The Use of a Fish Trawl to Sample Large Fish

by Gary C. Matlock

Management Data Series Number 2
1979

Texas Parks and Wildlife Department
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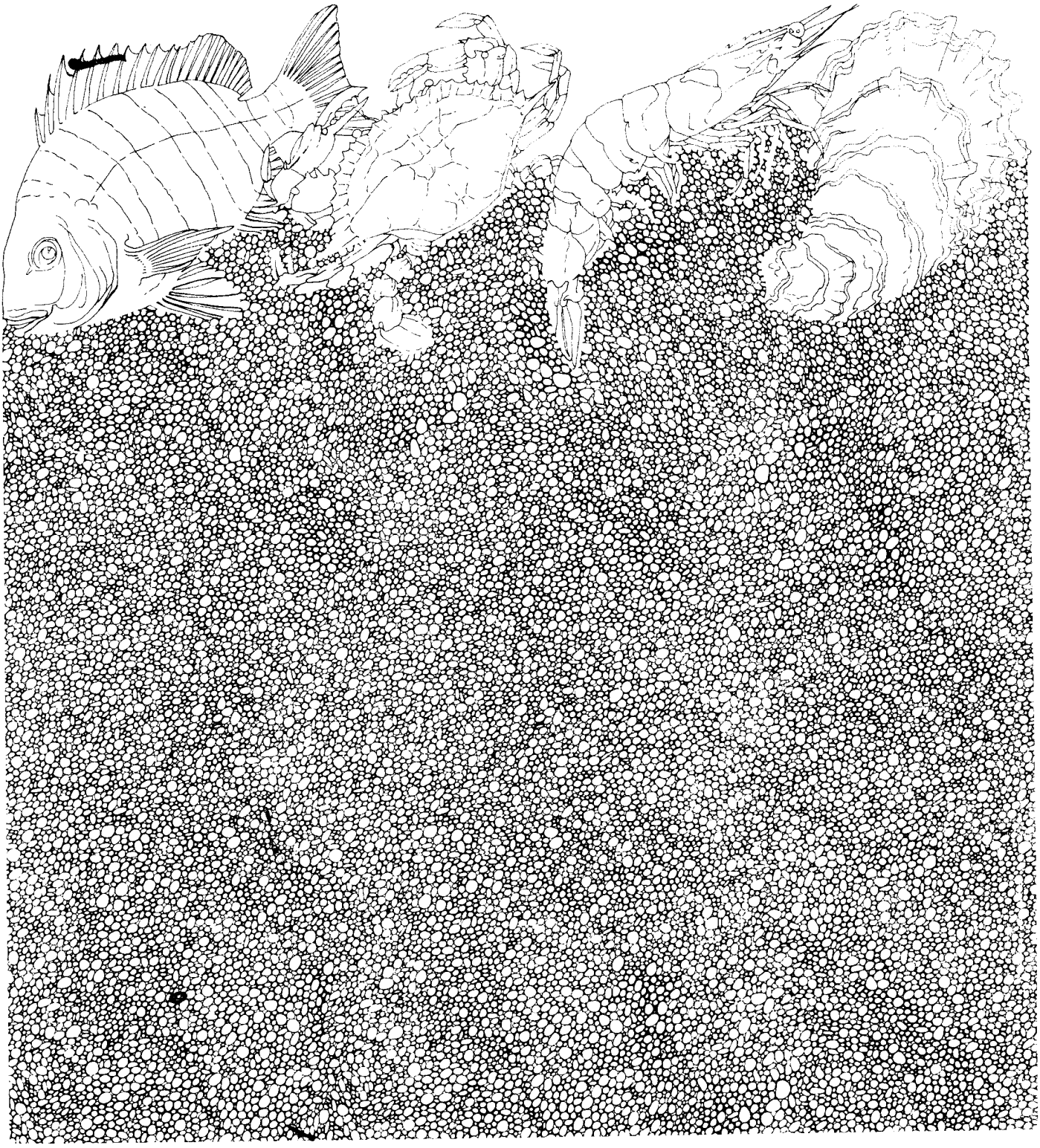

