Job Report

H.D. Hoese
Marine Biologist

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Project Name : Basic Ecological Survey of Area M-3.

Period Covered: September 1, 1958 - September 1, 1959 Job No. A-3

A Checklist of Fishes of Area M-3.

Objectives: To determine forms present, their relative abundance and life histories and relationships to hydrography.

Procedure:- Stations were occupied in Area M-3 and collections were made monthly with seines, nets, trawls, etc. Associated data on hydrography and other data were taken.

Findings:

Description of Areas

East Bay has been adequately described by Reid (1955a and later papers). East Bay is similar to West Bay in depth orientation, but differs considerably in bottom sediments. Much of East Bay is deep mud, unconsolidated but not reduced. In many places in the upper end the mud is loose to a depth of four feet below the surface of the bottom. East Bay has several small bayous entering the upper end and receives a large amount of water from marsh drainage. Rollover Pass, opening into the upper end of East Bay, was re-opened on May 29, 1959 introducing high salinity water into the bay. Discussion of the fauna of East Bay will not include the recent marine invaders apparently due to the opening of Rollover.

West Bay is an elongate shallow bay which trends NE-SW. The upper end of the bay is marked by shallow areas and the Deer Islands, which may be the remnants of a relict tidal delta. The lower end of the bay is marked by the relatively stable tidal delta of San Luis Pass. The largest stream system entering West Bay enters in the southern end through Chocolate Bay. Salinities in this bay are the lowest for the area, and the fauna is correspondingly meager. A small creek, Highland Bayou, enters in the upper end, but it is freshwater. Flow is sporadic and small. A fairly large marsh drainage is apparently isolated from West Bay by the Intracoastal Waterway running north of West Bay.

West Bay is about fourteen nautical miles long (from Deer Island to tidal delta of San Luis) and about three miles across at its widest point.

While depths are usually less than five feet, waters near San Luis Pass are as deep as seven feet. The channel at San Luis may be twenty to twenty-five feet, but its depth varies greatly.

Lower Galveston Bay is a muddy-sandy area influenced by tides through Bolivar Roads. It is cut off from much of the Upper Galveston Bay area by the Texas City Dike.

Salinity

West Bay is the most northern outlier of high salinity water in

rather than long strings of bubbles - at the time the picture was taken some of the gases had diffused out of the blood vessels, Fig. 8).

At 0845 water temperature was 11.0°C, salinity was 20.4°/oo, and D.O. was 23.3 ppm on the surface. Water under these conditions of temperature and salinity is saturated with oxygen at 9.45 ppm therefore the dissolved oxygen in the water was 246.6% of saturation. Supersaturation was caused by an extensive (see attached map) bloom of plankton. These plankters as tentatively identified by Mr. William Wilson of the U.S. Fish and Wildlife Service, Galveston Laboratory, were: a euglenoid, Eutreptia (marina); the dinoflagellates Prorocentrum cutellum and Gymnodinium (symplex). He stated that they appeared to be present in nearly equal numbers.

The table below shows climatic and hydrographic conditions present in the area before and during the time this mortality occurred. Until the afternoon of 15 January, winds remained light and variable.

Date	Time	Water Temp.	°/oo Salinity	pH	Dissolved Oxygen	Barometric Pressure	Cloud Conditions
			(Seabrook Laboratory)				
1959							
9 Jan.	0900	5.0	17.8	8.5	9.9	30.41	Overcast
	1600	8.9	17.7	8.6	14.9	30.36	Clear
10	No observations made						
11	1215	8.9				30.30	Partly cloudy
12	0900	8.9	17.4	7.1	10.1	30.34	Few clouds
	1600	11.7	17.6	8.6	13.6	30.30	Partly cloudy
13	0900	10.5	19.3	8.4	11.9	30.24	Scattered clouds
	1700	11.8	18.9	8.5	12.4	30.12	Few clouds
14	1700	15.0	18.4	8.6	11.4	29.87	Partly cloudy
15	1000	13.3	19.5	8.3	11.6	29.76	Cloudy
	1630	12.8	19.7	8.4	12.7	29.80	Overcast
			(Sylvan Beach)				
14 Jan.	0900	11.2	20.4	8.2	23.3		
	1500	13.6	20.1	8.3	23.8		
15	0830	11.9			16.5		
	1530				19.6		
	2230				13.0		
16	0730				11.4		

