies of Diphyidae.
А. – Monophyinae, *Monophyes irregularis* Claus; Б- Galettinae, *Sulculeolaria quadrivalvis* Blainville; В. – Chuniphyinae, *Clausophyes galeata* L. & v. R.; Г.- Diphyinae, *Eudoxoides mitra*; Д. Dimophyinae, *Dimophyes arctica* (Chun); *1*. - Anterior, *2*. – posterior definitive nectophore, *3*. – monogastric stage, (кр - bract, з – gonophore).

The present revision regards the genera *Sulculeolaria* (with basal teeth on the nectophores) and *Galetta* (without basal teeth) as independent, bearing in mind that the presence or absence of teeth on the base of the subumbrella served as a taxonomic feature of the genus (Stepanjants, 1967, p. 88). Studies on a sufficiently large number of specimens from the collections of the Zoological Institute of the USSR Academy of Sciences has allowed us to conclude that the presence or absence of teeth in the

Galettinae is a permanent feature and never varies within the species. There is a whole group of species in whose representatives basal teeth have never been found and which, on this basis, should be placed in the genus *Galetta*. Another group of species is characterised by the presence of basal teeth and on this basis may be attributed to the other genus *Sulculeolaria*. Both genera may also be differentiated by the size of the nectophores: they are smaller in *Galetta* than in *Sulculeolaria*. In addition, the presence in representatives of *Galetta* of commissures connecting the lateral radial canals to the ventral canal is a transient feature since representatives of *Sulculeolaria* always have commissures (see below).

It is not out of place to mention here that the number of basal teeth in various representatives of *Sulculeolaria* may also be regarded as a permanent feature if we are talking of real basal teeth that in different specimens of the same species vary in size, shape and may even be absent (see below) should rather be regarded as outgrowths of the subumbrella wall and not take their size, shape, or even absence or presence as a permanent feature.

Galetta Stechow, 1921.

Anterior nectophore 10-17 mm[1] in height, laterally flattened with a noticeably arched longitudinal axis. Nectophores without basal teeth in the base of the subumbrella, but have a mouthplate consisting of two wings.

The lateral radial canals of the subumbrella wall may be connected to the ventral one by commissures, but they may also lack the latter. The baso-ventral edge of the nectophores more or less obliquely cut off. Somatocyst may be very small, often oval in shape, or long like a narrow arched tube.

Posterior nectophores up to 20 (26?) mm in height with a continuous or divided mouth-plate. Structure of the mouthplate is very indicative for each species of the genus *Galetta*.

Type species *Galeolaria australis* Quoy and Gaimard, 1833.

Stepanjants' work (1967) states that the species of the genus *Galetta* are so closely related that the right of each of them to an independent status must henceforth be revised. The present revision recognises the following species as independent: *G. australis* (Q. & G., 1833), *G. biloba* (M. Sars, 1846), *G. chuni* (Lens and van Riemsdijk, 1908), *G. angusta* (Totton, 1954), *G. bigelowi* Sears, 1950, and describes a hitherto unknown species from the equatorial waters of the Pacific: *Galetta pacifica* sp. n.

Table for the identification of species of the genus *Galetta*

1 (8) Anterior nectophore with a very small, hardly noticeable somatocyst.
2 (3) Length of the mouthplate of the anterior nectophore a quarter of its overall height. Ventro-basal edge of the anterior nectophore sharply tapered. *Galetta bigelowi* M. Sears
3 (2) Length of mouthplate of anterior nectophore less than a quarter of its height, ventro-basal edge of anterior nectophore hardly tapered.
4 (5) Left wing of mouthplate of anterior nectophore has a small mesogloeal valve. Mouth-plate of posterior nectophore divided, its left wing bearing a mesogloeal valve and is smaller than the right wing. *Galetta pacifica* sp. n.

[1] According to Totton (1965) up to 26 mm.

