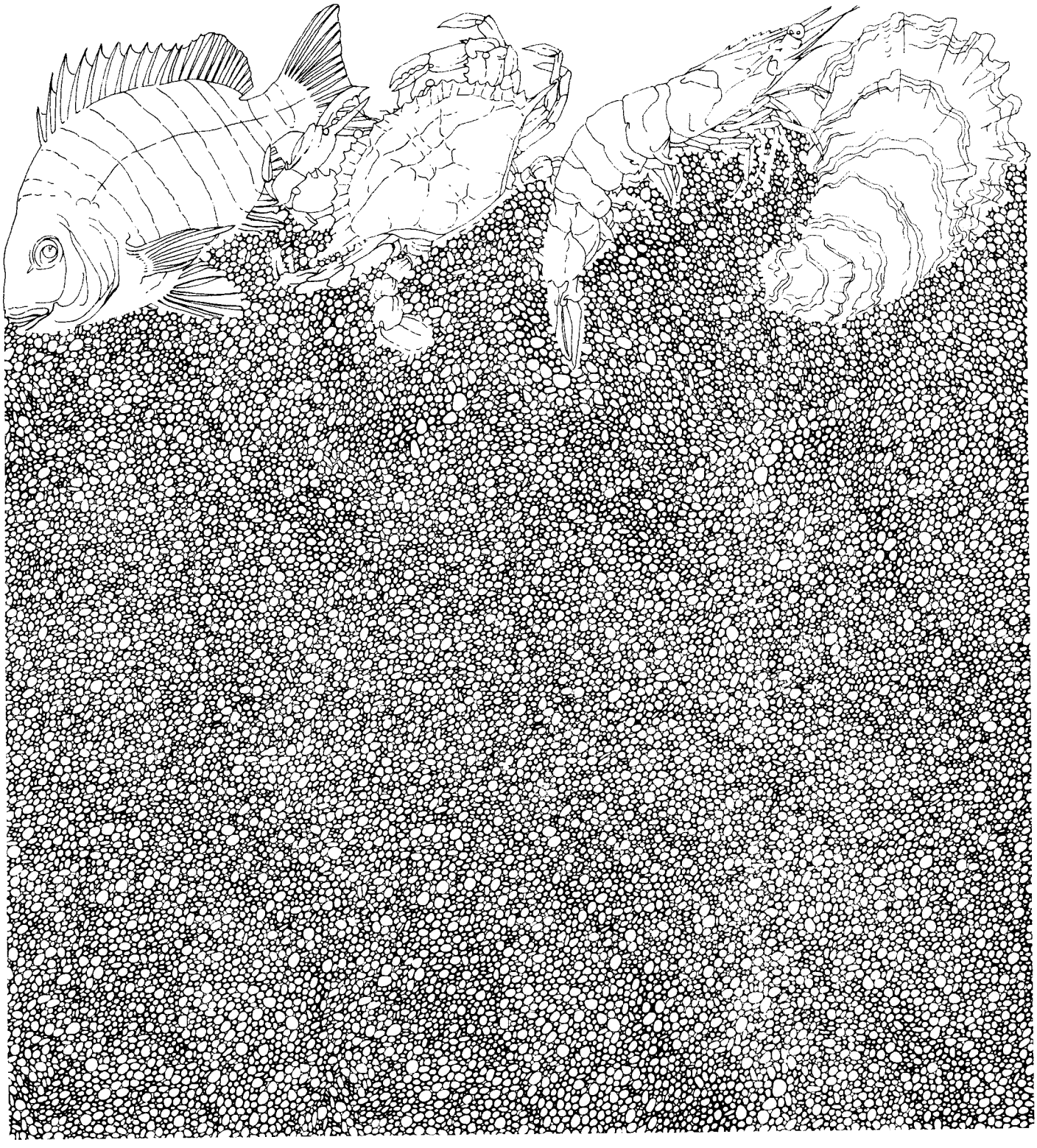
Penaeid Shrimp Monitoring off the Central Texas Coast, 1977-1981

by Terry J. Cody and Billy E. Fuls

Management Data Series Number 71
1984

Texas Parks and Wildlife Department
Coastal Fisheries Branch



PENAEID SHRIMP MONITORING OFF THE CENTRAL TEXAS COAST, 1977-1981

by

Terry J. Cody and Billy E. Fuls

MANAGEMENT DATA SERIES
No. 71
1984

Texas Parks and Wildlife Department
Coastal Fisheries Branch
4200 Smith School Road
Austin, Texas 78744

ACKNOWLEDGEMENTS

We would like to thank the crew of the research vessel Western Gulf, Captain Domingo Perez and David Mejorado, for making our field work as pleasant as possible and for collecting shrimp samples under adverse conditions at times.

A special thanks to our review committee--Patricia Johansen, C. E. Bryan, Tom Heffernan and Roy Johnson--for their much-needed suggestions and to Elaine LeBlanc, Delores Kleypas and Nancy Ziegler for typing the manuscript.

This study was conducted with partial funding from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, under P.L. 88-309 (Project No. 2-312).

ABSTRACT

From October 1977 through March 1981 the Texas Parks and Wildlife Department's (TPWD) research vessel Western Gulf took 256 trawl samples in the Gulf of Mexico as part of a continuing program to monitor commercial penaeid shrimp stocks for movement, size and abundance. Night samples were collected off the central Texas coast during May-August at depths of 11-18, 20-27, 29-37 and 38-46 m. An additional transect out to a depth of 55 m was added in 1980 off the south Texas coast. Day samples were collected in 5-9, 11-18 and 20-27 m depth zones off Port Aransas and Pass Cavallo from October 1977 through March 1978 with supplementary samples from April 1978 to March 1981.

There was no indication of a major movement of brown shrimp (Penaeus aztecus) into the Gulf before the closed season in 1978, 1979 or 1980. During 1978 and 1980 emigrating brown shrimp were most abundant in the 11-18 m depth zone in June corresponding with the start of the 1 June-15 July Gulf closed season in Texas waters. Limited sampling during 1979 indicated that brown shrimp abundance was below average in all zones until August. Texas shrimp landings and TPWD shrimp samples were highest during 1978 and lowest during 1979. The mean size of brown shrimp generally increased with depth and all shrimp caught beyond 18 m met legal count (39/lb, heads-on) by August.

During 1980 brown shrimp were more abundant during May off south Texas (346/h) than off central Texas (16/h). Catch rates were generally high (1654-2868/h) in the 11-18 m zone in both areas from June through August.

White shrimp (P. setiferus) were most abundant during November and December. The mean sizes were smallest during December and January corresponding with the winter (15 December-1 February) closed season.

INTRODUCTION

In recent years the need for current information on the commercial penaeid shrimp (Penaeus aztecus, P. setiferus and P. duorarum) stocks of Texas has been re-emphasized by legislation at both the state and federal levels.

In Texas the Texas Parks and Wildlife Department (TPWD) Commission has the authority to set the summer closed shrimp season in the Gulf of Mexico. The closed season is ordinarily from 1 June to 15 July and allows a portion of the emigrating shrimp an opportunity to reach a larger size before harvest. In 1975 the Texas Shrimp Conservation Act was amended by the 64th Texas Legislature to provide greater flexibility in the management of penaeid shrimp resources. Chapter 77 of the Parks and Wildlife Code provides that the Parks and Wildlife Commission (or its Executive Director) may, based on sound biological data, change the opening and closing dates of the 1 June-15 July closed season to provide for an earlier, later or longer season not to exceed 60 days.

The Fishery Conservation and Management Act of 1976 (Public Law 94-265) established a 200-mi Fishery Conservation Zone (FCZ) around the United States and created eight regional management councils responsible for the preparation of plans to manage the fishery resources within this zone. Using the best available biological, sociological and economic data the Gulf of Mexico Fishery Management Council developed a plan to manage shrimp in the FCZ in 1981. Measure 2 of the plan provided for a closure of the FCZ off Texas during the same period that Texas closes its territorial sea. By providing additional time and area for growth before harvest and by minimizing waste caused by discarding of undersized shrimp, this measure should increase the total yield of the shrimp harvest in both weight and value. As with all fishery plans developed by the regional councils, the Shrimp Management Plan will continue to be evaluated for effectiveness and updated or modified as needed.

The purpose of this study was to monitor penaeid shrimp in the Gulf of Mexico along the south-central coast of Texas for movement, growth and relative abundance to formulate management recommendations that result in the capture of larger, more valuable shrimp without excessive discarding of smaller shrimp. Specific objectives were:

- to determine when the major movement of shrimp into the Gulf occurred,
- to estimate the size of shrimp before, during and after the closed season and
- to monitor the relative abundance of penaeid shrimp by month, depth zone and for the total sampling period.

MATERIALS AND METHODS

In October 1977 TPWD established a penaeid shrimp monitoring program in the Gulf of Mexico similar to that conducted during 1975-1977 (Cody et al. 1978). Samples were collected along transects off the central and south Texas coast between Pass Cavallo and Port Mansfield (Figure 1).

Although sampling design changed during the study the basic program remained the same (Cody and Rice 1979, Cody and Avent 1980). Night samples were collected from May through August to monitor brown shrimp (Penaeus aztecus) emigration from the bays and size and relative abundance during the summer closed season in the Gulf. Samples were collected off Port Aransas during 1978, 1979 and 1980 and off Port Mansfield during 1980. The depth zones sampled were 11-18, 20-27, 29-37 and 38-46 m off Port Aransas and Port Mansfield, with an additional zone (48-55 m) off Port Mansfield.

Day samples were collected mainly from November through February to monitor white shrimp (P. setiferus) emigration from the bays and size and relative abundance during the winter (16 December-1 February) closed season in the Gulf. Samples were collected off Pass Cavallo during 1977-78 and off Port Aransas during 1977-78, 1978-79, 1979-80 and 1980-81. The depth zones sampled were 5-9, 11-18 and 20-27 m during 1977-78 and 5-9 and 11-18 m during 1978-79, 1979-80 and 1980-81. Supplemental day samples were also collected during other months.

Sampling was conducted aboard the research vessel Western Gulf, a 21.9-m steel-hull shrimp trawler operated out of TPWD's Marine Laboratory at Rockport. Shrimp samples were collected with a 13.7-m wide otter trawl with 5.1-cm stretched mesh. Nets were equipped with tickler chains and were spread by wooden doors 0.9 m high and 2.1 m long.