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EXECUTIVE SUMMARY

Red drum (Sciaenops ocellata) is one of the most important finfishes sought by both commercial and recreational fishermen in Texas bays. One of the most important considerations involved in effective management of this species is its abundance and distribution within each bay system. Results of the first 5 mo of a finfish population monitoring program initiated in 1975 by the Coastal Fisheries Branch of the Texas Parks and Wildlife Department indicated that red drum were most abundant in shoreline areas. Populations in water $\leq$ 6 feet declined from fall through winter perhaps because fish moved from the sampled areas to water > 6 feet within the bay or to the gulf as water temperatures declined. This study examined the feasibility of using a fish trawl to sample the deep portions of Texas bays for large (> 27 inches) red drum and other finfishes.

During each month, except January, from September 1976 through March 1977 two fish trawl samples, one 2h before and one 2h after sunset, were collected in Aransas Bay. The fish trawl was 60 feet wide by 15 feet high with 4.5-inch stretched mesh webbing in the wings and body and 3-inch stretched mesh webbing in the bag. All animals caught were identified and counted. The total length of each fish was determined. Prior to each sample, wind speed and direction, air and water temperatures and salinities were obtained.

The total number of fish and species caught generally declined from September through March. Only gulf menhaden (Brevoortia patronus) was caught in every sample. No red drum were caught. Air and water temperature and salinity generally declined from September through December and increased through March. Only blue crab (Callinectes sapidus) catches were significantly greater during the night. The mean size of each species except Atlantic cutlassfish (Trichiurus lepturus), black drum (Pogonias cromis) and cownose ray (Rhinoptera bonasus) was generally < 8 inches with no apparrent differences between fish caught during day and night.

A fish trawl pulled behind the R/V Western Gulf did not appear to be suitable for sampling large fish in water $\geq$ 11 feet deep. Previous studies indicated that red drum should have been available to the fish trawl. However, no red drum, large spotted seatrout (Cynoscion nebulosus), southern flounder (Paralichthys lethostigma), sheepshead (Archosargus probatocephalus) or Atlantic croaker (Micropogon undulatus). Only five large black drum were caught in addition to small individuals of other species. The 11-foot draft of the Western Gulf (approximately equal to the water depth) may have frightened fish before the trawl was able to capture them. A fish trawl pulled by a shallower draft (5 feet) vessel in Corpus Christi Bay 2 yr earlier caught red drum, spotted seatrout, black drum and sheepshead ranging from 7.9 to 31.5 inches. If a shallower draft vessel were used in Aransas Bay, a fish trawl may be suitable for sampling large fish.

THE USE OF A FISH TRAWL TO SAMPLE LARGE FISH

ABSTRACT

A fish trawl was pulled behind the R/V Western Gulf at one location in the Aransas Bay system during September 1976-March 1977 to sample large (> 700 mm) red drum (Sciaenops ocellata) and other finfishes. The total number of fish and species caught generally declined from September through March as did water temperature and salinity. Catches of blue crab (Callinectes sapidus) were significantly ($p < 0.05$) higher at night than during the day. Trawling did not appear to be suitable for sampling large fish in deep portions of the Aransas Bay system perhaps because of the deep draft (3.3 m) of the Western Gulf.