5 (4) Wings of mouthplate in anterior nectophore have no valves. Mouth-plate of posterior nectophore continuous.
6 (7) Mouth-plate of posterior nectophore smooth *Galetta australis* Q. & G.
7 (6) Mouth-plate of posterior nectophore has a concave edge and has a mesogloeal tooth to the left, under the base of the subumbrella. *Galetta angusta* (Totton)
8 (1) Somatocyst of anterior nectophore very distinct.
9 (10) Somatocyst of anterior nectophore shaped like a small oval vesicle. Mouth-plate of posterior nectophore divided and has in the middle of the dorsal side a trough-like depression. Wings of lamella equal. *Galetta biloba* (M. Sars)
10 (9) Somatocyst of anterior nectophore is a slender arched tube. Mouthplate of posterior nectophore divided, with its right wing larger than the left, trough-like depression absent. *Galetta chuni* (Lens and van Riemsdijk, 1908)

Galetta australis (Quoy and Gaimard, 1833)
(Fig. 2, *1, 2*)

Anterior definitive nectophore up to 11 mm in height[2]. Ventro-basal edge slightly tapered. Pedicular canal at the point of divergence of the somatocyst does not drop below the ventro-basal edge of the nectophore. Lateral canals may connect to the ventral by commissures but sometimes the latter may be absent (fig. 2, *1*). Somatocyst vesicle shaped or as a very small tube. Comprises about 1/20th the overall height of the nectophore. Posterior definitive nectophore up to 13 mm in height. Mouth-plate continuous (Fig. 2, *2*). Cormidia of the siphosome covered by a hood-like protective bract.

Totton (1954, 1965) believes that *G. australis* is a collective species part of which should be identified with *G. biloba*, as Bigelow (12911) had done although he named the species he found *G. australis*. Totton identifies the other sort with *G. turgida* Gegenbaur. In connection with Blainville's wok (1834), which contains a description of the genus *Galeolaria* (=*Galetta*) (both *Galetta australis* and *Galetta biloba* are mentioned) taken by Lesueur (1807), and later described by Sars (1846), one must assume that these are independent species.

The absence of a somatocyst in the illustration depicting the anterior nectophore of *G. australis* (Quoy and Gaimard, 1833) confirms the synonymy of *G. australis* with *G. turgida* for the somatocyst of this species Is so small that in several specimens it is not visible. Thus, the synonymy of *G. australis* with *G. turgida* is logical but priority must be given to the name *G. australis*.

The anterior nectophores of *G. australis* discovered in the equatorial waters of the Pacific have no commissures connecting the lateral radial canals with the ventral canal. No mention of them either in Gegenbaur's description (1854). However, Totton (1965) stresses the presence of commissural canals and depicts them in the illustration (fig. 2). As the information on *G. chuni* (see below) has shown the presence or absence of commissural canals is a transient feature and cannot serve as a specific criterion for this genus.

Atlantic, Pacific and Indian Oceans, Mediterranean Sea. According to Margulis (1971) for the Atlantic *G. australis* is a widespread tropical species. Found between 0 and 1600 m, but mainly between 300 m and the surface.

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[2] The nectophore measurements given in Stepanjants (1967) are over-estimated: details taken from Bigelow's (1911) description of *G. biloba*.

Galetta bigelowi M. Sears, 1950
(Fig. 2, *3*)

Based on published material only.

Anterior definitive nectophore up to 7 mm in height, conical in shape. Characteristic is a very broad ventro-basal plane of the nectophore that equals ½ its overall height. Two-lobed mouthplate arched towards the nectosac. Ventral radial canal divides at the point of confluence with the ring canal. Lower nectophore unknown. Protective bracts of cormidia unknown.

Vicinity of Marshall Islands, South China Sea and Pacific coast of Mexico between 200 to 0 m.

