

Margulis, R. Ya. 1993

Cordagalma tottoni sp. n. - A new siphonophore
of the suborder Physonectae (Cnidaria, Hydrozoa, Siphonophora).

Zoologicheskii Zhurnal 72(9), 14-19.

Another translation in *Hydrobiological Journal*, **30(3)**, 79-84

The genus *Cordagalma*, and the type species *C. cordiformis*, was described by Totton (1932) from the Great Barrier Reef. The author had at his disposal only nectophores. Carré, (1968) collected live specimens of a physonect in the Mediterranean that he described as *C. cordiformis* because their nectophores "... in the preserved state correspond to the 1932 description of Totton". Based on this material, that author described all the zooids of the colony, and photographed them as well. In material from the southern part of the Pacific Ocean, I found fragments of colonies that, based on structure of their nectophores, belong to the genus *Cordagalma*. Since the original description of *C. cordiformis* was based exclusively on the structure of the nectophores, the zooids from my material were compared with those from the Mediterranean, as described by Carré. This comparison discloses significant differences in the structure of the gastrozooids, tentilla, palpons and bracts (mature gonophores were absent from the Pacific material). This suggests that another species of the genus *Cordagalma* has been found. Its description is given below.

Cordagalma tottoni sp. n.
(Figs 1, 2 3)

Material: Fragments of a colony taken by the research vessel "Vozrozhdenia" during its 10th cruise, 18-12-1986. St. 72, 35°S 139°W, 100-0 m. Juday net. The material contains fragments of a stem with pneumatophore, buds of nectophores and a part of the siphosome, three nectophores, two gastrozooids, and several small sections of the siphosome.. It is assumed here that all these parts belong to the same colony, which is treated as the holotype of the species, housed in ZIN RAN, St. Petersburg, No. 10214/1.

Description: Pneumatophore elongate, single-chambered, with rounded apex, height c. 1 mm. Below the pneumatophore are several young buds of nectophores and traces of the attachment of detached ones. One young nectophore was attached to the stalk, but had to be detached for illustration. Unfortunately it was subsequently lost. A young nectophore, about 1 mm long, heart-shaped, with pointed rounded apex. The middle of the basal part bears two small notches, Ridges on the ventral side and lateral radial canals were not observed. Two larger nectophores, 3.5 x 2.5 x 2.5 mm, in the sample had been separated from the stem of the colony. Both nectophores were laterally compressed, so that they had an attenuated triangular shape. The apex was rounded and formed a more or less pointed snout. Two ridges, extending down to the basal part, originated about 0.3-0.5 mm from the apex, on the ventral side of the nectophore. In the nectophores examined these ridges lie close to the mid line. When parted, the ridges are seen to delimit a triangular indentation in the centre on the ventral face of the nectophore, being deeper toward the base. The latter part is divided into two lobes by a more or less deep indentation, thus imparting to the nectophore its cordiform shape. The ostium is strongly displaced toward the dorsal side and lies on its centre. On the lateral sides of the nectophore there is a

