

Florida State Board of Conservation

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RED TIDE OUTBREAKS OFF THE FLORIDA WEST COAST

by

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Respectfully submitted by

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THE MARINE LABORATORY. UNIVERSITY OF MIAMI

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Coral Gables
Florida

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Director

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RED TIDE OUTBREAKS OFF THE FLORIDA WEST COAST

Abstract

A compilation of reports of Red Tide on the west coast of Florida from 1844 to January 1955 is given. Also included are two working diagrams of incidence of Red Tide, suggesting that 1) Red Tide occurs more frequently in the months of August through January, 2) the individual Red Tide outbreaks are part of larger outbreaks which seem to move from south to north, and 3) summer outbreaks appear to originate mostly north of Venice, winter and spring outbreaks further south. Further data are required to give complete support to 2). If this is substantiated, it is pointed out that control may be exerted by action in a limited focal area or areas of origin. Otherwise the problem of control may be of the greatest difficulty since it will require action over a much wider area or areas.

To control Red Tide effectively, it is, among other things, necessary to be able to predict future outbreaks. Prediction demands knowledge of the conditions under which it is possible for an outbreak to take place. It may be that various ambient phenomena, such as chemical and biological characteristics of the water, weather and hydrographic conditions, et cetera, can be correlated with occurrence of Red Tide and thus enable the scientist to foretell both new outbreaks and movements of outbreaks which have already begun, in time to control them. It is thus necessary to have as detailed as possible analyses of the incidence and pattern of these outbreaks.

This chronological report of Red Tide occurrence has been prepared to make The Marine Laboratory records available to all agencies working on the Red Tide problem. Items included have been obtained from a) the scientific literature, b) newspaper accounts, c) personal communication with residents of the critical area, and d) personal observations made by members of The Marine Laboratory staff. Two things must be noticed: First, many incidences of Red Tide, especially before 1947, were probably not recorded; and, second, all recorded observations may not be included in the material available to this Laboratory, i.e., there, are probably records in personal letters, ships' logs, and other such places. Any additional records of Red Tide occurrence will be welcomed by all agencies currently working on this important problem.

It must be mentioned, however, that since the individuals who have observed the Red Tide from 1844 to the present time, have not, for the most part, been trained scientists, or individuals who live sufficiently close to the sea to know all its aspects, it is probable that some of the occurrences noted in this report were not necessarily Red Tide. For example, shrimp boats are known to finish sorting the shrimp from the fish in their catch on their way to home port and to dump the trash fish overboard. Thus it may be that some of the "dead fish" reports along the west coast are not distinguishable from mortalities due to Red Tide. Also, some of the occurrences may have been reported by individuals who did not personally see the phenomenon. One must be careful, therefore, to weigh gingerly the implications of the various reports.

It would appear, from a preliminary analysis of the reports of late 1953 and 1954, that the Red Tide, in the absence of onshore winds, travels with the northward component of the Florida West Coast Cyclonic Eddy, moving from south to north. It is suspected (*, page 81) that the Red Tide originates inside of the passes, and that the epidemic is carried by these currents to the points of observation. In other words, it seems that various reports of Red Tide outbreaks along the coast are usually reports of a single, moving outbreak. While this does not preclude Red Tide outbreaks which may originate independently over a wide area, the occurrence data presented in this report would seem to show that further progress in the analysis along these

lines would depend in part, on a greater knowledge of current movements. It is of the utmost importance to obtain further data inasmuch as the problem of control will obviously be relatively simple if it can be shown that a long sequence of outbreaks has its origin in a limited focal area. If the reverse is true, control would involve the almost simultaneous treatment of a relatively long coastline and be relatively impractical.

Figure 1 is a schematic representation of the reported incidences of Red Tide of the lower west coast of Florida for the period from December 1953 through January 1955. For convenience of presentation, the west coast was divided (Figure 2) into seven arbitrary areas:

- | | |
|-----|---|
| I | North of St. Petersburg |
| II | Bellaire Beach south to Passage Key Inlet |
| III | Passage Key Inlet south to Midnight Pass |
| IV | Midnight Pass south to Stump Pass |
| V | Stump Pass south to La Costa Island |
| VI | La Costa Island south to Sanibel Island |
| VII | South of Sanibel Island |

This diagram is a working tool. It would seem from, a close inspection of the occurrence data, that the outbreaks can be separated in several different ways. The divisions shown here were chosen because they emphasize the apparent movement from south to north with the current. The diagram seems to show that most of the outbreaks originate in the southernmost area and proceed north, while others originate farther north; perhaps in the passes. The intensity and extent of outbreaks appear to be functions of the speed of the current along the shore as well as other pertinent hydrographic, meteorological and biological factors. Several other possibilities for the slanting dotted lines were considered. For the present purposes, however, it was decided to outline only the major divisions of outbreak and thereby gain clarity.

A histogram showing the number of times per month that Red Tide was reported from 1878 through 1953 is given as Figure 3. Since this diagram is an attempt to determine the season of the year in which Red Tide has appeared, a number of references to Red Tide which were too vague for this purpose were therefore not included. It should be noted that mortality of marine animals associated with discolored water has been reported during all months of the year, but Red Tide seems to have occurred most frequently from July through January, with relatively few occurrence in the months from February through June.

If the severity of a particular attack is measured by length of that attack, then the most severe reported attacks have been in the Gasparilla Island and Sarasota areas (see Figure 1). It is probable that the reporting from these areas has been more accurate, since there are more inhabitants there who turn in reports, especially when compared with the area south of this. This is not a determinable factor at the present time.

A preliminary attempt was made to determine the dates of initial outbreaks of Red Tide in various areas. (See Table 1) This information was then compiled into a schematic diagram (see Figure 4). It may be of interest to note that a period of seven days (Full Moon plus or minus three) is apparently free from initial outbreaks. This does not, of course, imply that an outbreak which is in progress would cease at the beginning of this period.

The Marine Laboratory is presenting this report not only as an aid to research by all participating agencies, but also in the hope that any person or agency reading this report will see the importance of accurate occurrence records, and forward any they may have which have not been included.

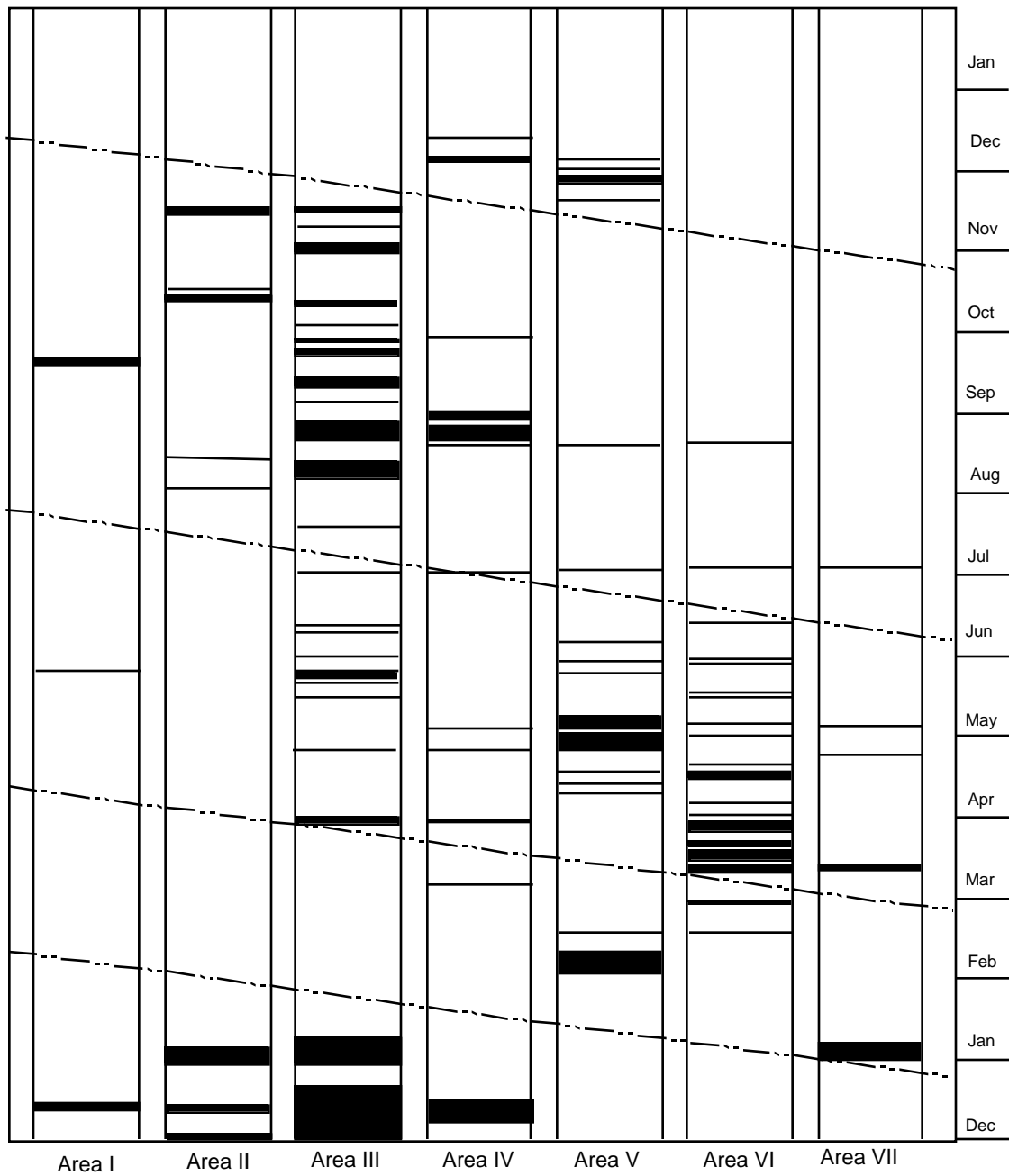


Figure 1. Duration of reported outbreaks of the Red Tide (December, 1953 - January, 1955).