ACKNOWLEDGEMENTS

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INTRODUCTION

Red drum (Sciaenops ocellata) is one of the most important finfishes sought by both commercial and recreational fishermen in Texas bays. During September 1976-August 1977 commercial fishermen landed 689,600 kg of red drum with an ex-vessel value of $702,997 (Texas Parks and Wildlife Department 1977). Recreational boat fishermen caught 99,745 kg of red drum on weekends alone during the same period (Green et al. 1978). One of the most important considerations involved in effective management of this species is its abundance and distribution within each bay system. The Coastal Fisheries Branch of the Texas Parks and Wildlife Department began an intensive program in November 1975 to monitor the abundance of adult and large-sized finfish populations, including red drum, in Texas bays. Results of the first 5 mo of this sampling program indicated that red drum were most abundant in shoreline areas and that populations generally declined from fall through winter (Matlock et al. 1978). However, sampling was restricted to water $\leq$ 1.8 m deep, and Matlock et al. (1978) suggested that red drum may have moved from the sampled areas to water > 1.8 m within the bay or to the Gulf as water temperatures declined. Pearson (1929) and Gunter (1945) described a general movement of red drum to the Gulf during winter and a return to the bays in spring; however, Simmons and Breuer (1962) stated that these movements may be less pronounced and cover shorter periods than had been assumed, indicating that red drum may utilize the deep ($\geq$ 1.8 m) portions of the bays during winter. Unfortunately these areas have not been sampled adequately, partially due to the lack of a suitable gear. This study examined the feasibility of using a fish trawl to sample the deep portions of Texas bays for large (> 700 mm) red drum and other finfishes.

MATERIALS AND METHODS

During each month, except January, from September 1976 through March 1977 two fish trawl samples were collected east of Intracoastal Waterway Marker 49 in Aransas Bay. On each sample day, one sample was initiated at least 2 h before sunset and the other at least 2 h after sunset. A fish trawl, 18.3 m wide by 4.6 m high, with 11.4-cm stretched mesh webbing in the wings and body and 7.6-cm stretched mesh webbing in the bag was towed by the 21.9-m R/V Western Gulf in an easterly direction for 0.5 h. The trawl was spread with standard wooden otter trawl doors (0.9 m high by 2.1 m long). The leg lines (connecting cable between doors and net) were 27.4 m long.

Each organism caught was identified to species (Fotheringham and Brunenmeister 1975, Parker et al. 1972, Manning 1968, Williams 1965, Pulley 1952) and counted. In addition, the total length of each fish was measured (to the nearest 1 mm).

Prior to the collection of each sample, wind speed and direction and barometric pressure were obtained from a local radio station; temperatures were measured with a bulb thermometer and salinities with a Goldberg direct-read refractometer (Appendix A). The sign test (Siegel 1956) was used to compare day and night catches for species caught during at least 5 mo.

RESULTS

A total of 34 species of fish, 7 species of crustaceans, 1 mollusks and 1 cnidarian were captured in 12 fish trawls (Table 1). The total number of fish and species caught generally declined from September through March. Only one species, gulf menhaden (Brevoortia patronus), was caught in every sample. No red drum were caught. Air and water temperature and salinity generally declined from September through December and increased through March (Appendix A).

Catches of five species of fish--sand seatrout (Cynoscion arenarius), spot (Leiostomus xanthurus), Atlantic croaker (Micropogon undulatus), gulf menhaden and sea catfish (Arius felis)--during daylight were not significantly different ($P>0.05$) from those during night (Table 2). Blue crab catches were significantly ($P<0.05$) greater during the night than the day. No other species was caught frequently enough for any statistical examination; however, there were no apparent differences between day and night catches (Table 1).

The mean size of each species except Atlantic cutlassfish (Trichiurus lepturus), black drum (Pogonias cromis) and cownose ray (Rhinoptera bonasus) was generally < 200 mm with no apparent differences between fish caught during day and night (Table 1).

DISCUSSION

The purpose of this study was to examine the feasibility of using a fish trawl for sampling deep portions of Texas bays for large (> 700 mm) finfishes important to Texas commercial and recreational fisheries. A fish trawl pulled behind the R/V Western Gulf did not appear to be suitable for sampling large finfish in water $\geq$ 3.3 m deep. Large finfish were present along the shoreline in the Aransas Bay system during fall 1976 and winter 1977 (Matlock and Weaver 1979). Matlock et al. (1978), May et al. (1976) and Mahood (1974) have reported that finfish generally move to deep portions of a bay with the passage of cold fronts during fall and winter. Therefore, fish should have been available to the fish trawl. However, no red drum, large spotted seatrout (Cynoscion nebulosus), southern flounder (Paralichthys lethostigma), sheepshead (Archosargus probatocephalus) or Atlantic croaker were caught. Only five large black drum were caught in addition to small individuals of other species. The 3.3-m draft of the Western Gulf (approximately equal to the water depth) may have frightened fish before the trawl