the northwestern Gulf of Mexico. During the study salinities were almost always over 20 parts per thousand. Apparently West Bay received some drainage from the marsh lying to the north of bay previous to the cutting of the new intracoastal waterway. Ostrea equestris has largely replaced Crassostrea virginica in the reefs. Because the same effect was caused by the recent drought, it is difficult to say that the population of Ostrea is permanent, but since the drought ended in 1957 it is probable.

West Bay can be classified as a polyhaline bay both from the standpoint of salinity and the fauna.

East Bay was a more typical estuary in that a salinity gradient existed from the upper to the lower end. Typically, salinities were less than 5 parts per thousand in the upper end and became gradually higher to 12-15 parts per thousand near Hanna's Reef. Similarly, low salinities were occasionally found far up Chocolate Bay. But the rainfall in the drainage system is sporadic and salinities were not always consistently low.

As Reid (1955a) found salinities to the right (looking down bay) were consistently lower than those to the left.

Temperature

An accurate range and average of temperatures was not determined due to the size of the areas. However, surface water and air temperatures were similar except in the deeper areas of Bolivar Roads, the Houston Ship Channel and the Texas City Channel. Being deeper they changed temperature more slowly, but in winter they were as cold (7° C.) as were shallower waters. Since the data is sporadic and shows little deviation from temperatures in Upper Galveston Bay and other Texas Bays, the data are not presented. The impetus for the fall migration of fishes was due to drops in temperature, but since there are many deep channels in the area, most fishes remained in the bay further into the winter than is typical of other Texas Bays.

Plants of Area M-3

Most of the area was characterized by the emergent grass Spartina growing on shore. East Bay contained essentially no submerged vegetation except a very rare red algae.

The algae were not studied extensively, but West Bay contained the greatest variety and probably the largest mass. Gracilaria cornea, Cladophora, Ulva, Enteromorpha and several other algae were abundant in West Bay during the spring.

The spermatophytes were not accurately mapped, for they occurred sporadically and in irregular spacing. Ruppia maritima occurred in pure stands in upper West Bay near San Luis Pass. Thalassia testudinium beds were widespread along the souther nshore of West Bay, but did not grow in pure stands. Leaves of Diplantheria wrightii were found floating in the water, but no stands were located.

The Following Species of Fishes have been Taken in Area M-3

Dasyatis sabina (LeSueur). The stingaree was not common but was found in every month.

Gymnura micrura (Bloch and Schneider). The butterfly ray was rare in the area and was found only in the vicinity of San Luis Pass and Bolivar Roads.

Lepisosteus spatula (Cope). The alligator gar is wide spread in the area, being very abundant in East Bay. It frequents most all of the harbors in the area.

Brevoortia patronus Goode. Young and juvenile menhaden were one of the most abundant fishes of the area.

Anchoa mitchilli (Valenciennes). This anchovy is one of the most common fishes of the area and is particularly abundant in Upper East Bay.

Anchoa hepsetus (Linnaeus). This anchovy is ralatively rare, having been found only in lower Galveston Bay and West Bay.

Synodus foetens (Linnaeus). Lizardfish are not common in the area.

Urophysis floridanus (Bean and Dresel). This species was common in West and lower Galveston Bay from February through April. Young were common only in February and March.

Syngnathus sp. Two species of pipefishes S. scovelli and S. floridae were common in the Thalassia flats in West Bay.