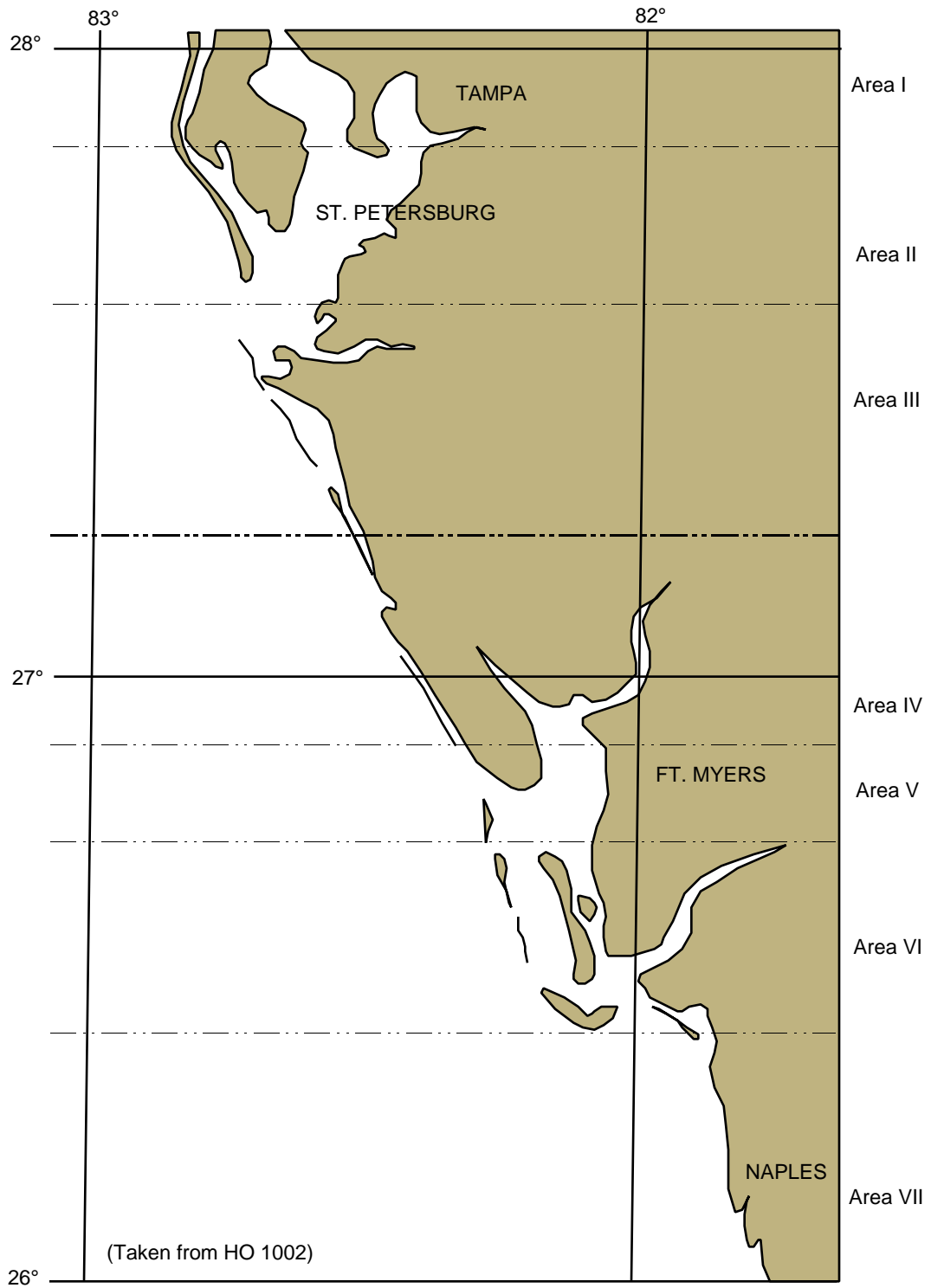


Figure 2. Area divisions.

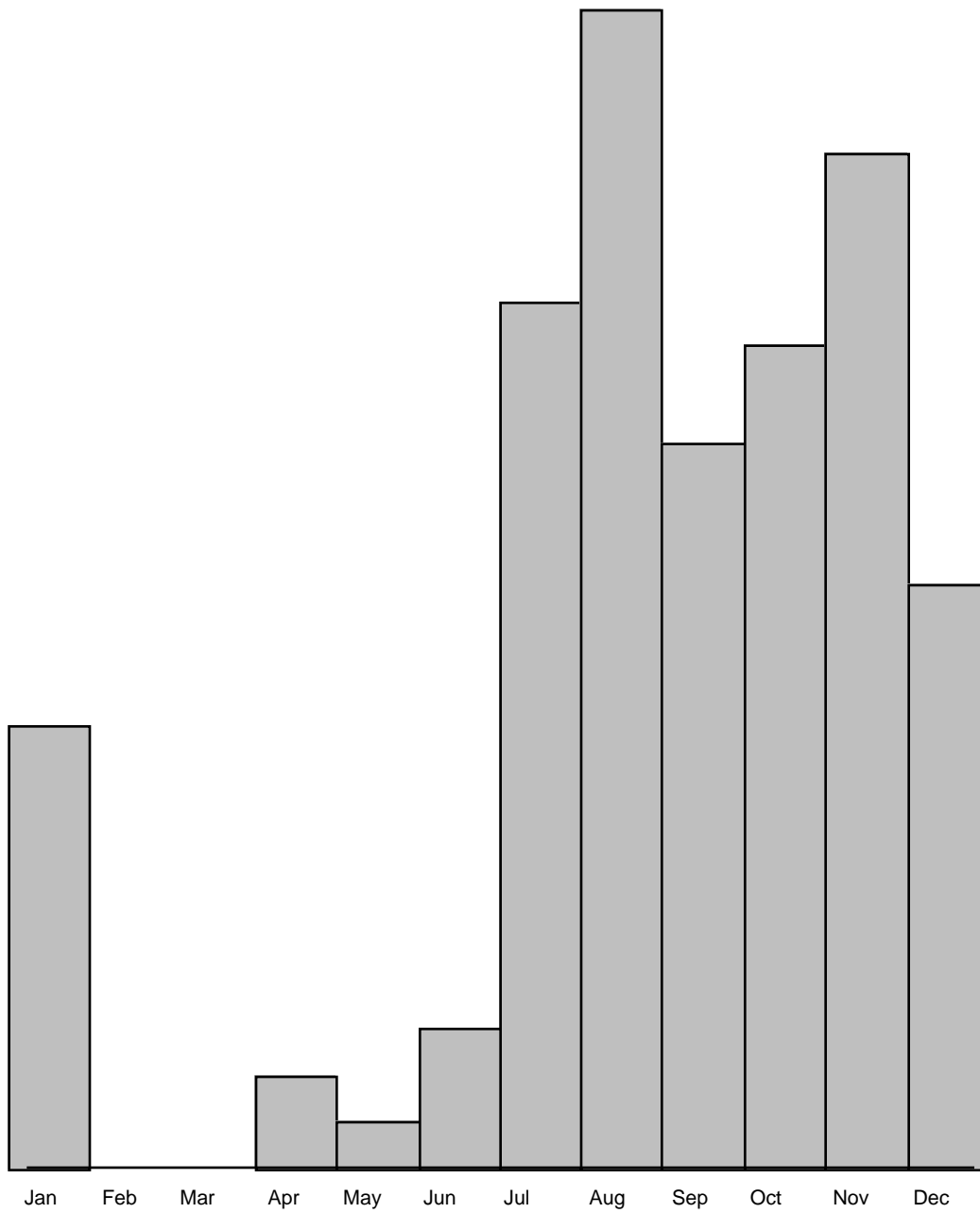
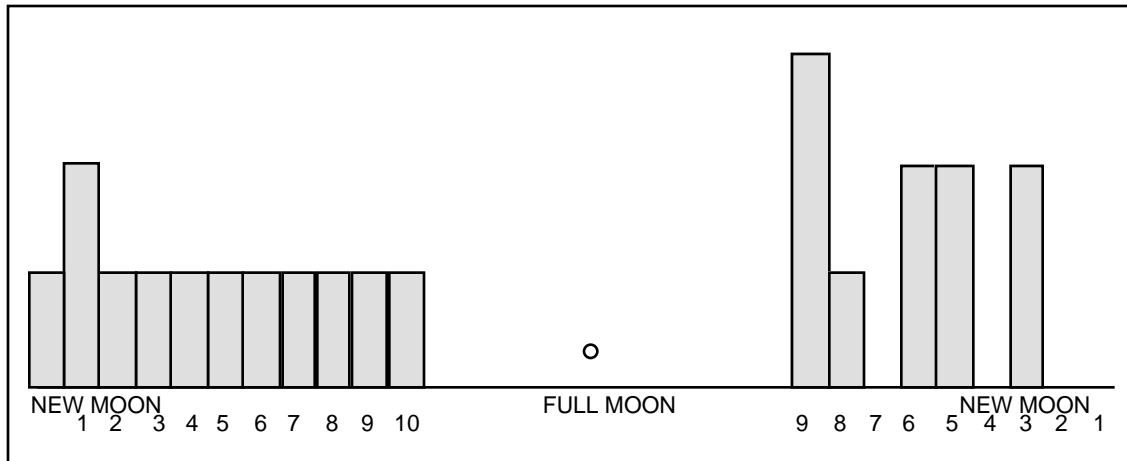


Figure 3. Number of reported outbreaks of Red Tide (1898 - 1953, inclusive).

