

ON *VIRGULARIA GRACILLIMA* (KOLLIKER) FROM THE  
CHILKA LAKE.

By ABDUL HAMID, *M.Sc. (Punjab)*, Lecturer in Biology, Lawrence  
College, Ghoragali.

(Plate VIII.)

The material on which the present study is based consists of 150 colonies that were collected from the Chilka Lake by the late Dr. Annandale, Director of the Zoological Survey of India.

In 1888 Kölliker (5) created this species from material collected by the "Challenger" Expedition near Long Island, New Zealand, at a depth of 18 meters, but gave an inadequate account of the species. In 1916, Hickson (3) defined the species as follows:—

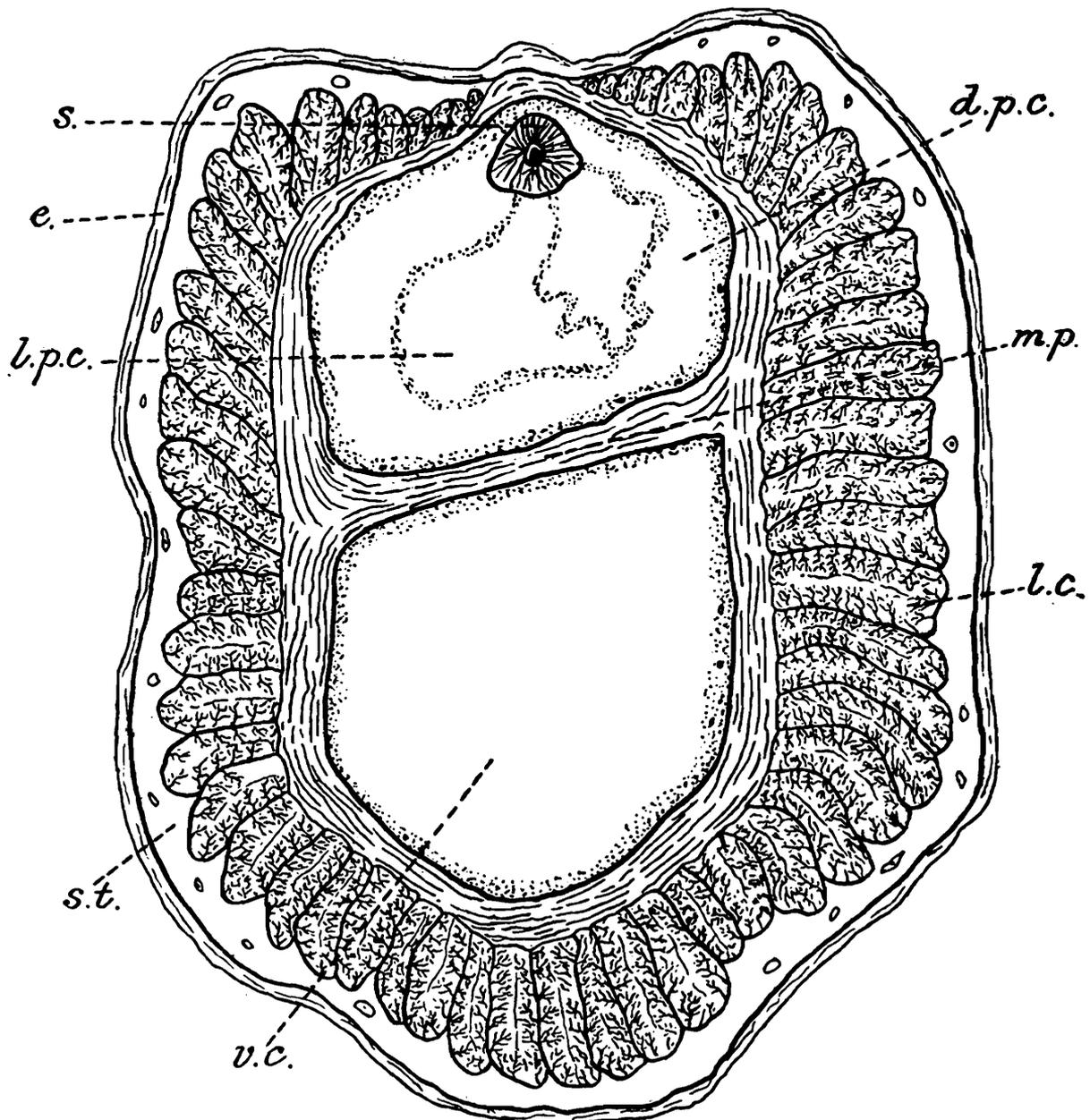
"Small and very slender *Virgularias* with pairs of leaves separated by considerable intervals composed of 3-7 autozooids, according to the size. Autozooids united only at the base and usually expanded in preserved specimens, without calyx or tubercles. Siphonozooids in a single row between the leaves, fewer in number than the autozooids of the neighbouring leaves. Axis very slender, and marked by striated surface ridges."

