Job Report

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A Survey of the Invertebrate Species Present in Mesquite Bay and Cedar Bayou Pass

Abstract: A comparison was made of invertebrates present in Mesquite Bay and Cedar Bayou Pass with the pass open to the Gulf of Mexico and with it closed. This comparison showed that white shrimp were more abundant and brown shrimp less abundant when the pass was open. In addition, high salinity forms, not reported when the pass was closed, became relatively abundant when the pass was opened.

Cedar Bayou Pass allows gulf water to enter lower Mesquite Bay. However, salinity is influenced primarily by influx of water from the Guadalupe River system.

Objectives: The object of this survey was to gather information concerning the macro-invertebrate species present in Mesquite Bay and Cedar Bayou Pass, and to compare these data with data gathered by H. D. Hoese (1958) when Cedar Bayou was closed.

Procedure: Sampling of the macro-invertebrate population was conducted with a 10-foot trawl of 1 1/2-inch stretch mesh, an Ekmen dredge, and a clam dredge at 14 stations in the bay and pass (Figure 1). Specimens were returned to the laboratory for identification and recording. Shrimp and crabs were measured in millimeters and recorded for comparison with the previous project's results. Water temperature was measured in degrees centigrade and salinity was determined by the Mohr Titration method.

Findings: Invertebrates taken during both surveys are presented in Tables 1 and 2. These tables also list stations and salinities in which the organisms were found.

If all trawl catch figures are multiplied by 2.44, they can be compared with Hoese's work more readily, since 2.44 times less trawls were made during this recent survey.

Porifera

Desmospongiae

Demospongiae sp Hoese reports one unidentified specimen (Table 1), stating it was quite common until June, 1957. Salinities were extremely high, 50 ppt, due to prevailing drouth conditions. No Desmospongiae were found in this study. Lowered or more moderate salinities caused by increased rainfall and the influence of Cedar Bayou on Mesquite Bay may have created conditions unfavorable to the growth of this sponge.