Bottom trawling time ranged from 10 to 60 min. Samples were processed on the afterdeck of the Western Gulf after each trawl by culling shrimp from the catch and dividing the shrimp into groups according to species. For each species, all shrimp were divided by sex and weighed en masse if ≤ 50 shrimp were captured; individual shrimp were then measured. If >50 shrimp of one species were caught a subsample of at least 50 shrimp was divided by sex, weighed en masse and individually measured. The remainder of this species was weighed and a ratio used to estimate the total number of shrimp caught.

Weights were measured to the nearest 10 g using platform scales. Total lengths of individual shrimp were measured to the nearest mm. Bottom and surface hydrological data were taken at each sample station and were accurate to ± 1 C and ± 1 o/oo. Bottom water samples were taken with a Nansen bottle. An A.O. refractometer was used to determine salinities. Standard lab-grade thermometers were used to determine temperatures. Station locations were estimated using LORAN-A station 3H3 and depth.

In Texas the minimum commercial legal size for penaeid shrimp is 86 whole shrimp per kg (39/lb) or 143 tails per kg (65/lb). Throughout this report the term "count" refers to the number of whole shrimp per lb and "legal-count" refers to shrimp counts $\geq$86/kg (39/lb heads-on). Shrimp with a mean size $\geq$110 mm approximate legal count (Fontaine 1971).

RESULTS

From October 1977 through March 1981, 256 shrimp trawl samples were collected in the Gulf of Mexico (Appendix A).

Brown Shrimp--Night Samples

1978--May to August Season, Port Aransas

Mean catch rates were highest during June (3523/h) in the 11-18 m depth zone and during June (2330/h) and July (3984/h) in the 20-27 m depth zone (Table 1). The mean catch rate for all samples combined was 14.33 ± 2.38 kg/h (Figure 2).

Mean sizes were $\leq$ 110 mm in the 11-18, 20-27 and 29-37 m depth zones from May through July (Figure 3). By August mean sizes were $\geq$ 115 mm in all zones except 11-18 m.

1979--May to August Season, Port Aransas

The highest mean catch rates of the season occurred during July (1560/h) in the 20-27 m depth zone and August (4675/h) in the 11-18 m zone (Table 1). The mean catch rate for all samples combined was 6.48 ± 2.04 kg/h (Figure 2).

The mean sizes were $<$110 mm in the 11-18 m depth zone during May, July and August and in the 20-27 m zone during July (Figure 3). The mean sizes in the 29-37 and 38-46 m zones exceeded 120 mm throughout the season.

1980--May to August Season, Port Aransas

Mean catch rates were highest during June (2607/h) and July (2342/h) in the 11-18 m depth zone (Table 1). No other monthly mean catch rates exceeded 2000/h. The mean catch rate for all samples combined was 9.28 ± 2.12 kg/h (Figure 2).

Mean sizes were $<$110 mm in the 11-18 m depth zone throughout the season and in the 20-27 m zone and 29-37 m zone during June (Figure 3). By August mean sizes were $>$120 mm in all zones except 11-18 m.

1980--May to August Season, Port Mansfield

Highest catch rates for the season occurred in 11-18 m depth zone during July (2868/h) and August (2710/h) and in the 29-37 m zone during July (2308/h) (Table 2). Mean catch rates for all samples combined were 716 ± 201/h and 8.20 ± 2.16 kg/h.

During May, June and July mean sizes ranged from 72 to 78 mm in the 11-18 m depth zone and 90 to 98 mm in the 20-27 m zone (Table 2). By August mean sizes were >110 mm in all depth zones.

Brown shrimp did not meet legal count in the 11-18 m depth zone and the 20-27 m zone from May through July. The highest counts within the season occurred in the 11-18 m zone during May (207/1b) and July (113/1b). By August all samples exceeded legal count.

White Shrimp and Pink Shrimp--1980 Night Trawls

During 1980 white shrimp were collected in eight samples off Port Aransas and in three samples off Port Mansfield (Appendix B, Table 3). The highest catch rates occurred at 15 m off Port Aransas during June (222/h, 8.74 kg/h). At no other time did the catch exceed 28/h or 0.86 kg/h. Mean sizes ranged from 129 to 194 mm and counts ranged from 6 to 23/1b.

During 1980 pink shrimp (P. duorarum) were collected in 13 samples off Port Aransas and in seven samples off Port Mansfield (Appendix B, Table 3). The only catches over 100/h or 1 kg/h occurred off Port Mansfield. Highest catch rates occurred during late May at 11 m (174/h) and 20 m (238/h). Mean sizes ranged from 80 to 172 mm and count sizes ranged from 10 to 101/1b.

White Shrimp--Day Trawls

1977-1978--November to February Season

Mean catch rates were highest during November (479/h) and December (532/h) in the 5-9 m depth zone and during December (464/h) in the 11-18 m zone (Table 3). All other catch rates were <400/h. The mean catch rate for all samples combined was 4.20 ± 0.78 kg/h (Figure 4).

Mean sizes were <110 mm during January and February in the 5-9 m depth zone and during February in the 11-18 m zone. Shrimp approached or exceeded legal count at all other times (Table 3).

1978-1979--November to February Season

The highest mean catch rates occurred during November (2605/h) and December (2556/h) in the 5-9 m depth zone (Table 3). Catch rates did not exceed 400/h during any other sampling period. The mean catch rate for all samples combined was 8.89 ± 3.86 kg/h (Figure 4).

Mean sizes were <110 mm during November and December in the 5-9 m depth zone and during January in the 11-18 m zone. These were the only months during which white shrimp did not meet legal count (Table 3).

1979-1980--November to February Season

Mean catch rates were highest during December in the 5-9 m depth zone (1128/h) and the 11-18 m zone (716/h) (Table 3). The mean catch rate for all samples combined was 3.47 ± 0.66 kg/h (Figure 4).

Mean sizes were <110 mm in the 5-9 m depth zone during December, January and February and in the 11-18 m zone during December. Shrimp did not meet legal count in the 5-9 m zone during the November-February season (Table 3).

Brown shrimp outnumbered white shrimp in day samples only twice during December 1979-July 1980 (Appendix C, Table 3). On 5 June 1980 brown shrimp and white shrimp were collected at rates of 252 and 44/h, respectively. On 25 June the brown shrimp catch was 1788/h, the white shrimp catch was 444/h, and the pink shrimp catch was 76/h.

1980-1981--November to March Season

Mean catch rates were highest during December (238/h) in the 5-9 m depth zone and during November (204/h) in 11-18 m zone (Table 3). Mean catch rates for all samples combined were 195 ± 39/h and 2.48 ± 0.50 kg/h (Figure 4).

Mean sizes were <110 mm only during February in the 11-18 m depth zone. White shrimp did not meet legal count during November in 5-9 m and during February in the 11-18 m zone (Table 3).

During the November 1980-March 1981 season brown shrimp outnumbered white shrimp in day samples only once--on 30 March 1981 at 7 m the brown shrimp catch was 12/h and the white shrimp catch was 6/h (Appendix C, Table 4).

DISCUSSION

During 1978 and 1980, sampling indicated that the Texas closed season from 1 June through 15 July protected the largest number of undersize brown shrimp within the State's territorial sea. During 1979 the major movement of small brown shrimp did not appear in the samples until August; however, this may not have been representative of actual conditions on the shrimp grounds since two of the three cruises scheduled during the closed season were cancelled because of bad weather and mechanical breakdowns. Because of these sampling problems, an earlier emigration of brown shrimp during 1979 may have been missed. Catch rates in Aransas Bay indicated the major movement of brown shrimp into the Gulf occurred during the 1979 closed season (Benefield and Baker 1980). There was no indication of a major movement into the Gulf before the 1 June closing date during 1978, 1979 or 1980.

In general the mean size of brown shrimp increased with depth during the May-August season. With the exception of June 1979 when the catch rate was extremely low (4/h) monthly mean sizes of brown shrimp in the 11-18 m depth zone were <110 mm and did not meet legal count. However, even after the season opens (generally on 16 July) these small shrimp are still protected by a law that closes Gulf waters within the 12.8 m (7 fm) depth zone at night year-round. Also, after June, shrimp are available in deeper waters and fishing pressure on small shrimp in the shallower waters is diminished. Beyond 27 m brown shrimp nearly always approached or exceeded legal count.

During 1980 count size was generally higher (indicating a smaller mean size of shrimp) off Port Mansfield than off Port Aransas.

Catches of white shrimp and pink shrimp had little effect on overall catch rates or mean size of mixed penaeids during 1980. Only three times was count changed from non-legal (for brown shrimp only) to legal status (for all species combined) by the addition of white shrimp and pink shrimp to the brown shrimp catch.

Monthly catch rates by depth zones for brown shrimp indicated a great deal of variation between years. Much of the variation was probably due to natural changes in the amount of shrimp available and the movement patterns induced by environmental conditions. Other factors that may also have contributed to this apparent variation between years are changes in the sampling program that have led to uneven sample sizes and non-randomly selected stations.

Total Texas shrimp landings showed the same general pattern of relative abundance as the mean catch (kg/h) in TPWD samples for 1978-1980. Total landings and TPWD catch rates were highest during 1978, lowest during 1979 and intermediate during 1980. A similar pattern was also evident in the 29-37 and 38-46 m zones.

White shrimp samples indicated that the major movement of white shrimp into the Gulf of Mexico occurred during November and December 1977-81. With the exception of the 1980-81 season (which may have been affected by Hurricane Allen during August 1980), most white shrimp caught during November approached or exceeded legal count while those caught during December and January failed to meet legal count. These data indicated that closing the Gulf season from 16 December through 1 February protected part of the white shrimp population that emigrated to the Gulf during the winter from the bays along the central Texas coast.

LITERATURE CITED

Benefield, R. L. and W. B. Baker, Jr. 1980. Studies of shrimp populations in selected coastal bays of Texas. Tex. Pks. Wildl. Dept., Coast. Fish. Branch, Mngmnt. Data Ser. No. 13. 102 p.