TABLE 1.

Dates of Apparent Initial Outbreaks of Red Tide in Areas III, IV, and V, with Relationship to New Moon

Date of Apparent Outbreak	Relationship to New Moon
January 1, 1954	N. M. -3
February 3, 1954	N. M.
March 8, 1954	N. M. +3
April 27, 1954	N. M. -5
May 26, 1954	N. M. -6
June 1, 1954	N. M. +1
June 7, 1954	N. M. +6
July 21, 1954	N. M. -8
August 10, 1954	N. M. +10
August 18, 1954	N. M. -9
August 22, 1954	N. M. -5
September 5, 1954	N. M. +7
September 23, 1954	N. M. -3
September 27, 1954	N. M. +1
October 6, 1954	N. M. +8
October 30, 1954	N. M. +4
November 18, 1954	N. M. -6
November 27, 1954	N. M. +2
December 1, 1954	N. M. +5
December 5, 1954	N. M. +9
December 14, 1954	N. M. -9
January 13, 1955	N. M. -9



APPARENT INITIAL OUTBREAKS OF RED TIDE WITH RELATIONSHIP TO NEW M'OOON
(Figure 4)

List of Reported Outbreaks in Chronological Order

1844

"One of the oldest residents on the Florida coast, Mr. Benjamin Curry, of Manatee, told me, what others confirmed, that as far back as 1844 a widespread destruction of all sorts of saltwater animal life occurred, apparently due to causes precisely similar to those which produced the lately noticed desolation." (Ingersoll, E., 1882, page 75)

1851

"Again, in 1854 the fishes suffered all along the southern shore, and have done so at intervals to a less degree..." (*ibid.*)

1856 or 1857

"It is said that in 1856 or 157 there was a similar occurrence of limited extent over in the bay, and frequently the smacks fishing near shore along the coast meet fresh water, which kills their fish... " (Jefferson, J. P., Porter, J. Y., and Moore, T., 1879, page 245)

About 1856

"...that fishermen returning from the coast of Florida with fish, in an apartment of their boats communicating freely with the surrounding water, have had them die suddenly on reaching a certain kind of water distinguishable by its color. This has occurred several times, notably about 1865 and in 1878, when large numbers were thrown on the shore at Key West, many of them of very large size, so that perhaps all that came within the influence of the poisoned water perished sooner or later." (Glazier, W. C. W., 1882, pages 126-127)

Intervals between 1854 and 1878

"Again, in 1854 the fishes suffered all along the southern shore and have done so at intervals since to a less degree, until in 1878 an excessive fatality spread among them, which was wider in the extent of its damaging effects and probably more destructive in point of number of its victims than the later visitation of 1880. Even the cooler half of 1879 was not exempt from some appearance of the plague." (Ingersoll, E., 1882, page 75)

1878

See above.

"About two years ago certain portions of our Gulf waters became poisoned in some way that caused the death of all the fish that came in contact with it." (Moore, M. A., 1882, page 125)

"During its prevalence two years ago the military commander at Fort Jefferson on the Tortugas had to make daily details to carry off the dead fish thrown up on the beach for fear it would breed a pestilence." (*ibid.*, pages 125-126)

January:

"In regard to some of the manifestations of this deadly influence in the sea during 1876, Mr. John Brady, Jr., an intelligent captain, told me that the time of year was January and that the 'poisoned water', to which universal belief credits the death of the fishes, could easily be

distinguished from the clear blue of the pure surrounding element." (Ingersoll, E., 1882, page 75)

"...and a very severe attack was reported in January, 1878." (Taylor H, F., 1917, page 13)

September 9:

"Some three or four weeks ago, the fishing-smacks over in Florida Bay lost about all their fish in their wells, and attributed it to fresh water, which they supposed had from some cause or other come down in great volume from the mainland. On the 9th instant, the sailing-vessel which connects us with Key West met water of a dark color about midway between here and there, but saw no dead fish." (Jefferson, J. P., Porter, J. Y., and Moore, T., 1879, page 244)

September 11:

"On her return, on the night of the 11th, she struck it off Rebecca Shoals, about 25 miles east of here, and found it extending some 10 miles out in the Gulf. That same night it came down upon us here, and the next morning the beach and surface of the water, as far as the eye could reach, were covered with dead fish. The appearance of the water had entirely changed; instead of the usual clear blue or green, it was very dark, like cypress water, and when viewed at depths over 10 feet, was almost black." (*Ibid.*, pages 244-246)

October 11:

"October 11th, at 7 a.m., saw the water a very dark color and dead fish drifting by as far as we could see east and west of the Key." (*Ibid.*, page 246)

October 12:

"Oct. 12th; 4 p.m., fish of all kinds on the beach, weighing from a few grains up to Jewfish, weighing about 150 lbs." (*Ibid.*, p. 246)

October 13, 14, 15, and 16:

"Dead fish drifting on this Key and at Fort Jefferson, distance from this Key 3-3/4 miles." (*Ibid.*, page 246)

October 30 and 31:

"The water colored a light brown. I do not see any fish dead or alive." (*Ibid.*, page 246.)

November 20:

"Since my communication in October, another large body of the darkcolored water described therein made its way down the coast, across Florida Bay, striking Tortugas about the 20th of November, and extending up the reef as far as Key West, probably further. At Key West its approach could be seen distinctly; at first, belts of it, some narrow, others broad, came into the harbor, following the various channels leading to the northward, and only in these belts were the fish affected; in the course of twenty-four hours, however, all the water in the harbor was similarly colored, and the surface water was covered with dead and dying fish." (Jefferson, J. P., 1879, page 363)

"...until in 1878 an excessive fatality spread among them, which was wider in the extent of its damaging effects and probably more destructive in point of number of victims than the later visitation of 1880." (Ingersoll, E., 1882, page 74)

1879

"Even the cooler half of 1879 was not exempt from some appearance of the plague." (*Ibid.*, page 75)

1880

"In regard to the epidemic of 1880, it took place on the west coast of Florida. The hurricane, which immediately preceded the epidemic, was from the northeast, blowing directly off shore. It was probably blowing at a rate of from 60 to 100 miles per hours, making an overtop that would bring cold water from almost any depth, and of course it would roil the water so that it would be streaked with various colors," (Pierce, H. D., 1884, page 265)

August to November:

"In August, September, October, and November, 1880, it occurred again, but in relatively milder form." (Taylor, H. F, 1917, page 13)

Autumn:

"...'poisoned water' which was supposed to have caused the remarkable mortality among the seafishes that occurred in the autumn of 1880." (Ingersoll, E., 1882, page 74)

"Concerning the attack of 1880 I am able to say more. It began suddenly and immediately followed the terrible hurricane which is known as the 'August gale', the fish and all other ocean life suddenly dying in hordes all along the southern (eastern) shore of Tampa Bay, on Egmont Key, at its mouth, which was the most northern point, and thence southward as far as Shark River, in Whitewater Bay, on the coast. Thence fatal localities were to be found in the currents that set southward through Bahia Honda Passage, through the Northwest Passage beyond Key West, and even out in the neighborhood of the far isolated Tortugas." (*Ibid.*, pages 75 and 76)

October 17:

"The first dead fish we saw was on Sunday, October 17, as the tide came in. There were thousands of small fish floating on the water, most of them quite dead." (*Ibid.*, page 76)

"The fish began dying on the outside beaches first, as `Mr. Strand, assistant light-keeper at Egmont, reports them coming up first on the 17th of October, while Mrs. Hoy observed them first on the 1st or 2nd of November, at Little Manatee River." (Walker, S. T., 1884, page 106)

October 18:

"The next day other kinds were dying ... " (Ingersoll, E, 1882, page 76)

October 25:

"...and by the 25th of October nearly all kinds of fish that inhabit these waters were dying, except the ray family." (*Ibid.*, page 76)

October (latter part):

"Statement of Mr. Williams, of Point Pinellas: 'The fish began dying about the last of October here.'" (Walker, S. T., 1884, page 107)

October 25 to November 10:

"From the 25th of October to the 10th of November was the worst time; during that time, the stench was so bad that it was impossible to go on the beach... They continued to die for about six weeks; they kept getting less every day." (Ingersoll, E., 1882, page 76)

November 1 or 2:

"The fish began dying on the outside beaches first, as Mr. Strand, assistant light-keeper at Egmont, reports them coming up first on the 17th of October, while Mrs. Hoy observed them first on the 1st or 2nd of November, at Little Manatee River." (Walker, S. T., 1884, page 106)

November 20:

"On leaving Clear Water, November 20, I sailed through Boca Ceiga Bay, and encountered the first dead fish floating on the water near Bird Key, a little southeast of Pass A'Trilla." (*Ibid.*, page 105)

November:

"This state of affairs has occurred again; the waters of some portions of the Gulf becoming so obnoxious as to kill the fish." (Moore, M. A., 1882, page 125)

1882

July 20:

"We learn from Capt. William Jackson of the steamer LIZZIE HENDERSON, that on his trip from Cedar Key, Tuesday, he encountered a streak of poisoned water, covered with all varieties of dead fish, of more than a mile in extent, off Indian Pass, between Clear Water and Egmont Light." (Anonymous, 1883, page 104)

July:

"In July, 1882, the plague returned; in this case it may be connected with the tilefish disaster..." (Taylor, H. F., 1917, page 13)

1883

According to Taylor (1917) the plague occurred during this year.