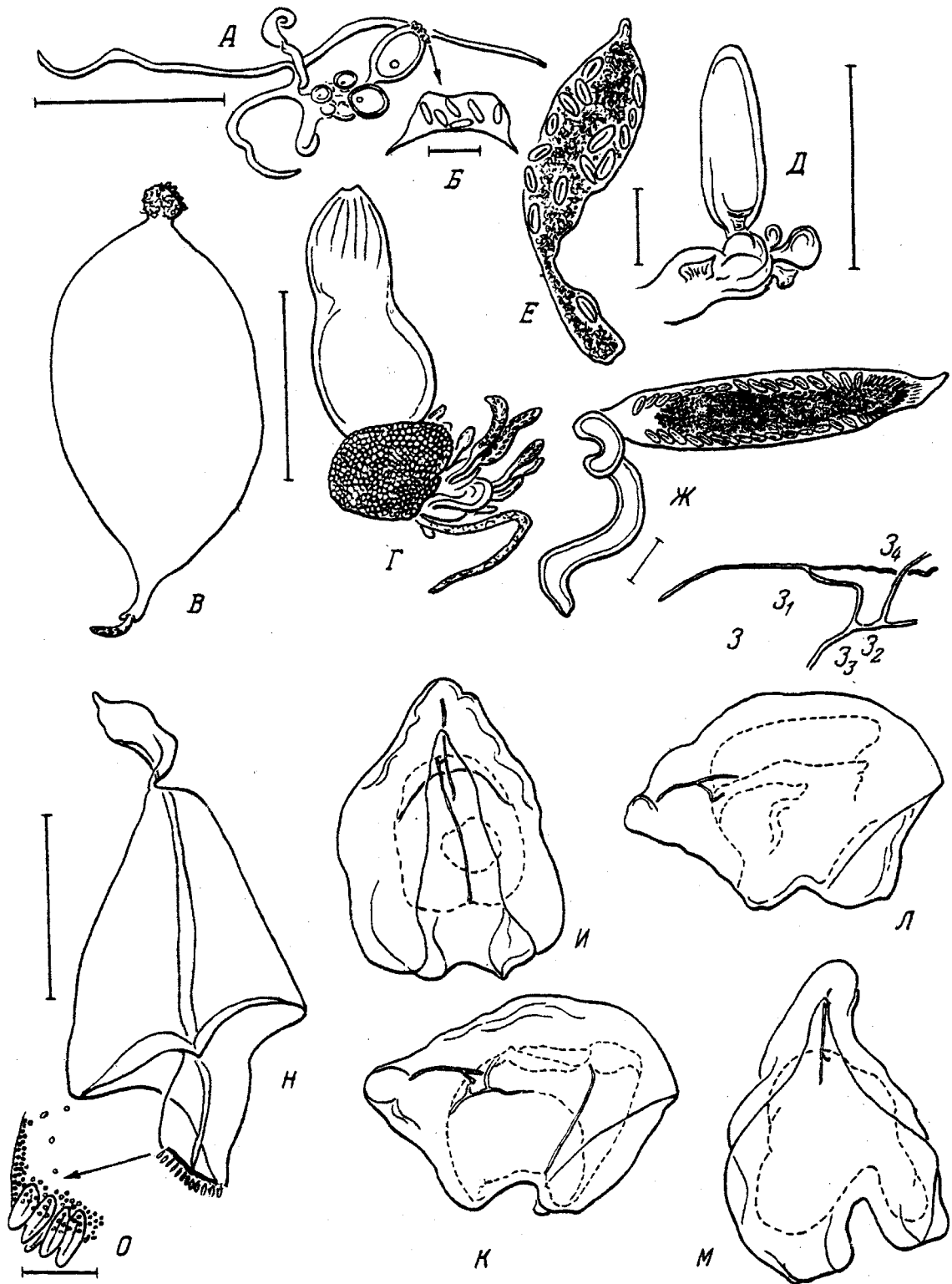


Figure 1.

Zooids of *Cordagalma tottoni*: **A** – section of siphosome with young gonophores and unarmed buds; **Б** – apical part of gonophore with nematocysts; **В** – palpon with palpacle; **Г** – gastrozoid; **Д** – section of stem with pneumatophore and nectophore buds; **Е, Ж** – tentilla; **3** gastrovascular canal system of nectophore: **3₁** – pedicular canal; **3₂** – origin of ventral canal; **3₃** – origin of dorsal canal; **3₄** – origin of lateral canal; **И-М** – nectophores; (**И, М** – ventral view, **К, Л** – lateral view); **Н** – bract; **О** – apical part of bract. Scale (mm): **A, B, Г, Д, И-Н** – 1; **Е, Ж, О** – 0.1; **3** – 0.14.

poorly defined ridge, running from the basal part of the ventral side to the posterior third of the ostial opening. The pedicular canal arises a short distance from the apex of the nectophore and, on reaching the vicinity of the nectosac splits into two branches, one of which continues down through the mesogloea along the ventral side of the nectophore, and ends blindly, with a total length of c. 0.5 mm. The other branch runs to the ventral wall of the nectosac where it connects with the radial canals. The branch has a smooth bend in its mid region so that both of its ends are directed toward the apex of the nectophore. The lateral radial canals branch from the ventral canal at a distance of c. 0.2 mm from the point of insertion of the pedicular canal, and arch gently as they descend toward the ostium without forming a loop.

The remains of the section of the siphosome that is attached to the nectosome bears several palpons, buds of gonophores, numerous bracts, and two types of outgrowths that will be described below. The fragments of the siphosome that had broken from the common stem had similar types of zooids.