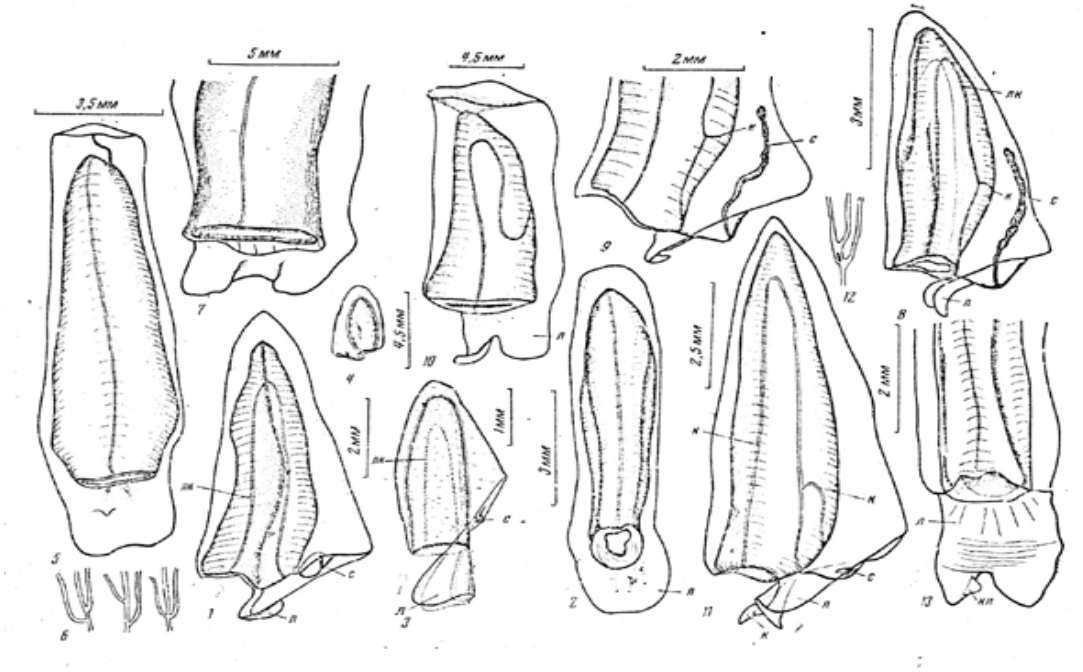

Fig. 2. Species of *Galetta* (*1-10*) and *G. pacifica* Stepanjants sp. n. (*11-13*). *G. australis* Q. & G. *1*. – anterior, *2*. - -posterior nectophore; *G. bigelowi* M. Sears *3*. – anterior nectophore (after Sears, 1950); *G. angusta* Totton *4*. – anterior nectophore (after Alvariño, 1950); *5*. – posterior nectophore; *G. biloba* (M. Sars) *6*. – diagram of the connection of the ventral canal with commissures, *9*. – basal part of anterior nectophore with rudimentary commissure, *10*. – posterior nectophore; *G. pacifica 11*. – anterior nectophore, *12*. – diagram of connection of ventral radial canal to commissures in anterior nectophore, *13*. – basal part of posterior nectophore; лк – lateral radial canals, к – somatocyst, л – lamella, кл – valve.

Galetta pacifica Stepanjants, sp. n.
(Fig. 2, *11-13*)

Type specimen in the collections of the Zoological Institute of the USSR Academy of Sciences. SRTM/8-452, station 271, horizon 100-0 m. Found one anterior and one posterior definitive nectophore.

Anterior definitive nectophore 9 mm in height, conical shape (Fig. 2, *11*). Two lobed mouthplate. Each wing bent inwards towards the ventral side. Left wing of the

mouthplate carries a fine mesogloeal valve. Small T-shaped somatocyst, slightly asymmetrical. Lateral radial canals approach close to the top of the nectosac. Commissures joining the ventral canal near the base of the nectosac. Ventral canal diverges towards the right commissure thickening at the point where it joins it (Fig. 2, *12*).

Posterior definitive nectophore 13 mm in height. Long mouthplate, 2 mm, divided at its base. Right wing broader than left. Left wing bears fine mesogloeal valve (Fig. 2, *13*). Section of the mouthplate above the wings has transverse wrinkles. Mesogloea of mouthplate near the base of the nectosac is thickened. No sign of bracts of the cormidia.

Nectophores of the species being described differ from those of other known species of the genus in having mesogloeal valves on the left lobes of both nectophore, T-shaped somatocyst and special features relating to the junction of the commissures with the ventral canal of the anterior nectophore.

Equatorial waters of the Pacific: 159°24'E, 0°38'N between 100 and 0 m.

Galetta angusta (Totton, 1954)
(Fig. 2, *4,5*)

Anterior nectophore up to 8 mm in height (Fig. 2, *4*). Small somatocyst. Absence of lateral radial canals and accordingly of commissures also. Posterior definitive nectophore up to 16 mm in height. Mouthplate slightly forked at base. Edges of the equal-sized wings are rounded. On the left side of the mouthplate there is a mesogloeal tooth (Fig. 2, *5*). No sign of bracts of cormidia.