1885

October:

Fish mortality occurred in water of a reddish color between Charlotte Harbor and Egmont Key. (Glennan, A. H., 1887, pages 10 and 11)

About 1895

"...after the practically complete extermination of the sponges from so-called 'poison water'. This has recurred at irregular intervals about ten years apart. In 1878, for instance, practically all sponges accessible to the hookers between Johns Pass and Cedar Key were destroyed and the fishery was abandoned for several years, the first sign of recuperation being about 1882. About 1895 a similar occurrence in the northern part of the Bay grounds killed the sponges between St. Marks and the mouth of the Suwannee River from about the 5-fathom curve to the greatest depth explored by the hookers, and in 1901 I was informed that the first sponges taken since then from the depleted bed had been obtained recently." (Moore, H. F., 1910, page 501)

1908

Summer:

"In the summer of 1908 a similar mortality destroyed the sponge beds along the keys between Key West and the mainland." (Taylor, H. F., 1917, page 13)

"In the summer of 1908 the sponge beds in this region and to the eastward were destroyed by poison water. It is probable that this was fresh water from the Everglades,..." (Moore, H. F., 1910, page 434)

(According to Smith, 1941, this is probably an outbreak of sponge blight rather than Red Tide.)

1916

October 3:

"The abnormal conditions seemed to be moving southward, occurring at Boca Grande on October 3 and 15, at Captiva Pass about the middle of October,..." (Taylor, H. F., 1917, page 6)

October (middle part):

See above.

October 18:

See above.

October 20:

"... at Blind Pass about October 20,..." (*Ibid.*, page 6)

November 1:

"... at San Carlos Pass about November 1..." (*Ibid.*, page 6)

November 5:

"... and dead fish were first seen at Big Marco Pass on November 5." (*Ibid.*, page 6)

November 6:

"Fish were seen dying by the multiplied thousands here." (Fort Myers News)

November 11:

"...7 miles south of Boca Grande fish still dying ... along the Captiva Pass and inside waters of Pine Island Sound." (Taylor, H. F., 1917, page 7)

November 13 and 14:

"On November 13 and 14 dead fishes were in greater abundance, coming in, apparently, on the tide." (*Ibid.*, page 9)

1924

"In 1924 Red Tide struck on the Manatee River killing Crevalle, Jacks, and Snook by the thousands." (St. Petersburg Times, January 31, 1954)

1932

"A disastrous Red Tide struck from Boca Grande to Naples. (*Ibid.*)

1946

November, 1946 to July, 1947:

"Furthermore, the mortality of fish and other animals occurred sporadically over a period of 9 months from November, 1946 to July 1947." (Davis, C. C., 1948, pages 356-360)

November 20:

"Mackerel fishermen first noticed dead and dying fishes, and turtles in streaks of discolored water ten to fourteen miles offshore from Naples on November 20, 1946... The mortality moved northward and shoreward and reached the bays behind Sanibel and Captiva Islands, as far north as Boca Grande Pass. Fish continued dying there until late in January, 1947." (Gunter, G., Williams, R. R., Davis, C. C., and Smith, F. G. W., 1948, page 311)

November:

"The death of the fish were reported as far back as late November near Indian Cay and Cape Romano..." (Miami Herald, January 19, 1947)

December 24:

Dead fish were first seen on December 24. (Fort Myers News, December 27, 1946)

December 27:

"Thousands of dead fish were reported floating from Ft. Myers to Naples - - - from close inshore to four miles out (first seen on 24 December). Mullet, Key West Grunt, Angelfish, and Pinfish were the principal victims. An orange streak in the water near the buoy marking the entrance to the Caloosahatchee Cross State Canal. There was a long stretch of calm preceding a Northwester. (*Ibid.*)

1947

January:

"At one location near Fort Myers, Florida, during the January mortality, it (*Gymnodinium brevis*) was 13,900,000 cells per liter and was probably even higher in other localities at that time." (Davis, C. C., 1948, page 358)

January 10:

"The mortality moved northward and reached Boca Grande by January 10." (Gunter, G., Smith, F. G. W., and Williams, R. H., 1947, page 256)

January 19:

"...he (Captain of a freighter) sailed through dead fishes from Dry Tortugas to Fort Myers... the disturbance was many miles farther off shore at the southern end of the Florida peninsula than at its northern limit." (*Ibid.*, page 256)

January 19:

"At Fort Myers on January 19 the beach was littered with fish in excess of 170/foot of shore line, in addition to those floating on the water in bays and sounds and to a distance of 10 miles offshore." (*Ibid.*, page 256)

January 19:

"...and since the mortality wave has extended to Boca Grande and beyond." (Miami Herald, January 19, 1947)

January 22 to 26:

"An odorless but acrid gas causing stinging of the nostrils and hard coughing made life miserable for the residents of Captiva Island when a northwest wind caused a heavy surf on the Gulf Beach from January 22 to 26. This gas, which could not be identified, was not present during calm weather on January 28, but could be detected by boiling samples of Gulf and Bay water. It was particularly strong in a sample of the yellow water." (*Ibid.*, page 257)

January 28:

"A patch of vivid yellow water, seen south of Useppa Island on January 28, consisted almost exclusively of *Gymmodinium* sp. with a mixture of numerous larval invertebrates. The water was viscid and slimy, having the consistency of diluted syrup. A fish was seen dying in this water." (*Ibid.*, page 257)

January 29:

"Fish continued dying in the bays behind Captiva and Sanibel islands as late as January 29." (*Ibid.*, page 256)

March:

According to Slobodkin (1953, page 150) Red Tide occurred during this month.

April:

"In April 1947, there were further reports of fish mortality in the Gulf of Mexico off the Florida Keys,...." (Davis, C. C, 1948, page 358)

April 2:

"After the end of January, 1947, there were no further accounts of the death of fishes and other animals until April 2nd when reports, then several days old, were received that the surface of the ocean from Cape Florida to Marathon and west almost to Key West was covered with dead fishes of all kinds." (Gunter, G., Williams, R. H., Davis, G. C., and Smith, F. G. W., 1948, page 312)

June 20:

"On June 20th fish were noted dying again at Bonita Beach south of Fort Myers and within the next three days the mortality had spread northward again to Fort Myers beach and the area around Captiva Island." (*Ibid.*, page 312)

June 21-30:

"Late in June, 1947, reports were received by the Service of the recurrence of fish mortality in the Fort Myers area. The case was investigated by William W. Anderson of the Service who interviewed a number of persons including Mr. S. W. Smith, President of the Caloosahatchee Conservation Club, commercial fishermen and guide boat operators, and made personal observations. According to this information the first incidence of the death of fish was noticed on June 21. The mortality increased up to June 26 and, as on previous occasions, was rather indiscriminate, affecting a great variety of fishes. Examination made on June 30 of the decaying remains of fish disclosed a preponderance of catfish,..." (Galtsoff, P. S., 1948, page 11)

July:

"The mortality continued on into early July when it died out only to break out once more near Venice on July 18th, whence it moved north to Sarasota and the beaches north of St. Petersburg during July and August." (Gunter, G., Williams, R. R., Davis, C. C., and Smith, F. G. W., 1948, page 332)

"In July, off Venice, a sample was obtained containing over 60,000,000 (*Gymnodinium brevis*,) cells per liter." Davis, C. C., 1948, pages 358-360

July 6:

'Early in July, 1947, the red water reappeared along the west coast of Florida, off Venice... that the red water first appeared off Venice and areas to the south about July 6. This colored water was first observed in streaks about 3 to 6 feet wide and a hundred' yards long from just off the beaches to approximately 10 miles offshore. It rapidly spread, and in about one week was continuous from the beach cut to approximately 11 miles offshore. (Galtsoff, P. S., 1948, page 12)

July 10:

"About July 10, 1947, Red Tide started 7 miles northwest of Sarasota and stretched about 50 miles southward." (Tampa daily Times)

July 13:

"Red Tide hit Punta Gorda Beach." (Miami Daily News, August, 1947)

July 14-15:

"Still at Punta Gorda." (u. n.)

July 16:

"Reddish-green water spread from Lemon Bay to south of Sarasota. (u. n.)

July 18:

".. to break out once more near Venice on July 18th..." (Gunter, G., Williams, R. R., Davis, C. C., and Smith, F. G. W., 1948, page 312)

July 19:

"Fish died at Venice Bay." (u. n.)

July 20:

"Fish died at Sarasota." (u. n.)

July 21:

"On July 21 observations were made by airplane. Evidence of Red Tide was found from a point about one-half way up Longboat Key (between Sarasota entrance and Tampa Bay entrance) south to Captiva Island (a short way above Fort Myers entrance). Several runs were made offshore and the infected water at points extended as far as 18 miles off the beaches." (Galtsoff, P. S., 1945, page 12)

July 22:

"Pilots could detect the gas over Red Tide area 1,000 feet in the air. Fish were present in area 7 miles north west of Sarasota to 50 miles southward." (u. n.)

July 26:

"Red Tide 10-15 miles SSW of Tampa Bay mouth. Fish were reported dying at Bradenton Beach." (u. n..)

July 28:

"On this date Anna Maria Key area was the northern terminus of Red Tide. Fish were found dead 10 miles offshore." (Tampa Daily Times)

July 30

"From observations of aviators and fishermen it appears that the infected waters were slowly moving northward and at the time of my departure from Sarasota on July 30, another water was reported to be as far north as Anna Maria Key almost to Tampa Bay." (Galtsoff, P. S., 1948, page 12)

[DATE UNDECIPHERABLE]:

"Heavy masses of fish were reported 5 miles off Gulf Beaches." (u. n.)

[DATE UNDECIPHERABLE]:

"Red Tide fish floated by the mouth of Tampa Bay." (Tampa Daily Times)

July 31:

"Dead fish were floating 1 mile south of Piney Point - St. Petersburg Ferry route in Tampa Bay." (*Ibid.*)

"Thousands of dead stingarees were located at Ballast Point. There were dead fish from Boca Grande to Tampa Bay." (*Ibid.*)

August:

The mortality had moved north to Sarasota and the beaches north of St. Petersburg during July and August. (u. n.)