Only one of the gastrozooids was well preserved. Its height was 2 mm. Its basal part, c. 0.5 mm long, was covered, like a sleeve, by a mass of small cells that, perhaps, are nematocysts. Distal to this there is a moderately inflated oval part, with a poorly defined constriction just above its centre, and a simple mouth at the end. A part of the base of a tentacle was preserved and bore several tentilla. The latter have a long, thin pedicle whose length almost equals that of the cnidoband, which is oval, 0.6-0.8 mm in length, with a small, beak-shaped tip. Along the sides of the cnidoband large nematocysts are disposed in a single row, with 15-17 per row. The space between the rows, and the entire tip down to about 0.25 the length of the cnidoband, is entirely filled with small nematocysts. The types of nematocyst were not determined.

The palpons are large and oval, with a height of 2.5 mm and a width that may reach 1.0 mm. The apical end is beak-shaped or clavate, sometimes covered with nematocysts. The basal part consists of a very thin pedicle. A palpacle is not present on all the palpons. Those that are present are short and, when armed with nematocyst, resemble the tentilla. Palpacles without nematocysts also are present.

All the preserved gonophores are immature, distributed in groups, and spherical or oval. Sometimes the tips of the gonophores have outgrowths containing several nematocysts.

Bracts are numerous. Each is divided into a thin wing-shaped stalk and a large diamond-shaped bract. The basal part of the diamond is several times larger than the apical part. At the junction between these two regions there is, on the dorsal side, a ridge that runs almost perpendicular to the plane of the bract. The apical part of the bract is sub-triangular with a large, crest-like, almost quadrangular outgrowth on the dorsal surface. Along the distal margin of this outgrowth is arranged a row of large nematocysts. At the base of the row, and along the ridge that bisects the bract there are some very small nematocysts. The bracteal canal is fine and runs from the stalk to the distal end, being slightly wider in the mid region of the bract. The nematocysts are lost in older bracts.

On the siphosome of the colony, amongst the other zooids, there are numerous fine elongated outgrowths bearing no armature. Also one finds a few outgrowths that resemble the armed palpacles or tentilla.

The species is named for the English zoologist A.K. Totton.

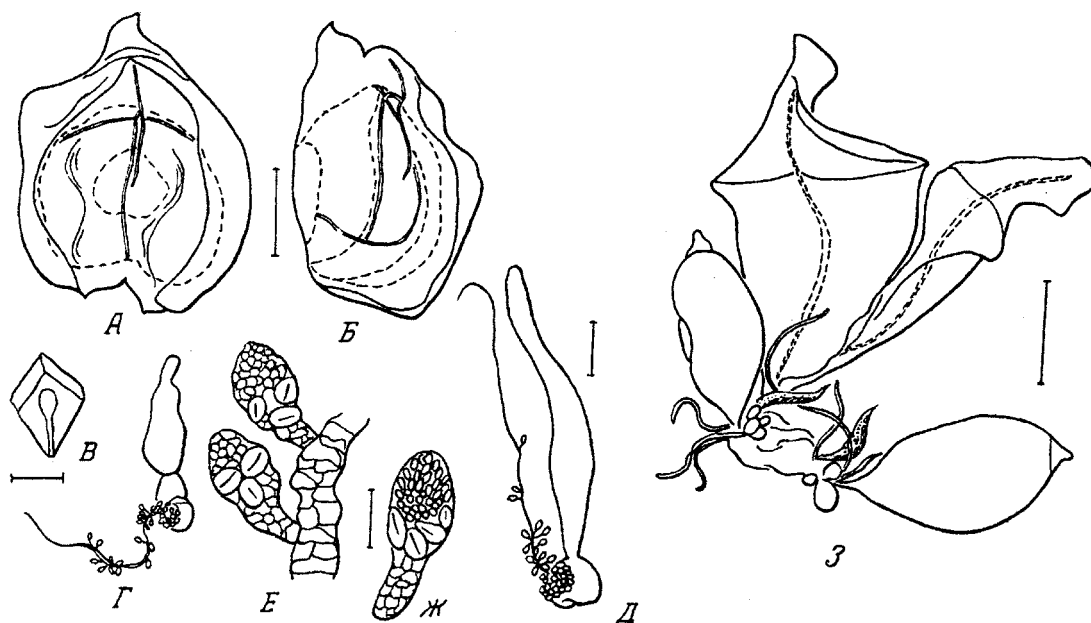


Figure 2.

