

BULLETIN  
OF THE  
UNITED STATES FISH COMMISSION.  
1886.

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I.—VEGETABLE PARASITES OF CODFISH.

By W. G. FARLOW.

In the Report of the U. S. Fish Commissioner for 1878 (Washington, 1880), I gave an account of the alga, or, more properly, the schizomycete, which causes the reddening of codfish, that has proved a source of serious trouble to the fishermen of Gloucester. In the same article there was described a second parasite, *Sarcina morrhue* Farlow, found growing with the *Clathrocystis roseo-persicina* Cohn, the species which causes the redness. Since the publication of the above-named article, the peculiar redness, which up to that time was known only on our coast, has been observed in other countries. As the accounts of its occurrence have been published in journals which are not often read in this country, the following statement of what is known about the trouble in foreign countries may be of interest.

In the *Journal de Médecine de l'Algérie*, 1884, p. 6, Dr. E. Bertherand gave an account of poisoning which occurred among the troops encamped at Sidi-Bel-Abbès and in the neighborhood of Algiers. The trouble, which lasted but a short time, is said to have been caused by eating dried codfish which had become "échauffée," to use the local expression. The fish eaten had a vermilion tint along the spine, and the discoloration was not merely superficial, but extended also to the flesh. The color was attributed by M. Mégnin to the growth of a fungus, which he named *Coniothecium bertherandi*. A description and figure of the fungus were given in the *Revue Mycologique*, Vol. VI, p. 114, pl. 46, f. 3.

Thinking that there might be some connection between the fungus found in Algiers and the *Sarcina* of our coast, I communicated to the editor of the *Revue* a notice\* of the *Clathrocystis* and *Sarcina* known

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\*L. c., Vol. VI, p. 197. Maladies des morues sèches, par W. G. Farlow, October, 1884.

on our coast, together with a description and figure of a third species, *Oidium pulvinatum* Farlow, found on codfish sent from Gloucester by Prof. A. Hyatt. In the *Revue* for January, 1885, the editor, M. Casimir Roumequère, under the title of "Observations sur le *Coniothecium berthrandi*," raised the question of the identity of the *Coniothecium* of Algiers with our *Clathrocystis*—a point which could not well be settled by the description and figure of M. Mégnin.

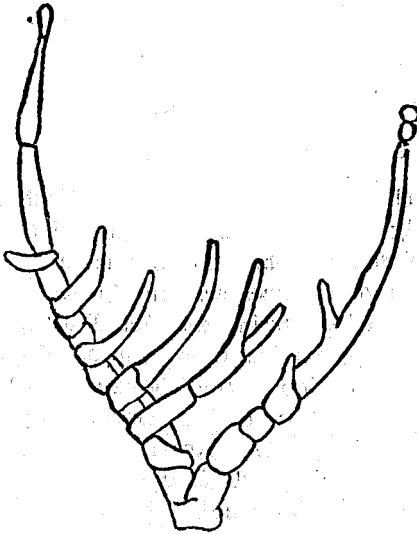


FIG. 1.

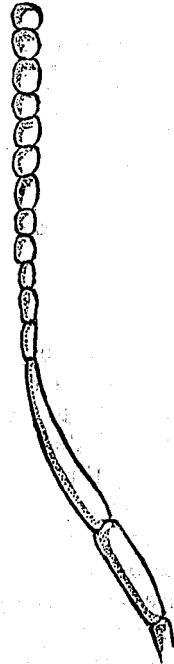


FIG. 2.

TORULA PULVINATA.—Fig. 1. Young fructiferous hyphae. Fig. 2. A chain of mature spores, magnified 700 diameters.

The subject was still further discussed in the *Revue* for April, where a number of interesting facts with regard to the prevalence of the redness in France were cited. Specimens of red fish were received from Bordeaux and Dieppe, and the redness was recognized by Roumequère and Patouillard as due to the presence of *Clathrocystis*. On the testimony of an eye-witness it is stated that in the market of Algiers fish have been seen in which the redness had reached a stage such that the flesh was so deliquescent that, on attempting to lift the codfish, the tail separated from the body. From all accounts there seems to be no doubt that sickness was produced as a result of eating the red fish in Algiers. On the other hand, according to M. Couédic, no harm has arisen in France from this cause, for, unless the redness has reached an advanced stage, it may be scraped from the surface, and what remains of the fish is uninjured. It may be remarked that the fish found at Dieppe had

come from the Newfoundland fisheries, and I presume that the same is true of those from Bordeaux, although I have no definite information on this point, nor is there any mention of the kind of salt generally used in the French fisheries.