Tropical waters of the Atlantic, Pacific and Indian Oceans. In catches between 550 and 0 m, but mainly between 150 and 0 m.

Galetta biloba (M. Sars, 1846)
(Fig. 2, *6,7*)

Anterior definitive nectophore up to 26 mm in height and conical[3]. Oval somatocyst making up $1/7^{th}$ of total height of nectophore. Lateral radial canals form a loop close to top of nectosac. There are commissures that join the ventral canal either on one level or several; the left one being higher than the right or v.v. (fig. 2, *6*).

Posterior definitive nectophore up to 26 mm in height[4]. Mouthplate divided at base. Between wings of mouthplate, on its dorsal side, there is a groove ()Fig. 2, *7*). Bracts protecting the cormidia are hood-shaped. The illustration is based on Totton.

Tropical waters of Atlantic, Pacific and Indian Oceans, Mediterranean. Margulis (1971) considers it a widespread tropical species capable of migrating in great numbers to the north. Discovered in catches between 736 m and the surface, but generally not deeper than 200 m.

Galetta chuni (Lens and van Riemsdijk, 1908)
(Fig. 2, *8-10*)

Anterior definitive nectophore up to 10 mm high. somatocyst shaped like a long, narrow, convoluted tube. In most cases the height of the somatocyst is half that

[3] Not more than 17 mm in our material.
[4] According to Totton; our specimens not more than 20 mm.

of the nectophore. In the diagnosis of *G. chuni* (Totton, 1965) he stresses that a feature of the anterior nectophores of this species is the absence of commissures joining the lateral and ventral canals. This is also stressed by Alvariño (1968). Our samples include specimens of the anterior nectophore of *G. chuni* without commissures, with commissures, and even a rudimentary commissure (Fig. 2, *8,9*). This gives grounds to assume that the presence o=r absence of commissures in representatives of the genus *Galetta* and in *G. chuni* is, at any rate, a transient feature.

Posterior definitive nectophore up to 9 mm in height, with a mouthplate divided at its base in such a way that the left wing is broader than the right (Fig. 2, *10*). No bracts.

Tropical waters of the Atlantic, Pacific and Indian Oceans. Margulis (1971) considers this species as central-northern equatorial as it is not encountered below 18°S in the Atlantic. According to Margulis the centres of its area of distribution in the Atlantic are the northern subtropics and both tropical zones. According to Alvariño (1971) and Stepanjants (1967) in the Pacific this species is not encountered outside the southern tropical zone. Found between 20 m and the surface.

Sulculeolaria Blainville, 1830

Anterior definitive nectophore up to 23 (26?) mm in height, flatted laterally with a noticeably curved longitudinal axis. The base has 2 or 3 dorso-basal teeth and two latero-basal outgrowths – the latter may be absent. The lateral radial canals of the subumbrella wall are connected to the ventral canal by commissures. Baso-ventral edge of the nectophore cut obliquely. Somatocyst may be very small and oval or drawn out into a slender, sometimes curved, tube with a cap. Posterior definitive nectophore up to 27 mm in height, bearing at its base 2 or 3 dorso-basal teeth and 3 latero-basal outgrowths. Mouthplate continuous or divided with or without teeth.

Type species *Sulculeolaria quadrivalvis* Blainville, 1830.

Stepanjants (1967) considers *Sulculeolaria quadrivalvis* and *S. quadridentata* to be independent species on the grounds that in one the nectophores have 2 basal teeth and in the other 4. The study of a large number of specimens has made us reject this viewpoint and allows us to agree with Totton (1954, 1965) who considers that they are the same species. The number of dorso-basal teeth is strictly constant (2), while the latero-basal outgrowths may be present (large or small) or absent. Taking into account the total morphological resemblance of the nectophores with 2 or 4 teeth we must recognise that *S. quadridentata* is a synonym of *S. quadrivalvis*.

