

INVESTIGATIONS OF "RED TIDE" FISH KILL IN FLORIDA

In response to a request from the Office of the Surgeon General, Dr. F. Earle Lyman, Assistant Chief of the Entomology Division, CDC, accompanied by Mr. D. C. Thurman, Jr., CDC Entomologist of the Florida State Board of Health, visited the West Coast of Florida on July 28, 1947, to investigate the dying fish problem in that area and to arrange for CDC assistance in alleviating fly breeding conditions.

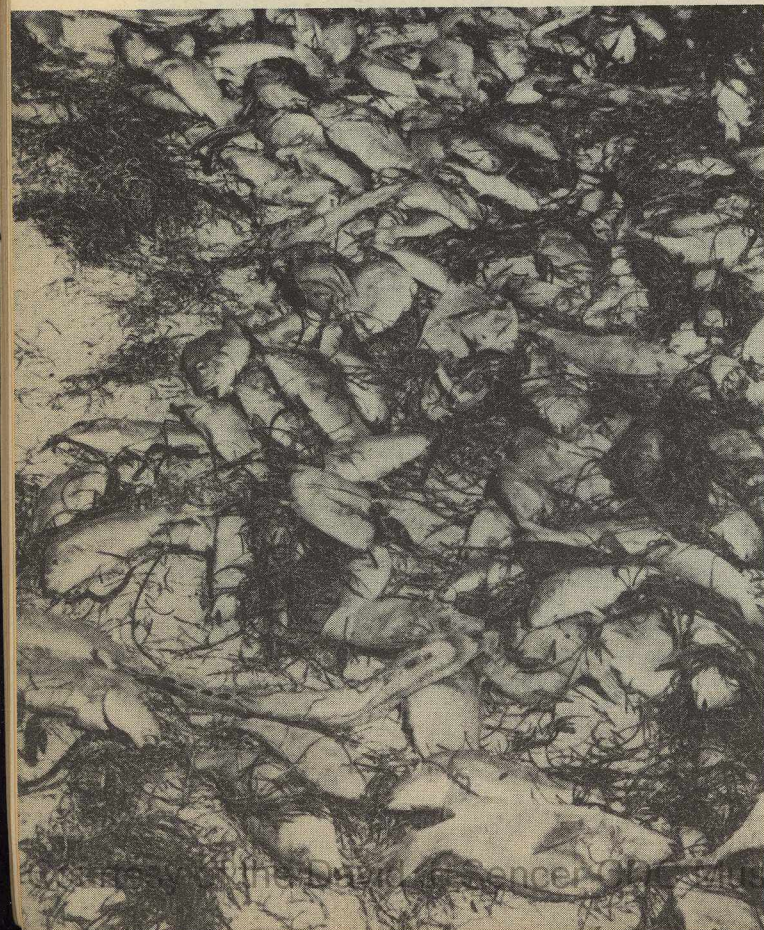
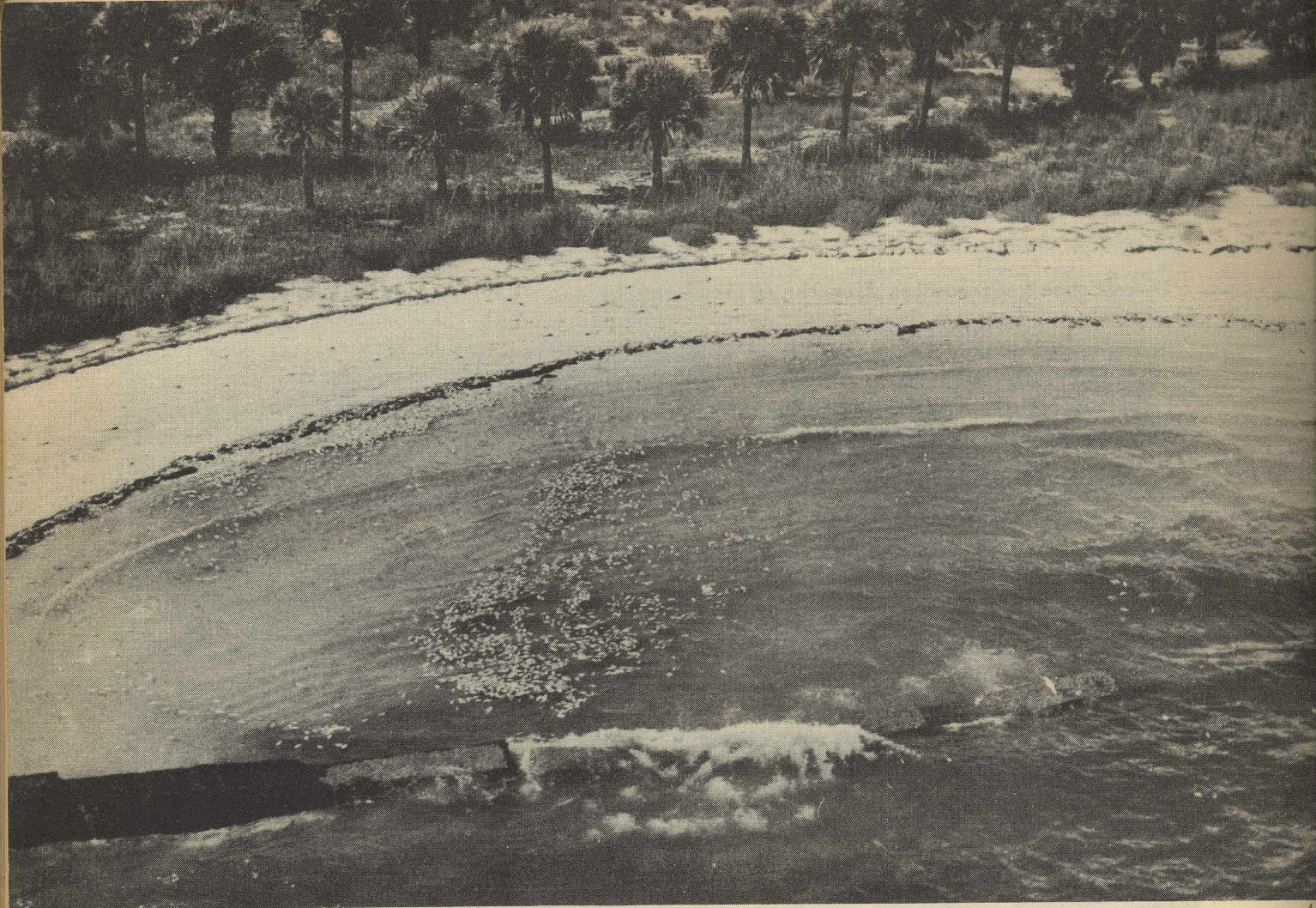
The present plague of dying fish began during late November 1946 and has continued in a series of more or less interrupted outbreaks up to the time of the present investigation in July 1947. Large numbers of fish had begun dying on the Gulf Coast

