UNUSUAL MASS FISH MORTALITIES IN THE CARIBBEAN AND GULF OF MEXICO

AN AD HOC SYMPOSIUM
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A REPORT ON OBSERVED RECENT FISH MORTALITIES IN THE NETHERLANDS ANTILLES AS THE RELATE TO THE REGIONAL PROBLEM

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On September 14, 1980 dead and dying fish floating on the surface were reported by some fishermen in the area between the island of Curacao and the little island if Klein Curacao.

A few days later dead fish were also reported from Aruba and Bonaire. The fish kill lasted till September 23; on this day there was a slight shift in the current and no more dead fish were seen afterward. However, local tropical fish dealers who were working in the export trade experienced heavy mortalities amongst their catches which lasted much longer.

The survival rate among their aquarium fish was much lower than usual and this effect lasted until the first week of December. It seemed that the fish were much more sensitive to all sorts of infections. The reports on the fish kill in other areas in the Caribbean indicate that fish kills had been occurring since late August, cq., about three weeks earlier and lasted until about September 20.

In Aruba the dead fish were reported from the Bucuti and Noord-Druif areas on the northern side of the island; in Curacao most dead fish were found in the area around Klein Curacao Island and along the southeastern part of Curacao; in Bonaire, the area between Malmok and Wecua on the northwestern side. The yellowtail snapper (Ocyrus chrysurus) was the dominant species among the dead fish. Other fish included sergeant major (Abudefduf saxatilis), queen triggerfish (Balistes vetula), porcupinefish (Diodon hystrix), schoolmaster (Lutjanus apodus) and scorpionfish (Scorpaena plumieri). A few pelagics were affected as well. Fishermen reported a

rainbow runner (Elagatis bipinnulata) which could be grabbed by hand in the open sea, and there were also reports on a few dying dolphinfish and a very weak sailfish which was gaffed. Although these reports were not verified by our Department, I am inclined to believe them; especially the reports on the rainbow runner and dolphinfish which were seen and caught by a knowledgeable fishermen I know personally (they ate the rainbow runner without any ill effects). Since pelagics sink when dead, not to surface again, pelagics might have died en gross without anybody noticing.

The water temperture as measured in Curacao was 28.5°C; this is quite high but still within normal range (see Table 1).

The oxygen content of the water was measured and was found to be normal (cq., near saturation). The water was not murky nor more turbid than usual either.

Yet, fish were swimming at or below the surface as if in need of oxygen. Fish like sergeant major and queen triggerfish were also found dead. Normally these fish are quite hardy and are also found in inner bays where oxygen conditions are substantially lower than in the open sea. The fish kills all took place along the open reef and were especially severe around the little island of Klein Curacao (1, 2 km^2) which lies in the open sea.

The inner bays did not experience any fish kills during the same period. Normally, during conditions of calm weather and rain, fish kills do occur in these inner bays.

On September 24 at about 1430, a BT measurement was made about one mile in the open sea south of a reef area which was affected by the fish kill (see Figure 1).

Table 1: Mean seawater surface temperatures for the area between 12-14°N and 66-70°W (from 1947 until 1979). Data from KNMI computer data bank in De bilt, Netherlands.

Month	Temperature (°C)
January	25.8
February	25.4
March	25.6
April	26.4
May	26.5
June	26.8
July	26.9
August	27.5
September	28.1
October	28.0
November	27.8
December	26.9
Year	26.8

