

Florida State Board of Conservation

Ernest Mitts, Director

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Progress Report

RED TIDE INVESTIGATIONS

by

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RED TIDE INVESTIGATIONS

OBJECTIVES

The ultimate goal of the investigations into the Red Tide phenomena of the west coast of Florida is to be able to eliminate the effects of Red Tide outbreaks. Since the first news of a Red Tide outbreak is usually a report of dead fish, it is received too late to prevent the outbreak and avoid the damaging effects of the plague. For this reason, it is necessary to be able to foresee or predict it. Once an outbreak has begun, its spread to other localities must be predictable, in order that these areas may be protected.

The achievement of this goal requires that: a) we find the means to predict the initial outbreak, its time and place of occurrence; and, b) we be able to delineate the further progress of an outbreak once it has started. Once we have a general basis of prediction, control will depend upon continuous analysis of the variables on which the prediction is based, followed by application of sound methods of control.

It is obvious that the most difficult problem, as well as the most important problem, is the one of prediction. A discussion of progress along these lines follows below.

ACTIVITIES

The approaches to these objectives have been described in previous reports, and will be briefly reviewed here.

1. Field Station. Activities at the Boca Grande Field Station have been expanded in order that a more detailed study of the inshore waters may be undertaken. The schooner, HEART'S DESIRE, a 40 foot craft with auxiliary power, is now being employed for these studies. With this larger vessel we find that we are not so much at the mercy of the weather, and our range has been extended. It is now possible to occupy anchor stations for days at a time, a feat that was impossible with a smaller craft. Some laboratory analysis is also carried on at the Field Station, using the facilities of the Cape Haze Marine Laboratory.

All of the above has been accomplished with no overall increase in expenditures at the Field Station.

2. Hydrographic Cruises. The R/V GERDA has made two cruises in May, 1956 and August, 1956, since the last report. The May, 1956 cruise marked the end of our first set of hydrographic cruises. After compiling the data for the first set, a general off shore pattern of circulation was determined. Along with the regular cruise, in May, 1956, the State Patrol Boat, PCNJ?P [NOT CLEAR], which is a shallow-draft vessel, sampled Whitewater Bay, and all of the passes from there north to the Crystal River. The August, 1956 cruise marked the beginning of our second set of cruises and an important change [SEVERAL WORDS NOT CLEAR] time. During this year, it is planned to stay within the 30 fathom line in order to determine in more detail the inshore currents of the Red Tide area. This study will be supplemented by data gathered at the Boca Grande Field Station. Sampling techniques have been modified slightly, but include all of the pertinent sampling taken in previous cruises. The remaining cruises intend to employ equipment which should give a more detailed picture of localized current patterns. A scientist from the U. S. Fish and Wildlife Service accompanied our crew on the August, 1956 cruise to take samples. U. S. Fish and Wildlife Service personnel have been notified of the dates of the remaining cruises, and it is expected that they will send at least one scientist on future cruises.

3. Laboratory Analysis. Analyses of field data are continued. The study of chromogenic bacteria has been continued. These will be discussed in greater detail later in the report.

PERSONNEL

Due to the nature of the distribution of the funds we find that we must operate with fewer personnel than before. This has been somewhat of a detriment in our laboratory analysis, and has also presented a problem in cruise operations. Although we are operating under this handicap, we have managed to fall only slightly behind our first year's pace thus far, thanks to the volunteer aid from some local interested persons.

RESULTS

A. Prediction

An objective method for the prediction of major Red Tide outbreaks was successfully tested last year when the prediction that there would be NO major Red Tide outbreak in the period October 1955 - October 1956 was verified. (This prediction was made in September, 1955, and communicated orally to Mr. Ernest Mitts of the Florida State Board of Conservation.) The method requires continuous testing, however, in order to determine its reliability.

Preparation of the forecast for the period October 1956 - October 1957 was made more difficult this year, since the United States Weather Bureau discontinued the collection of data at Carrabelle, Florida. Air temperature observations from Carrabelle are an essential part of the data required for the prediction. Fortunately, it was possible to use data based on the past temperature range in this instance. Since the indicated probability of a major Red Tide outbreak in the period October 1956 - October 1957 is small, the forecast that there would be no MAJOR outbreak was sent to Mr. Mitts on September 27, 1956.

We have written to the United States Weather Bureau and requested that they resume observations at Carrabelle; the matter is now under consideration. If the unfortunate occurs, and the request is denied, your help will be requested. Those data are essential to the prediction method.

The Red Tide Prediction method formulated thus far, merely asserts the probability of a major Red Tide outbreak for the period of one year ahead. In the event of a high probability, it would be desirable to know specifically where and when this outbreak would occur. This is a very difficult problem, and no immediate solution is expected, although we are directing a considerable portion of our efforts toward that direction. The nature of this effort is described in the section under Oceanography, since the Red Tide, and hence the prediction of Red Tide, cannot be divorced from the oceanographic environment.

B. Oceanography

Thus far, we have concentrated on determining the major features of water masses and their movements. These studies have suggested that the movements of certain specific masses of water, particularly those of the Apalachicola and Peace Rivers, are likely to be involved in major Red Tide outbreaks. In fact, these studies formed a basis of the present prediction method.

The tidal regime in the Gulf of Mexico alternates between the daily type and the semi-daily type. Incomplete evidence suggests that Red Tide outbreaks favor periods of daily tidal regime.

This lead is being followed to explore its potentialities. Exploration of this lead fits into our present program of studying the water circulation in smaller areas, but in greater detail. In addition to our usual sampling of the sea, we shall increase our emphasis on current measurements. Besides the GEK (Geomagnetic Electro-kinetograph), we shall have at least three other current measuring devices in the field; the Ekman current meter, the von Arx current meter, and a current drogue. (The latter two are already in use at the Field Station.) These three current-measuring devices can be used only when the vessel is anchored, and therefore are time-consuming. However, the results are worthwhile.

Our past efforts have given us the broad features; our present and future efforts will emphasize features of intermediate scales. These features, when interpreted against the broad background, will yield additional clues to the "when", "where" and "how" of Red Tide outbreaks.

C. Biological Studies

We believe that there has been some misunderstanding concerning the status of the roles of *Gymnodinium brevis* and the colored bacteria, *Flavobacterium piscicida* in the Red Tide phenomenon. In order to clarify this issue, we believe that some statement should be made to put aside any misunderstandings which might possibly still exist. Both *G. brevis* and the chromogenic bacteria have been shown to be toxic to fish. Unfortunately, the bacteria were not studied during active Red Tide outbreaks. It may be, therefore, that there is an association between these organisms in some instances. Although The Marine Laboratory was first to show that *G. brevis* is associated with most of the investigated fish kills in the Florida Gulf, nevertheless, because *F. piscicida* has been demonstrated to be toxic to fish and it is normally present in these waters, we consider it worthy of investigation as a possible contributor to Red Tide fish kills.

Those chromogenic bacteria which were found at the Lemon Bay fish kill have been shown to be toxic to fish. As a matter of fact, all chromogenic bacteria now in culture and found prior to May, 1956 have been shown to be toxic to fish. During the May, 1956 cruise, 22 stations yielded chromogenic bacteria, eight of those were found at Whitewater Bay, seven of which are toxic to fish. Two of the samples, from the Suwanee River area, yielded the very rare occurrence of a pure culture in nature. Those samples are not being tested for toxicity.