Mugil cephalus Linnaeus. Mullet were very common in the area the year round but were taken in trawls only when they were driven to deeper water by cold weather. M. curema Valenciennes also occurred but was uncommon.

Polydactylus octonemus (Girard). Young threadfin were not uncommon in April and May in West Bay. However, none were taken in East Bay.

Centropristes philadelphicus (Linnaeus). This sea bass was common in certain areas during the winter months. It was taken most often in deep channels but was also found in the shallows of West Bay. Only a very limited size range was taken.

Carangidae

Members of this family are only strays into the area, but a few species are occasionally taken in the Houston Ship Channel. These are: Caranx hippos, Chloroscombrus chrysurus, Vomer setapinnis, Selene vomer, and Oligoplites saurus.

Eucinostomus sp. Gerrids are a conspicuous part of the winter fauna of lower Galveston and West Bays.

Orthopristis chrysopterus. Pigfish were common in West and lower Galveston Bays during most of the year. Young were common in the grass flats of West Bay and older individuals were found most often in the vicinity of oyster reefs.

Sciaenidae

Members of this family were very abundant in the areas as is true for the whole Texas Coast. The most common species was Micropogon undulatus which was ubiquitous over the whole area. Young of the species were most abundant in the upper end of East Bay. Leiostomus xanthurus, Bairdiella chrysura, Stellifer lanceolatus, were also abundant. Sciaenops ocellata and Pogonias

cromis were also abundant, but seemed most common in East Bay. Hanna's Reef often produced large redfish and drum in spring and early summer.

Cynoscion nothus. This species was found only rarely in the vicinity of Bolivar Roads.

Cynoscion arenarius. This species was very common in parts of East Bay and the rest of the area, but it was most common in deeper areas.

Lagodon rhomboides (Linnaeus). The pinfish is one of the most abundant fishes in this region preferring areas of extensive vegetation and oyster reefs.

Archosargus probatocephalus (Walbaum). Sheepshead are relatively common sports fishes in the area. Adults have been taken and tagged (none returned) from the vicinity of oyster reefs. Young are abundant in areas of vegetation in West Bay. Young and adults are also common near piling and jetties in the vicinity.

Trichiurus lepturus Linnaeus. Cutlassfish are one of the most abundant fishes in the area in November, and were common again in March through May in lower Galveston and West Bays. They were most common in lower Galveston Bay.

Citharichthys spilopterus, Etropus crossotus, Symphurus plaguisa, Trinectes maculatus, Ancylopsetta quadrocellata.

These flatfishes were not common over most of the area, but they are often mistaken by laymen as the young of Paralichthys.

Paralichthys lethostigma. The southern flounder did not seem to be common in the area. Most were taken in the upper end of East Bay and the Intracoastal Waterway south of West Bay.

Sphoeroides nephelus (Goode & Bean). Puffers were not common, but were found occasionally in West Bay.

Porichthys porosissimus (Valenciennes). Mishipmen [redacted] in the high salinity areas of the bay.

Opsanus beta (Goode and Bean). Toadfish were restricted to oyster reefs, sunken cans and the like, and were found everywhere but East Bay.

Distributions of Certain Fishes

Since West Bay [redacted] high salinity, many marine species were taken here, but not in East Bay, (see Table 1). This was presumably due mainly to salinity. However, the absence of a growth stage of at least two species in East Bay, juvenile Cynoscion nebulosus and Archosargus probatocephalus, is apparently due to high turbidity; and for a lack of vegetation may be a limiting factor. The young of redfish, croaker and flounder seemed to prefer the less saline upper end of East Bay.

West Bay is the northermost outlier of high salinity water in the western Gulf of Mexico. Consistent with this is the similarity of the fauna of West Bay and the more polyhaline bays to the south. Since temperatures are not much different than those in the Rockport Bay area, salinity is apparently the important factor in limiting the distribution of marine forms in the Galveston Bay system.