Zooids of *Cordagalma cordiforme* (A-Ж) and *C. tottoni* (3): A, Б – nectophore (A – ventral view, Б – lateral view); Б – bract; Г, Д – gastrozoid; E, Ж – tentilla; 3 – section of siphosome with palpons, bracts, buds of gonophores, armed and unarmed outgrowths.

Scale (mm): A, Б, 3 – 1; Б, Г, Д – 1/7; E, Ж – 0.05.

Differential diagnosis: The new species, *C. tottoni*, differs from *C. cordiformis*, as described by Carré (1968), by the structure of the different zooids. In the new species budding of the nectophores occurs in the zone directly below the pneumatophore, whereas in *C. cordiformis* this zone is at some distance from the latter. This, however, might depend on the state of the colony at the time of fixation. The nectophores *C. tottoni* are narrower. It is difficult to say how important and how constant this feature is until we can obtain data on the age variability of the nectophores within the same colony of each species. A better character lies in the connection between the radial and pedicular canals. In *C. cordiformis* all the canals meet at one point, as can be seen in the illustrations of Totton (1932) and the photographs of Carré. Neither author considers this to be a diagnostic feature, and do not mention it in their descriptions. The lateral radial canals of the nectophores of *C. tottoni* connect with the ventral radial canal at some distance from the pedicular canal. Moreover, on the lateral sides of the latter species there is a ridge, which is not shown for *C. cordiformis*. The gastrozoid of *C. tottoni* differs, by its oval shape, from the long, vermiform gastrozoid of *C. cordiformis*, as well as in the presence of a large number of small cells around its base. If one assumed that the long gastrozoid of *C. cordiformis* could contract and become shorter and oval as a result of fixation, there still remains the differences in the basal parts of the gastrozoid of the two. The difference in the structure of the tentilla is great. In the new species the cnidoband is elongate, so that its length is five times greater than its breadth, while in *C. cordiformis* it is oviform and surrounded by long cnidocils, absent from the former species. No more than 5 stenoteles in the basal part of the cnidoband, with anisorhizas in the mid region and 12 isorhizas in the apical part. The nematocysts of *C. tottoni* have not been identified, but the large ones along the lateral sides of the cnidoband could be stenoteles, and the numerous ones in the central and apical parts - anisorhizas and isorhizas. Their number and distribution differ, however, from *C. cordiformis*. The palpons of both species have a similar structure, but palpacles are absent in *C. cordiformis*, while in the new species the

palpacles can be armed with nematocysts. Significant differences also exist in the structure of the bracts. In *C. cordiformis* they have a truncated pyramidal shape. The external outline is repeated in the centre by ridges, forming a diamond of a smaller size. The corners of the smaller diamonds are connected with those of the larger diamond by ridges. The canal ends in a club-shaped dilation at the apical corner of the smaller diamond. The bracts of *C. tottoni* have an irregular diamond shape, the proximal part of which does not exceed the size of the basal part by more than twice. The canal runs through the entire bract to the apical end and does not have a club-shaped dilation. In the photograph of the stem of *C. cordiformis* one cannot see the fine outgrowths, armed or not with nematocysts. The author does not mention them in his description. Thus the presence of such outgrowths on the stem of the colony of *C. tottoni* constitutes one more difference between these two species.

Comments and conclusions: In the material from the southern part of the Pacific Ocean in collections from NES "Professor Mesyatzev", 3rd cruise, 29.iv.1980, station 72, 42°02'S, 83°8'W, 100-0 m, Juday net, I found two fragments of the stem of colonies with pneumatophores and various zooids, plus 40 nectophores measuring from 0.3 to 3.0 mm. These fragments I describe as *C. cordiformis* (Fig. 2, Ж). All the nectophores are devoid of ridges on their lateral surfaces, and their radial canals link with the pedicular canal at the same point, which is particularly characteristic for the nectophore of this species. The nectophores differ from one another by the length of the apical outgrowth and the depth of the basal indentation. Some small differences in the structure of the other zooids were found from the description of Carré. Thus, in some gastrozooids, the stalk is not thin, as Carré suggests, but can be of almost the same girth as the central part. One could suppose that the stalk contracted due to fixation, although thick stalks were present also in gastrozooids with extended, relaxed central regions. Tentilla, in contrast to the Mediterranean *C. cordiformis*, do not have large visible cnidocils. The bract does not have a small diamond on its dorsal side, where only two apical ridges are present. On the other hand, the canal has the same structure as that described by Carré, (1968). In the material examined there were only two very young bracts. It is not known whether there are variations in the structure of the latter within the colony. Unfortunately Carré did not discuss this. Only a study of a large number of colonies will make it possible to answer the question whether or not these differences in the structure of some zooids are intraspecific variations in *C. cordiformis*, or whether one should erect a subspecies.

