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TEMPERATURE CONTROL EXPERIMENTS ON THE FUNGUS DISEASE,
DERMOCYSTIDIUM MARINUM, OF OYSTERS *1

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In 1950 Mackin, Owen, and Collier described a fungus parasite, Dermocystidium marinum, found in oysters of Louisiana coastal waters. Since that time numerous studies have been conducted on the nature of the fungus and its effects upon the host. It has been definitely established that the pathogen is the main contributor to the causes of mortality of oysters in some areas. Ray and Chandler (1955) have adequately reviewed the literature on the subject.

Among the various observations that have been made on the fungus disease there is very positive evidence that the incidence and intensity of the infection are primarily controlled by the temperature of the water. Mackin (1953) found that mortality rates and intensity of the infection were greatly depressed during the winter months in Barataria Bay, Louisiana. Hewatt and Andrews (1953) reported a high mortality period extending from June through October in the lower York River, Virginia. Ray and Chandler (1955) stated that temperatures exceeding 20°C. favor the development of Dermocystidium marinum in waters of the Gulf of Mexico.

During the summer of 1954 we conducted a series of experiments in an effort to determine the effects of relatively low and high temperatures on the development of the fungus disease. Oysters were collected from two different sources. One group of oysters, estimated to be three years of age, was collected from Wreck Shoal of the James River, where no evidence of the fungus has been found. This group will be referred to as the "Nonendemic Oysters". The other group of oysters came from the Rappahannock River, where fungus infections have been found. This group will be designated "Endemic Oysters".

A total of 300 oysters was used in the experiments. They were held in trays suspended from the Virginia Fisheries Laboratory pier for a period of approximately two weeks. They were then placed in well aerated laboratory aquaria to which a mince of oyster tissues, heavily infected with Dermocystidium marinum, had been added. All of the oysters were kept in this environment for a period of 24 hours. They were then returned to the pier trays and held for another week. Another infectious mince of tissues was fed to

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TABLE I.

History of six series of oysters used in experiments.

Series	Source	Date 1st Artificial Infection	Date 2nd Artificial Infection	Experiment Begun	Experimental Environment
V-M-1	James River	9 July 54	13 July 54	20 July 54	Low Temp. at 15°C.
V-M-2	Rappahannock River	14 July 54	19 July 54	27 July 54	Low Temp. at 15°C.
V-M-3	James River	9 July 54	13 July 54	20 July 54	Lab. Vat. at 28°C.
V-M-4	Rappahannock River	19 July 54	19 July 54	27 July 54	Lab. Vat. at 28°C.
V-M-5	James River	9 July 54	13 July 54	20 July 54	Pier Tray at 26-30°C.
V-M-6	Rappahannock River	14 July 54	19 July 54	27 July 54	Pier Tray at 26-30°C.

the oysters to ensure infections and they were again returned to the pier trays for one week. Earlier observations had revealed that oysters subjected to the "feeding" technique at temperatures above 26°C. would become heavily infected and die within a period of four or five weeks.

Six experimental series were set up, each consisting of 50 oysters. The history and treatment of each series are shown in Table I. Series V-M-1 and V-M-2 were placed in a lead-lined vat, of about 150-liter capacity, containing water which was aerated and maintained at a temperature of 15°C. Series V-M-3 and V-M-4 were placed in a similar vat kept at a temperature of 28°C. Series V-M-5 and V-M-6 were held in trays suspended from the laboratory pier. The temperature of the river water varied from 26° to 30°C.

The oysters were examined at frequent intervals and gapers, i.e. oysters which could not maintain closure of the shells, were removed. The thioglycollate culture technique, described by Ray (1952 and 1952a), was used for diagnosis of the fungus disease in the gapers. The intensities of infections were classified as "heavy", "moderate", "light", or "negative" according to the system employed by Ray et al. (1953).

The results of the tests for Dermocystidium marinum and the mortalities in the six series of oysters are shown in Figure 1. Over the period of approximately six weeks there was a mortality of only 10 percent among the oysters (Series V-M-1 and V-M-2) held at 15°C. Of the 10 oysters which died in the group only one was found to be free of infection. Heavy or moderate infections were present in three of the gapers. Ninety-nine of the 100 oysters (Series V-M-3 and V-M-4) held at 28°C. in the closed laboratory vat had died by the end of the six-week period. All of these deaths occurred during the first four weeks of the experiment. The intensities of the fungus infections found in the nonendemic James River gapers were much greater than those noted in the endemic oysters.

Series V-M-5 and V-M-6, which were held in a tray suspended from the pier, had a total mortality of 53 percent. Thirty-seven of the gapers were taken from the nonendemic group and only 16 from the endemic group over the six-week period.