A word should be said in relation to the distribution of the *Sarcina morrhua* and *Oidium pulvinatum*. After my note in the Report of 1878 had gone to press, there appeared a paper\* by Poulsen, in which he described a new species, *Sarcina litoralis*, found on mud near Copenhagen. As the description of Poulsen's species corresponded very nearly to my *S. morrhua*, I sent a specimen of the latter species to the Danish botanist, who expressed the opinion that, in spite of a difference in the micrometric measurements, it was the same as his *S. litoralis*. As the latter name appeared in print before the Report of 1878, it has priority. The most recent reference to the *Sarcina* is in the *Miscellanea Mycologica* † of Saccardo and Berlese, who recognized the species on the surface of codfish sent from Algiers by Prof. L. Trabut. They consider the *Coniothecium bertherandi* of Mégnin to be identical with *S. litoralis* Poulsen, which they state is considered by Zopf a condition of *Beggiatoa roseo-persicina*, under which name Zopf includes *Clathrocystis roseo-persicina* as a zoöglæa form. Both in this country and Algiers the *Sarcina* is found in company with the *Clathrocystis*, but it does not seem to me to be well proved that the two forms belong to the same species. As it occurs on our coast, the *Sarcina* is quite destitute of any purple or rose color, and the size of the cells as well as their conformation does not lend any support to the view that the *Sarcina* is a stage of the *Beggiatoa*. In the present connection the point of interest is that the *Sarcina* is found on codfish in countries as far apart as New England and Algiers, and on mud in salt marshes in Denmark. A *Sarcina* was found by Patouillard on salted pork, and he thinks it probable that the species is the same as that found on codfish. If this supposition is correct, we have in the *Sarcina* a form which may have been communicated to the codfish by the salt used in curing. In general, it may be said that, with the exception of the long-known *Sarcina ventriculi*, but little is known by botanists of the species of this genus.

The third species, *Oidium pulvinatum* Farlow, is a distinctly higher form than the others. It forms small brown spots on the surface of the dried cod, and is said to injure the sale of the fish; but I do not possess any definite information about the extent of the injury. The fungus would be placed by botanists in the *Hyphomycetes*, and I was in doubt whether to consider it a *Torula* or an *Oidium*. The color and texture of the spores remind one rather of *Torula*, while, on the other hand, the ramification and pulvinate character of the mycelium resemble rather certain forms formerly referred to *Oidium*. The name *Oidium pulvinatum*

\* Om nogle mikroskopiske Planteorganismen, V. A. Poulsen. Vidensk. Meddel. naturh. Foren., Copenhagen. 1880.

† Atti del R. Istituto Veneto, Ser. VI, Vol. 3.

must be abandoned, however, as there is already a species of that name, and in the *Revue Mycologique* of January, 1885, I proposed to substitute the name *O. morrhua*. In the article of Saccardo and Berlese before mentioned, this species is said to occur in Algiers in company with *Clathrocystis* and *Sarcina*, and they consider it a *Torula* rather than an *Oidium*, adopting the name *T. pulvinata*. Patouillard also found on salted pork a fungus which he thinks probably belongs to the same species. As the specific description was originally given in the *Revue Mycologique* the following translation may be of service to those who do not have access to that journal: "Spores spherical, 3.5-5  $\mu$  in diameter, fuscous, attached in chains (average 12-15), arising from secundly fasciculate hyphæ, which are pulvinately compacted in scattered spots."

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## 2.—PRELIMINARY NOTICE OF THE DEVELOPMENT OF THE TOAD-FISH, *BATRACHUS TAU*.

By JOHN A. RYDER.

The ova of this fish are large, and measure from 5 to 5½ millimeters in diameter. They are dirty yellow, almost amber colored, and adherent to the surfaces of submerged objects, especially the under sides of boulders, under which the parent fish seem to clear away the mud and thus form a retreat in which they may spawn. The ova are attached to the roof of the little retreat prepared by the adults, where the eggs are found spread over an area about as large as one's hand in a single layer, hardly in contact with each other, and to the number of about 200. A discoidal area about 3 millimeters in diameter at the upper surface of each egg glues the latter firmly to the supporting surface (Fig. 4).

Fertilization of the ova probably occurs at the time of their extrusion by the female, which, like the female catfish, manifests no further interest in her offspring. The male at once assumes the care of the brood, and seems to remain in the vicinity until the young fish are hatched out and set free.

The germinal disk is developed at the under or inferior pole of the vitellus and opposite the point where the ovum is attached to the roof of the retreat by its adhesive membrane (Fig. 4). There are no oil globules in the yelk, the latter seeming to be remarkably homogeneous. It is therefore not very clear what it is that determines the inferior and inverted position of the blastodisk.

Equally remarkable is the fact that as development proceeds the young adherent embryos are found to have their heads directed towards the opening of their retreat and their tails towards its blind and dark extremity (Fig. 5). This appears to be invariably the case, and it would seem that the direction from which light comes in this instance, at least, has a great deal to do in determining the direction of the axis