Distribution: Now, as it is clear that the genus *Cordagalma* consists of two species, whose nectophores can be distinguished only by examining their radial canals, previous records for *C. cordiformis* need to be re-checked. Undoubtedly, this species has been found in the area of the Great Barrier Reef and the St. Vincent Islands (Totton, 1932); and the Gulf of Akaba; east coast of Africa (without stating exact position) (Totton, 1965); in the Mediterranean in the vicinity of Villefranche-sur-mer (Carré, 1968), at station at 44°S 110°W; 44°S 159°57.6'W; 43°S 108°30'W; 42°02'S 85°58'W; 39°59'S 03°21'W (my unpublished data). *C. tottoni* is known, so far, from just one locality - 35°S 139°W. Other data I propose to view as records for the genus *Cordagalma*: Sargasso Sea (Purcell, 1981); southern part of the Pacific between 22°S and 49°S, and 82°W and 147°W; a station at 39°S 97°W (my unpublished data and Margulis, 1987).

References

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My Comments.

1. There are undoubtedly at least 2 species of *Cordagalma* as a second has been collected by JSL.
2. Initially I did not believe that the stem of *C. tottoni*, with bracts, belongs with the loose nectophores that Margulis found in the same sample. However, having examined the specimen, I am more disposed to think that they do.
3. I initially thought that the stem, with bracts, did not even belong to the genus *Cordagalma*. In both species of *Cordagalma*, described and undescribed, the bracteal canal is short and ends in a dilation. The tentilla have very characteristic structures and, in the undescribed species, they are very peculiar! The tentillum ascribed to *C. tottoni* is slightly odd, but has the "usual" physonect arrangement of two rows of ?stenoteles surrounding numerous rows of smaller nematocysts.
4. The two loose nectophores clearly belong to a *Cordagalma* sp., and clearly are in a poor state of preservation! The ventro-lateral ridges that Margulis describes are nothing more than the ventral edges of the hydroecial flaps.
5. The problem remains as to whether they are an unusual form of the nectophores of *C. cordiformis* or whether there are specific differences with regard to the arrangement of the radial canals. In the undescribed species of *Cordagalma*, as in the *C. cordiformis* that I have, all four canals meet at the point of insertion of the pedicular canal. Interestingly though, the long pedicular canal in the nectophore of the undescribed species has a pronounced arch; but it goes apically, not basally. In my *C. cordiformis* I can see the basal "extension" of the pedicular canal; although it may be a remnant of the giant axon - I cannot tell. My suspicion would be that in Margulis' poor material the dorsal canal has been torn so as to give the appearance that the pedicular canal does not join in conjunction with the lateral radial canals. I can no other reason for distinguishing them. However, an examination of the material shows that the lateral canals do indeed arise from the dorsal canal, away from the pedicular canal.
6. One interesting point that Margulis raises at the start of the text is that we are assuming that Totton's *C. cordiformis*, described on the basis of only nectophores, is the same as the one described by Carré. I would be surprised if it was not, but we need some specimens from the Great Barrier Reef to be certain. I wonder if Harbison has any.
7. I conclude: That Margulis has made another mess of things! However, now I believe that the stem, with bracts, may belong with the detached nectophores. The problem remains what is it? The bracts resemble Physonect 'V', or at least my drawings of it. (At the moment I cannot find the single specimen!) Thus the specific name may be retainable; and at present, I think, it cannot be synonymised with any extant species.

I am now convinced that there are sufficient reasons to distinguish the loose nectophores, which Margulis ascribes to *C. tottoni*, from those of *C. cordiformis*, on the basis of the point of origin of the lateral radial canals.