was able to capture them. A fish trawl (similar to the one used during this study) was used in January 1974 in Corpus Christi Bay and caught red drum, spotted seatrout, black drum and sheepshead ranging from 200 to 800 mm (T. L. Heffernan, Texas Parks and Wildlife Department, unpublished data). The draft (1.5 m) of the vessel used in Corpus Christi Bay was approximately 50% shallower than that of the Western Gulf. If a shallower draft vessel were used in Aransas Bay, a fish trawl may be suitable for sampling large fish.

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Table 1. Total number and mean total length (mm) ± 1 standard error (in parenthesis) of organisms caught in fish trawls pulled in Aransas Bay during September 1976-March 1977 (lengths obtained for fish only).

Species	September		October		November		December		February		March	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Pisces	121	134	55	115	168	100	68	28	18	6	43	32
Atlantic bumper (*Chloroscombrus chrysurus*)	19 (46±3)	0	0	0	0	0	0	0	0	0	0	0
Atlantic croaker (*Micropogon undulatus*)	20 (159±9)	12 (159±12)	1 (306)	2 (154±29)	14 (112±3)	7 (104±2)	0	4 (159)	0	0	2 (56±9)	0
Atlantic cutlassfish (*Trichiurus lepturus*)	3 (529±219)	0	0	1 (331)	0	0	0	0	0	0	4 (340±36)	0
Atlantic stingray (*Dasyatis sabina*)	2 (169±32)	1 (265)	0	0	0	1 (268)	0	1 (121)	0	0	1 (152)	0
Atlantic thread herring (*Opisthonema oglinum*)	0	0	0	0	0	0	0	0	0	0	1 (143)	0
Atlantic threadfin (*Polydactylus octonemus*)	1 (171)	0	0	0	0	0	0	0	0	0	0	0
Bay anchovy (*Anchoa mitchilli*)	11 (39±2)[d]	5 (50±3)	1 (52)	1 (62)	1 e	0	5 e	4 e	0	0	1 (63)	0
Bay whiff (*Citharichthys spilopterus*)	0	0	0	0	1 (92)	0	0	0	0	0	0	0
Black drum (*Pognoias cromis*)	0	0	0	0	2 (882±18)	2 (497±343)	1 (156)	0	1 (810)	1 (885)	0	0
Cownose ray (*Rhinoptera bonasus*)	0	0	0	0	0	0	0	0	0	0	0 (447±13)	0
Crevalle jack (*Caranx hippos*)	1 (136)	0	0	0	0	0	0	0	0	0	3	0

Table 1. (Cont'd.).

Species	September		October		November		December		February		March	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Pisces												
Finescale menhaden (*Brevoortia gunteri*)	7 (250±5)	1 (256)	0	0	0	0	0	0	0	1 (83)	0	0
Gafftopsail catfish (*Bagre marinus*)	17 (146±10)	19 (146±3)	1 (150)	2 (129±5)	1 (385)	0	0	0	0	0	0	0
Gizzard shad (*Dorosoma cepedianum*)	0	0	1 (120)	1 (181)	1 (155)	0	1 (121)	1 (93)	0	0	0	0
Gulf butterfish (*Peprilus burti*)	0	0	0	0	0	0	0	1 e	0	0	4 (104±4)	0
Gulf menhaden (*Brevoortie patronus*)	20 (172±1)	16 (177±4)	39 (123±6)	75 (117±2)[b]	66 (147±4)[c]	60 (128±5)[a]	52 (103±2)	11 (99±2)	12 (102±12)	2 (92±2)	16 (217±4)	18 (164±8)
Harvestfish (*Peprilus alepidotus*)	2 (113±51)	0	0	1 (135)	0	0	0	0	0	0	1 (78)	2 (116±1)
Inshore lizardfish (*Synodus foetens*)	1 (180)	0	0	0	0	0	0	0	0	0	0	0
Least puffer (*Sphoeroides parvus*)	0	0	4 (57±3)	0	1 (160)	3 (86±11)	0	0	0	0	0	0
Mottled mojarra (*Eucinostomus lefroyi*)	0	0	0	1 (60)	0	0	0	0	0	0	0	0
Pinfish (*Lagodon rhomboides*)	0	0	0	0	10 (112±4)	0	0	0	0	0	0	3 (116±2)
Sand seatrout (*Cynoscion arenarius*)	6 (171±3)	5 (196±12)	0	1 (88)	2 (181±41)	3 (155±20)	1 (85)	0	1 (174)	0	0	0