Figure 1
Mesquite Bay and Cedar Bayou Otter Trawl Stations - 0

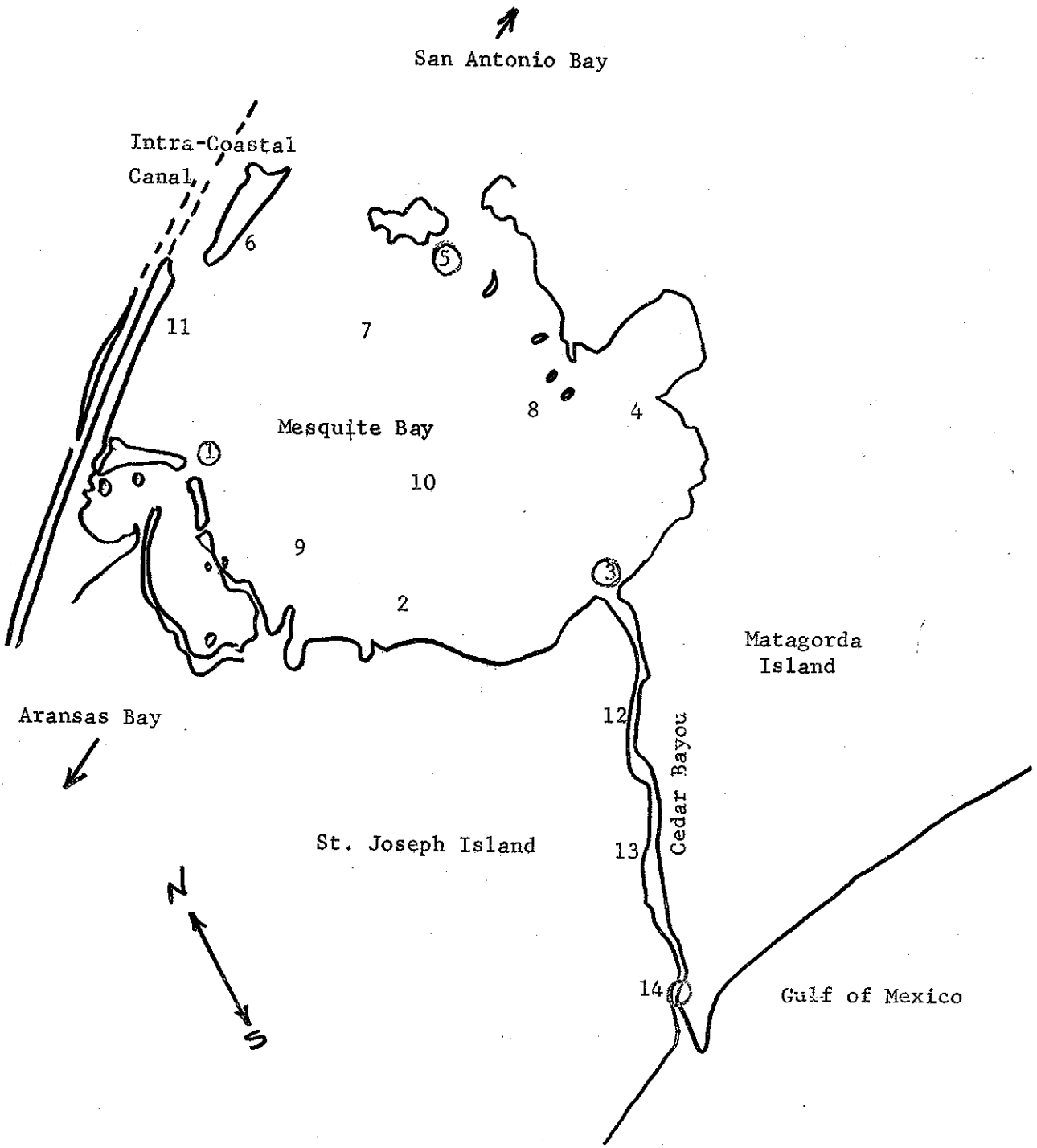

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TABLE I

Invertebrates, salinity ranges, and stations taken.

X=Hoese
O=Schultz

* not taken

STATIONS	1	3	5	14	Salinity Range ppt.
Species					
Desmospongiae sp	Hoese found this sponge at other stations				50.0
Cliona trutte	X				16.0
Cliona celata		O			34.4
Pelagia sp	One specimen in September 1957				17.3
Dactylometra quinquecirrha	Found in July, September, and October				13. -26.0
	O	O	O	O	14.0-36.0
Aurelia aurita			X		21.2-45.3
	O	O	O	O	18.6-36.3
Stomolophus meleagris	X	X			44.5
	O	O	O	O	14.5-35.4
Leptogorgia setacea				X	*
		O		O	35.3
Renilla reniformis	Not reported by Hoese				
		O		O	26.0-30.0
Mnemiopsis mecradyi	Collected in 1957				4.9-40.1
Beroe ovata	Recorded in late winter and spring				37.5-45.3
				O	33.0-36.0
Stylochus ellipticus					3.3
Neanthes succinia	Hoese collected two specimens				
	O	O	O		1.9-36.9
Balanus sp	Occasionally observed by Hoese				
	O	O	O		1.9-36.9
Erichsonella attenuata	Recorded in 1957 at other stations				2.4-13.4
	O	O	O		16.0-29.0
Penaeus setiferus	Stations not mentioned				2.9-45.3
	O	O	O	O	1.9-36.9
Penaeus duorarum	Stations not mentioned				2.7-35.7
	O	O	O	O	1.9-36.0
Penaeus aztecus	X	X	X	X	15.0-33.0
	O	O	O	O	19.0-36.0
Xiphopeneus krøyeri	Hoese reports one from station 8.				17.5
Trachypeneus similis		O			23.9
Sicyonia dorsalis		O			23.8
Sicyonia brevirostris		O			32.9

TABLE I Cont.
Invertebrates, salinity ranges, and stations taken.