August 1:

Many dead fish were reported in Tampa Bay and at Indian Rocks. (u. n.)

August 3:

The main body of Red Tide was opposite Clearwater. It was also reported that the spread of Red Tide into Tampa Bay was checked by a heavy spring tide well laden with rainwater. (St. Petersburg Times)

August 5:

"According to an Associated Press release of August 5 from Clearwater, Florida, the red water had by that date reached approximately 15 miles north of Clearwater and was still moving northward." (Galtsoff, P. S., 1946, page 12)

Many dead fish still reported at Indian Rocks. (u. n.)

The center of the plague appeared to be about 8 miles off Hurricane Pass north of Clearwater. (St. Petersburg Times)

August 6:

Fish were reported 32 miles northwest of Clearwater beach and 19 miles out. (u. n.)

August 8:

Cats were reported dead and dying from eating Red Tide fish at Clearwater. (Tampa Daily Times)

'The focal point of Red Tide was north of Anclote Light. (St. Petersburg Times)

"At Tarpon Springs the red water was noticed by sponge fishermen about August 8, and since that time has been fluctuating about this point. No dead fish were, however, found in the harbor at Tarpon Springs." (Galtsoff, P. S., 1948, page 13)

August 10:

Coast Guard flying patrol reported new Red Tide forming between Pass-a-Grille Beach and Indian Rock, about 4 miles offshore. It was headed northwest. The previous night, Red Tide fish washed into Clearwater through Little Pass." (St. Petersburg Times)

August 11:

"A chance of wind blew the dead fish 10 miles out to sea, with the greatest number of fish on the beach, at Indian Rock." (Tampa Daily Times)

"Indian Rock Beach has the largest number of dead fish; there were none at Sunset, St. Petersburg, or Pass-a-Grille." (St. Petersburg Times)

August 12:

"Red Tide was 70 miles long and 40 miles wide, 12 miles offshore, 80 miles south of Pensacola, and 280 miles west northwest of Tampa. (Tampa Daily Times)

Pass-a-Grille began, accumulating new deposits of dead fish. (St. Petersburg Times)

August 14:

Fish which have been taken alive and placed in the live wells, died shortly after the vessel entered, the Red Tide area. (Tampa Daily Times)

Beaches were free of Red Tide except for a few patches at Passa-Grille and Madeira. Dead flounder were reported at Madeira. A patch of dead fish 30 miles long was located 10 miles west of Clearwater. (St. Petersburg Times)

August 15:

"Observations made by the Service on August 15 by low-flying plane over the section of the coast between Captiva Island and approximately 20 miles north of Tarpon Springs and 20 miles offshore disclosed the presence of red water approximately 5 miles north of Egmont Key (entrance to Tampa Bay) to a point almost directly off Tarpon Springs. The affected area extended generally from just off the beaches to an irregular line from 10 to 15 miles offshore. Numerous dead fish were observed within the red area..." (Galtsoff, P. S., 1948, page 13)

August 16:

"Large concentrations of dead freshly-killed fish were located from Clearwater to Sarasota; also in Boca Ceiga Bay." (Tampa Daily Times)

August 17:

Dead fish came in from Anna Maria Island to Clearwater Beach. (St. Petersburg Times)

August 18:

New patches of Red Tide were reported 10 miles offshore from Clearwater to Sarasota. (Tampa Daily Times)

August 19:

All beach areas were clear of Red Tide, but it was still present in the Gulf of Mexico. (St. Petersburg Times)

August 21:

Reports of gas from Clearwater, Belleaire, and John's Pass. (Tampa Daily Times)

August 22:

There was a nauseating gas from Don Ce-Sar to Madeira. (St. Petersburg Times)

"On August 22 fish were still dying in Clearwater Bay, while carcasses from the outside waters were driven by the onshore wind through two wide passes and cast almost onto the streets of the city." (Galtsoff, P. S, .1948, page 14)

August 23:

"Gulf residents ceased coughing and sneezing yesterday as the gaseous odors which hang over the beaches Thursday afternoon and evening abated somewhat." (St. Petersburg Times)

August 24:

Fish piled up again from Pass-a-Grille to Indian Rock. (St. Petersburg Times)

August 25:

" ... noticed over a Red Tide the formation of a great bank of white gaseous fog... 1-1/2 miles offshore from John's Pass... 10 feet high and 2 miles up and down the shore line." (St. Petersburg Independent)

August 26:

"Gases continued to boil up in the Gulf churning the water into foam in the area... said he believed there were many of these pockets in the area." (St. Petersburg Times)

August 27:

"Red Tide deaths were heaviest at Anna Maria Key." (Tampa Daily News)

"Red Tide shows a decline.. Lido Beach and Sarasota Bay free from dead fish." (St. Petersburg Times)

August 28:

Dead fish and gas were reported from Clearwater to Venice. (Tampa Daily News)

August 30:

It was found that porpoises and sea gulls vanished when Red Tide approached. Dead shrimp, flounder, crabs, were noted off Ballast Point, Tampa. (Tampa Daily News)

Red Tide abating; fish still coming in at Pass-a-Grille and Blind Pass. (St. Petersburg Times)

August 31:

Red Tide patches still offshore. (St. Petersburg Times)

September 1:

"Gases were unusually strong at Treasure Island and could be detected at Boca Ceiga. The hydrogen sulfide was turning the houses black." (p.c. Bonnie Eldred, Madeira Beach)

September 2:

Red Tide moved to Clearwater; the lower beaches were reported clear. (St. Petersburg Times)

September 11:

Nearly all signs of Red Tide have disappeared. (St. Petersburg Times)

September 12:

"There are reports that birds are dying in great quantities." (Tampa Daily Times)

September 17:

Red Tide apparently ended. (St. Petersburg Times)

September 21:

"Yesterday following the hurricane there was absolutely no sign of Red Tide." (St. Petersburg Times)

September 30:

"...said that *Gymnodinium brevis* killed all fish in the goldfish pools in Pinellas County near Lake Maggiore." (Tampa Daily Times)

More fish ponds were hit by Red Tide following hurricane. (St. Petersburg Times)

1949

August 12:

"About 3,000 dead fish were found on a two-mile stretch of Anna Maria Beach near Bradenton on the Gulf of Mexico, yesterday. The cause of death was not certain. (Winter Haven News-Chief)

1951

March 17:

Report of 35 mile stretch of red water 70 miles northeast of Yucatan. (u. n.)

May 16:

"A sample of discolored water was delivered to this laboratory by Mr. W. E. Dilley of the Park Service at Havestraw. The information received up to the present is scanty but is presented here for review.

"An area of fish mortality was observed associated with discolored sea water on May 16, 1951. This was in the vicinity of Whitewater Bay. The sample brought to this laboratory was taken on the 18th at North River on the northeast side of Whitewater Bay. It had a yellowish cast and was said to be of less chromatic intensity than that of the water on May 16th.

"A qualitative survey revealed the following important dinoflagellate genera to be present:

Prorocentrum
Gonyaulax
Gymnodinium

" The *Gymnodinium* was not *G. brevis*. The organism, seen were greatly below bloom proportions. Since this sample was taken later than the actual mortality occurred, with a heavy rain in-between, a bloom may have been present.

Quantitative counts of these organisms will be made after a two week settling period.

"Nutrient agar plates were streaked with the sea water (a) after dilution, and (b) straight from the sample. The latter showed a distinct yellow coloration similar to that caused by members of the genus *Flavobacterium*. The pigment is being analyzed, and subcultures of the bacterium are growing." (Unpublished report by F. Lasker, Research Assistant, The Marine Laboratory, University of Miami)

1952

June 1:

An area 100 miles square, about 90 miles west of Tarpon Springs appeared discolored. (u. n.)

June 16:

Fish and Wildlife Service reports a reddish bloom from Anna Maria to Boca Grande. (u. n.)

September 25.

"The big concentrations seen to have broken up; at one time they stretched from Ft. Myers to Clearwater, 100 miles." (Tampa Daily Times)

October 12:

"Popeyed fish from Dry Tortugas to Ft. Myers." (*)

October 19:

"No more fish dying no *G. brevis*." (*)

October 25:

According to Slobodkin (1953, page 150) Red Tide occurred at Boca Grande and southwest of Sanibel on this date.

November 6:

Report of Red Tide. (Miami Herald)

November 8:

"Red Tide was found to run only three feet deep." (Ft. Myers News)

November 11:

The first outbreak was reported off Ft. Myers on November 11, 1952, and was on the decline a few days later. (Chew, F., 1953, page 610)

November 12:

"Millions of dead fish from Dry Tortugas to Ft. Myers... their eyes seemed to pop out." (St. Petersburg Times)

November 13:

Dead fish at mouth of Caloosahatchee River and in small patches west of Sanibel. Heavy concentration northward 10 yards wide and one or more miles long in Blind Pass. (u. n.)

"Air Survey Finds Piles of Dead Fish Floating off Coast of Lee County." (Headline, Ft. Myers News Press)

November 14:

Red Tide from Boca Grande south to 20 miles off Naples. (u. n.)

November 15:

"Fishing boat captains have seen a string of geysers shot up from the water off Egmont Key, as if some underwater explosions were taking place." (St. Petersburg Times)

"Steady Northeast Wind Halts Northward Drift of masses of Dead Fish." (Headline in St. Petersburg newspaper)

November 16:

"...and was on the decline a few days later." (Chew, F., 1953, page 610)

"Howell of the Fish and Wildlife Service... noted a point fifteen miles off Sanibel where there seemed to be a definite barrier to the dead fish going westward,... although the wind was blowing in that direction... concentrations of *Gymnodinium brevis* were twelve inches deep in red water... much larger in muddy brown water." (Ft. Myers News)

November 19:

No more fish dying - no trace of *Gymnodinium brevis*." (u. n.)