During the winter months, the fish fauna was generally sparse, but the few fishes in the area tended to congregate in the deeper channels. Offats Bayou with depths over 30 feet had an intensive winter fishery, consisting of mainly Cynoscion nebulosus, but included Sciaenops ocellatus, Archosargus probatocephalus, Paralichthys lethostigma and occasionally a few other species. Immediately after a sharp temperature drop, large numbers of speckled trout and fewer numbers of other species were caught by sportsfishermen. Since Offats Bayou does not normally produce outstanding catches, except occasionally in the hotter summer months, it is concluded that these fish are driven to deeper water by temperature. Since any natural food supply would be rapidly depleted many of these fish would be caught on hook and line.

TABLE 1

Fishes Taken in West Bay But Not in East Bay

Gymnura micrura	Cynoscion nebulosus (juv.)
Anchoa hepsetus	
Urophycis floridanus	
Centropristes philadelphicus	
Opsanus beta	
Orthopristis chrysopterus	
Chloroscombrus chrysurus	
Vomer setapinnis	
Selene vomer	
Ancylopsetta quadrocellata	
Porichthys porossissimus	

Prepared by Hinton D. Hoese — Approved By Leonard T. Lee

Marine Biologist — Date Approved 30 Sept. 1959

Salinity

Previous to the opening of Rollover, East Bay waters were very fresh. During May salinities varied from 3 parts per thousand in the extreme upper end to 12 parts per thousand near Hanna Reef. Isohalines for May 12 show about the same distribution shown by Reid (1955) for June 1954, with lower salinities along the right shore (looking down the bay). However, in May 1958 salinities at any given point were about half the value found by Reid.

East Bay is apparently, under normal conditions, a fresh bay judging from the meager number of mollusc shells and the only two abundant living species Rangia cuneata and Macoma mitchelli are indicators of a low salinity environment (Parker, 1955).

Immediately after the opening (May 29) the area suffered heavy rains from a storm and isohalines on June 1 show a faster flushing rate and generally lower salinities over most of the bay. As late as June 11 salinities over the bay were still low but had risen to 7-8 parts per thousand in the upper bay. However salinities in Rollover Bay were 25.1 parts per thousand a rise of about 22 parts per thousand in two weeks.

The influence of higher salinity was slow taking two months to reach even the upper bay. Reid (1957) indicated that Rollover Pass served more as an outlet than an inlet, and the gradual encroachment of salt waters supports this. Even several days of strong onshore winds during June of 1959 did not appreciably raise the salinity in East Bay.

Fauna

Most attention was given the upper portion of the bay since this is the area first influenced by Rollover. The fauna of the lower bay was essentially similar with a few more species and generally larger individuals.

Macoma mitchelli is probably the most abundant pelecypod in East Bay. Its presence was first noted by Reid (1955) who found it abundant in the stomachs of croakers. Because this species along with Rangia cuneata Gray is a low salinity form, higher salinities may be detrimental to its existence. Whole attached valves are common in the mud; so only the absence of live specimens would be indicative of partial or total mortality.

The commercial oyster, Crassostrea virginica (Gmelin) had apparently spread into the upper bay after the original opening of Rollover Pass (Reid, 1957), presumably, due to higher salinities. These oysters are represented by dead shell, apparently being killed by low salinities after Rollover was closed for construction.

A few of the molluscs have been found in the upper bay, but they are rare and probably not important members of the community.

The remainder of the fauna of the upper bay during May 1959 consisted of juvenile fishes and shrimps. The river shrimp Macrobrachium ohione was abundant, several ovigerous females being taken. The most abundant element was the brown shrimp Penaeus aztecus Ives. Juveniles were extremely abundant in May. The remainder of the fauna consisted of juvenile Micropogon undulatus Linnaeus, Leiostomus xanthurus, Citharichthys spilopterus, Sciaenops ocellatus, Paralichthys sp. and juvenile and adult Callinectes sapidus. No change in this fauna was noted in June although the average sizes of most of the species were larger.