Table 1. (Cont'd.).

Species	September		October		November		December		February		March	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Pisces												
Sea catfish (Arius felis)	3 (338±19)	1 (275)	2 (308±2)	4 (226±61)	2 (92±1)	3 (90±5)	1 (93)	2 (134±44)	0	0	6 (264±10)	8 (272±22)
Sheepshead (Archosargus probatocephalus)	0	0	0	0	0	1 125	0	0	0	0	0	0
Silver jenny (Eucinostomus gula)	0	1 (93)	0	0	0	0	0	0	0	0	0	0
Silver perch (Bairdiella chrysura)	0	2 (111±1)	0	0	5 (119±9)	2 (86±7)	0	0	0	0	0	0
Southern flounder (Paralichthys lethostigma)	1 (321)	3 (263±6)	0	1 (231)	1 (173)	5 (195±15)	0	0	0	0	0	0
Southern kingfish (Menticirrhus americanus)	1 (255)	1 (271)	0	0	0	0	0	0	0	0	0	1 (236)
Spanish mackerel (Scomberomorus maculatus)	0	1 (272)	1 (188)	1 (186)	0	0	1 (545)	0	0	0	0	0
Spot (Leiostomus xanthurus)	6 (154±5)	63 (142±2)	5 (138±2)	23 (141±1)	47 (135±2)[a]	5 (129±6)	4 (117±3)	1 (130)	0	0	4 (136±2)	0
Spotted seatrout (Cynoscion nebulosus)	0	0	0	0	14 (177±5)	8 (169±4)	2 (168±4)	2 (116±11)	4 (199±44)	2 (252±8)	0	0
Striped mullet (Mugil cephalus)	0	3 (147±10)	0	0	0	0	0	0	0	0	0	0
Tidewater silverside (Menidia beryllina)	0	0	0	0	0	0	0	1 (71)	0	0	0	0
White mullet (Mugil curema)	0	0	0	1 (148)	0	0	0	0	0	0	0	0

Table 1. (Cont'd.).

Species	September		October		November		December		February		March	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Mollusca	5	2	0	0	0	0	0	0	0	0	0	0
Brief squid (Lolliguncula brevis)	5	2	0	0	0	0	0	0	0	0	0	0
Crustacea	105	83	20	47	7	6	4	6	1	1	1	25
Blue crab (Callinectes sapidus)	13	15	6	20	0	1	3	5	0	0	0	0
Brown shrimp (Penaeus aztecus)	21	33	2	8	1	0	0	1	0	0	0	0
Lesser blue crab (Callinectes similis)	1	8	0	3	0	0	0	0	1	1	1	25
Mantis shrimp (Squilla empusa)	6	9	0	1	0	0	0	0	0	0	0	0
Neopanope texana	0	0	0	0	0	0	1	0	0	0	0	0
Portunus gibbesi	0	0	0	1	0	0	0	0	0	0	0	0
White shrimp (Penaeus setiferus)	64	18	12	14	6	5	0	0	0	0	0	0
Cnidaria	0	0	0	0	0	0	0	0	0	0	462	245
Cabbagehead (Stomolophus sp.)	0	0	0	0	0	0	0	0	0	0	462	245

[a] 18 fish measured.

[b] 73 fish measured.

[c] 19 fish measured.

[d] 9 fish measured.

[e] no fish measured.