of Florida early in July and west winds had littered the beaches from Boca Grande northward to Sarasota with tons of decaying fish including many deep-sea fish, such as tarpon and jewfish, as well as smaller fish, crabs, etc.

Many residents had moved away from the beaches because of the foul odors. Not only was the area affected by foul odors but a throat irritation accompanied by coughing was experienced by persons visiting the beaches. The dead fish accumulated just above the high tide mark soon became virtually alive with scavenger fly maggots belonging to the families Calliphoridae and Sarcophagidae. The first peak of fly



Raft of dead fish floating in the open waters of the Gulf, note the bloated appearance of these fish. (Photograph courtesy the Times, St. Petersburg, Florida.)



(above) Protected bays and coves collect large numbers of dead fish. (left) Masses of decaying fish collected on the beaches at the high-tide mark where they breed enormous numbers of flesh and blow flies. (Photographs courtesy the Times, St. Petersburg, Florida.)

emergence occurred near Sarasota on July 28. However, at Boca Grande to the south many adults already had emerged and flies were extremely abundant on the vegetation adjacent to the high tide mark. In those places where the fish had been raked or collected into piles or had been buried in shallow pits (covered 6 inches or less with sand,) fly breeding was more intense than in those areas where the fish had been allowed to remain on the surface to dry in the sun.

The exact causes of the fish kill are still unknown. According to a report by Dr. F. G. Walton Smith of the University of Miami, such kills in the past have occurred in many parts of the world, and records show that they have occurred in

Florida in 1844, 1854, 1878, 1880, 1882, 1883, 1908, and 1916. The recent kills are associated with what is known as the "red", "yellow", or "rotten" tide, which gives the water a color from amber yellow to red or green. This red tide is evidently caused by the presence of enormous numbers of a dinoflagellate protozoan (Class Mastigophora, *Gymnodinium* sp.), as yet unidentified. According to Dr. Smith, the fish are probably killed by some toxic substance, presumably a gas which results from the decay of these dead microscopic organisms. Moreover, the kill has not resulted from wartime poisonous gases buried in the Gulf, from adverse meteorological conditions, or from a gill infection of the fish by *Gymnodinium* itself. All of these causes, however, have had popular support.

