

INFLUENCE OF SEA WATER ON
PROTOZOAL ACTIVITY AND
PURIFICATION OF SEWAGE BY THE
ACTIVATED SLUDGE PROCESS

IN the course of our investigations on the occurrence, distribution and development of protozoa in the different Activated Sludge Plants ('diffused air' and surface aeration) in India, it was noted that certain species of marine *Vorticella* and *Zoothamnium* predominated in the sludge from the diffused aeration plant at Tuticorin which is operated with sea water due to acute shortage of fresh water.¹ The purification plant at Tuticorin is the only one of its kind in the world in being worked with sea water.²

The Tuticorin Activated Sludge Plant was installed in September 1928 to treat the sewage from a population of 3,000 persons at 15 gallons per head, and in recent years it has been dealing with a correspondingly increased volume of sewage as from a population of about 5,000. The purification plant has been functioning very efficiently since the start; the effluent from the settling tank has always appeared brighter and cleaner than the sea water taken into the works for use (e.g., the sea water contained 3.948% total solids and 0.616% organic matter, i.e., loss on ignition, and the corresponding figures for the effluent are 3.936% and 0.584%; the chloride

case of *Carchesium*, are continuous with the thread in the main stalk, causing all of the zooids to contract together.

Studies have shown that when the *Vorticellids* in the above sludge are selectively rendered inactive or killed out (by employing heat or other sterilising agents), the clarification of sewage is adversely affected and eventually stopped; that the rate of clarification is closely dependent on the number of active *Vorticellids* in the medium.

Apart from our observations, there is no record of the occurrence of *Zoothamnium* sp. in any artificial system of sewage purification. It may also be noted that Bhatia has not recorded *Zoothamnium* from Indian waters.³ *Zoothamnium* sp. has been reported from Niagara River.⁴ More recently, certain species of *Zoothamnium* has been noticed in the mouths of the brackish-water fish, *Acentrogobius neilli* (Day) occurring in the Buckingham Canal, Madras, and has also been obtained from the stomach-contents of fishes such as *Therapon jarbua*.⁵

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FIG. 1. A cluster of marine species of *Vorticella* × 115.



FIG. 2 A colony of *Zoothamnium* sp. × 115.

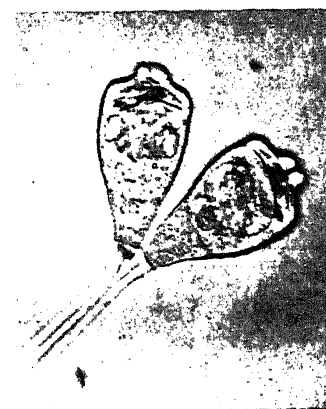


FIG. 3 Two individuals of the colony of *Zoothamnium* sp. enlarged × 675.

Photomicrographs of the marine species of *Vorticella* and *Zoothamnium* occurring in the Activated Sludge at Tuticorin, where sea water is used for flushing purposes. (Reduced to $\frac{3}{4}$)

contents of both were just the same). The clotting and clarifying action of the sludge and its settling property are as remarkable as those of activated sludge formed in other aeration tanks operated with fresh-water.

Observations over a period of eight years have shown that the outstanding feature of the activated sludge produced with sea water is the active presence of a large number of certain species of marine *Vorticella* (*Vorticella marina* and other forms) and *Zoothamnium* sp., one ml. of the mixed liquor containing 8,000 to 18,000 active protozoan cells depending upon the concentration of sludge (the other forms of protozoa, mostly small ciliates, in the sludge are relatively few). Two of the commoner species of these *Vorticellids* are shown in Figures 1-3. Figs. 2 and 3 show the distinctive feature of *Zoothamnium*, viz., the contractile threads from the lateral branches of the colony, unlike in the

corin; and to Dr. B. R. Seshachar, Central College, Bangalore, for kindly taking the photomicrographs of the protozoa and confirming the identification of the organisms.

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