X=Hoese
O=Schultz

* not taken

STATIONS	1	3	5	14	Salinity Range ppt.
Species					
Alpheus heterochelis	Hoese reports this species at other stations.				3.0-16.0
	O	O	O		1.9-34.3
Alpheus armallatus	Hoese reports this species at other stations.				Not given
Paleomonetes sp	Hoese reports Paleomon shrimp as common.				
	O	O	O		1.9-28.9
Paleomonetes pugio	O	O	O		1.9-15.7
Paleomonetes vulgaris	O	O	O		14.9-24.7
Macrobrachium ohione	X				3.7- 5.0
Petrolisthes armatus	X				5.3-35.7
	O	O	O		7.9-29.4
Clibanarius vittatus				X	13.5-45.3
	O	O		O	13.2-36.0
Pagurus floridanus				X	13.2*23.8
		O		O	17.9-36.0
Pagurus longicarpus	O				35.0
Pagurus annulipes		O			13.4
Callinectes sapidus	X	X	X	X	2.8-26.5
	O	O	O	O	1.9-36.0
Callinectes danae	X	X	X	X	5.0-45.3
	O	O	O	O	8.9-36.0
Ovalipes ocelatus		O			19.2
Arenaeus cribrarius				X	21.9
Pinnotheres ostreum	O	O	O		1.9-33.4
Panopeus herbstii		O			19.2
Eurypanopeus depressus	Hoese reports as present at some stations.				37.5-45.3
	O	O	O		1.9-34.4
Rithropanopeus harrisii	X	X	X	X	2.0- 7.0
Heterocrypta granulata	X	X	X		28.5-33.4
Menippe mercenaria				X	24.2-36.0
	O	O	O	O	14.0-36.0
Libinia dubia	Hoese reports collecting some.				34.6-38.5
		O		O	25.1-35.6
Squilla empusa	Hoese did not give stations.				15.6-34.6
	O	O	O	O	23.4-36.0

TABLE II

Stations, species, and salinity ranges.

X=Hoese
O=Schultz

*not taken

STATIONS / Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Salinity Range
Polynices duplicatus			X O									X			20.4 36.9
Thais haemastoma			O											O	26.0-36.0
Busycon contrarium			O											O	28.0-36.0
Cantharus cancellarius			O											O	23.0-36.0
Anachis obesa			X				X					X			*
Nassarius acutus			X				O	O		O					* 23.0-27.0
Nuculana acuta		X	X												*
Brachiodontes recurvas	Hoese found these on oyster reefs.														0-12.0
Brachiodontes exustus	Hoese found these on oyster reefs. O		O	O	O			O	O						12.0 1.9-36.0
Anomia simplex	Hoese took one specimen. O		O	O	O			O	O						* 22.0-36.0
Ostrea equestris	X														35.0-45.3
Crassostrea virginica	X O		X O	X O	X O			X O	X O						* * 1.9-23.4
Chione cancelata		X O				O	O			O	O				38.5 23.0-35.0
Mercenaria campechiences	Hoese found these in a dying condition. O									O	O				* 23.0-35.0
Mulinia lateralis	Hoese reports this species as most abundant. O	O		O	O	O	O	O	O	O	O	O			* 23.0-36.0
Tagelus divisus		X O		O		O	O			O	O				37.7 23.9-35.0
Tagelus plebius				O											28.0-33.0
Abra aequalis	O					O		O	O						25.0-36.0
Ensis minor		O			O	O	X			O	X O				* 23.9-35.0
Crepedula glauca			O												33.0-35.0
Crepedula fornicata			O					O							33.0-35.0

TABLE II Cont.
Stations, species, and salinity ranges.

X=Hoese
O=Schultz

* not taken

STATIONS / Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Salinity Range
Cerithium varible	O	O					O				O				23.9-33.4
Anachis avara	O	O	O					O	O						23.0-33.5
Astrangia astreiformis		O	O	O	O			O	O						23.0-33.5
Bugula sp	Hoese reports one specimen														*
		O	O	O	O			O	O						23.0-33.5
Anadra transversa		O	O	O	O			O	O						23.0-35.5
Pandora trileneata		O	O							O					25.0-35.0
Crassinella lunulata		O	O	O						O					25 -35
Lucina sp.		O		O						O					25.0-35.0
Zoobotryon pellucidum	O		O		O									O	22.0-23.0
Molgula sp.	Hoese found these in the winter on reefs.														16.4-15.6
														O	31.7

Clionidae

Cliona trutte (Old) Reported previously but not taken during this study.

Clinoa celata (Grant) This species was encountered at Station 3 in July, 1960. It was not found during the previous study.

Coelenterata

Pelagidae

Pelagia sp Reported by Hoese only.

Dactylometra quinquecirrha (Desor) This species was reported in July, September, and October by Hoese, and in June, July, August, and September in the later survey.

Ulmaridae

Aurelia aurita (Linnaeus) This was not found during this survey period.

Stomolophidae

Stomolophus meleagris (L. Agassiz). This species was reported only once during the 1958 study but was present at all stations during the early summer months of 1960. Beginning in September the numbers dwindled rapidly.

Anthozoa

Leptogorgia setacea (Pallas) This particular coral is not common to the bays but is washed into the bay from the Gulf through Cedar Bayou.