December 8:

"...the poisonous substances... porpoises and sea turtles are also killed." (Tampa Daily Times)

December 16:

"Report at Siesta Key that there are many fish dying but no discolored water is present. (u. n.)

1953

January 3:

"There were signs of another bloom off Dry Tortugas on January 3, 1953, and subsequent airplane observations disclosed suspicious areas." (Chow, F., 1953, page 610)

January 22:

"A definite recurrence was detected off Smith Shoal on January 22, 1953." (*Ibid.*, page 610)

January 2

"Two minor flare-ups of Red Tide are killing fish off Key West." (St. Petersburg Times)

August 19:

"Dead fish off Nokomis. (St. Petersburg Times)

August 27 to September 6:

"Many dead fish Anna Maria to Bullet Key and Bradenton." (*)

September 1:

"Copper Sulphate has been tried on the Red Tide which has been with us since September 1" (Tampa Daily Times, September 24, 1953)

September 6:

"Red Tide has been here for the past 10 days, large quantities of dead fish were reported from Anna Maria Island to Mullet Key and Bradenton." (St. Petersburg Times)

September 7:

"Red Tide is back.. strung out between Venice and Clearwater... gusty weather kept the fish from collecting." (Tampa Daily Times)

"Floating into beaches from Venice to Hurricane Pass, also Clearwater, gusty weather." (*)

"Dead fish floated into the beaches from Venice to Hurricane Pass." (St. Petersburg Times)

September 10:

"Red Tide is apparently increasing." (St. Petersburg Times)

September 14:

"Dead fish from Red Tide are stretched from Venice to Indian Rock. St. Petersburg Beaches are covered with dead fish. Some fish in Boca Ciega Bay." (St. Petersburg Times)

"Twelve to twenty-two miles off shore, strips of fish were located ranging from Ft. Myers to Clearwater, apparently blown off by heavy southeast winds." (u. n.)

"...noted that the fish were smaller and fewer than in 1947, also that in 1947 some came in alive, those were all dead." (Tampa Daily Times)

September 21:

"Anna Maria Island is besieged by Red Tide." (St. Petersburg Times)

September 22:

"Red Tide is thickest off Anna Maria Key." (Tampa Daily Times)

September 23:

"The beaches are now clear of Red Tide." (St. Petersburg Times)

September 24:

"Heavy concentration of fish north of Clearwater, near Anclote Key." (u. n.)

September 25:

"Winds scattered dead fish which hovered close off the shore of Holiday Island." (St. Petersburg Times)

September 30:

"Thousands of dead fish drifted into St. Joseph's Sound. A Coast Guard flight revealed no further signs of Red Tide in the Gulf." (St. Petersburg Times)

October 4:

"Red Tide reappeared from Anclote Key to John's Pass." (St. Petersburg Times)

October 5:

"Clearwater had dead fish." (Sarasota newspaper)

October 10:

"New patches of red water near St. Petersburg." (u. n.)

November 21:

"Gas, dead fish, discolored water." (*)

December 3:

"Dead fish and odor are still present at Manatoc... Sarasota Keys, from Treasure Island to Anna Maria Island; however, incidents are reduced." (St. Petersburg Times)

December 7:

"Dead fish litter Siesta Key Beaches." (Sarasota newspaper)

December 9:

"New outbreak of Red Tide at Sarasota Beach." (Sarasota newspaper)

December 10:

"Fumes and stench from Red Tide forced people to leave the beaches at Sarasota." (St. Petersburg Times)

December 15:

"A few dead fish reached the beaches from Pass-a-Grille to Clearwater yesterday. Some patches are in the mouth of Tampa, Bay." (St. Petersburg Times)

December 16:

"Red Tide is back again; it is thickest at Siesta Key; high concentration of *G. brevis* at Midnight Pass." (Tampa Daily Times)

December 17:

"Sarasota was hit by the worst Red Tide since 1947." (St. Petersburg Times)

"Beaches were being cleared of dead fish killed by the Red Tide." (Bradenton Herald)

"An outbreak of Red Tide, the worst since 1947, had apparently disappeared from the Venice area today after an bad weekend." (Venice Gondolier)

December 20.

"One boat captain says that a yellowish mist rose off the water and he was overcome with coughing and sneezing and almost passed out with nausea." (St. Petersburg Times)

December 23:

Sarasota free of Red Tide. (Sarasota newspaper)

December 31 and January 1:

"A serious outbreak of Red Tide occurred during the final quarter of 1953, Several biologists of the Laboratory went to the area during the emergency." (Quarterly Report on Fisheries Research, Dec., 1953, The Marine Laboratory, University of Miami)

"A fish kill was reported at Little Marco Pass. An estimate of 100,000 lbs. of mullet were found on the beach. Fish were in the process of dying. (p.c. G. Broadhead and H. Mefford, The Marine Laboratory, University of Miami)

1954

January 1:

See above.

"Red Tide in Manatee River, Tampa Bay, Terra Ceiga, and Sarasota Bay. Mullet dead in Marco Pass*" (u. n.)

January 5:

"Hundreds of mullet in Little Marco Pass on the southwest Florida coast were killed by Red Tide organisms." (DeLand Sun News)

"Red Tide back in lower Tampa Bay area." (Sarasota newspaper)

January 6:

"A new Red Tide developed over the weekend in Manatee, Tampa, Terra Ceia, and Sarasota. Yesterday in the Manatee thousands of dead fish were being washed ashore and many others were dying. The Red Tide slowed down considerably today in the Manatee River." (Tampa Daily Times)

"Red Tide hits Palmetto." (Sarasota newspaper)

January 10:

"Red Tide gone from Manatee." (Sarasota newspaper)

February 4:

"Red Tide off Boca Grande. Many dead and dying fish. Much irritant gas." (*)

February 10:

"*Bairdiella* dying in Boca Grande inlets." (*)

February 17:

"*G. brevis* 100,000/L. off Captiva. Much irritant gas." (*)

February 18:

"100 yd x 1 mile streak of red water off Boca Grande. A few dead fish in passes." (*)

February 28:

"Fish dying in Redfish and Captiva Passes." (*)

February 29:

"San Carlos Marina, Ft. Myers Beach-surface 300,000 *Gymnodinium brevis*/L, bottom 480,000 *Gymnodinium brevis*/L. A few dead fish in region but none actually dying." (*)

March 8:

"Red water at Venice." (*)

March 11:

"Fish kill at Big Carlos Inlet and Estero Island." (*)

March 12:

"80,000 *G. brevis*/L, off Marina Pier at Surface.

Samples shaken: Redfish Pass - 580,000/L.

Blind Pass - 680,000/L.

Captiva Pass - 60,000/L.

Neck of bottle after standing:

Redfish Pass - 3.9×10^6 /L.

Blind Pass - 2.3×10^6 /L.

Captiva Pass - 0.58×10^6 /L.

G. brevis at Ft. Myers Beach 0.14×10^6 /L." (*)

"San Carlos Bay - mild fish kill. 80,000/L. at surface. No bottom count made.

Fish dying in Big Carlos Pass. No *G. brevis* on surface." (*)

March 13:

"Outbreak diminishing in San Carlos area. Wind W to NW." (*)

March 15:

0.6×10^6 /L. *G. brevis* in Marina. Many copepods in area. Yellow water in bay side of Captiva, between Captiva and Beech Key. 6' x 100' long." (*)

March 16:

"Dead mullet, catfish, etc. off Captiva, probably several days old. Wind N to NE. Many fish coming in by lighthouse at Sanibel." (*)

March 17:

"Yellow water and dead fish off Captiva." (*)

March 19:

"4 x 10⁶/L. *G. brevis* on bottom of Marina." (*)

March 28:

"11 x 10⁶/L. *G. brevis* on off R-6." (*) (R6 = Hydrographic Station Number)

March 29:

"...Scattered dead fish from Big Pass to Ft. Myers Beach. Dead fish 5 miles south of Sanibel lighthouse." (*)

March 30:

"Dead fish in San Carlos Marina. Dead fish off Captiva and Sanibel..." (*)

March 31:

"Many dead and dying mullet and anchovies, 1-2 days old in Marina...." (*)

April 1:

"Dead fish in inlets of Captiva and Sanibel. Red water off Casey Key." (*)

April 2:

"There is Red Tide in Sarasota... worst affected was Siesta Key; there are dead fish from Big Sarasota Pass to Midnight Pass." (Sarasota newspaper)

"*Brevis* in Pine Island Sound off York Island." (*)

April 7

"Fish dying off Captiva." (*)

April 11:

"Fish dying in Boca Grande Pass. Fish dying 20-30 miles off shore." (*)

April 15:

"Freshly dead fish in Boca Grande Pass, especially at tide rip." (*)

April 16, .

"Baby Tarpon were coming down the Caloosahatchee River floating belly up. Tarpon are usually the last to succumb to Red Tide." (St. Petersburg Times)

April 18:

"Red water in inner Passes of Captiva." (*)

April 19:

"Red Tide water killing fish around Boca Grande." (St. Petersburg Times)

April 21:

"Moderate concentration of *G. brevis* off Sanibel and Captiva Islands." (*)

April 24:

"Dead mullet in Venice Inlet." (*)

April 28:

"Yellow water offshore and on bay side of Longboat Key. Dead fish at Boca Grande." (*)

"Fish dying in Boca Grande to Venice, yellow water also present. Fish dying, in Big Pass. Dead fish at Anna Maria Key.