Cody, T. J., K. W. Rice, and C. E. Bryan. 1978. Commercial fish and penaeid shrimp studies, northwestern Gulf of Mexico. Tex. Pks. Wildl. Dept., P. L. 88-309 Proj. 2-276-R Com. Rep. 29 p.

Cody, T. J. and K. W. Rice. 1979. Shrimp and finfish investigations in the northwestern Gulf. Tex. Pks. Wildl. Dept. P. L. 88-309 Proj. 2-312-R-1 Seg. Rep. 81 p.

Cody, T. J. and R. M. Avent. 1980. Shrimp and finfish investigations in the northwestern Gulf. Tex. Pks. Wildl. Dept. P. L. 88-309 Proj. 2-312-R-2 Seg. Rep. 117 p.

Fontaine, C. T. 1971. Conversion tables for commercially important penaeid shrimp of Gulf of Mexico. U.S. Dep. Commer., NOAA, NMFS Data Rep. 70, Seattle, Wash. 9 p.

Table 1. Trends in relative abundance and size, by month and depth, of brown shrimp (Penaeus aztecus) collected in night samples with a 13.7-m otter trawl in the Gulf of Mexico off the central Texas coast (1976-80).[a]

		Depth zones											
		11-18 m (6-10 fm)			20-27 m (11-15 fm)			29-37 m (16-20 fm)			38-46 m (21-25 fm)		
Month	Year	Kg/h	No./h	Mean (mm)	Kg/h	No./h	Mean (mm)	Kg/h	No./h	Mean (mm)	Kg/h	No./h	Mean (mm)
May	1976	9.58	1890	88	5.75	663	100	1.10	42	145	1.44	43	149
	1977[b]	3.42	681	88	3.50	457	99	3.61	359	118	2.73	139	130
	1978[b]	8.48	1262	92	12.04	1472	99	0.56	44	110	1.02	34	146
	1979	3.18	505	91	0.81	45	121	0.68	19	154	0.87	21	160
	1980[b]	0.16	16	95	0.34	14	136	0.52	18	151	1.70	48	156
June	1976	3.77	432	99	27.53	3714	96	6.55	537	111	2.84	205	117
	1977	9.09	1155	95	14.33	1298	106	9.58	1046	102	3.91	186	135
	1978	20.68	3523	88	20.92	2330	100	7.82	699	108	7.07	604	108
	1979[b]	0.08	4	135	4.80	358	120	1.42	94	122	1.74	80	132
	1980	24.80	2607	104	14.16	1558	95	8.50	754	109	1.60	91	130
July	1976	22.76	2524	103	26.91	2333	110	23.87	2513	104	16.18	1225	119
	1977	31.67	2784	108	15.67	1418	114	26.14	2321	107	35.92	2611	115
	1978	8.96	1112	97	35.48	3984	98	12.60	1126	109	18.16	1400	115
	1979[b]	9.30	850	109	16.34	1560	109	5.31	342	121	1.88	108	128
	1980	19.26	2342	95	5.42	393	116	9.28	595	123	7.19	411	123
August	1976	3.77	459	100	ND	-	-	ND	-	-	ND	-	-
	1977	4.50	598	96	14.92	968	122	24.31	1539	120	22.14	1681	111
	1978	1.85	215	99	7.65	498	120	3.24	236	115	10.01	636	120
	1979	34.16	4675	92	10.08	749	115	5.04	269	130	4.82	214	137
	1980	15.35	1654	98	8.37	463	122	4.08	167	135	8.98	337	139

[a] 1976 & 1977 samples were taken off Port Aransas, Corpus Christi Pass, Cedar Bayou, and Pass Cavallo; 1978 samples were taken off Port Aransas and Cedar Bayou, and 1979 and 1980 samples were taken off Port Aransas only.

[b] Samples taken last two days of the month only.

ND = No Data

Table 2. Abundance and size of brown shrimp (Penaeus aztecus) in night shrimp trawls off Port Mansfield, Texas (May-August 1980).

Sampling period			Depth zones											
			11-18 m			(6-10 fm)			20-27 m			(11-15 fm)		
Month	Day	Year	No.[a]	range (mm)	mean (mm)	ct.[b]	No./h	kg/h	No.	range (mm)	mean (mm)	ct.	No./h	kg/h
May	20-21	1980	1	57-142	72	207	346	0.76	1	72-133	90	71	616	3.94
June	17-18	1980	1	62-114	76	82	80	0.44	1	65-135	90	57	1186	9.44
July	23-24	1980	1	62-128	78	113	2868	11.48	1	73-128	98	47	984	9.48
August	25-26	1980	1	78-144	113	32	2710	39.01	1	100-173	131	23	990	19.20

Depth zones (cont'd.)														
29-37 m			(16-20 fm)			38-46 m			(21-25 fm)			48-55 m			(26-30 fm)		
No.	range (mm)	mean (mm)	ct.	No./h	kg/h	No.	range (mm)	mean (mm)	ct.	No./h	kg/h	No.	range (mm)	mean (mm)	ct.	No./h	kg/h
1	79-180	137	18	200	5.02	1	152-177	167	10	44	1.96	1	134-188	169	11	32	1.36
1	82-198	114	48	414	3.98	1	110-194	158	13	40	1.40	1	142-158	150	9	8	0.42
1	83-142	108	41	2308	25.40	1	96-176	120	30	480	7.20	1	123-192	150	15	140	4.20
1	105-184	135	23	482	9.66	1	101-176	137	20	280	6.46	1	109-183	146	16	118	3.32

a Number of samples

b Count is the number of shrimp per pound (heads-on)

Table 3. Trends in relative abundance and count size by month and depth of white shrimp (Penaeus setiferus) collected in day samples with a 13.7-m otter trawl in the Gulf of Mexico off the central Texas coast (1975-1981).

		Depth zones											
		5-9 m (3-5 fm)				11-18 m (6-10 fm)				20-27 m (11-15 fm)			
Month	Year	Kg/h	No./h	Mean (mm)	Count[a]	Kg/h	No./h	Mean (mm)	Count	Kg/h	No./h	Mean (mm)	Count
November	1975	4.35	479	108	50	6.86	438	122	29	0.45	22	145	22
	1976	9.37	790	116	38	6.98	363	132	24	0.04	2	145	22
	1977	7.57	479	124	29	6.74	394	132	27	2.34	83	151	16
	1978	26.31	2605	107	45	4.28	388	110	41	4.28	196	138	21
	1979	ND				ND				ND			
	1980	2.28	276	112	55	3.18	204	126	29	ND			
December	1975	5.09	974	91	89	5.32	577	113	49	2.33	116	147	23
	1976	4.22	504	105	54	1.15	92	118	36	0.39	28	122	33
	1977	5.61	532	114	43	6.13	464	119	34	2.96	137	142	21
	1978	20.87	2556	103	56	1.74	132	120	34	2.59	130	135	23
	1979	7.38	1128	90	69	6.16	716	101	53	0.86	24	155	13
	1980	2.76	238	113	39	1.32	114	114	39	ND			
January	1976	4.12	578	102	64	0.67	60	117	41	0.29	12	145	19
	1977	0.43	67	102	71	0.65	53	118	37	0.18	6	152	15
	1978	0.15	26	85	79	ND				ND			
	1979	ND				2.18	251	107	52	ND			
	1980	1.58	238	97	68	1.92	148	118	35	ND			
	1981	1.38	108	110	36	0.42	27	117	29	ND			
February	1976	2.61	183	120	32	1.45	81	127	25	1.02	28	159	12
	1977	1.39	174	102	57	0.92	85	115	42	0.34	14	140	19
	1978	0.42	78	91	84	3.10	323	105	47	4.10	297	120	33
	1979	ND				ND				ND			
	1980	3.76	389	105	47	4.46	422	113	40	ND			
	1981	0.09	6	118	30	3.12	291	108	42	ND			

[a]Count = Number per pound (heads-on).

ND = No Data

Figure 1. Penaeid shrimp sampling areas off the coast of Texas (1977-1981).