Renillidae

Renilla mulleri (Kolliker) The sea pansy was found during this study consistently in and around Cedar Bayou during the summer months and occasionally during the winter of 1960. This soft coral is a gulf form but is found in bays near inlets according to Parker (1958).

Ctenophora

Lobatae

Mnemiopsis mccradyi (A. Agassiz) This jelly was not recorded in 1960.

Beroidae

Beroe ovata (Camisso and Eysenhart) The comb jelly was common in the late winter and spring.

Platyhelminthes

Planoceridae

Stylochus ellipticus (Girard) The oyster leech was not recorded during the second survey.

Annelida

Polychaeta

Neanthes succinia (Frey and Leuchart) This species seems to be one of the more common polychaetes in Mesquite Bay, on and around oyster reefs.

Arthropoda

Copepoda

Copepoda Copepods were deleted from both studies.

Cirripedia

Balanidae

Balanus sp Barnacles were found on pilings and oyster clusters.

Isopoda

Erichsonella attenuata (Harger) This isopod, present during both surveys, was found associated with vegetation in a wide range of salinities.

Decapoda

Peneidae

According to Hoese (1958), juvenile peneid shrimp were common in 1956, during the months of January and February; the period of greatest abundance in 1960 was from March through August. Mesquite Bay was used as a nursery area by brown shrimp but not commonly by whites. Most of the shrimp were 45 to 140 millimeters long.

Penaeus setiferus (Linnaeus) Hoese reported 234 white shrimp taken during his survey while this study yielded a total of 758 with the greatest numbers being found in November (Figure 2).

When Cedar Bayou is open shrimp move out through Cedar Bayou Pass and into the Gulf (Simmons, 1951). The greatest number of whites was taken in November, but September also had a large number recorded with 148 taken. The size ranges and modes are shown in Figure 2. This increase in numbers in the fall can be attributed to two things. First there is at this time, a natural migration of whites from their nursery grounds to the Gulf, and second, a rapid drop in salinities of the upper bays due to heavy rains in September, October, and November caused an exodus.

The difference in total numbers caught between the two studies can be attributed to availability.

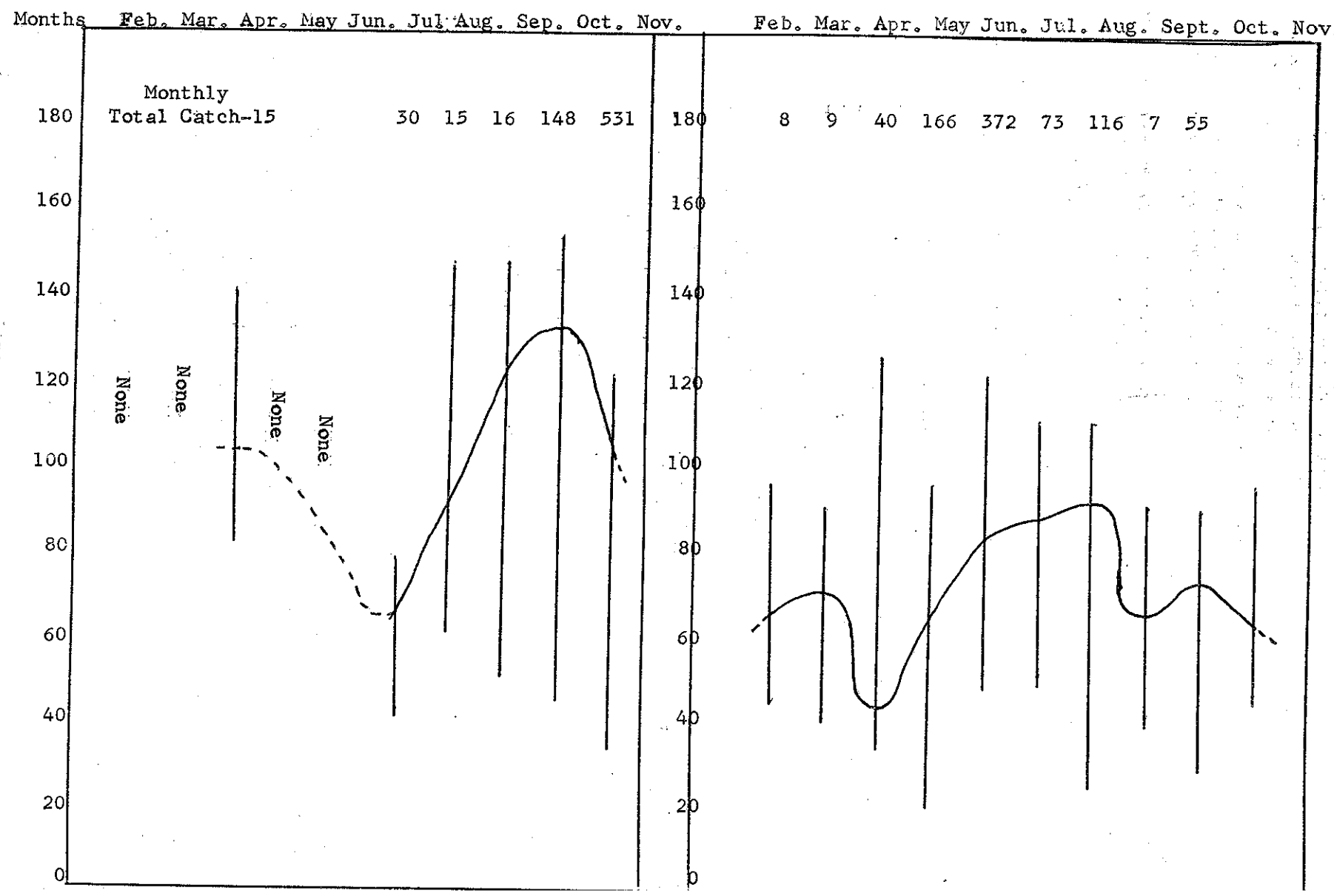
Penaeus duorarum (Burkenroad) The pink shrimp was not recorded in abundance during either study. Most were encountered in September and October by both writers. Hoese reported 280 while 60 were found later. This particular shrimp, which is fairly common in more saline Redfish Bay near Aransas Pass, is probably not of great importance to the Mesquite Bay area, at least during years of low salinity.

