Observations of Red Drum Mortality in the Gulf of Mexico

by Roy W. Spears

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Coastal Fisheries Branch

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ABSTRACT

Approximately 3704 large red drum (Sciaenops ocellatus) were found dead from 30 June 1981 to 9 July 1981 on the Gulf of Mexico beach from Cedar Bayou to Port Isabel, Texas. No other fish species were found. Autopsied fish did not show any signs of external injury. Plankton collected in nearshore Gulf waters were representative of those usually present and were not known to be toxic to fish. None were sufficiently abundant to produce anoxic conditions. Bacteria (Vibrio sp.) were found in the liver and brain tissue, but these are normally present in the environment and may have invaded the tissues after death. Causative factors of this mortality remain unknown.

INTRODUCTION

Mass mortalities of fish on the Gulf coast are not uncommon. In 1935, approximately 4500 kg per 1.6 km of menhaden (Brevoortia patronus), mullet (Mugil cephalus), and other fish species were observed from Port Aransas south for 140-320 km (Lund 1935). An irritating gas associated with the dead fish was carried onshore by prevailing winds. A catastrophic mass death involving millions of fish occurred on the Florida Gulf coast in 1946 (Gunter et al. 1947). An odorless, acidic gas was also associated with the kill. In 1939, a massive kill in Offatts Bayou, a small branch of Galveston Bay, Texas, resulted from "boils" up to 9 m in diameter that released gas into the atmosphere (Gunter et al. 1951). A catastrophic mortality of marine fishes and other animals occurred on the Florida coast in July 1947 (Gunter et al. 1948). Deaths were associated with a bloom of a dinoflagellate (Gymnodinium brevi). Changes in meteorological conditions may have altered hydrological conditions which increased the supply of nutrient salts resulting in a plankton bloom. Explosions associated with seismic exploration for oil were a more remote possibility.

Dinoflagellate blooms have resulted in fish mortalities in the Gulf of Mexico. Gunter et al. (1948) reported nine fish kills caused by dinoflagellate blooms that occurred on an average of every 11 years, but spaced from 1 to 30 years apart, during a 102-year period. Discolored water was observed during most of the kills.

During June 1981, a large number of red drum (Sciaenops ocellatus) were reported dead on the Gulf beach from Cedar Bayou to Port Isabel, Texas. The objective of this study was to estimate the number of fish killed and examine possible causes for the kill.

MATERIALS AND METHODS

Overflights of the Gulf beach were made during 30 June 1981 to 9 July 1981 from Cedar Bayou to Port Isabel to determine the geographic extent of the fish kill and estimate the number of dead fish (Figure 1). These overflights included the areas from Port Aransas to Port Isabel on 30 June, 16 km north of Baffin Bay to Baffin Bay on 1 July and 3 July, and Cedar Bayou to Port Aransas on 9 July. The Gulf beach from 16 km north of Baffin Bay to Baffin Bay was surveyed on separate days to determine if dead fish were continuing to wash ashore.

One ground survey was made along Mustang Island on 2 July. All dead red drum on the beach between the Port Aransas jetties and Access Road No. 2, a distance of 18.6 km, were counted, measured and weighed. Preliminary autopsies were performed at the TPWD Rockport Marine Laboratory on three fish obtained from the beach near Port Aransas. Two red drum, measuring 91 and 106 cm, were sent to Texas A & M University for bacterial, viral and parasitic examination.

The initial fish kill report indicated that dead fish were found near an offshore drilling rig 4.8 km south of the Port Mansfield Cut. The rig

was reported to be the source of a "yellow substance" in the water. A water sample was collected near the rig by TPWD personnel and analyzed for salinity, dissolved oxygen, chlorides and pH. Dissolved oxygen and salinity measurements were made with a YSI meter. A Corning Model 10 pH meter was used to record pH and chlorides were measured according to the U.S. Environmental Protection Agency (1979). A plankton grab sample was collected and preserved with basic Lugol's fixative in the vicinity of dead fish about 300 m from the Port Mansfield Channel. Personnel from the University of Texas Marine Science Institute, Port Aransas, Texas collected plankton samples and conducted various vertical profiles of dissolved oxygen and salinity in the area of the fish kill.