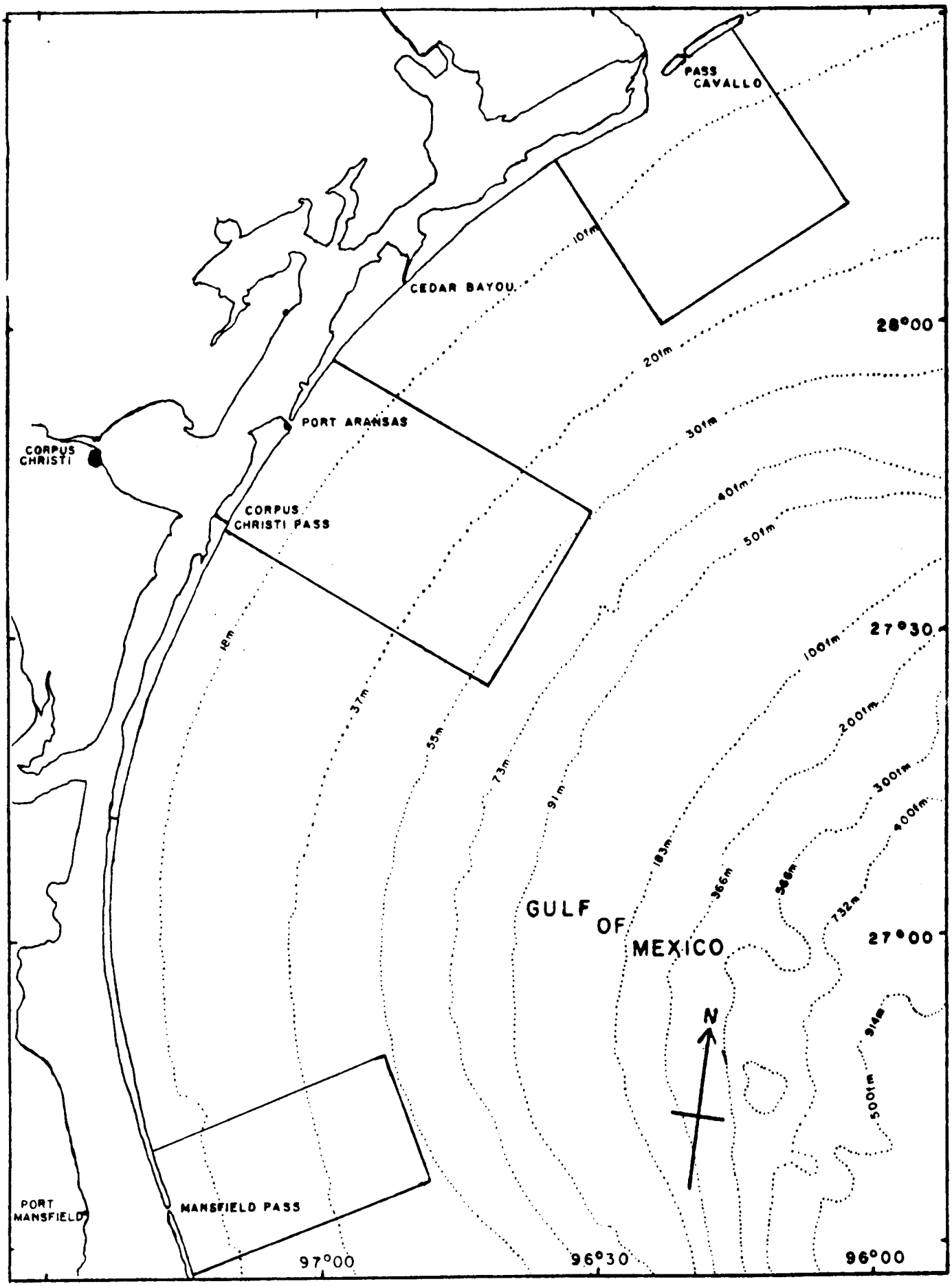

PASS CAVALLO
CEDAR BAYOU
PORT ARANSAS
CORPUS CHRISTI
CORPUS CHRISTI PASS
PORT MANSFIELD
MANSFIELD PASS
GULF OF MEXICO
N
10m
20m
30m
40m
50m
100m
200m
300m
400m
500m
18m
37m
55m
73m
91m
183m
366m
549m
732m
914m
28°00
27°30
27°00
97°00
96°30
96°00

Figure 2. Total Texas landings and seasonal catch rates for brown shrimp (Penaeus aztecus) collected during May-August off the central Texas coast.

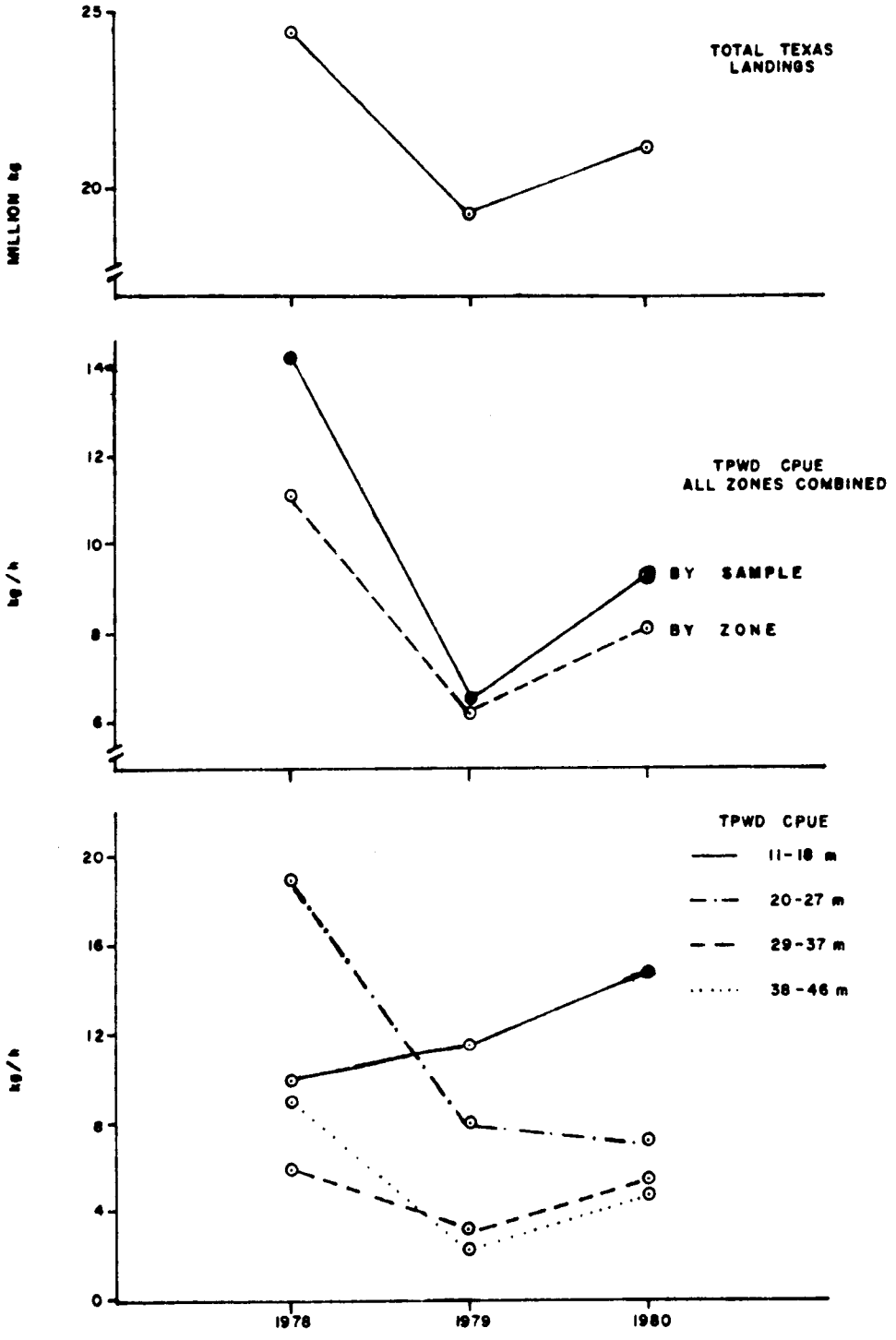

TOTAL TEXAS LANDINGS
MILLION kg
25
20
TPWD CPUE ALL ZONES COMBINED
BY SAMPLE
BY ZONE
kg/h
14
12
10
8
6
TPWD CPUE
11-18 m
20-27 m
29-37 m
38-46 m
kg/h
20
16
12
8
4
0
1978
1979
1980

Figure 3. Mean size of brown shrimp (Penaeus aztecus) by month and depth in night shrimp trawl samples taken off the central Texas coast.