The lack of sufficient numbers makes it impossible to establish monthly length frequencies. However, the average size was about 65 millimeters with a range from 35 to 90 millimeters.

September was the month of greatest abundance.

Figure 2
Monthly catch of White shrimp from Mesquite Bay. The curve represents the modal size, the straight line the size range for each month's catch in 1960.

Figure 3
Monthly catch of brown shrimp. I.B.I.D.



Penaeus aztecus (Ives) A total of 899 brown shrimp was taken in 1960 compared to 4,830 during the previous study. Apparently brown shrimp used Mesquite Bay to a larger extent when it was a bay without a direct outlet to the Gulf.

Hoese recorded two peaks of abundance, one in June and another in November, while in 1960 peaks occurred in three different months, June, August, and October; the months between showed a drop in numbers as well as a fluctuation in size range (Figure 3).

The distribution of brown shrimp in Mesquite Bay appears to have changed little, since in both cases they were found at all trawl stations at some time during the periods of study.

When large brown shrimp, up to 98 millimeters, were taken in Mesquite Bay they appeared to be moving toward the Gulf. Subsequent capture of browns, 65 to 140 millimeters long, in 3 to 12 fathoms of water, in the Gulf, off Cedar Bayou, indicates a general offshore migration of brown shrimp starting in July and continuing into the winter months.

Xiphopeneus krøyeri (Heller) Found by Hoese only.

Trachypeneus similis (Smith) One specimen was taken in March 1960. Hoese did not report it in 1958.

Sicyoninae

Sicyonia dorsalis Kingsley The rock shrimp was taken in Mesquite Bay at Station 3. Salinity was 23.8 ppt, and the temperature was 28.9° C. It was unreported by Hoese.

Sicyonia brevirostris Stimpson This shrimp was taken at Station 3 also. The salinity was 32.9 ppt and the temperature was 28.8° C. This shrimp was not reported previously.

Alpheidae or Cragonidae

Alpheus heterochelis Say Present during both studies.

Alpheus armallatus (H. Milne - Edwards) Present during the previous study only.

Palaeomonidae

Paleomonetes pugio (Holthuis)

Paleomonetes vulgaris (Say) Hoese reported grass shrimp present but did not go into their identification. Two species were taken during this study. The first listed dominated the total catch during the winter and the second in the spring. In the spring a total reduction of grass shrimp was noted. This decline in numbers may be a result of the increase in peneaid shrimp numbers at that time. A study concerning the competitive relationship between the peneaids and the paleomonetid shrimp should be undertaken as it may be relatively important as an indicator for future predictions of shrimp abundance.