Table 2. Number of months during which the number of individuals caught in fish trawls during the day exceeded (+), equalled (0) or did not exceed (-) the number of individuals caught during the night in fish trawls.

Species	+	-	0	Total	Probability
Sand seatrout	1	4	0	5	0.376
Spot	3	2	0	5	1.000
Atlantic croaker	3	2	0	5	1.000
Gulf menhaden	4	2	0	6	0.688
Sea catfish	1	4	0	5	0.376
Blue crab	0	5	1	6	0.032

Appendix A - Hydrological and Meteorological Data

Hydrological and meteorological conditions at Intracoastal Waterway Marker 49 in Aransas Bay during September 1976–March 1977.

Date	Time (CST)	Water depth	Wind speed (km/h)	Wind direction	Cloud cover (%)	Precipitation	Fog	Sea condition	Water depth (m)	Air temperature (C)	Water temperature (C)	Salinity (0/00)	Barometric pressure (mm Hg)	Bottom type	Vegetation
9-30-76	1630	Surface	16	NE	10-25	None	No	1	3.3	25.0	26.0	19.4	762	Mud	Sparse
9-30-76	1630	Bottom	16	NE	10-25	None	No	1	3.3	25.0	26.5	19.0	762	Mud	Sparse
9-30-76	1950	Surface	16	E	0-9	None	No	1	3.4	24.5	25.0	18.9	763	Mud	Sparse
9-30-76	1950	Bottom	16	E	0-9	None	No	1	3.4	24.5	24.5	19.4	763	Mud	Sparse
10-26-76	1645	Surface	32	N	91-100	None	No	3	3.7	19.9	20.0	16.7	762	Mud	Sparse
10-26-76	1645	Bottom	32	N	91-100	None	No	3	3.7	19.9	20.1	16.7	762	Mud	Sparse
10-26-76	1945	Surface	29	N	91-100	None	No	3	3.7	19.8	19.8	16.7	762	Mud	None
10-26-76	1945	Bottom	29	N	91-100	None	No	3	3.7	19.8	19.8	16.7	762	Mud	None
11-18-76	1610	Surface	16	NE	91-100	Slight	Yes	2	3.4	12.5	10.0	8.9	765	Mud	None
11-18-76	1610	Bottom	16	NE	91-100	Slight	Yes	2	3.4	12.5	10.5	10.0	765	Mud	None
11-18-76	1915	Surface	16	NE	91-100	Slight	Yes	2	3.4	11.2	10.0	10.0	765	Mud	Sparse
11-18-76	1915	Bottom	16	NE	91-100	Slight	Yes	2	3.4	11.2	10.5	10.0	765	Mud	Sparse
12-22-76	1610	Surface	19	N	91-100	Slight	Yes	2	3.1	11.5	10.5	4.4	766	Mud	None
12-22-76	1610	Bottom	19	N	91-100	Slight	Yes	2	3.1	11.5	10.0	4.4	766	Mud	None
12-22-76	1900	Surface	8	N	91-100	Slight	Yes	1	3.1	11.0	10.0	3.3	766	Mud	None
12-22-76	1900	Bottom	8	N	91-100	Slight	Yes	1	3.1	11.0	10.5	5.6	766	Mud	None
2-01-77	1645	Surface	32	NE	91-100	Slight	Yes	3	4.0	8.0	9.0	15.0	769	Mud	None
2-01-77	2015	Surface	32	NE	91-100	Slight	Yes	3	4.0	9.0	9.0	16.0	769	Mud	None
3-21-77	1700	Surface	16	SE	91-100	None	No	1	3.7	25.2	21.7	20.0	-	Mud	None
3-21-77	1700	Bottom	16	SE	91-100	None	No	1	3.7	25.2	20.5	23.3	-	Mud	None
3-21-77	1925	Surface	40	NE	91-100	None	No	3	3.7	17.8	19.4	23.3	-	Mud	None
3-21-77	1925	Bottom	40	NE	91-100	None	No	3	3.7	17.8	19.4	23.3	-	Mud	None

[a] 1=calm; 2=choppy; 3=rough