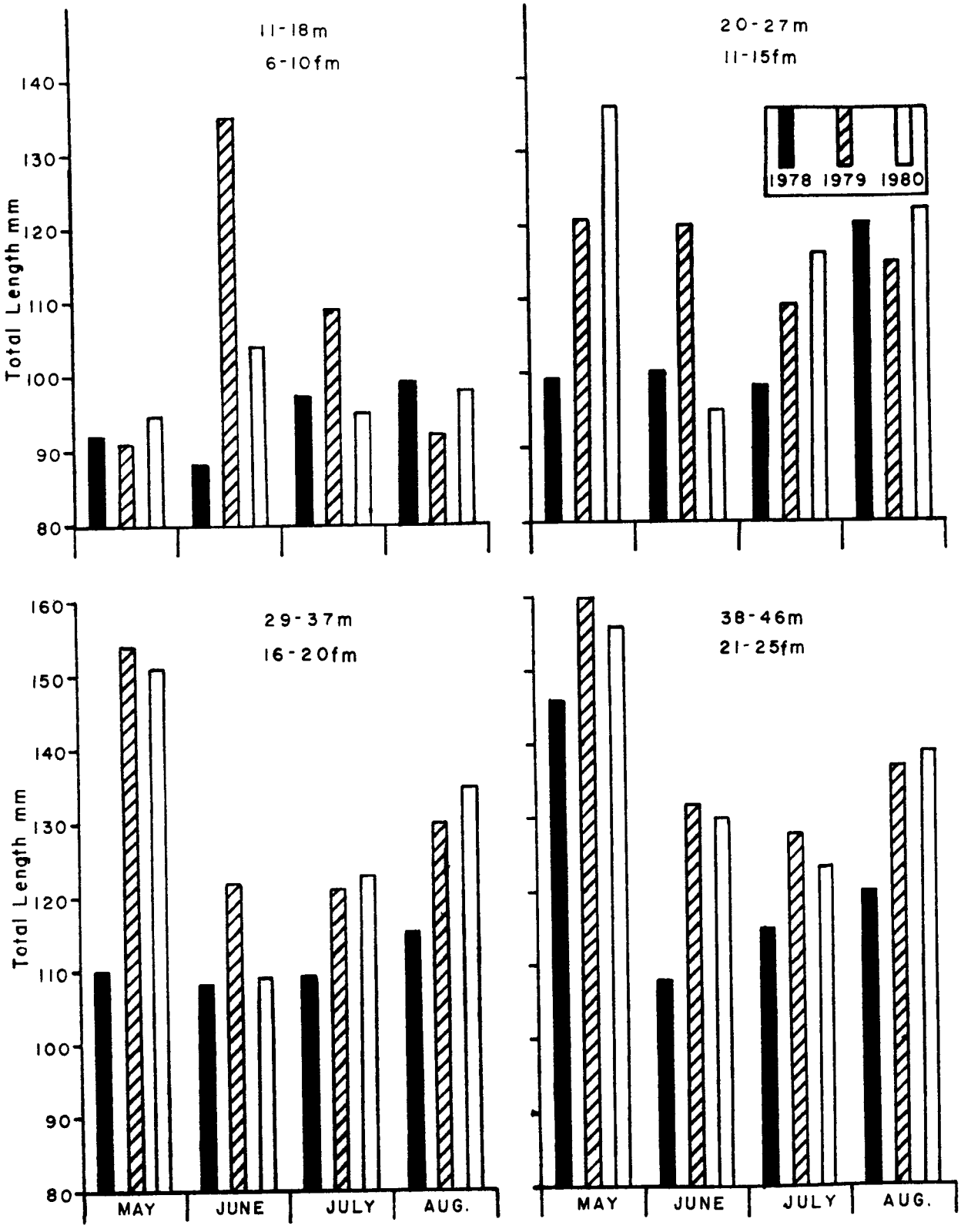
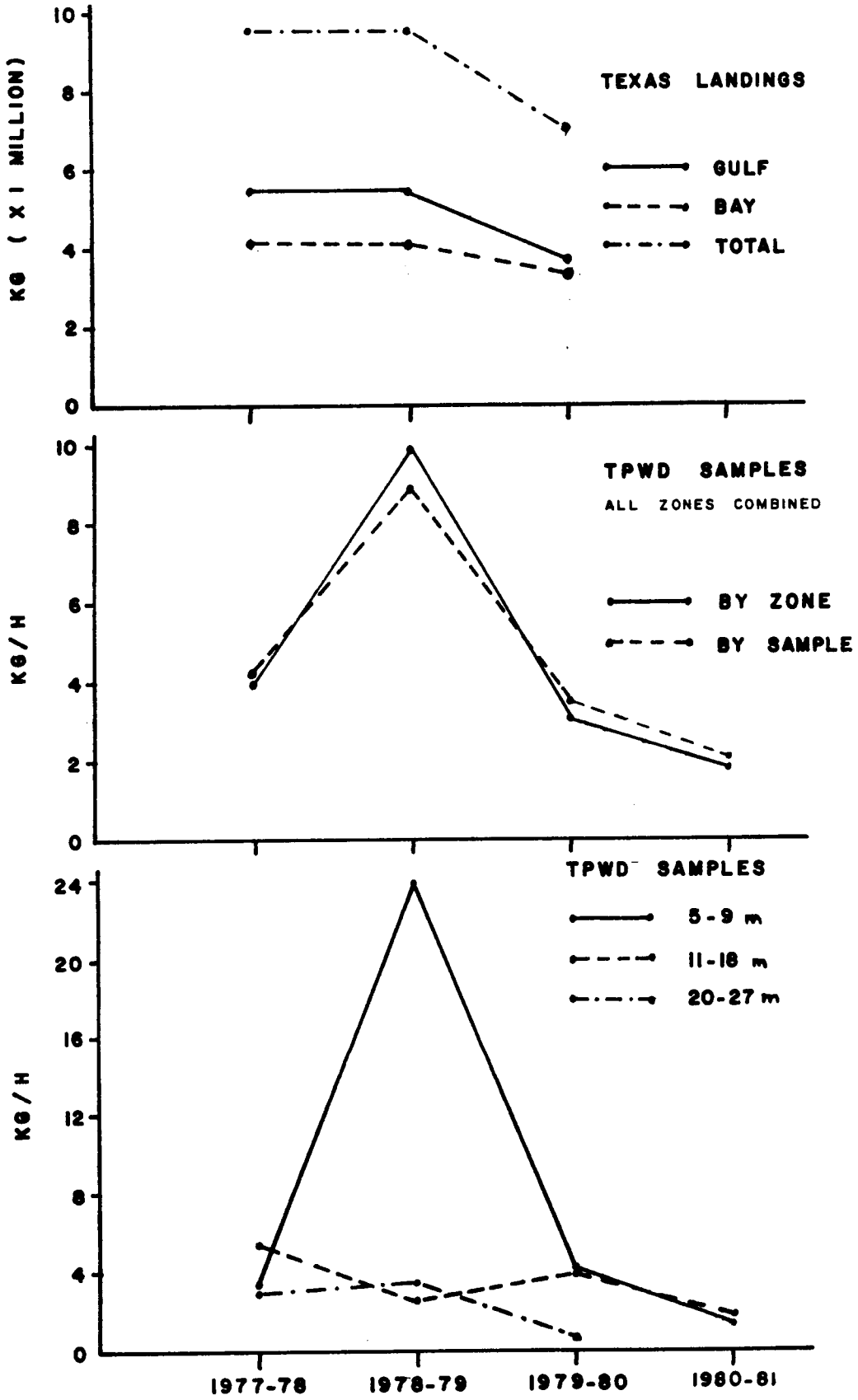

11-18m
6-10fm
20-27m
11-15fm
1978 1979 1980
Total Length mm
140
130
120
110
100
90
80
29-37m
16-20fm
38-46m
21-25fm
160
150
140
130
120
110
100
90
80
MAY
JUNE
JULY
AUG.

Figure 4. Total Texas landings and seasonal catch rates for white shrimp (Penaeus setiferus) collected during November-February off the central Texas coast.


KG (X 1 MILLION)
TEXAS LANDINGS
GULF
BAY
TOTAL
KG/H
TPWD SAMPLES
ALL ZONES COMBINED
BY ZONE
BY SAMPLE
KG/H
TPWD SAMPLES
5-9 m
11-18 m
20-27 m
1977-78
1978-79
1979-80
1980-81

Appendix A. Station list with hydrological data for all samples collected during October 1977-March 1981.

Table A.1. Station list with hydrological data for samples taken during segments 1, 2, & 3 (October 1977-March 1981).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort	Tow direction	Hydrology				Species[c]
											Bottom		Surface		
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm		(min)	degrees	Temp. (C)	Sal. (o/oo)	Temp. (C)	Sal. (o/oo)	
	mo-da-yr														
77-01-01	10-05-77	1533 (D)	27°42.6'	97°04.4'	2134	7	4	FL	30	210	28.5	37.2	28.5	37.8	W,B
77-01-02	10-05-77	1635 (D)	27°44.2'	97°03.8'	2105	15	8	FL	30	210	27.7	38.8	28.0	38.8	W,B
77-01-03	10-05-77	1806 (D)	27°39.4'	96°59.6'	2070	22	12	FL	30	210	28.5	37.2	28.5	37.8	W,B
77-01-04	10-05-77	2020 (N)	27°34.2'	96°47.6'	2072	38	21	FL	30	025	26.5	38.3	28.0	38.8	B,P
77-01-05	10-05-77	2122 (N)	27°37.6'	96°51.4'	2094	29	16	FL	30	200	27.5	38.8	28.5	38.8	B,W
77-01-06	10-05-77	2318 (N)	27°39.8'	96°59.8'	2075	22	12	FL	30	025	27.5	37.2	28.0	37.8	B,W,P
77-01-07	10-06-77	0049 (N)	27°45.8'	97°03.6'	2119	11	6	FL	30	025	27.5	38.3	28.0	37.7	B,W,P
77-02-01	10-25-77	1617 (D)	28°05.0'	96°20.6'	2540	27	15	FL	30	040	25.0	36.6	25.5	35.5	B
77-02-02	10-25-77	1805 (D)	28°09.8'	96°30.2'	2580	18	10	FL	30	040	23.5	32.8	24.0	32.8	W,B
77-02-03	10-25-77	1925 (D)	28°16.6'	96°25.6'	2620	11	6	FL	30	040	23.5	32.2	24.0	32.2	W,P
77-02-04	10-26-77	1008 (D)	28°20.0'	96°23.2'	2670	7	4	FL	30	210	23.7	33.3	23.7	32.2	-
77-03-01	11-10-77	1740 (D)	27°48.4'	97°03.2'	2148	7	4	FL	30	210	20.7	34.4	20.3	34.4	W,B,P
77-03-02	11-10-77	1825 (N)	27°46.6'	97°03.4'	2132	11	6	FL	30	020	19.6	32.2	20.3	32.2	W,B,P
77-03-03	11-11-77	1050 (D)	27°44.2'	96°53.6'	2140	24	13	FL	30	220	23.3	35.0	23.8	35.0	W,B
77-03-04	11-11-77	1215 (D)	27°43.2'	96°57.8'	2118	20	11	FL	30	210	23.0	35.0	23.2	35.0	W,B
77-03-05	11-11-77	1315 (D)	27°42.2'	97°01.4'	2090	18	10	FL	30	020	22.5	35.0	22.8	35.0	W,B,P
77-03-06	11-11-77	1430 (D)	27°45.0'	97°04.4'	2110	13	7	FL	30	030	20.5	35.0	20.0	35.0	W,B,P
77-05-01	11-30-77	1342 (D)	28°12.4'	96°13.2'	2655	24	13	FL	30	210	20.7	32.7	21.5	32.2	W,B,P
77-05-02	11-30-77	1522 (D)	28°15.8'	96°21.0'	2643	20	11	FL	30	030	20.0	32.2	19.6	31.0	W,B,P
77-05-03	11-30-77	1623 (D)	28°17.6'	96°20.0'	2665	18	10	FL	30	030	19.9	32.8	19.7	30.5	W
77-05-04	11-30-77	1723 (D)	28°19.8'	96°20.8'	2681	13	7	FL	30	195	19.1	30.0	19.3	30.0	W,B,P
77-05-05	11-30-77	1931 (N)	28°21.2'	96°21.2'	2693	11	6	FL	30	035	18.9	30.0	19.1	29.4	W,P
77-05-06	12-01-77	0746 (D)	28°23.4'	96°20.4'	2720	7	4	FL	30	210	19.0	30.0	19.1	29.4	W,P
77-05-07	12-01-77	1245 (D)	27°48.4'	96°49.2'	2211	24	13	FL	30	210	21.1	33.9	20.0	32.8	W,B,P
77-05-08	12-01-77	1400 (D)	27°47.0'	96°56.2'	2161	20	11	FL	30	030	21.1	33.9	21.0	33.9	W,B,P
77-05-09	12-01-77	1501 (D)	27°47.2'	96°57.6'	2159	18	10	FL	30	220	21.1	33.9	21.0	33.3	W,B,P
77-05-10	12-01-77	1610 (D)	27°47.2'	97°02.2'	2137	13	7	FL	30	210	20.0	33.3	20.2	33.3	W,B
77-05-11	12-01-77	1715 (D)	27°46.4'	97°05.4'	2117	7	4	FL	30	030	19.9	33.3	20.2	33.3	W,P
77-05-12	12-01-77	1858 (N)	27°46.6'	97°03.8'	2127	11	6	FL	30	030	20.0	33.3	20.1	32.8	W,P
77-06-01	12-12-77	2050 (N)	28°15.0'	96°21.8'	2630	11	6	FL	30	030	18.7	30.0	18.6	31.1	W,P
77-06-02	12-14-77	0803 (D)	28°24.0'	96°20.0'	2725	7	4	FL	30	220	17.7	28.9	17.5	27.8	W,P
77-06-03	12-14-77	0854 (D)	28°20.4'	96°20.2'	2690	13	7	FL	30	210	18.0	31.6	17.9	31.1	W,P
77-07-01	01-27-78	1135 (D)	27°46.8'	97°04.6'	2128	7	4	FL	30	210	10.0	28.9	9.8	28.3	W,P
77-08-01	02-14-78	1115 (D)	27°48.0'	97°04.2'	2143	7	4	FL	30	210	8.8	27.2	8.8	26.6	W
77-08-03	02-14-78	1225 (D)	27°44.6'	97°02.8'	2110	15	8	FL	30	220	9.9	28.9	9.4	26.1	W,P
77-08-06	02-14-78	1505 (D)	27°39.6'	97°00.2'	2076	22	12	FL	30	025	11.0	32.2	10.5	31.1	W,P
77-08-08	02-14-78	1905 (N)	27°46.0'	97°04.4'	2118	11	6	FL	30	025	9.2	26.6	9.0	26.6	W
77-09-01	02-16-78	1405 (D)	28°24.6'	96°20.0'	2730	7	4	FL	30	210	9.9	26.6	9.5	26.6	W
77-09-02	02-16-78	1500 (D)	28°20.0'	96°19.8'	2688	15	8	FL	30	025	10.2	27.8	10.0	27.2	W,P