The colony is slender and bilaterally symmetrical, consisting of a well developed stalk or peduncle and a long uniformly thick rachis. The length of the colony varies from 40 to 170 mm. The peduncle has a well developed bladder or "end bulb" which varies from 10 to 15 mm. in length. There is a clearly marked dorsal furrow on the peduncle, which does not extend to the "end bulb". On the latter there are parallel longitudinal lines equidistant from one another. The axial skeleton does not extend into the "end bulb". The leaves of the rachis are small, each composed of autozooids arranged in a single curved row. The coenosarc of the rachis is much attenuated in preserved specimens. At the distal end of the colony the axial skeleton is exposed owing probably to the soft parts having been bitten off by marine organisms or to some other natural cause. In the proximal portion of the rachis the leaves decrease in size to the condition of faint ridges, these latter being formed by undeveloped autozooids.

The number of autozooids forming a leaf varies from 3 to 7. Each autozooid is slender and cylindrical, consisting of an anthocodium bearing a crown of pinnate tentacles, an oral opening, and an anthostele into which the former can be retracted. The leaf itself is formed by the fusion of the anthosteles.

1. *Peduncle* (text-fig. 1).—The ectoderm of the peduncle is very thin, and appears to be mostly rubbed off. Below the ectoderm is a well developed "spongy tissue" in which a few irregular granular cells lie embedded. In this region there are about 45 longitudinal canals, the inner lining of which bears pleats of longitudinal muscles. In a transverse section, these muscles appear to fill almost the entire lumen of each canal.

The canals become narrower towards the dorsal side and disappear near the dorsal furrow. There seems to be some evidence in support of the view that the function of these canals is to help in distending the peduncle rather than nutritive. Here and there in the spongy tissue occur spaces, which are due to the spicules having been dissolved out by acid before section cutting. Internally the spongy tissue is lined by a complete ring of circular muscle fibres, which surround the large primitive canal. The primitive canal is a large central space which is divided into a dorsal and a ventral canal by a complete muscular partition. In the dorsal canal are two smaller lateral canals. These lateral canals are related to the axial skeleton, which lies near the furrow. Neither the axial skeleton nor the lateral canals extend into the "end bulb".



TEXT-FIG. 1.—*Virgularia gracillima* (Kölliker).

Transverse section through peduncle,  $\times 164$ . *d. p. c.*, dorsal primitive canal. *e.*, ectoderm. *l. c.*, longitudinal canal. *l. p. c.*, lateral primitive canal. *m. p.*, muscular partition. *s.*, axial skeleton. *s. t.*, spongy tissue. *v. c.*, ventral canal.

2. *Radial canals* appear to be somewhat trumpet-shaped in transverse section. They are arranged in a single row on each dorso-lateral aspect

of the rachis. The number of radial canals between two leaves of each side varies from 2 to 23. According to Pratt (2) the comparatively large number of radial canals in *Virgularia* is probably due "to the insufficiency of the zooids, to serve hydrostatic and possibly also nutritive purposes".

3. *Skeleton*.—The axial skeleton is well developed, being horny and containing traces of calcium carbonate. It is cylindrical in shape and is flexible. The appearance, in transverse section, is that of a central core with a number of lines radiating to the periphery. Spicules are absent from the rachis, but occur in the peduncle as small, oval "calcareous corpuscles"; they are of two kinds, one comparatively large and oval, and the other small and smooth. The two kinds of spicules form separate groups in the coenosarc.