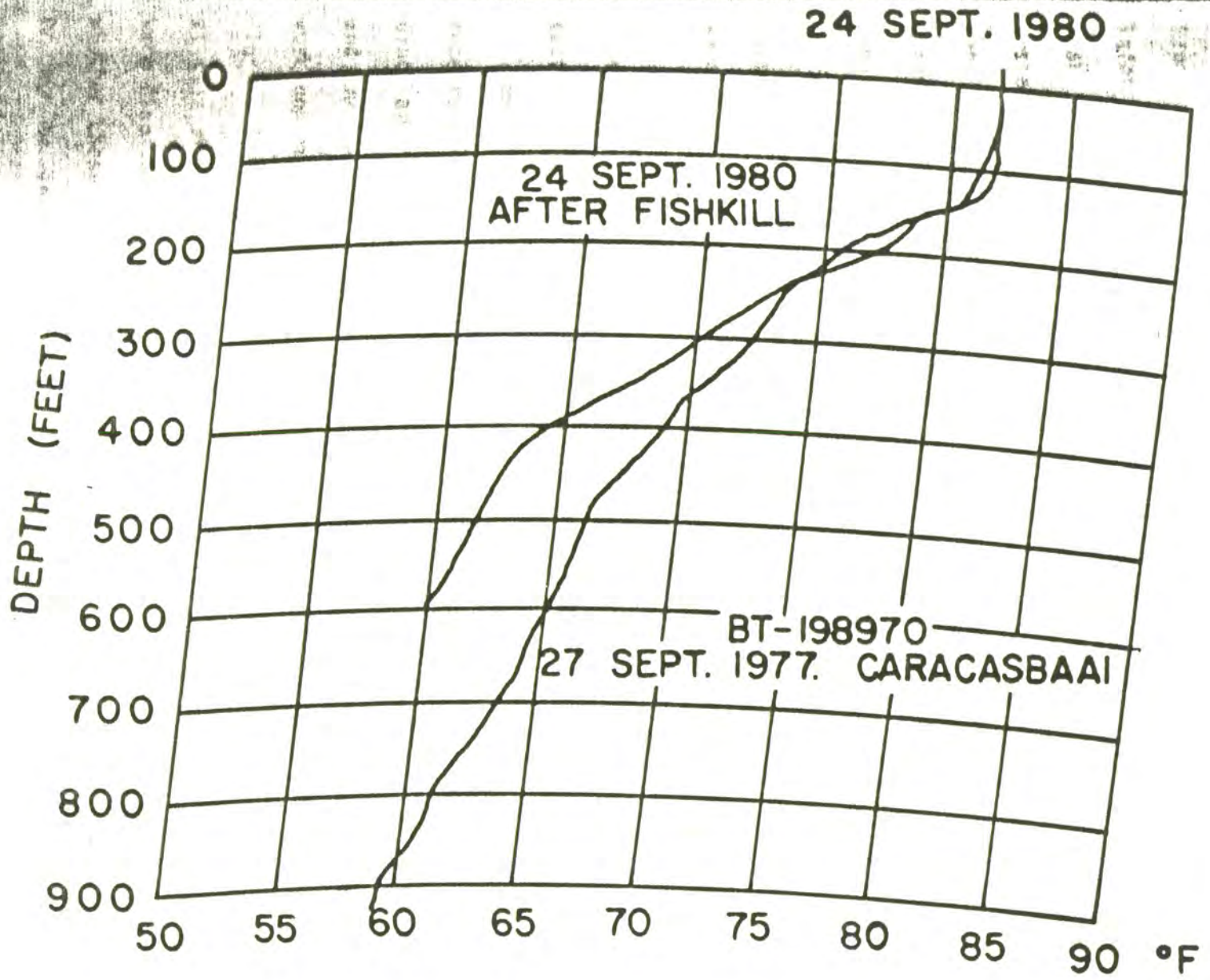

Figure 1. Comparison of BT temperatures measured near Klein Curacao in September 1977 and September 1980.

Fish were sent to CODREMAR in Puerto Rico, to IVIC in Venezuela, and to the University of Miami, Department of Microbiology for analysis. Fresh-looking fish or fish that were still alive when taken were selected. Dr. Nagelkerken of our Department travelled to Puerto Rico to obtain further information and to discuss matters with the authorities involved. The fish that were sent to Puerto Rico (four yellowtails and one schoolmaster) were tested for heavy metals with an atomic absorption spectrophotometer; results were negative. The fish were also tested for chlorinated hydrocarbons, and strangely enough, it turned out that about 0.5 ppm of DDT or DDT-like compounds were present and about 0.36 ppm of PCB (tolerance levels for DDT and PCB respectively are around 5 and 2 ppm). The indicated levels could not have caused the fish kills by themselves but, of course, they do indicate a separate problem we did not know about before.