Table A.1. (Cont'd.).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort (min)	Tow direction degrees	Hydrology				Species[c]
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm				Bottom		Surface		
											Temp. (C)	Sal. (σ/oo)	Temp. (C)	Sal. (θ/oo)	
	mo-da-yr														
77-09-03	02-16-78	1625 (D)	28°15.0'	96°15.2'	2674	22	12	FL	30	030	11.1	33.3	11.0	32.2	W
77-09-04	02-16-78	1845 (N)	28°16.6'	96°26.2'	2620	11	6	FL	30	050	9.8	27.2	9.1	25.5	W
77-11-01	03-08-78	1400 (D)	27°43.2'	96°56.2'	2126	22	12	FL	30	210	14.4	35.5	13.5	34.4	W
77-11-03	03-08-78	1520 (D)	27°45.0'	96°59.5'	2132	18	10	FL	30	020	13.4	35.5	13.2	34.4	W,P
77-11-05	03-08-78	1635 (D)	27°44.4'	97°02.2'	2108	15	8	FL	30	215	13.1	34.4	13.1	32.2	W,P
77-11-07	03-08-78	1745 (D)	27°44.2'	97°06.8'	2092	7	4	FL	30	020	12.6	31.6	12.6	31.1	W,P
77-11-09	03-08-78	2100 (N)	27°46.0'	97°04.2'	2120	11	6	FL	30	015	12.9	31.6	12.8	31.1	W,P
77-12-06	03-17-78	0455 (N)	28°17.8'	96°13.8'	2705	11	6	FL	30	210	13.7	30.0	13.9	27.8	W
77-12-07	03-17-78	0707 (D)	28°17.4'	96°26.2'	2630	7	4	FL	30	240	13.4	30.0	13.8	30.0	W
77-12-08	03-17-78	0805 (D)	28°14.8'	96°26.5'	2602	15	8	FL	30	220	13.9	33.3	13.6	33.3	W
77-12-09	03-17-78	0927 (D)	28°08.0'	96°24.6'	2555	22	12	FL	30	220	14.2	36.6	14.0	33.3	W
77-16-01	05-30-78	1440 (D)	27°48.8'	97°03.2'	2149	7	4	FL	30	210	28.4	32.2	28.8	31.6	-
77-16-02	05-30-78	1530 (D)	27°47.4'	97°02.6'	2135	11	6	FL	15	005	27.4	33.3	28.0	32.2	W,B
77-16-03	05-30-78	1620 (D)	27°47.4'	97°00.8'	2147	15	8	FL	30	010	27.0	33.3	27.8	33.3	W,B
77-16-04	05-30-78	1725 (D)	27°46.6'	96°57.6'	2152	18	10	FL	30	200	25.6	34.4	27.8	33.3	W,B
77-16-05	05-30-78	1840 (D)	27°43.4'	96°55.4'	2135	22	12	FL	30	210	22.7	36.1	27.0	33.3	B
77-16-06	05-30-78	2100 (N)	27°35.2'	96°46.4'	2090	38	21	FL	30	215	21.7	38.9	27.0	37.2	B
77-16-07	05-30-78	2220 (N)	27°38.0'	96°49.4'	2104	31	17	FL	15	030	21.2	35.5	27.0	32.2	B
77-16-08	05-30-78	2330 (N)	27°40.8'	96°53.2'	2117	26	14	FL	15	030	21.3	34.4	26.8	33.3	B
77-16-09	05-31-78	0020 (N)	27°43.4'	96°55.6'	2130	22	12	FL	15	030	22.0	35.5	27.0	33.3	B
77-16-10	05-31-78	0140 (N)	27°47.2'	97°01.2'	2140	15	8	FL	15	030	26.0	32.2	27.2	31.6	W,B,P
77-16-11	05-31-78	0220 (N)	27°47.6'	97°02.2'	2143	11	6	FL	15	030	26.7	33.3	27.0	33.3	W,B,P
77-19-01	06-08-78	2215 (N)	27°40.6'	96°41.2'	2175	38	21	FL	30	220	20.4	36.6	27.8	33.3	B
77-19-02	06-08-78	2325 (N)	27°41.2'	96°47.2'	2150	31	17	FL	30	220	28.6	36.6	27.6	33.3	B
77-19-03	06-09-78	0040 (N)	27°42.0'	96°52.4'	2134	26	14	FL	30	030	21.5	36.1	27.5	33.3	B
77-24-01	06-13-78	2130 (N)	27°45.2'	96°53.4'	2162	22	12	FL	30	030	22.5	36.6	28.4	32.2	B
77-24-02	06-13-78	2305 (N)	27°49.0'	96°59.0'	2164	15	8	FL	30	220	22.4	35.5	28.0	32.2	W,B,P
77-24-03	06-14-78	0015 (N)	27°48.0'	97°02.6'	2143	11	6	FL	30	030	26.2	33.3	28.1	32.2	W,B,P
77-24-04	06-14-78	0940 (D)	27°48.6'	97°03.4'	2148	7	4	FL	15	220	28.2	34.4	30.0	33.3	B
77-24-05	06-14-78	1025 (D)	27°48.6'	97°01.4'	2135	15	8	FL	15	030	27.6	34.4	28.8	33.2	B
77-24-06	06-14-78	1135 (D)	27°44.2'	96°54.8'	2145	22	12	FL	15	220	22.8	36.6	28.2	33.3	B
77-27-01	06-28-78	1235 (D)	27°48.2'	97°03.5'	2146	7	4	FL	15	210	27.8	35.5	29.0	33.3	W,B
77-27-02	06-28-78	1330 (D)	27°46.4'	97°01.4'	2136	15	8	FL	15	030	26.0	38.9	28.8	37.8	W,B,P
77-27-03	06-28-78	1500 (D)	27°46.4'	96°55.8'	2162	20	11	FL	15	030	25.6	37.2	28.8	35.5	W,B
77-27-06	06-28-78	1010 (N)	27°45.4'	96°56.8'	2146	20	11	FL	15	030	25.2	35.5	28.5	33.3	B,P
77-27-07	06-28-78	1125 (N)	27°46.8'	97°01.0'	2139	15	8	FL	15	030	26.5	35.5	28.4	34.4	B,W
77-27-08	06-29-78	0020 (N)	27°48.2'	97°02.4'	2148	11	6	FL	15	215	28.0	33.9	29.0	32.8	B,W,P
77-27-12	06-29-78	2130 (N)	27°38.5'	96°34.8'	2189	53	29	FL	15	030	20.8	37.7	29.5	33.3	B

Table A.1. (Cont'd.)