RESULTS

An estimated 3704 dead red drum were observed during the 5 surveys between 30 June and 9 July (Table 1). Approximately 2400 dead fish were observed during the 279 km overflight on 30 June from Port Aransas to Port Isabel. The estimated weights of fish observed ranged from 14 to 22 kg and length estimates ranged from 760 to 1270 mm. No fish were actually weighed or measured. No dead fish were observed from Baffin Bay to 16 km north of Baffin Bay.

On 1 July, 500 additional fish were counted during an overflight from 16 km north Baffin Bay to Baffin Bay. On 3 July, 200 more dead fish were observed during another overflight within the same 16 km area. It was assumed that these 200 fish were in addition to those observed on 1 July. No dead red drum were observed north of the Port Aransas jetties prior to 8 July. However, during a 9 July overflight, 500 dead red drum were observed between Cedar Bayou and Port Aransas.

One-hundred-four dead red drum were counted during the 2 July ground survey from the Port Aransas jetties to Access Road No. 2, a distance of 18.6 km. Weights of these fish ranged from 8-12 kg and the lengths ranged from 840 mm to 1080 mm (Table 2).

The autopsied fish did not show any signs of external injury, net marks, lesions or any other readily discernable cause of death. Due to the advanced state of tissue decomposition, internal examinations were inconclusive; however, internal organs appeared to be undamaged. Examination of the two specimens sent to Texas A&M University found bacteria (Vibrio sp.) in the liver and brain tissue. According to Dr. D. H. Lewis, these bacteria are normally present in the environment and probably invaded the tissues after death of the fish (Appendix A). The bacteria were isolated, cultured, and inoculated into live young red drum resulting in their death 6 hours later. Lesions normally associated with Vibrio related mortalities were found on the young fish; however, none were found on the fish involved in the kill. Dr. Lewis concluded that these bacteria were not the cause of the kill because they probably invaded the tissues after the death of the fish.

An overflight in the vicinity of the reported leaking drilling rig detected no discolored water or discharges, nor were the nearby beaches discolored. A report of a yellow substance in the Gulf near Pass Cavallo

was received during the investigation. It was thought to be a possible red tide; however, a flight from Cedar Bayou to Freeport revealed no evidence of the substance. Water sample analyses performed by TPWD revealed no unusual salinity (36 ppt), chlorides (18,500 mg/l), pH (8.3) or dissolved oxygen (7.2 mg/l) conditions. Oxygen profiles taken by University of Texas personnel did not indicate the presence of anoxic conditions in the vicinity of the fish kill (Amos 1981).

No toxin-producing organisms were found in the plankton sample collected by TPWD personnel. Plankton identified were representative of those usually present in the shallow Gulf at that time of year. The sample contained nanoflagellates, a few diatoms (Rhizosolenia sp.), blue-green algae (Trichodesmium sp.), and a few copepods. None of these organisms is known to be toxic to fish and none was sufficiently abundant to produce anoxic conditions. This information was corroborated by The University of Texas samples (Arnold and Rosson 1981).

DISCUSSION

The cause of the red drum kill is unknown. However, chemical or biological causes seem unlikely because of the absence of other species. Lack of any obvious chemical or biological cause for the fish kill has led to some speculation that the kill may have been caused by shrimping or fishing activities in the area. For example, a minor fish kill was reported in August 1981 in Redfish Bay. It was later determined that the source of these fish was a Louisiana shrimp boat which discarded about 200 red drum, ranging from 1.4 to 3.6 kg (Madeline Bailey, NMFS, personal communication). The fish were reportedly brought to Texas to be sold, but had spoiled en route. Some of these dead fish may have also resulted from illegal net fishing because local game wardens reported picking up several illegal nets in that area. However, it is unlikely that local shrimping and fishing activities could have captured the large number and size of fish involved in the kill. Such large fish are rare in the bays where most net fishing occurs and the 9.6-m nets used within the 8-m depth zone in the Gulf by shrimpers would be inadequate for catching such large and numerous red drum.

There has also been some speculation that these fish resulted from the dumping of red drum illegally caught in purse seines off some other Gulf state. For example, in May 1981, the Mississippi Marine Patrol apprehended a purse seine boat with 36,000 kg of large red drum aboard within the State's territorial waters. The Patrol released the live fish while the dead fish were left floating. The Texas fish kill occurred during the closed shrimp season when the Gulf was heavily patrolled by Parks and Wildlife game wardens and the Coast Guard. Although not impossible, it would have been difficult to distribute approximately 45,000 kg of fish without having been detected along 219 km of patrolled waters.