S. brintoni described by Alvariño (1968) also has dorso-basal teeth in its upper nectophore. The latter have no latero-basal outgrowths. Judging by the description of the nectophores of *S. brintoni* morphologically it very closely resembles those of *S. quadrivalvis*. Unfortunately Alvariño does not give a comparative analysis of the species named and from the table she provides it is difficult to ascertain what, in her opinion, are the differences. Our material contains a specimen of an anterior nectophore identified as *S. quadrivalvis* but also resembles *S. brintoni*: 2 dorso-basal teeth, mitten-like mouthplate wings and a ventral canal diverging towards the right commissure at the junction with the latter. The same specimen reveals a posterior nectophore apparently belonging to the same colony (other representatives of *Sulculeolaria* we not found here). Morphologically it resembles totally a typical *S. quadrivalvis* (fig. 3, *4*). Bearing this in mind, and also the features of *S. brintoni* are: 2 dorso-basal teeth, valves of the mouthplate wings of the anterior nectophore, may equally be attributed to *S. quadrivalvis*, while the

position of the ventral canal relative to the commissures in the latter species may be different (see below), there are grounds for doubting whether *S. brintoni* should be considered as separate.

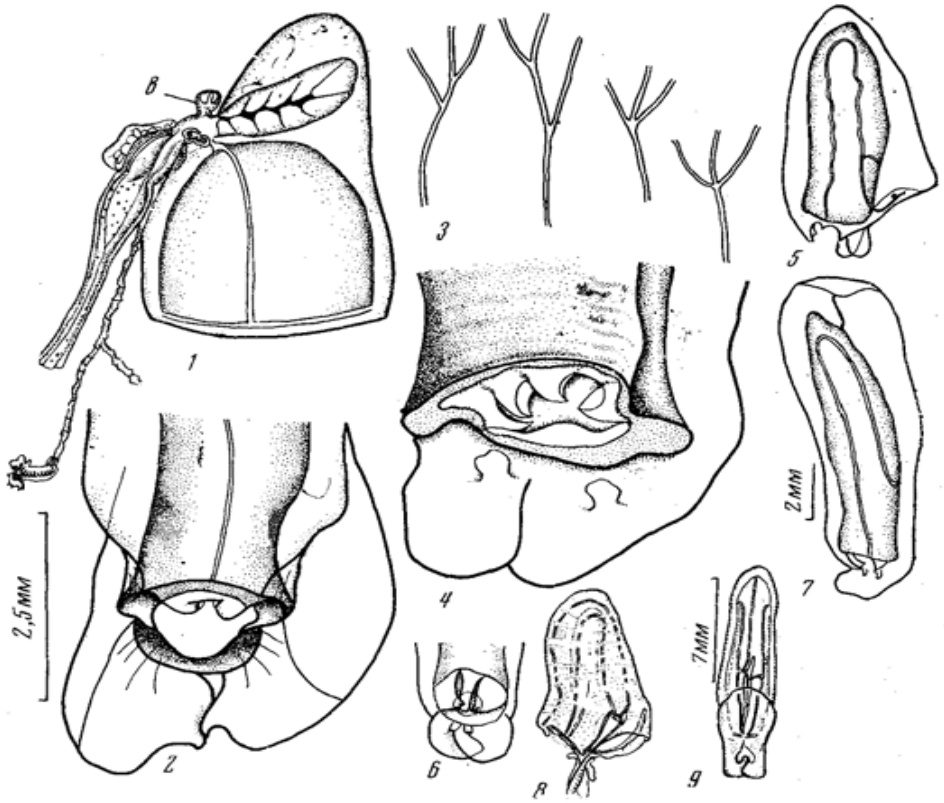

Fig. 3. Species of *Sulculeolaria*
S. quadrivalvis Blainville: *1*. – ten-day-old larval nectophore and bud of anterior definitive nectophore (*B*) (according to Metschnikoff, 1874); *2*. – basal part of anterior nectophore shown from below from dorsal side; *3*. – diagram of the various connections of the ventral radial canal with the commissures; *4*. – basal part of the posterior nectophore shown from below from the dorsal side; *S. monoica* Chun *5*. – anterior nectophore side view; *6*. – basal part of anterior nectophore shown from below from dorsal side; *7*. – posterior nectophore; *S. brintoni* Alvariño *8*. – anterior nectophore, side view; *9*. – anterior nectophore, view through centre.