Apparently, insecticides were found in the Curacao samples only. The fish that went to Venezuela were used in a bioassay test utilizing mice. The test gave positive results, killing all the mice.

Unfortunately, something went wrong with the other tests and we did not receive a full report. From Miami we were informed that large numbers of the dinoflagellate Oodinium ocellatum were found on the gills of fish from Curacao and the Cayman Islands. Microscopic slides of the gills were shown at a workshop on the toxic effects of algae which was held at West Palm Beach, Florida just after the kills took place. It seems that several participants at this meeting expressed their doubts as to whether the organisms involved were dinoflagellates, or blue-green algae. Also, there was some speculation whether these infections would have been the causative agents of the fish kill or may be infections that had attacked fish which were already weak or moribund.

Following the above summary of the available data, I would like to add some observations. I happened to be at sea on an inspection trip to Klein Curacao Island on August 5, the very morning after Hurricane Allen passed through the Caribbean. The hurricane passed north of Curacao on August 4 at midnight (see Figure 1 of Executive Summary and Recommendations). We reached eastpoint at about 0900 in the morning. Long waves could be seen coming in from the north/north-northwest. The waves were much longer than usual and were traveling much faster than the short waves normally present in this region. When we reached Klein Curacao the water around the plateau was white with sand much farther out than normally happens, even during very rough weather. It is typical that the fish kill was most severe in the Klein Curacao area and the southeast part of Curacao (Figure 2).

At the time I did not try to estimate the length, height or speed of the waves, nor did I measure their exact direction. When we returned to Curacao at about 1500 in the afternoon, the swell was already much weaker than during the morning and normal wave patterns were returning. One can speculate that Hurricane Allen with its extremely low central pressure of only 899 millibars could have generated waves of exceptional strength and longer than usual wave lengths, also there may have been underlying internal waves. Together, these could have disturbed bottom layers much deeper and in areas not normally affected by other wave types.

The areas on Bonaire and Aruba where the fish kill occurred would also have been exposed to the same wave action, but unfortunately, we have no reports on this.

At the time of the fish kills, a local newspaper reported that some dogs had died after being fed with fish. The dogs were taken to the veterinary service for autopsy and after laboratory analysis it turned out that they had

been poisoned with some organic phosphorus compound. It is suspected that the dogs were deliberately poisoned. At the time, the story caused a lot of apprehension, and demand for fish continued to be depressed for a much longer time than would have been the case otherwise. The incident will serve to illustrate that one has to evaluate such information carefully.

The fish kill in the Netherlands Antilles had the same general characteristics as elsewhere in the Caribbean area. These general chracteristics have not been clearly defined, but in any case, the following similarities can be noted:

(1) An association with high or higher than normal temperatures.

(2) The same types of fish were affected with only minor differences between the different localities.

(3) Several different organisms such as protozoans, dinoflagellates and different algae were involved. No direct link with toxic chemical pollutants could be found.

(4) There are indications that the phenomena could have been caused or triggered by the passage of Hurricane Allen through the Caribbean. The timing of the kills is a bit inconclusive. For instance, there does not seem to be a clear relation between the passing distance of Hurricane Allen and the time of occurrence of the kills. Even so, it can be said that all kills took place within a similar time span.