April 29 - May 5:

"Purple water off Venice; in strips 10-12' long; 4' wide...." (*)

April 30:

"Many dead fish off Captiva, but had been dead from some time. Fish dying at Boca Grande. Yellow water near Gasparilla Pass." (*)

May 1 .

"Fish dying at Boca Grande." (*)

May 2:

"A few dead fish drifting around Redfish Pass. SW wind since April 29. Minnows killed in prop wash as muddy bottom stirred up in Bull Bay near Placida, in Charlotte Harbor." (*)

May 3:

"Streak of dead fish 3 miles off Boca Grande; also 8 miles off. Red streak about 100-150 yds." (*)

May 6:

"Red Tide reported at Naples, just above Marco Island;.... Bad kill at Stump Pals. Dead fish in Lemon Bay." (*)

May 7:

"Fish still dying in Boca Grande Pass. Discolored water prevalent in many passes and bayous. Report of 'purple` water off Captiva." (*)

May 8:

"Red water in Gasparilla Island bayous. Many *G. brevis*, at least 20×10^6 on better, in 2' water, appeared in cluster under scope. *Trichodesmium* in great nos. off Boca Grande, about two miles out, Pin fish dying in Gasparilla Yacht lagoon. *Gonyaulax* on bottom." (*)

May 11:

"Great oily slick of *Trichodesmium* observed at Mudhole." (Mudhole is northwest of Naples)

May 16:

"A few dead fish this side of Redfish Pass." (*)

May 18:

"Dead trout, mackerel in San Carlos Bay." (*)

May 22 and 23:

"Dead fish in New Pass. Gone shortly afterwards." (*)

May 26:

"Dead fish around New, Pass docks. Water dark green." (*)

May 27:

"Fish kill at Boca Grande." (*)

May 28:

"Fish dying at New Pass. Fish kill at Homosassa Springs." (*)

May 29:

"*G. brevis* in some numbers along west side of Big Pine Island." (*)

May 30:

"Dead scallops in Pine Island Sound and dead fish. A definite outbreak." (*)

June 1:

"Red water collected at Demere Key inland canal. *G. brevis* about 2×10^6 . Fish dying in bait tanks at Venice. No color." (*)

June 2 and 3:

"*Gonyaulax* found in inner pass on Longboat Key. Records of red oysters and green mussels about May 18." (*)

June 7:

"Pilchards dying in great numbers at Boca Grande." (*)

June 11:

"Red Tide sent a long thin line of dead fish on the beaches from Anna Maria to Englewood."
(Bradenton Herald)

June 13 and 14:

"Catfish dying in considerable numbers between Tarpon Bay and Sanibel for last 2 days, particularly on high tides."

June 14:

"Red water off Cortez." (*)

July 4:

"Fish dead in great numbers 15-25 miles offshore from Naples to Sarasota." (*)

July 21:

"...for at least five miles previously we passed through these floating dead fish. Most of the fish appeared to be grunts, about eight inches long, with grouper noticed occasionally. We noticed one grouper, about six pounds, with gills still bright red, and widely extended." (p.c. Chryst, T. L., 403 N. 31st St., Bradenton)

July 21 and 22:

Dead fish were reported in the Gulf waters offshore. (u. n.)

July 22:

Some dead fish around Sarasota. (Tampa Morning Tribune, Friday, July 23)

August 5:

"Compass 240 from John's Pass. The water in dead fish area was just a gun-metal color. Friday, July 30, water was reported by fishermen cedar-red in color in this area. No irritant gas. Dead and decomposed fish. Large grouper, pigfish, grunt, and white bait dead. Saw flounder dying, also eels. Picked up a dying red pigfish and put it in bait well at 52 ft. hoping to bring it back to life, but it died shortly after." (p.c. Bonnie Eldred, Madeira Beach)

August 8:

"Returned from town at 9 P.M. Aug. 8. with party of 6, all began coughing and sneezing; called neighbors, also coughing. Conditions cleared at 8 A.M. Aug. 9, wind changed slightly." (p.c. E. Straka, Rt. 4, Box 1254)

August 9 and 10:

"Beach 1/2 to 3/4 miles north of Midnight Pass. Some freshly dead and some decomposed fish. Kill includes baby tarpon, jewfish, bat fish." (Ibid.)

August 10:

"Wind from West. Odor of fish. Residents at Coquina Beach report about 5 to 10 dead fish on their beach. Water cloudy. 'None on my beach but dead fish reported at Coquina Beach about 1/2 mile north of Gulf Ranch' ." (p.c. K. A. Tutin, RFD 5, Box 2096, Sarasota)

"Wind from northwest. Freshly dead fish." (p.c. Gulf Beach Hotel, Lido Beach)

"Water cloudy. No irritant gas. Freshly dead and decomposed fish."(p.c. E. M. Cannon, Rt. 5, Box 2650)

"Water clear. Moderate amount of irritant gas. Decomposed fish other than mullet, trout, pinfish or catfish." (p.c. Bud Sinclair, Longboat Key, Sarasota)

"Observations made from 22nd to 25th Street. Dead fish." (p.c. E. C. Kemp, Bradenton Beach)

Dead fish were washing on beaches at various places from St. Petersburg to Sanibel. Among the most common fish observed were (in order of abundance); pin fish, puffers (?), porcupine fish, *Opsanus tau*, batfish, cowfish, catfish, eels, triggerfish. Most fish on beach displayed a brilliant luminescence (phosphorescence) which appeared to be caused by bacteria, heads were affected most and when fish were laying on the sand for some time a band of luminescence circled the body of the body of the fish at the surface of the sand. The number of fish in an average 10 feet of shoreline was 20. Microscopic observation of the inshore waters revealed no *G. brevis*, but it should be mentioned that the fish appeared to be coming from, some distance offshore. (personal observation)

August 11:

Fish continued to wash on Gulf beaches, some appeared to be freshly killed, also coming in were a large number of flatfish and one large, badly-decomposed jewfish. The number of dead fish in an average 10 feet of shoreline was 58. .A few *G. brevis* were noted in the water today, also an unidentified species of *Gonyaulax*. (personal observation in Sarasota to Venice area)

"Both freshly dead and decomposed fish. Moderate amount of irritant gas. Species included mullet, pinfish, catfish and others. Dozens of dead fish visible floating offshore at least one or two dead fish per lineal beach foot." (p.c. C. T. Lind, Sarasota)

"First fish on beach at 2 P. M. Tuesday 8/10/54, a great many more at 9 A.M. today." (p.c. A. J. Norman, Box 1097, Manatee County Beach)

"Observation from boat at. New Pass to abeam of Ringling Museum. Compass direction 320°. Water cloudy green.. Stringy consistency. Moderate amount of irritant gas. Freshly dead and partly decomposed fish. Species included mullet, pinfish, blowfish and others. Dead fish in large groups as far north to abeam of Ringling Museum. My impression is that incoming tide brought dead fish to bay. Live bait seen active on surface of bay." (p.c. D. Knoodler, 218 Gulf Drive, Sarasota)

"Dead 1 skate. Balance are sardines, no other fish seen on 150 feet of beach 1-1/2 miles north of Cortez Bridge." (p.c. Mrs. V. L. Guerra. Bradenton Beach)

"On Aug. 11 an odor of Red Tide, but no irritant gas." (p.c. P. M. ZIngham, Anna Maria)

"Number of dead or dying fish about 20." (p.c. R. E. Smith, 1105 Gulf Drive, South Bradenton Beach)

August 12 and 13:

"Passage Key Inlet: Patches of dead fish approximately 8-10 miles west, water not discolored. Longboat Pass: Line of dead fish approximately 3 miles west leading to beach off Longboat Key. Longboat Key to Venice: This area (from beach to approximately 8 miles offshore) was concentrated with decayed fish and reddish-brown water. The wind was from the southwest at 5 knots, the sea light." (p.c. U. S. Coast Guard Station, St. Petersburg)

August 15:

"... It was 5 miles straight out from New pass and about 1/4 mile north. The water was slightly brown out this far as it was all the way out and there was the odor of Red Tide present although no dead fish were present." (p.c. J. Scroper, Sarasota) I

August 17:

"Water normal consistency. No irritant gas. Fish dying in surf. Wind Calm." (p.c. V. H. Maurer, 176-175 Terrace Drive, Street, Petersburg)

August 19:

"2 days ago there were a few dead fish on the beach, they were badly decomposed - only one's day duration." (p.c. Mar Vista Fishing Resort, Box 36, Longbeach)

August 19:

"A few decomposed fish, 15 pinfish in 200 feet of beach." (p.c. K. A. Tutin, RFD 5, Box 2096)

.August 20:

"Streaks of red water in filaments slightly south of Venice and was inshore. Some red water Gulf side of Boca Grande Pass in filaments. Colors of water very distinct in each body. Separation line marked by still water... Water in San Carlos Pass bays reddish in color." (p.c. U. S. Coast Guard Station, St. Petersburg)

August 23:

"Fish observed dying around Boca Grande Pass for past five days. Special call was made today to report many kinds of dying fish. Discolored water seen last Friday (Aug. 20, 1954)." (p.c. Mr. Delnar Fugate, Boca Grande)

August 23 to 27:

"Synopsis of Red Tide conditions prevailing during 23 through 27 August 1954: Scattered patches of dead fish prevalent in area 1/2 to 5 miles offshore between Sarasota and Venice. In immediate area of the dead fish water was streaked with oil. Remaining water reddish brown in color. Numerous schools of live fish observed in entire area. Winds from NE to NW averaging 7 to 12 mph." (p.c. U. S. Coast Guard Station, St. Petersburg)

August 30 and 31:

"A few fish on Aug. 30 and 31, 2 large Red and toadfish," (p.c. W. A. Smith, Manasota Key, Venice)

September 6:

"Freshly dead fish, mullet and whiting. Immature fish, several mullet, 4" to 6" long,.... whiting of same size and numerous." (p.c. Mrs. V. L. Guerra, Bradenton Beach)

September 11:

"Heavy amount of irritant gas. Fish dying in surf; also, freshly dead and decomposed; trout, pinfish, catfish and others." (Ibid.)