Table for the identification of species of the genus *Sulculeolaria*

1 (4) Somatocyst of anterior nectophore is tubular and long. Always 2 dorso-basal teeth.
2 (3) Anterior nectophore may have 2 latero-basal outgrowths. But the latter may only be rudimentary or completely absent. Mouthplate of posterior nectophore has 2 mesogloeal teeth and 2 wings. *Sulculeolaria quadrivalvis* Blainville, 1830
3 (2) Anterior nectophore has no latero-basal outgrowths. Posterior nectophore unknown. *Sulculeolaria brintoni* ? (Alvariño, 1968)
4 (1) Somatocyst of anterior nectophore is small and oval. Always 3 dorso-basal teeth. *Sulculeolaria monoica* (Chun, 1888)

Sulculeolaria quadrivalvis Blainville, 1830
(Fig. 3, *1-4*)

Larval colony reared by Metschnikoff at Villefranche (1884) has larval *Bargmannia* (Fig. 3, *1*) conical, smooth and with radial canals of unequal length. According to Metschnikoff the bud of the anterior definitive nectophore in *S. quadrivalvis* appears on the ninth or tenth day.

The anterior definitive nectophore up to 20 mm in height and conical. Base of nectophore has 2 permanent tetrahedral dorso-basal teeth and 2 latero-basal outgrowths. The latter may be powerful and long, small or absent (Fig. 3, *2*)/ This has been the basis for several authors to consider that specimens without latero-basal teeth belong to an independent species (see above). Mouthplate of anterior nectophore with rounded wings and mesogloeal valves. Lateral radial canals form loops reaching almost to the top of the nectosac. The commissures connecting the lateral radial canals with the ventral canal join the latter on one level or on different levels. Somatocyst shaped like a slender, narrow tube, sometimes curved, sometimes having a cap on the end. Top of the somatocyst lies 1/3 to ½ up the nectosac.

Posterior definitive nectophore up to 26 mm in height. Its base has 4 teeth; 2 dorso-basal and 2 latero-basal outgrowths. Mouthplate has two wings the base of each having one mesogloeal tooth-like outgrowth (Fig. 3, *4*). Bracts shaped like a hood cover the siphosomal cormidia (Fig. 1, *E*).

Atlantic, Pacific and Indian Oceans, Mediterranean and Red Seas. Margulis (1971) places it amongst the widespread tropical species. Encountered between 150 and 0 m, but mainly near the surface – at a depth of 50 m.

Sulculeolaria monoica (Chun, ,1888)
(Fig. 3, *5-7*)

Anterior definitive nectophore up to 20 mm in height and conical in shape. Base of anterior nectophore has 3 dorso-basal teeth that are slightly forked at the tip, and 2 latero-basal outgrowths. The latter may be large, hardly visible or absent. The dorsa-basal teeth and the latero-basal outgrowths, is such are well developed, lie in the plane of the subumbrella base. Mouthplate of anterior nectophore with rounded wings a 2 mesogloeal outgrowths at the base of the wings. Lateral radial canals form a loop reaching almost to the top of the nectosac. Lateral canals are joined to the ventral by commissures. Often lateral canals are wavy and curved. Somatocyst very small and oval and occupies about 1/2oth of the height of the nectophore. Posterior definitive nectophore up to 27 mm in height. Base carries 2 dorso-basal teeth and 2 latero-basal outgrowths. Mouthplate continuous with slightly arched edge and has 2 mesogloeal teeth near the base of the subumbrella. Bracts unknown.

Atlantic, Pacific and Indian Oceans. According to Margulis (1971) as regards the Atlantic this is a north-eastern-central equatorial species. Main area of distribution in the northern subtropics and both tropical zones. Encountered between 200 and 0 m.

Sulculeolaria brintoni **?** Alvariño, 1968.
(Fig. 3, *8-9*)

Based exclusively on literature sources. Only the anterior definitive nectophore is known up to 14 mm high. Features: 2 finger-like cylindrical dorso-basal

teeth inclined towards the subumbrella opening, mitten-shaped wings of the mouthplate of the anterior nectophore. At the point where it connects with the commissures the ventral radial canal diverges towards the right commissure.

As stated above the features mentioned may equally be applied to *S. quadrivalvis*. However, without actually being able to examine the nectophores that Alvariño attributes to *S. brintoni* it is not possible to identify the species named.

South China Sea and Gulf of Thailand. Between 153 and 0 m, but mainly no deeper than 50 m.

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