Macrobrachium ohione (Smith) Reported during the previous survey only.

Anomura

Porcellanidae

Petrolisthes armatus (Bibbs) This crab was common, during both studies, on oyster reefs and shell bottoms.

Paguridae

Clibanarius vittatus (Bosc) The striped hermit crab was found during both studies and was the most common hermit crab.

Pagurus floridanus (Benedict) This hermit crab is considered synonymous with P. pollicaris (Say) and was thus identified. The locations where it was taken were the same during both studies, Stations 3 and 14 (Figure 1). It was always found at stations near the Gulf in the higher salinity waters.

Pagurus longicarpus (Say) This crab was not reported by Hoese and was found only once at Station 14 in a salinity of 35 ppt. It probably prefers Gulf waters.

Pagurus annulipes (Stimpson) P. annulipes like P. longicarpus was not reported during the previous study and probably is unreported from the Texas coast. It does, however, appear to be quite common as it was also collected in Redfish Bay. This crab is very small and can easily be overlooked. It prefers the shells of Anarchis avara (Stearns) and Cerithium varible (Adams).

Provenzano (1959) states that this hermit crab can withstand high salinities and is found associated with Thalassia testudinum (Koenig and Sims). As Redfish Bay is covered with Thalassia beds its occurrence there is in order.

This hermit crab was taken at Station 3, in Cedar Bayou, in October when the salinity was 13.4 and the water temperature was 22.4° C.

Portunidae

Callinectes sapidus Rathbun Hoese reported the blue crab as the second most abundant invertebrate in Mesquite Bay with a total of 2,826 specimens being taken, compared to 780 in the 1960 survey. The blue crab varied in abundance from month to month (Figure 4). The greatest numbers occurred in late winter and spring months.

Three size groups were apparent in February (Figure 4), the first being about 10 to 60 millimeters, the second, 60 to 120 millimeters, and the oldest and largest group, 120 to 190 millimeters. Following these groups from month to month, a definite increase in size is seen with a shift in abundance from the smaller to the larger size group. This shift is practically completed by August when larger sizes dominate the total catch.

In September, the smaller crabs reappeared and increased in number to dominate the population until the following spring.