4. *Autozooids*.—In a transverse section through the tentacles the ectoderm appears to consist of closely arranged columnar cells, with granular contents and nuclei at different levels. A few nematocysts are also present. Below this columnar epithelium there is a fairly well developed layer of longitudinal muscle fibres whose cut ends are clearly seen in transverse section. The mesoglea is thin. The endoderm is in the form of a syncytium in which nuclei lie scattered.

The ectoderm of the stomodaeum is somewhat thick and uniformly ciliated, and consists of closely arranged columnar cells. Nuclei are irregularly arranged. The siphonoglyph is not conspicuous and the cells in that region are more compactly arranged with the nuclei massed along the middle. Granular gland cells occur in abundance, except in the region of the siphonoglyph, where they are absent. The dorsal pair of mesenteries are short and extend only to the lower end of the stomodaeum, whilst the remaining six mesenteries extend below the stomodaeum.

In a longitudinal vertical section of an autozoid several horizontal partitions are visible in the anthostelar cavity.

5. *Siphonozoids* can be seen in stained preparations under the low power of the microscope. They are arranged in a somewhat semicircular row on the ventral track (metarachis, Bourne and Thomson) between the leaves, each row consisting of four siphonozoids. They are not present on the dorsal track (pro-rachis). According to Hickson "the arrangement of the lateral siphonozoids is the most constant and reliable single character for the determination of the species".

The specimens from the Chilka Lake agree in every respect with Hickson's description of *Virgularia gracillima*. This species differs markedly from the eight other Indian species of *Virgularia* as shown on the following page.

*Virgularia gracillima* has previously been recorded from New Zealand (Kölliker, 1880) and Malaya (Hickson, 1916).

#### REFERENCES.

1. Delage and Hérouard.—"Traité de Zoologie concrète", Vol. I, Part II, 1901.
2. Pratt, Edith.—"Experimental observations on the organs of circulation and the power of locomotion in Pennatulids". *Q. J. M. S.*, Vol. LIV, p. 443, 1910.

No.	Name of species.	Locality.	Total length of colony.	Number of polyps in each pinnule.	Siphonozooids.	Remarks.
1	<i>V. rumphii</i> Kölliker .	South-west of Beyt island and Amboina.	252 mm. and 140 mm.	70 in one specimen and 55 in the other specimen.	....	Only 2 specimens in the collection.
2	<i>V. multiflora</i> Kner	Trincomalee .	..	11	....	Fragmentary specimens.
3	<i>V. loveni</i> Kölliker .	Do.	106 mm.	19—24	....	Only 3 fragmentary specimens.
4	<i>Virgularia</i> sp.? Thomson and Henderson.	Do.	..	23—24	....	Pinnules form double S-shaped figure.
5	<i>V. tuberculata</i> Thomson and Henderson.	Do.	110 mm. .	6	Occur singly or in small groups below each pinnule.	6 specimens.
6	<i>V. elegans</i> Grey . .	Gulf of Manaar .	..	18	....	
7	<i>V. calycina</i> Thomson .	Do. . .	..	18	....	
8	<i>V. indica</i> Thomson .	Do. .	..	15	15 occurring in a row midway between pinnules.	Axis covered with a reddish investment.
9	<i>V. gracillima</i> Kölliker	Chilka Lake . .	40—70 mm. .	3—7	4	Collection consists of over 150 specimens.

3. Hickson, S. J.—“ Cambridge Natural History. Coelenterata ” 1906.
4. *Id.*—“ Pennatulacea of the Siboga Expedition ”, Vol. LXXVII, 1916.
5. Kolliker, Albert.—“ Report on the pennatulids dredged by H.M.S. Challenger during the year 1873-1876.” Vol. I, Zoology, 1880.
6. Lankester, E. R.—“ A Treatise on Zoology ”, Part II, 1900.
7. Thomson, J. and Crane, G.—“ Report on a Collection of Alcyonarians from Okhamandal in Kathiawar” *Marine Zoology of Okhamandal*, Part I, 1909.
8. Thomson, J. and Henderson, W. D.—“ On the other Alcyonaria ”, *Ceylon Pearl Oyster Fisheries and Marine Biology*. Royal Soc., London, Part III, 1905.
9. Thomson, J.—“ On the Alcyonaria.” *Ceylon Pearl Oyster Fisheries and Marine Biology*. Royal Soc., London, Part IV, 1905.