Florida State Board of Conservation

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EMERGENCY REPORT ON THE FLORIDA RED TIDE

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THE MARINE LABORATORY
University of Miami

Coral Gables
Florida

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EMERGENCY REPORT ON THE FLORIDA RED TIDE SITUATION

SUMMARY OF RESEARCH RESULTS

1. The first serious outbreak of recent years was that of 1946-47, when the Marine Laboratory of the University of Miami was able to discover the immediate cause. This was a microscopic plankton organism new to science and was named *Gymnodinium brevis*.

2. The Red Tide occurs sporadically, not every year, but at irregular intervals. The oldest records at The Marine Laboratory show serious outbreaks in 1844, 1854, 1878, 1880, 1882, 1863, 1865, 1908, 1916. Outbreaks studied in the field by Marine Laboratory scientists occurred in 1946, 1947, 1948, 1952, 1953-4.

3. The damage caused by the direct loss of fishes to the commercial industry is over l,OOO,OO0 during a bad Red Tide year. The damage to the tourist industry is hard to estimate, but it must be vary considerably higher than this.

4. The organism, *Gymnodinium brevis*, was found by laboratory experiment at Miami to release poisons into the water which kill fishes and, to some extent, other marine life. This only occurs when *G. brevis* is present in enormous and unusual concentrations, up to 60 million to the quart.

5. Phosphorus compounds are necessary to the growth of plankton. In the Red Tide outbreaks, chemists of this laboratory found abnormally high concentrations of this element.

6. The high phosphorus content is only one factor responsible for the Red Tide. Probable causes of this were reported by this laboratory in 1949. Other factors in the oceanographic conditions associated with it were reported in 1953.

7. For purposes of prediction of Red Tide outbreaks, attempts were made by this laboratory in 1947, and later by the U.S. Fish and Wildlife Service, to establish correlations with meteorological phenomena. These were not successful. Later work at this laboratory suggests a new approach to this and there is hope that it may lead to successful prediction of outbreaks.

8. Culture of Red Tide in the laboratory has been carried out and has provided information on the special nutritional requirements of *Gymnodinium*.

9. A complete review of all exiting knowledge has been prepared by this laboratory for The Gulf of Mexico Bibliography now being published by the U.S. Fish and Wildlife Service.

10. Published results of the research carried out by the laboratory on the problem follow:

Gunter, Gordon, F. G. Walton Smith, and Robert H. Williams.

1947. Mass mortality of marine animals on the lower west coast of Florida. Science, Vol. 105, No. 2723.

Gunter, Gordon, Robert H. Charles 0. Davis, and F. G. Walton Smith

l948. Catastrophic mass mortality of marine animals and coincident Phytoplankton bloom on the west coast of Florida, November 1946 to May 1947. Ecological Monogr., Vol. 18.

Davis, Charles C.

1948. A new species of *Gymnodinium*. Botanical Gazette, Vol. 9, No. 3.

Gunter, Gordon.

1947. Catastrophism in the sea and its paleontological significance with special reference to the of Mexico. Am. Journ. Sci., Vol. 245.

Smith, F. G. Walton.

1948. Basic causes of Red Tide off the west coast of Florida. Quart. Journ. Fla. Acad. Sci., Vol. 11., No. 1.

Chew, Frank.

1953. Results of Hydrographic and Chemical Investigations in the Region of the "Red Tide" Bloom on the Coast of Florida in November 1952.

For The Florida State Board of Conservation:

1948. Educational Bulletin No. 1., The Red Tide.

RECOMMENDATIONS

1. In view of the very considerable damage to the tourist industry and fisheries of the Florida West Coast, every effort should be made to seek a solution to the problem of PREVENTING Red Tide outbreaks. This automatically necessitates developing a method of PREVENTING outbreaks before they have proceeded too far. Dusting the water with copper or other toxic compounds would be relatively valueless without this. It is of no use to kill the causative organism after the outbreak has already strewn fish on the beaches. An explosion must be prevented before it happens; once an explosion has occurred the damage is done. Only foreknowledge can stop the explosion and prevent the damage.

2. The cause of the Red Tide was discovered by the Marine Laboratory of the University of Miami in 1947. Since then, this Laboratory has conducted, on a small scale due to limited funds, the only continuous study of this problem in the state. Scientists from this Laboratory have checked every reported outbreak of Red Tide during this period, in addition to keeping the Red Tide alive for considerable periods in the Laboratory. 0ceanogranhic studies have also been made at sea.

As a result of this continuous research, the Marine Laboratory of the University of Miami is able to state with complete assurance that successful PREDICTION, PREVENTION and CONTROL can only be attained as the result of the following program:

(a) Full-time year-round oceanographic investigation of the chemical and physical changes of the West Coast waters.

(b) Multiple statistical correlation of outbreaks with meteorological and other ambient phenomena.

(c) Tropistic and nutritional laboratory studies of the causative organism.

3. Limited funds for studying the Red Tide organism in this laboratory have in the past, been made available from sources outside of the State of Florida. Funds for a brief oceanographic survey were made available during 1952 through a federal grant to the Marine Laboratory. A survey financed by the Army Engineers will be helpful in supplying information as to the possible relationship with runoff from Lake Okeechobee through the Caloosahatchee. These studies have been helped out in the past by the use of scientists employed under the fisheries research program of the State Board of Conservation,

4. In view of the seriousness of the situation it is recommended that the following program be initiated without delay, if there is any possible way of financing its either by local, state or federal emergency funds.

(a) Oceanographic investigation of conditions leading up to Red Tide outbreaks. This must be year-round, probable duration, two years.

Estimated cost, per year $45,000

Facilities, trained oceanographers, oceangoing vessels equipped for the work, available at the University of Miami.

Funds available at Miami now nil

(b) Continued nutritional and tropistic studies in the laboratory, probable duration one to two years.

Estimated cost, per year $15,000

Facilities and staff experienced in culturing Red Tide, plus living cultures of Red Tides available at Miami.

Funds available at Miami now $5,000

(c) Multiple statistical correlation study for prediction of Red Tide from meteorological, oceanographic and other ambient phenomena, of one to two years duration.

Estimated cost, per year $12,0OO

Meteorologists, oceanographers, and statistical analysts available at Miami.

Funds available at Miami now $2,000

5. The probability of solving the problem will be greatly enhanced by providing adequate funds, and by concentrating them on an all-out attack along the lines indicated above. For the greatest possible chance of quick success, these funds should be concentrated in one locality or organization, equipped with proper laboratory facilities and oceanographic vessels, and with personnel experienced in the Red Tide problem.