

THE MARINE LABORATORY
University of Miami

SPECIAL SERVICE BULLETIN No. 10

Red Tide Bacterial Studies

by

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March, 1955

Red Tide Project

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[Restored and transferred to electronic form by A. Y. Cantillo (NOAA) in 2000 as part of the Coastal and Estuarine Data/Document Archeology and Rescue (CEDAR) for South Florida. sponsored by the South Florida Ecosystem Restoration Prediction and Modeling Program. Original stored at the Library, Rosenstiel School of Marine and Atmospheric Science, University of Miami. Minor editorial changes were made.]

RED TIDE BACTERIAL STUDIES

SUMMARY

1. Cell free extracts of bacterial cultures are capable of killing fish under laboratory conditions. One of those organisms was isolated and is undoubtedly the cause of a "Red Tide" condition found at Whitewater Bay on the southwest tip of Florida. Many dead and dying fish were reported at this occurrence with the characteristic discoloration of water.
2. The second bacterium was isolated from Tampa Bay in April of 1954 and appears to be a strain or closely related species of the original isolate.
3. At least nineteen other pigmented bacteria have been isolated from time to time in areas at which, "Red Tide" has been known to occur. All of these organisms appear to be closely related strains of the original isolate. All of these organisms will give the characteristic "Red Tide" color to the medium in which it is grown.
4. Of the pigmented bacteria tested from these areas all are capable of killing fish rapidly.

This report constitutes an expansion of the bacteriological data issued to the Florida State Board of Conservation in our Preliminary Report on Red Tide studies, January to June, 1954. Since the period of the last report investigations have been carried forth concerning the identification and toxicity of the bacteria reported from at that time. Cell free extract tests for toxicity were made from selected organisms while physiological work was initiated for all of the other bacteria isolated. The original strain was isolated from a mass fish kill in Whitewater Bay and has been identified as *Flavobacterium piscicida*, a new species, by the author. Cell free tests were conducted by Dr. Ernest Reynolds of this Laboratory. The following report gives the pertinent information concerning our work to date. Because of the importance of this work cultures of *F. piscicida* have been sent to various interested investigators at the following institutions: University of Georgia, University of Idaho, and the Pfizer Laboratories. Any other agency interested in obtaining more detailed information concerning these organisms may do so by corresponding with:

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Results of the physiological activity of the various strains of chromogenic bacteria isolated from Red Tide areas points to the conclusion that they are similar to *F. piscicida*. This research was done to identify these organisms but it is also of great value as to the nature of the metabolism and its possible relationship between these pigmented strains and *Gymnodinium brevis*.

It has been found that these bacterial cultures when passed through a microfilter to remove the cells does not lose its capacity to kill fish. The filter used was of such a porosity that the largest size particle capable of passing through was 0.6 microns or approximately one forty three thousandths of an inch. Despite the fact that the porosity was so minute a few cells managed to pass through but did not affect the results of the experiment as the fish were killed before these cells were able to multiply to any degree, *G. brevis* ranges from fifty to sixty

times the size of this organism. Autoclaving or steam sterilization renders the toxic completely innocuous as does the introduction of various chemical agents.

The conclusions drawn from these experiments are as follows: The fish are killed by a water soluble, toxic material, produced by the growth of the bacteria. The toxin is thermolabile, that is, unstable at high temperatures, but extremely poisonous under natural climatic conditions. Given the correct conditions these organisms appear capable of "blooming" and causing mass mortality of marine organisms in nature.