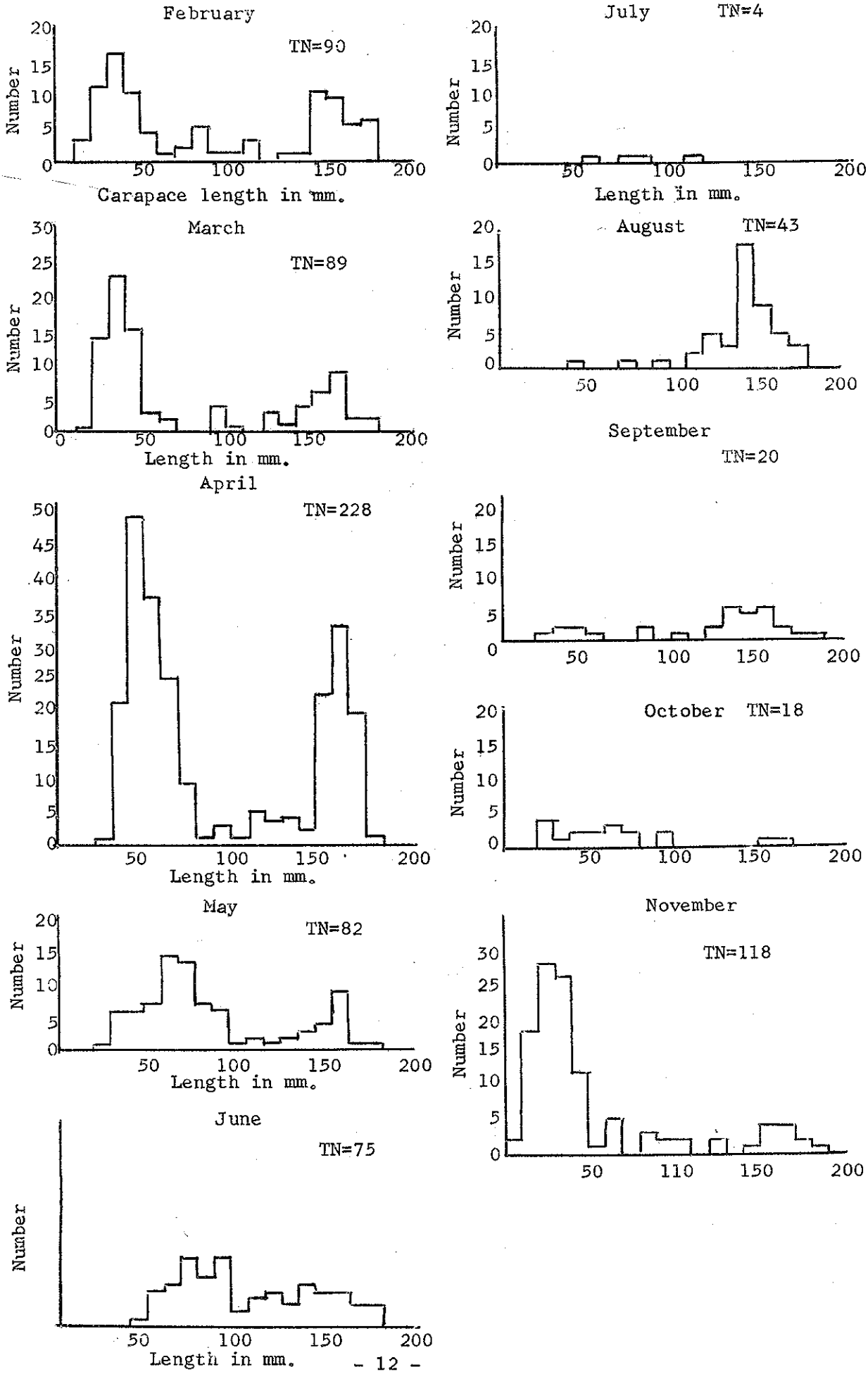
Ovigerous females were observed during the latter part of the summer, moving toward the Gulf through Cedar Bayou. These are commonly called orange sponge crabs as the eggs are still in their earliest development. As the summer continues the eggs become black prior to spawning.

During this and the past study, it was noted that many crabs less than 110 millimeters wide were infested with the parasite Loxothylacus texanus (Boschman). Percentage infection was not calculated during this recent survey period so no comparison can be made.

Callinectes danae (Smith) This small crab was not abundant but it was present during every month of the study, especially at Stations 3 and 14, indicating a preference for higher salinities. Most were less than 40 millimeters wide with a few as large as 80 millimeters. This crab is a fair indicator of high salinity and inlet influenced waters.

Ovalipes ocelatus (Herbst) This crab was not taken by Hoese. In the recent survey it was taken at Station 14 in March.

Figure 4
Monthly length frequencies for the blue crab from Mesquite Bay, 1960.



Arenaeus cribrarius (Lamarck) This crab was not taken in 1960.

Pinnotheridae

Pinnotheres ostreum Say The oyster crab was not reported in the previous study but was found to be quite common on the reef near Stations 1,3, and 5. Only occasional specimens were noted and no counts were made.

Panopeus herbstii Milne-Edwards One specimen was taken in March, 1960.

Eurypanopeus depressus (Smith) This crab was one of the common mud crabs encountered and was usually taken along with shell and benthic algae at Stations 3 and 5.

Rithropanopeus harrisii (Smith) This crab was not captured in 1960 but a very closely related species, Neopenopeus texana Sayi, was taken.

Heterocrypta granulata (Giffes) H. granulata was not reported by Hoese, but was not uncommon at Stations 1, 3 and 5 in June, July and August, 1960.

Menippe mercenaria (Say) The stone crab was fairly common during spring and summer months but few were observed at any other time.

This crab was found in intermediate to high salinities, 14.0 ppt. to 38.8 ppt. as reported by Hoese and 24.2 to 36.0 ppt. during this survey.

Maiidae

Libinia dubia Milne-Edwards Hoese found this crab occasionally in winter in salinities of 34 to 38 ppt. It was captured in July 1960 at Stations 3 and 14. Salinities were 25.1 to 35.6 ppt.

Mollusca

Hoese's work on mollusks included dead shell as well as live shell. This report normally does not consider the specimens recorded as dead.

The specimens collected and recorded during both studies are listed in Table 2.