It was observed during the investigation that samples of sea water containing *Gymnodinium* had a much higher viscosity than normal sea water. When heated, small bubbles of gas formed which upon inhalation by humans produced a very distinct irritation to the mucous membranes of the throat and caused severe coughing. This irritation

subsided quickly when breathing of the fumes from the heated water stopped. No distinctive odor from the gas was apparent nor was any irritation produced after the water had been boiled for a short time, cooled, and then reheated, which seems to indicate that the irritant is a gas readily released by boiling. Water samples were collected by Dr. W. W. Anderson, Chief, Gulf Investigations, Fish and Wild Life Service, New Orleans, for complete analysis in Washington. A report of the findings will be sent to CDC when completed.

RECOMMENDATIONS MADE

After discussions of the problem by CDC investigators in conference with Dr. W. L. Wright, Health Officer of Sarasota County, Mr. Ross E. Windom, City Manager of Sarasota, and Mr. Melton Williams, Director of Anti-Mosquito District of Sarasota County, it was recommended that DDT be used for controlling the adult flies. This step was advisable in order to prevent the flies from migrating into the towns and creating a nuisance. Arrangements were made for CDC, through the Florida State Board of Health,

Accumulated
dead fish
form
almost solid mats
at the
water's edge.

(Photograph courtesy
the Times
St. Petersburg,
Florida.)



to furnish the DDT and supervision and for the county and city to supply the necessary labor and equipment for applying the spray. A Dobbins 100-gallon orchard sprayer was available although it was considered too small for the purpose. Mr. John A. Mulrennan, in charge of CDC activities for the Florida State Board of Health, furnished eight 55-gallon drums of DDT isomer, 35 percent concentrate, which arrived in Sarasota by truck on July 31. Spraying of the DDT was initiated immediately and was continued under the supervision of Mr. Thurman. While greater success could have been obtained by using an airplane or a ground fog machine for dispensing the DDT, the group felt that, because of the limited health hazard, this greater expense was not justified.

RESULTS

Spraying was begun on Sarasota county beaches on August 1 by a crew of four men. Fly control of the worst areas was soon effected and spraying work was discontinued about August 8. Prior to application of the spray the beaches were inspected and spray applications were scheduled as near as possible to the peak of emergence so that adult flies were killed before they began to migrate. A small amount of spraying was done at Boca Grande on Gasparilla Island on August 2 - 3. Here the flies already had migrated from the beaches and were becoming a nuisance around homes. The 5% DDT emulsion applied with a Bean orchard sprayer was used throughout the town and excellent results were obtained.

SPECIAL ENTOMOLOGICAL ACTIVITIES IN FLORIDA

ANOPHELES ALBIMANUS SURVEY

During the winter of 1946-47, evidence was accumulated which indicated that *Anopheles albimanus* is established in the Florida Keys on Stock Island near Key West, with intermittent breeding on Key West itself. Collections of adults have since been taken in light trap collection on Boca Chica, Cudjoe Key, Marathon (Vaca Key) and Islamorada. The Entomologists of the U. S. Quarantine Service determined a specimen of this important *Anopheles* from Fisher's Island in Dade County, in the spring of 1947.

For the purpose of gaining additional information about the distribution, populations and biology of *Anopheles albimanus*, an intensive anopheline survey of South Florida has been inaugurated under the direction of CDC Activities, Division of Entomology, Florida State Board of Health. Mr. J. S. Haeger, entomologist, assigned to the project, has established headquarters at Homestead, Florida, from which point he will cover the area south to Key West and Cape Sable, operating light traps at strategic locations and searching for anopheline larvae in likely looking breeding places. From data obtained during this

survey conclusions will be made as to whether or not control work is warranted.

SPOTTED FEVER INVESTIGATIONS

Entomological investigations are being carried on in connection with the occurrence of sporadic cases of Spotted Fever in Florida. Clinical cases have been reported from a number of widely separated areas and cases which have been more definitely identified by the use of blood tests have been found at Quincy in Gadsden County, near Bradenton, Manatee County, and at Orlando in Orange County. Arrangements have been made with the Virus and Neurotropic Disease Laboratory of the U. S. Public Health Service in Montgomery, Alabama to test ticks collected from places where human diseases were acquired. Several collections have been submitted to the laboratory. An investigation has been made of the Gadsden and Manatee County cases and plans are being made to collect ticks in Orange County in the near future.

Species of ticks collected in suspected areas are as follows: *Dermacentor variabilis* Say, *Amblyomma americanum* (L), *Amblyomma maculatum* Koch, and *Ixodes scapularis* Say.