Two tests of samples of live oysters from each of the series of oysters held at low temperature were conducted during the six weeks. The first test was made from tissues of five oysters on August 23. Each of the nonendemic oysters was infected. No infections were found in the sample of endemic oysters. The second test was conducted on August 31 and again revealed light infections in each of the nonendemic oysters. Only two of the five endemic oysters were infected.

Conclusions

1. Oysters which were fed a tissue mince from heavily infected gapers and held in a closed, aerated aquarium at 28°C. became infected with Dermocystidium marinum. All of the oysters were killed by the disease in a period of approximately four weeks.
2. When oysters were experimentally infected and held at a temperature of 15°C. the progress of the fungus infection was arrested and mortalities caused by the disease were negligible.
3. Experimentally infected oysters suspended in endemic waters from the laboratory pier died at a slower rate than oysters held in a closed aquarium at approximately the same temperature.
4. The results suggest that oysters taken from an endemic area are less susceptible to infection by Dermocystidium than oysters collected from nonendemic waters.

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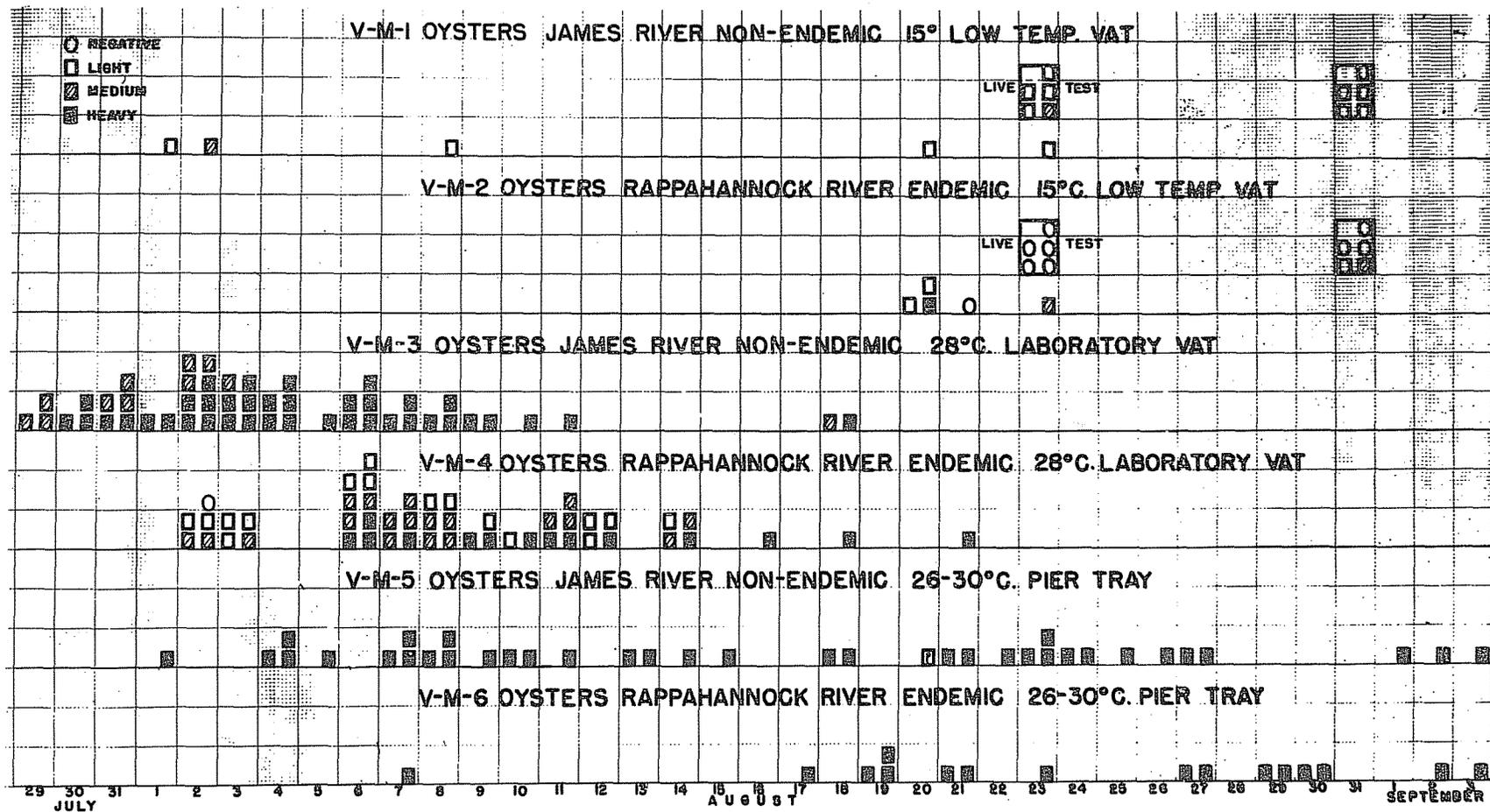


Fig. 1. Results of the tests for *D. marinum* in the six series of oysters.