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort (min)	Tow direction degrees	Hydrology				Species[c]
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm				Bottom		Surface		
											Temp. (C)	Sal. (o/oo)	Temp. (C)	Sal. (o/oo)	
	mo-da-yr														
77-27-13	06-29-78	2315 (N)	27°42.8'	96°38.0'	2213	40	22	FL	15	210	22.3	35.5	28.2	33.3	B
77-27-14	06-29-78	2345 (N)	27°44.4'	96°41.6'	2217	33	18	FL	15	040	22.8	36.6	29.0	33.3	B
77-27-15	06-30-78	0115 (N)	27°49.6'	96°49.6'	2223	22	12	FL	15	210	25.7	35.5	29.0	33.3	B,P
77-29-01	07-12-78	2240 (N)	27°38.2'	96°33.8'	2193	55	30	FL	15	210	20.2	37.7	28.5	36.6	B
77-29-02	07-13-78	0010 (N)	27°41.0'	96°39.4'	2190	40	22	FL	15	210	22.0	36.1	27.9	36.1	B
77-29-03	07-13-78	0125 (N)	27°41.4'	96°44.6'	2168	33	18	FL	15	035	23.0	37.7	27.9	36.6	B
77-29-04	07-13-78	0300 (N)	27°45.4'	96°53.4'	2160	22	12	FL	15	035	23.0	37.7	27.2	36.6	B
77-29-05	07-13-78	0400 (N)	27°46.8'	96°55.4'	2167	20	11	FL	15	035	23.4	36.6	27.2	36.1	B
77-30-01	07-14-78	1850 (D)	27°48.0'	97°04.0'	2136	7	4	FL	15	210	28.0	36.6	29.7	36.1	-
77-30-02	07-14-78	1940 (D)	27°46.6'	97°01.4'	2135	15	8	FL	15	040	25.4	37.2	28.5	37.2	W,B
77-30-03	07-14-78	2040 (D)	27°46.0'	96°57.0'	2155	20	11	FL	15	040	23.3	37.8	28.2	37.2	B
77-30-04	07-14-78	2330 (N)	27°46.6'	97°01.2'	2142	15	8	FL	15	040	27.0	36.6	28.1	36.6	B,W,P
77-30-05	07-15-78	0030 (N)	27°47.2'	97°03.0'	2140	11	6	FL	15	040	27.0	36.6	28.3	36.1	B,W,P
77-33-01	07-17-78	1835 (D)	27°46.0'	96°53.2'	2168	22	12	FL	15	040	27.0	37.7	29.4	37.7	B
77-33-02	07-17-78	2055 (N)	27°44.2'	96°38.0'	2229	38	21	FL	15	040	27.0	37.1	28.2	36.6	B
77-33-03	07-17-78	2200 (N)	27°45.2'	96°41.6'	2223	33	18	FL	15	040	24.2	37.7	27.5	37.1	B
77-33-04	07-17-78	2345 (N)	27°46.2'	96°52.4'	2175	22	12	FL	15	210	23.0	37.1	28.5	35.5	B
77-33-05	07-18-78	0038 (N)	27°46.6'	96°55.4'	2169	20	11	FL	15	040	24.4	37.7	29.2	36.0	B
77-35-01	07-19-78	1830 (D)	27°47.6'	97°04.2'	2133	7	4	FL	15	210	28.5	37.7	28.5	37.7	-
77-35-02	07-19-78	1915 (D)	27°46.4'	97°01.6'	2135	15	8	FL	15	040	26.0	38.8	28.2	38.3	B
77-37-01	08-08-78	1610 (D)	27°48.6'	97°03.0'	2150	7	4	FL	30	210	30.0	37.8	30.2	37.8	W,P,B
77-37-02	08-08-78	1725 (D)	27°44.4'	97°02.8'	2110	15	8	FL	30	210	28.8	37.8	29.0	37.1	B,P
77-37-13	08-09-78	2100 (N)	27°40.2'	96°55.8'	2097	24	13	FL	15	030	27.8	37.2	28.0	37.2	B
77-37-21	08-10-78	1315 (N)	27°44.8'	97°04.8'	2105	11	6	FL	10	030	29.2	37.7	29.5	37.7	B,W,P
77-37-24	08-10-78	2030 (N)	27°39.4'	96°43.2'	2152	38	21	FL	15	040	25.5	36.6	29.2	37.7	B
77-37-25	08-10-78	2130 (N)	27°39.6'	96°48.2'	2132	31	17	FL	15	220	27.0	36.6	29.2	37.7	B
77-38-09	08-16-78	1525 (D)	27°48.0'	97°03.6'	2145	7	4	FL	15	205	31.0	37.6	30.5	37.6	W,B
77-38-10	08-16-78	1620 (D)	27°47.6'	97°01.2'	2149	15	8	FL	15	030	28.5	36.1	30.0	36.6	B
77-38-11	08-16-78	1730 (D)	27°45.2'	96°53.8'	2161	22	12	FL	15	030	28.0	37.2	29.0	37.8	B
77-38-12	08-16-78	2030 (N)	27°40.4'	96°52.4'	2120	27	15	FL	15	030	26.0	36.1	29.2	37.8	B
77-38-18	08-17-78	0125 (N)	27°48.0'	97°02.2'	2150	11	6	FL	15	030	28.8	36.6	29.4	36.6	B
77-40-01	09-21-78	1330 (D)	27°50.4'	97°02.2'	2175	7	4	FL	30	010	29.8	35.0	29.9	34.4	W
77-40-02	09-21-78	1425 (D)	27°50.4'	97°00.8'	2180	11	6	FL	30	010	29.2	36.1	29.9	36.1	W,B,P
77-40-03	09-21-78	1630 (D)	27°45.4'	96°53.0'	2166	22	12	FL	30	030	29.2	35.5	29.8	35.0	B
77-41-01	09-29-78	1615 (D)	27°50.0'	97°01.4'	2172	9	5	FL	30	010	26.8	27.8	27.0	27.8	W,P,B
77-41-02	09-29-78	1725 (D)	27°50.4'	96°56.6'	2197	15	8	FL	15	210	27.2	27.8	27.4	27.8	-
77-41-03	09-29-78	1840 (D)	27°48.4'	96°54.6'	2194	20	11	FL	15	030	27.2	28.9	27.3	27.2	B
77-41-04	09-29-78	2050 (N)	27°42.0'	96°40.8'	2196	38	21	FL	15	030	27.8	34.4	27.5	32.2	B

Table A.1. (Cont'd.).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort	Tow direction	Hydrology				Species[c]
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm		(min)	degrees	Bottom Temp. (C)	Bottom Sal. (o/oo)	Surface Temp. (C)	Surface Sal. (o/oo)	
	mo-da-yr														
77-41-05	09-29-78	2135 (N)	27°43.4'	96°42.6'	2198	33	18	FL	15	230	27.8	33.3	27.4	31.1	B
77-41-06	09-29-78	2300 (N)	27°37.8'	96°57.8'	2164	24	13	FL	15	220	27.7	33.3	27.0	28.3	B,P
77-41-07	09-30-78	0030 (N)	27°47.0'	97°03.0'	2140	11	6	FL	15	030	27.0	27.2	26.5	26.6	P,B,W
77-41-08	09-30-78	0120 (N)	27°47.8'	97°04.2'	2140	7	4	FL	15	020	27.4	27.2	27.4	26.6	W,P,B
78-04-02	11-08-78	1425 (D)	27°48.5'	97°01.8'	2150	7	4	Fl	30	210	21.4	31.6	21.5	32.2	W
78-04-03	11-08-78	1520 (D)	27°46.1'	97°02.0'	2127	13	7	Fl	30	020	22.3	32.2	22.4	33.3	W
78-04-05	11-08-78	1645 (D)	27°44.4'	96°57.1'	2134	20	11	Fl	30	210	22.3	31.6	22.4	32.2	W
78-06-01	12-12-78	0855 (D)	27°47.7'	97°02.0'	2140	9	5	Fl	30	210	14.9	30.0	15.0	30.0	W
78-06-02	12-12-78	1005 (D)	27°44.7'	96°58.1'	2110	15	8	Fl	30	210	15.9	30.0	15.9	30.0	W,P
78-06-04	12-12-78	1405 (D)	27°38.9'	97°00.0'	2070	22	12	Fl	30	030	17.8	32.8	16.6	32.2	W,P
78-07-03	01-17-79	1730 (D)	27°50.1'	96°58.0'	2184	15	8	Fl	50	280	12.4	32.2	11.2	28.9	W,P
78-11-01	03-05-79	1730 (D)	27°50.7'	97°01.0'	2176	9	5	Fl	45	020	13.9	28.9	13.9	28.9	W,P
78-11-02	03-05-79	1830 (D)	27°51.0'	96°59.6'	2184	11	6	Fl	40	050	13.9	28.9	13.9	28.9	W,P
78-12-01	05-15-79	1620 (D)	27°47.8'	97°02.1'	2144	7	4	SB	30	210	24.2	22.8	24.6	22.8	B
78-12-02	05-15-79	2035 (N)	27°31.0'	96°43.0'	2070	49	27	SB	30	025	20.5	36.6	23.4	33.3	B
78-12-03	05-15-79	2155 (N)	27°37.3'	96°42.7'	2083	40	22	SB	30	022	23.0	33.5	23.0	33.3	B
78-12-04	05-15-79	2320 (N)	27°36.5'	96°49.5'	2092	33	18	SB	30	025	22.5	35.0	23.1	32.2	B
78-12-05	05-16-79	1240 (D)	27°49.2'	97°00.2'	2168	9	5	SB	30	020	23.8	26.6	24.9	21.2	B,P
78-12-06	05-16-79	1335 (D)	27°50.3'	96°59.0'	2180	13	7	SB	30	025	23.5	28.9	24.4	23.3	B,P
78-12-07	05-16-79	1516 (D)	27°46.9'	96°53.6'	2176	20	11	SB	30	210	23.5	29.4	24.4	26.6	W
78-12-08	05-16-79	1640 (D)	27°46.0'	96°50.5'	2182	24	13	SB	30	020	23.4	30.0	24.5	22.2	P
78-12-09	05-16-79	2050 (N)	27°47.1'	96°49.4'	2200	24	13	SB	30	035	23.3	28.9	24.2	21.1	W,P
78-12-10	05-16-79	2215 (N)	27°51.5'	96°56.2'	2210	15	8	SB	30	030	23.6	25.5	24.0	20.0	B,W,P
78-12-11	05-16-79	2326 (N)	27°53.3'	96°58.5'	2221	11	6	Fl	30	030	24.0	20.0	24.0	22.8	B,P
78-12-12	05-17-79	0026 (N)	27°53.7'	96°59.4'	2220	7	4	Fl	30	210	24.2	20.5	24.2	20.5	B,P
78-13-01	05-23-79	1346 (D)	27°47.2'	96°58.5'	2153	16	9	SB	30	210	23.4	33.3	25.5	28.3	B,W,P
78-13-02	05-23-79	1505 (D)	27°43.6'	96°55.4'	2132	22	12	SB	30	020	28.3	36.1	25.4	22.6	B
78-13-03	05-23-79	2050 (N)	27°36.7'	96°43.5'	2128	40	22	SB	30	210	21.7	35.5	25.3	23.3	B
78-13-04	05-23-79	2155 (N)	27°37.8'	96°48.1'	2110	33	18	SB	30	210	23.7	33.3	25.2	24.4	B
78-13-05	05-23-79	2320 (N)	27°39.3'	96°56.0'	2085	24	13	SB	30	030	23.3	33.3	25.0	26.6	B,P
78-13-06	05-24-79	0043 (N)	27°44.4'	97°01.4'	2112	16	9	SB	30	020	23.8	31.1	25.4	27.2	B,W,P
78-13-07	05-24-79	0207 (N)	27°45.8'	97°03.0'	2120	11	6	SB	30	020	25.0	27.2	25.3	25.5	B,W,P
78-13-08	05-24-79	1233 (D)	27°48.6'	97°02.9'	2147	7	4	SB	30	210	25.6	27.2	26.0	26.1	B,W
78-13-09	05-24-79	1325 (D)	27°45.2'	97°03.5'	2106	11	6	SB	30	180	24.5	31.1	26.3	27.2	B,W,P
78-14-01	06-21-79	2107 (N)	27°37.9'	96°43.4'	2138	38	21	SB	30	030	23.8	34.4	28.3	26.1	B
78-14-02	06-21-79	2238 (N)	27°40.0'	96°47.8'	2138	31	17	SB	30	210	25.0	34.4	27.8	27.8	B
78-14-03	06-22-79	0016 (N)	27°41.2'	96°54.3'	2119	24	13	SB	30	030	24.4	33.0	27.8	28.9	B
78-14-04	06-22-79	0210 (N)	27°45.4'	97°01.5'	2137	15	8	SB	30	030	24.9	32.2	27.9	27.8	B