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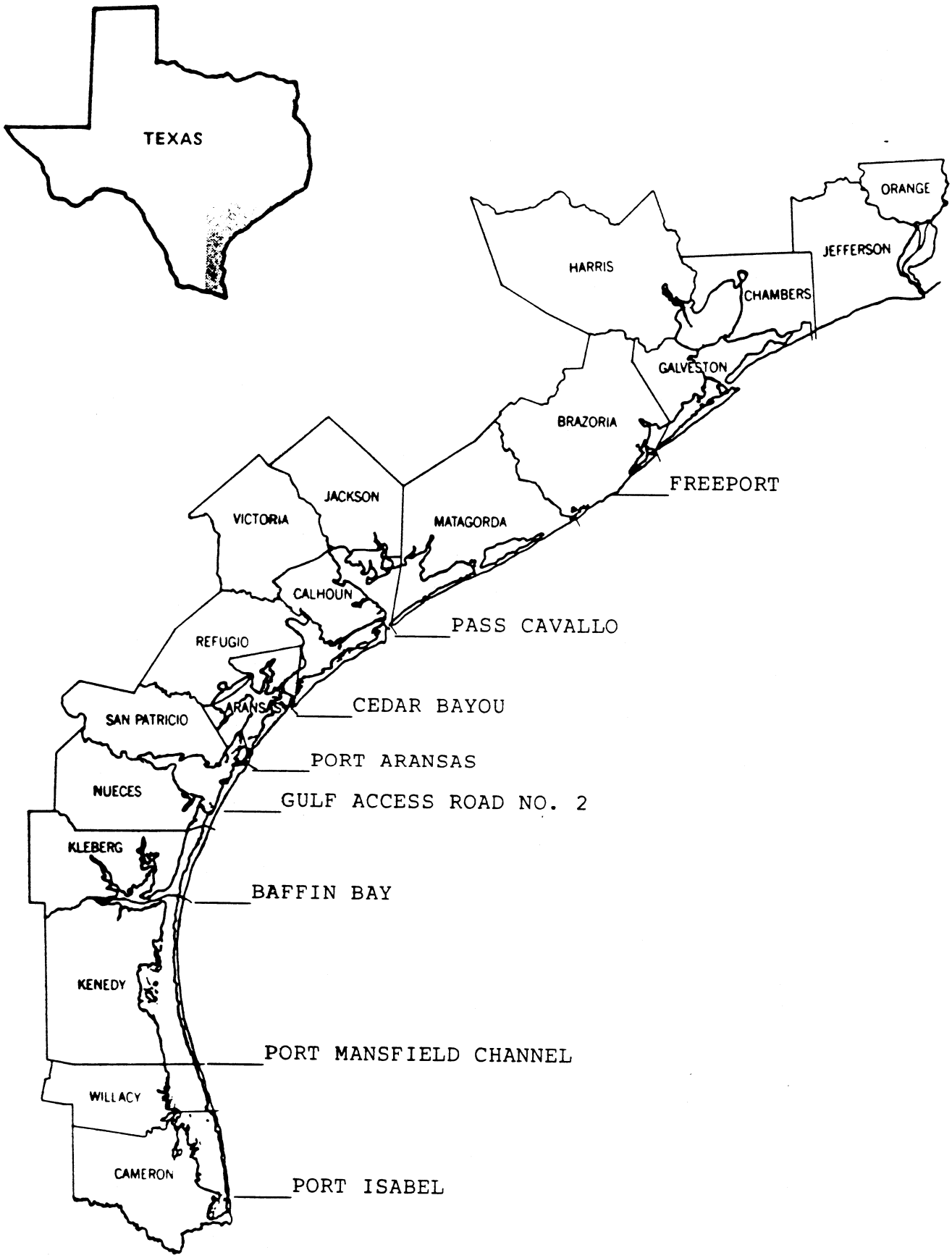
Table 1. Estimates of fish killed from the Cedar Bayou to Port Isabel, Texas during 30 June 1981 to 9 July 1981 on the Texas Gulf coast.