Polynices duplicatus (Say) This species, found only once by Hoese, was taken several times throughout the summer and winter at Stations 3 and 14. These stations have a characteristically high salinity which this animal seems to prefer.

Thais haemastoma (Conrad) The oyster drill was not reported alive in the previous study, however, it was quite common on reefs near Station 3 and in the bayou at Station 14.

Busycon contrarium (Conrad) Only found during this study, this animal made its appearance at Stations 3 and 14, staying very close to the influence of Gulf waters.

Cantharus cancellarius (Conrad) A common resident at Stations 3 and 14 was this mollusk. This invasion of high salinity organisms into Mesquite Bay will probably continue as long as the bayou is open, especially during the dry, summer months.

Anachis obesa (C.B. Adams) Collected during both studies in Cedar Bayou.

Nassarius acutus (Say) Collected during both studies and usually associated with vegetation or debris.

Nuculana acuta (Conrad) Reported by Hoese but not observed otherwise.

Brachiodontes recurvas (Rafinesque) This mussel was reported by Hoese during low salinity periods.

Brachiodontes exustus (Linnaeus) A high salinity organism taken commonly throughout this survey, it was found dead and dying coincident with lowered salinities in late fall.

Ostrea equestris Say The Gulf oyster dominated reefs during Hoese's study while it was not recorded at all during this survey. The high salinity which was prevalent during the beginning of Hoese's study was the most important single factor governing the life of this oyster in Mesquite Bay. Hoese relates that with the end of the drouth and beginning of lower salinities a complete kill of this organism took place. Within a few months Crassostrea virginica (Gemlin) appeared to displace it.

Crassostrea virginica (Gemlin) The commercial oyster, while relatively rare during the previous study, was quite abundant in this survey. The largest oysters were encountered around the bay mouth of Cedar Bayou and in the bay itself. The reefs in Bray Cove and Ayers Dugout, and Cedar Dugout were worked commercially proving very productive.

From September to December, salinities were very low and recently killed oysters were taken near Ayers Dugout at Station 5. As far as the Gulf oyster and commercial oyster are concerned, Cedar Bayou's opening has been one factor which controls their presence or abundance. The main factor, however, is rainfall as Hoese showed a converse relationship between river discharge and Mesquite Bay salinities.

Chione cancellata (Linnaeus) The abundance and range of this mollusk has increased in Mesquite Bay since the last study (Table 1). Whereas Hoese found it only at Station 2, it was found later at Stations 2, 6, 7, 10, and 11. Parker (1959) stated that this animal is abundant during times of high salinity but it might be more correct to say, times of moderate to high salinities.

Mercenaria campechiencis (Dall)

Mulinia lateralis (Say) This pelecypod was abundant during both studies.

Tagelus divisus (Spengler) Present during both studies.

Abra aequalis (Say) None of these organisms were found alive by Hoese but were later recorded at the stations indicated in Table 1.

Ensis minor Dall The razor clam was found during this study and Hoese's during periods of high salinity.

Loliginidae

Loligo brevis (Blainville) The common squid was found at most stations in

1960, while the previous study noted only two specimens.

Zoobotryon pellucidum (Ehrenberg) This species, while abundant during both studies, occurred in spring, summer, and early fall in this survey and only in January and February during Hoese's study. They were so abundant at Station 3 in July, 1960 that trawling could not be completed.

Since Cedar Bayou Pass was opened some changes have taken place in Mesquite Bay and the pass itself. Some animals now common or abundant, were not present when H. D. Hoese conducted his survey, and similarly, some animals now absent were present during Hoese's study.

The greatest changes have occurred in the non-motile forms, such as oysters and clams. These changes, however, have not been brought about solely by the reopening of the pass, at least not in most cases. The amount of rainfall or river discharge entering Mesquite Bay has been the factor regulating the presence or absence of many of the invertebrates as well as some vertebrates.

While some species such as Busycon contrarium and Thias haemostoma are present in Mesquite Bay due to the opening of Cedar Bayou, they are stenohaline and could not remain if salinities become lowered for any period of time.

Summary: A few changes in the invertebrate population have taken place since the opening of Cedar Bayou.

Several different species of mollusk, not present in 1958, now inhabit Mesquite Bay.

Oyster predators, not reported previously, are now common in the lower Bay.

Commercial oysters have become abundant enough for harvest since Hoese's study.

An increase in numbers of white shrimp was experienced over Hoese's total catch, while the reverse was true with brown shrimp.

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