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NOTES ON FUNGUS PARASITES OF BIVALVE MOLLUSKS

IN CHESAPEAKE BAY

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Note 1. Discovery of Fungus Infections in
Numerous Bivalve Species.

My hobby is collecting the mollusks of Chesapeake Bay. Having placed a few specimens in museums, and having made a check list (no new species yet) with appended distribution records, I found my hobby less stimulating than my research. But then my research had taken a turn which opened up new and inviting fields of discovery.

First came a devastating mortality of oysters in the Rappahannock River, for which no explanation has been found. Then Mackin et al. (1950) discovered the fungus disease of oysters, Dermocystidium marinum. But not until Ray (1952) developed the thioglycollate culture technique for easy detection of the fungus did we seriously begin to study oyster mortalities and their causes in Virginia (Hewatt and Andrews, 1954).

For some time Ray and Mackin searched among the invertebrate associates of oysters for alternate hosts, only to find that infection was easily accomplished directly from one oyster to another through water-borne spores (J. G. Mackin, Personal Communication). Since other bivalve mollusks would not be suspected as alternate hosts for an oyster disease, little effort was made to check them.

With this background, we at the Virginia Fisheries Laboratory were surprised in August, 1953, to find the meat of a dead clam, Venus mercenaria, infected with a D. marinum-like fungus. During the fall and winter of 1953-54, 12 of 16 species of bivalve mollusks collected near Gloucester Point, Virginia, were found infected with similar fungi (Table I). None of the fungus parasites has been identified except the one causing a mycosis in oysters. How many species of fungi are involved? Can spores from one host species infect individuals of other species? And of most immediate importance, how many bivalve species will serve as host to the oyster parasite?

Very early it was noticed that infections in some bivalve mollusks differed from infections in oysters in two ways: (1) In several host species 100 per cent infections have been found for groups of 25 animals. Infections in live oysters have never exceeded 80 per cent. (2) Nearly all infections of bivalve mollusks other than oysters have been "light" whereas most groups of oysters with a high percentage of infection show some "moderate" and "heavy" infections indicating

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Note 2. The Disappearance of Fungus Infections
in Late Winter and Spring.

According to the thioglycollate test (Ray, 1952), D. marinum almost disappears from live oysters in Chesapeake Bay during late winter and spring (March, April, and early May). Based on samples of 25 oysters, the disease apparently disappeared completely by March in oysters that had been 80 per cent infected in November. Despite the apparent absence of the disease in late spring, oysters which have once had infections develop earlier and greater mortalities the following summer than oysters transplanted from areas where infections never occur. Also, oysters once infected, but testing negative in late spring, will develop the disease in areas where the fungus is not present. This suggests that latent infections, not detected by the thioglycollate method, are present in these oysters throughout the winter and spring. Apparently Chesapeake winters may not be quite long and severe enough to eliminate infections from all oysters.

The possible role of other bivalves as sources of infective material for the oyster disease must not be overlooked. Sketchy records suggest that fungus infections in the other bivalves also disappear in late winter except in Macoma balthica and Anadara trans-versa.

Note 3. Racial Differences in Susceptibility
to D. marinum.

Dermocystidium is a fascinating disease! It resembles a human disease called Blastomycosis in that nearly all organs and tissues are attacked. This makes it easy to study: almost any piece of a dead or live oyster can be cultured with reasonable expectation of making a correct diagnosis of infection.

Dermocystidium is a deadly disease! We are continually astounded at its scope. From 80 to 85 per cent of all our dead oysters from trays show serious infections of the fungus. Only young oysters under one year of age escape the disease. Excluding predation and adverse physical conditions such as too much silting, the disease appears to be the dominant cause of oyster deaths in lower Chesapeake Bay and the lower areas of the major tributaries in Virginia.

Worst of all for the oysterman, there is as yet little evidence of resistance to the disease. Six year old oysters in trays at Gloucester Point are still dying at about the same rate and with the same degree of fungus infection as they did three years ago.

Table II

Effects of Source (Race?) and Age on Susceptibility of Oysters
to D. marinum

Incidence in live oysters--September 1953

| History | Source | Number tested | Percentage infected | Weighted incidence** |
|----------------------------|----------------------------------|---------------|---------------------|----------------------|
| Yearlings* | South Carolina (Tray 28) | 50 | 10 | 0.10 |
| | Chesapeake Bay (Tray 33) | 50 | 0 | 0.00 |
| | Seaside of Virginia (Tray 15) | 25 | 64 | 0.88 |
| Two-year old oysters | South Carolina (Tray 4) | 25 | 20 | 0.20 |
| | Chesapeake Bay (Tray 11) | 37 | 35 | 0.78 |

* All moved as spat to Gloucester Point in fall of 1952.

** Weighted incidence combines intensity and incidence of infection by assigning artificial values of 0 for negative, 1 for light, 3 for moderate, and 5 for heavy infections. To get weighted incidence the sum of all values is divided by the number of oysters tested. These ratings can be compared directly with the six categories assigned integers from 0 to 5 by Mackin (1951). Our ratings (ten in all) have been grouped into 4 categories.

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