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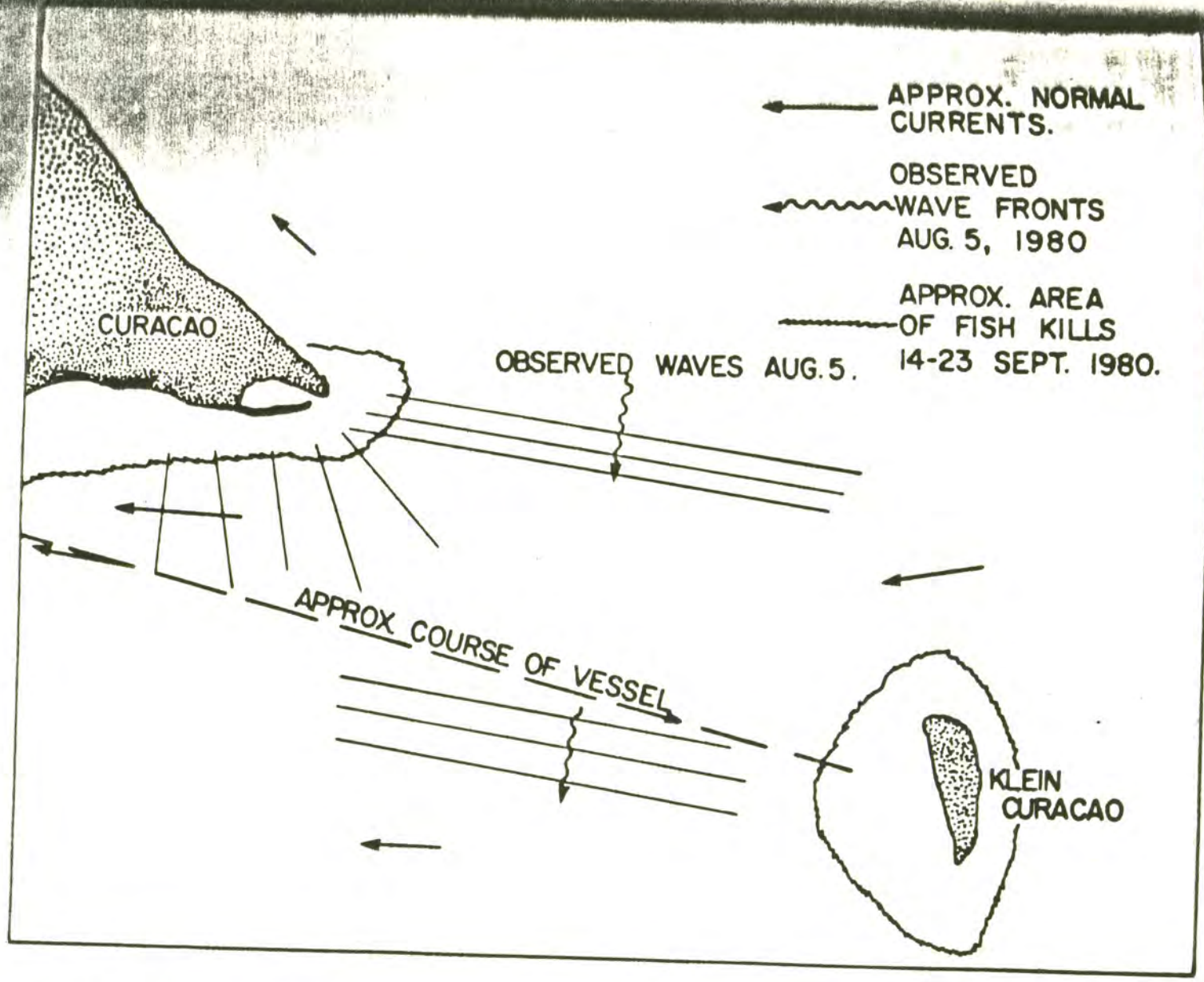

Figure 2. Approximate area where fish kills were observed in August/September 1980 near Klein Curacao. Figure also shows track of Curacao Department of Agriculture and Fisheries vessel on August 5, 1980, the observed direction of swells on the A.M. of that date, and the approximate direction of normal coastal and interisland currents.