Date	Type of survey	Number of dead fish	Weight range (kg)	Total length range (mm)	Area description
30 June	Aerial	2400	14-22	760-1270	Port Aransas to Port Isabel
01 July	Aerial	500			16 km north of Baffin Bay to Baffin Bay
02 July	Ground	104	8-12	840-1080	Port Aransas jetties to Access Road No. 2
03 July	Aerial	200			16 km north of Baffin Bay to Baffin Bay
09 July	Aerial	500			Cedar Bayou to Port Aransas
Total		**3704**			

Table 2. Total lengths of 104 red drum collected from Mustang Island on 2 July 1981 between the Port Aransas jetties and Access Road No. 2 (mean total length = 990 mm).

Length (mm)	Number Counted
840	2
850	2
880	2
920	6
930	2
940	6
950	3
960	5
970	6
980	2
990	11
1000	2
1010	14
1020	15
1030	8
1040	2
1050	2
1060	9
1070	2
1080	3
Total	**104**

Figure 1. Location of red drum fish kill from Cedar Bayou to Port Isabel, Texas during 30 June 1981 to 9 July 1981 on the Texas Gulf coast.


TEXAS
ORANGE
JEFFERSON
HARRIS
CHAMBERS
GALVESTON
BRAZORIA
FREEPORT
JACKSON
VICTORIA
MATAGORDA
CALHOUN
PASS CAVALLO
REFUGIO
CEDAR BAYOU
ARANSAS
SAN PATRICIO
PORT ARANSAS
NUECES
GULF ACCESS ROAD NO. 2
KLEBERG
BAFFIN BAY
KENEDY
PORT MANSFIELD CHANNEL
WILLACY
CAMERON
PORT ISABEL

Appendix A. Lewis, D. H. Letter of October 16, 1981 to Mr. Tom Heffernan.

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Leland

NOV 12 1981

October 16, 1981

MEMORANDUM

TO: Mr. Tom Heffernan
Texas Parks & Wildlife
P.O. Box 1707
Rockport, TX 78382

FROM: D. H. Lewis

SUBJECT: Update on Laboratory Findings on Redfish Submitted July, 1981

Redfish (2) received July 4, 1981 collected as part of the redfish "kill" were examined grossly for lesions or other signs which may have contributed to the "kill".

There were no obvious external signs of disease. Internally there were minor lesions in the heart and liver in one of the fish. suggestive of initial stages of infection with fungus Ichthyosporidium hoferi, an agent frequently observed in several species of wild captured marine fish. Impression smears of those lesions were equivocal and efforts to culture the agent were negative after 1 months incubation.

Impression smears of brain, liver and kidney revealed the presence of gram-variable and gram negative bacteria. Tissue samples were processed to detect anaerobic and aerobic bacteria. Three facultatively anaerobic bacteria were recovered from the tissues: Vibrio algosus, Vibrio anguillarum and an Aeromonas sp. Of these bacteria, only V. anguillarum has been implicated in disease problems of marine fish. Usual signs associated with vibriosis (the disease caused by V. anguillarum) include capillary breakdown in the orbit, oral cavity, vent and varying degrees of fin and gill necrosis. None of these signs were evident in fish examined. It should also be added that these organisms are commonly found in the marine environment, i.e. in sediments and waters near coastal areas, occasionally in the intestinal tracts and on surfaces of most marine fish.

Based upon the available information, i.e. state of decomposition of some of the tissues, ubiquitous distribution of these agents throughout the body of the fish, lack of gross signs of disease, it seem likely the bacteria played no role in the kill.

Toxicologic analysis of liver, brain and muscle tissues of fish taken prior to and during the kill failed to reveal quantities of common toxic pollutants, e.g. Hg and other heavy metals, polychlorinated HC and organophosphates to account for the kill.

After exhaustive microbiologic, histopathologic and toxicologic analysis we are unable to verify the involvement of microbial or toxicologic agents in the redfish kill reported in July, 1981.

The relative uniformity of the size (and apparent age-group), involvement of only redfish and the absence of gross signs associated with the kill are not consistent with any currently known disease process.

xc: Dr. N. P. Clarke
Mr. Robert Kemp✓
Mr. Roy Spears
Dr. Connie Arnold
Dr. Wallace Klussmann