"No irritant gas. Fish dying in surf and also freshly dead. Pinfish, blowfish and others." (p.c., A. M. Mulholland, Rt. 5, Box 2925, Longboat Key)

September 12:

"Freshly dead fish (very few since yesterday). Can see no fish floating, condition seems improved." (Ibid.)

September 13:

A report of dead fish in an embayed area near the residence of Mr. Lowdermilk, City Manager, Naples.

September 15:

"Only a few freshly dead, all pinfish. Some decomposed on the beach." (p.c. Mrs. V. L. Guerra, Bradenton Beach)

"Fish decomposed, other than mullet, trout, pinfish or catfish." (p.c. R. M. Ingham, Anna Maria)

September 16:

"2 small grouper (?) and 1 pinfish. Red Tide odor, but no irritation." (Ibid.)

September 20:

"Color of water was dull green with scattered dead fish 18 miles off Clearwater. The size of area was 12 x 8 miles. The distance between fish varied." (p.c. U. S. Coast Guard Station, St. Petersburg)

September 21:

"Scattered dead fish off Clearwater with no discoloration of water, The size of the area was 12 x 8 miles and the distance between dead fish was 300 ft. Covered area from west of Clearwater to 15 miles south of Sanibel Island 12 to 20 miles offshore. Only indication of Red Tide was the fish off Clearwater." (Ibid.)

September 22:

"Scattered dead fish, off Clearwater. The size of the area was 8 x 15 miles and the distances between dead fish was 200 to 300 ft." (Ibid.)

September 23:

"Water amber or rusty in patches or streaks. Consistency normal. No irritant gas. Freshly dead catfish, none on beach yet." (p.c. Mar Vista Fishing, Resort, Box 36, Longbeach)

September 24:

"Water amber or rusty in patches or streaks. Consistency normal. No irritant gas. Dead pinfish, none on beach yet." (Ibid.)

September 25:

"Water amber or rusty in patches or streaks. Fish freshly dead, including mullet, trout, pinfish, catfish and others. (Ibid.)

September 28:

"Water stringy and syrupy. No irritant gas. Fish dead, decomposed and dying in surf - including mullet, pinfish, catfish and others." (p.c. E. M. Cannon, Box 2650, Sarasota)

September 29:

"Water cloudy and reddish in Button Wood Harbor. This started 9/23/54. Fish freshly dead and decomposed. One pinfish every 10 ft. floating." (p.c. B. Sinclair, Longboat Key)

"Many dead fish in the bay with strong smell. None on the Gulf beach." (p.c. A. Y. Mulholland, Rt. 5, Box 2925, Longboat Key)

September 27 to October 2:

"Several flights were conducted throughout the week (9/27 to 10/2) but the only suspicious area was noted off Englewood. The color of the water was muddy and the size of the area was approximately 8 miles. The distance between dead fish was about 1200 feet." (p.c. U. S. Coast Guard Station, St. Petersburg)

October 5:

"An odor similar to the Red Tide odor is present at times. No evidence of dead fish." (p.c. Mar Vista Fishing Resort, Box 36, Longbeach)

October 6:

"There are no dead fish on the beach or in the surf. But the gas odor is noticeable when wind is SW." (p.c. Mrs. V. L. Guerra, Bradenton Beach)

October 13:

"No irritant gas. Decomposed pinfish present." (Ibid.)

October 15:

"A few dead fish, no. water discoloration. Fish seemed to have been dead for sometime. (p.c. L. Johnson, Belle Vista Beach)

October 16:

"Fish not freshly dead. Water cloudy. Bay stirred by easterly winds. Fish decomposed (3 or 4 days). 700 dead fish in 1/4 mile. All grunts, most likely pinfish (*Orthopristis chrysopterus*), all about the same size (6 inches). Only on Gulf beach of the island. Dead a few days, eyes picked out." (p.c. H. Wass, Mullet Key, Pass-a-Grille)

October 20:

"Scattered' dead fish approximately 30 KM, out from Tampa Bay. Color of the water was normal." (p.c. U. S. Coast Guard Station, St. Petersburg)

October 30:

"Very heavy deposit of sea moss with many sea slugs present deposited October 30th, still building up (Nov. 1) and giving off gas which stings the eyes and ruins part inside and out of buildings near the beach. The County plans to do something to help the disposal. This is the largest deposit of weed that anyone in these parts can remember, also 30 to 40 dead fish." (p.c. W. D. Thompson, Grey Gull Hotel, Siesta Key)

November 3:

"Fish on the beach with the sea weed. Mullet and crabs, about 150 mullet in the length of the beach." (Ibid.)

November 17:

"There were no dead fish to be seen, but there was the odor of decaying fish from the Gulf all day today." (p.c. C. L. Rettberg, 677-75th Ave, St. Petersburg Beach)

"For a distance of approximately 50 yards water is dark, muddy, waste filled. Moderate amount of irritant gas. No dead fish," (p.c. Mrs. V. L. Guerra, Bradenton Beach)

"Beach back to normal.... water still a little murky." (p.c. W. D. , Grey Gull Hotel, Siesta Key)

November 18, 19, 22:

"Tasteless and odorless gas in the air all the way south of Hurricane Pass to and below Knight's Pass. Very much worse at Knight's Pass. Caused throat irritation and coughing. About one large mullet for every 100 feet of beach, and at Knight's Pass both the water and beach were thick with dead, mullet, cowfish and squid. Wind was from the Southwest on the 22nd. Noticed some gas irritation on the 18th, but only a few fish on the entire stretch as above. Were on Bonita Beach on the 19th, from road down to the point.... Saw a few dead fish. About average 1 to 300 ft. of beach. Thought some gas.. Report here that dead fish coming through Gasparilla Pass in quantity. (p.c. S. W. Kilmer, Box 447, Englewood)

November 20:

"Mullet dying." (Report from unidentified fisherman)

"On November 20, we had irritant gas as if Red Tide was present; there were no dead fish, but a red colored seaweed came in on the beach and was 3 foot deep in places; the seaweed is still here, but the gas only lasted the one day while the weed was coning in..... Irritant gas only evidence." (p.c. Fred J. Hack, Box 214, Nakomis ... observation made on Casey Key)

November 21:

"Choking gas fumes and dead mullet. Stump Pass, Punta Gorda Beach." (p.c. Mrs. W. G. Hamor Winter Haven)

"Counted, 7 dead, mullet and 1 large drum fish on beach. Stump Pass." (p.c. Karl Markmiller, Box 447, Englewood)

November 22:

"Odorless and tasteless gas - very heavy amount. Throat and nose irritant. Beach and water full of dead fish. Mullet, cowfish and squid. Bad as last year. Southwest wind." (p.c. Mrs. Kilmer, Box 447, Englewood)

November 23:

"Choking fumes and dead fish, Stump Pass, Punta Gorda Beach." (p.c. Mrs. W. G. Hamor Winter Haven)

November 27:

"Catfish and mullet died in bayou in back of Boca Grande. Dying fish were also observed in Gasparilla Pass. (p.c. W. Wheeler, Boat Captain, Boca Grande)

December 1:

During the morning the number of *Gymnodinium brevis* in the bayou behind Boca Grande was less than 1000/L. In the afternoon at 3 o'clock, the number had reached 12,000,000/L, and six or seven catfish came to the surface and died. Shortly thereafter the count went down rapidly and no more dying fish were observed." (personal observation)

December 3:

"8-1/2 miles offshore (250° from Venice Inlet). Light green patch of milky water with few blades of grass and debris intermixed. Very demarked patch about 300 feet in diameter. No odor. (p.c. Victor Retty, Jr.

"One dead balloon fish - pretty old (out from Redfish Pass)." (p.c. unidentified boat captain)

December 4:

"At 'Operation Jim Brevis' Station #70, numerous fresh dead fish floating - glass minnows." p.c. Tom Borland, Boca Grande)

"At 'Operation Jim Brevis' Station #182, small grunt dead, wholesome grass and seaweed. No odor." (p.c. Col. R. G. Sherman, Tampa Bay)

"Dying fish noted in Gasparilla Pass at 1:00 P.M. - Saturday, Dec. 4 - discolored, water in Pass and in Gasparilla Sound... color muddy... Sound mostly clear, but amber patches." (p.c. D. O. Fugate, Boca Grande)

December 5:

"Dead fish all around Boca Grande, especially in Gasparilla Pass where red water and gas were also present." (p.c. fishermen and residents of Boca Grande)

December 5 and 6:

"We had irritant gas Sunday night, the 5th, and Tuesday, the 6th, with very rough seas and a strong southwest wind followed by sea weed. Every time this weed comes in with a rough sea we get irritant gas." (p.c. F. J. Hack; Box 214, Nokomis [UNDICIPHERABLE])

December 14:

"Have just received a call from Geo. Gibbs at Venice. He reports that since about 4 AM gas has been coming in badly at Manasota Key. No water discoloration, seaweed or dead fish, just gas." (p.c. R. L. Jackson, Box 308, Sarasota)

1955

January 13:

"In spots gas irritates while on Beach, but not in noticeable in house, Wednesday and Thursday were the only days we felt the irritation and then only slight - no dead fish - but wind is brisk and from the Gulf." (p.c. Mrs. J. A. Bollis, Boca Grande)

p.c. Personal communication

u. n. Unidentified newspaper account

(*) taken from: Preliminary report. Red Tide Studies. January to June, 1954. The Marine Laboratory, University of Miami, 1954.

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