Table A.1. (Cont'd.).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort	Tow direction	Hydrology				Species[c]
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm		(min)	degrees	Bottom Temp. (C)	Bottom Sal. (o/oo)	Surface Temp. (C)	Surface Sal. (o/oo)	
	mo-da-yr														
78-15-01	07-30-79	1600 (D)	27°51.3'	97°01.6'	2175	7	4	SB	30	030	29.3	35.5	29.5	33.3	B,W
78-15-02	07-30-79	1725 (D)	27°51.3'	96°58.7'	2195	13	7	SB	30	030	28.5	36.1	29.2	34.4	B,W,P
78-16-01	08-02-79	1610 (D)	27°48.4'	97°01.3'	2155	9	5	SB	30	200	28.8	36.6	29.0	35.5	B,W,P
78-16-02	08-02-79	2035 (N)	27°39.2'	96°41.2'	2164	40	22	SB	30	210	25.5	36.6	29.0	36.6	B,W
78-16-03	08-02-79	2205 (N)	27°41.2'	96°46.9'	2150	31	17	SB	30	210	28.8	35.5	26.3	36.6	B
78-16-04	**08-02-79**	**2325 (N)**	**27°42.8'**	**96°53.5'**	**2139**	**24**	**13**	**SB**	**30**	**210**	**28.9**	**35.5**	**28.3**	**36.6**	**B,P**
78-16-05	**08-03-79**	**0110 (N)**	**27°46.7'**	**97°01.2'**	**2135**	**15**	**8**	**SB**	**30**	**030**	**28.4**	**36.1**	**28.7**	**36.1**	**B,W,P**
78-17-01	**08-09-79**	**1704 (D)**	**27°48.2'**	**97°00.7'**	**2155**	**11**	**6**	**SB**	**30**	**210**	**29.9**	**33.3**	**30.3**	**28.9**	**B,W**
78-17-03	**08-09-79**	**2100 (N)**	**27°43.7'**	**96°57.2'**	**2125**	**20**	**11**	**SB**	**30**	**220**	**29.2**	**35.5**	**29.3**	**34.4**	**B**
78-17-05	**08-09-79**	**2300 (N)**	**27°46.8'**	**97°01.5'**	**2142**	**13**	**7**	**SB**	**30**	**230**	**29.7**	**33.9**	**29.5**	**33.9**	**B**
78-17-10	**08-10-79**	**2236 (N)**	**27°37.9'**	**96°43.4'**	**2139**	**38**	**21**	**SB**	**30**	**210**	**24.2**	**38.9**	**29.0**	**36.6**	**B**
78-17-11	**08-10-79**	**2356 (N)**	**27°37.8'**	**96°48.1'**	**2112**	**33**	**18**	**SB**	**30**	**210**	**28.3**	**36.6**	**29.0**	**36.1**	**B**
78-18-09	**08-23-79**	**0053 (N)**	**27°49.2'**	**97°00.3'**	**2166**	**13**	**7**	**SB**	**60**	**030**	**-**	**-**	**30.0**	**33.9**	**B**
78-18-10	**08-23-79**	**0315 (N)**	**27°49.7'**	**96°51.8'**	**2220**	**20**	**11**	**SB**	**30**	**210**	**29.5**	**34.4**	**29.6**	**33.3**	**B**
78-18-11	**08-23-79**	**2003 (N)**	**27°38.8'**	**96°42.5'**	**2150**	**38**	**21**	**SB**	**30**	**220**	**26.7**	**37.2**	**29.4**	**35.5**	**B**
78-18-12	**08-23-79**	**2116 (N)**	**27°39.6'**	**96°48.3'**	**2128**	**31**	**17**	**SB**	**30**	**210**	**29.3**	**34.4**	**29.3**	**34.4**	**B**
79-03-01	12-19-79	0925 (D)	27°48.4'	97°02.0'	2150	7	4	SB	20	220	13.6	25.5	13.5	25.5	B,W,P
79-03-02	12-19-79	1010 (D)	27°47.0'	97°01.8'	2140	13	7	SB	15	030	14.9	26.6	13.8	25.5	W,P
79-03-06	12-20-79	0840 (D)	27°45.3'	96°56.2'	2147	20	11	SB	30	200	17.3	30.5	16.5	29.4	B,W
79-03-09	12-20-79	1230 (D)	27°38.2'	96°47.8'	2115	33	18	SB	30	210	17.9	31.6	19.0	33.3	B
80-01-01	01-15-80	1225 (D)	27°48.3'	97°03.1'	2145	7	4	SB	30	200	15.1	31.2	15.9	30.2	B,W
80-01-04	01-15-80	1755 (D)	27°43.0'	97°03.5'	2087	15	8	SB	60	020	14.7	29.1	15.1	29.1	B,W,P
80-03-01	02-21-80	1340 (D)	27°48.2'	97°03.7'	2148	7	4	F1	30	205	13.6	32.2	17.6	29.4	W,P
80-03-02	02-21-80	1340 (D)	27°48.2'	97°03.7'	2148	7	4	SB	30	205	13.6	32.2	17.6	29.4	B,W,P
80-03-03	02-21-80	1430 (D)	27°45.7'	97°03.0'	2120	13	7	F1	30	020	-	-	-	-	W,P
80-03-04	02-21-80	1430 (D)	27°45.7'	97°03.0'	2120	13	7	SB	30	020	-	-	-	-	W,P
80-03-05	02-21-80	1520 (D)	27°46.6'	97°03.0'	2135	11	6	F1	60	245	14.0	34.4	16.8	30.0	W,P
80-03-06	02-21-80	1520 (D)	27°46.6'	97°03.0'	2135	11	6	SB	60	245	14.0	34.4	16.8	30.0	W,P
80-06-01	05-19-80	2045 (N)	27°35.5'	96°45.0'	2107	40	22	SB	30	210	23.2	33.3	23.4	33.3	B,P
80-06-02	05-19-80	2205 (N)	27°36.8'	96°50.6'	2089	31	17	SB	30	210	23.2	33.3	23.4	33.3	B,P
80-06-03	05-19-80	2350 (N)	27°42.5'	96°56.5'	2120	22	12	SB	30	025	23.5	32.8	23.9	32.8	B,W,P
80-06-04	05-20-80	0140 (N)	27°45.6'	97°02.8'	2122	13	7	SB	30	025	24.6	31.6	25.0	31.1	B,W,P
80-06-05	05-20-80	2105 (N)	26°40.0'	96°51.8'	1480	48	26	SB	30	155	20.8	36.1	24.0	34.4	B
80-06-06	05-20-80	2220 (N)	26°37.2'	96°56.0'	1432	40	22	SB	30	155	23.3	34.4	23.7	34.4	B
80-06-07	05-21-80	0020 (N)	26°31.6'	97°03.4'	1329	29	16	SB	30	340	23.5	33.3	23.9	33.3	B,W,P
80-06-08	05-21-80	0130 (N)	26°32.5'	97°09.4'	1316	20	11	SB	30	340	24.2	33.3	24.2	33.3	B,P
80-06-09	05-21-80	0130 (N)	26°31.5'	97°14.5'	1287	11	6	SB	30	340	24.8	33.9	25.0	33.9	B,W,P

Table A.1. (Cont'd.).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort (min)	Tow direction degrees	Hydrography				Species[c]
			Latitude (N)	Longitude (W)	Loran 3H3	m	fm				Bottom		Surface		
											Temp. (C)	Sal. (o/oo)	Temp. (C)	Sal. (o/oo)	
	mo-da-yr														
80-08-01	06-05-80	1550 (D)	27°51.0'	97°02.0'	2175	7	4	SB	15	040	28.1	30.0	28.3	29.4	B,W
80-08-02	06-05-80	1640 (D)	27°48.6'	97°03.8'	2148	7	4	SB	15	215	28.1	30.0	28.5	31.1	-
80-08-03	06-05-80	2110 (N)	27°37.2'	96°43.6'	2127	40	22	SB	30	210	23.0	35.0	27.5	30.0	B
80-08-04	06-05-80	2220 (N)	27°83.2'	96°48.1'	2114	33	18	SB	30	210	23.5	35.0	28.1	27.8	B
80-08-05	06-05-80	2400 (N)	26°40.3'	96°55.6'	2100	24	13	SB	30	030	25.1	33.3	27.8	27.2	B
80-08-06	06-06-80	0155 (N)	27°46.3'	97°01.8'	2131	15	8	SB	30	030	27.5	30.0	27.7	29.4	B,W,P
80-09-01	06-17-80	2220 (N)	26°37.2'	96°49.5'	1460	48	26	SB	30	320	23.5	36.6	28.5	32.8	B
80-09-02	06-17-80	2350 (N)	26°37.6'	96°56.2'	1436	40	22	SB	30	160	24.0	36.6	28.5	32.2	B
80-09-03	06-18-80	0145 (N)	26°37.2'	97°05.6'	1383	31	17	SB	30	330	27.0	36.6	28.0	31.6	B
80-09-04	06-18-80	0250 (N)	26°36.6'	97°08.6'	1372	22	12	SB	30	160	27.5	37.2	28.0	32.2	B,P
80-09-05	06-18-80	0455 (N)	26°37.0'	97°15.4'	1352	13	7	SB	30	165	-	-	27.8	34.4	B,P
80-09-06	06-18-80	2214 (N)	27°34.5'	96°44.0'	2098	42	23	SB	30	025	23.5	36.6	28.5	32.2	B
80-09-07	06-18-80	2340 (N)	27°38.3'	96°48.7'	2117	31	17	SB	30	025	24.5	36.1	28.5	28.8	B,P
80-10-01	06-22-80	0935 (D)	North of Port Aransas Jetties			7	4	SB	15	030	-	-	-	-	W,B
80-13-01	**06-25-80**	**1204 (D)**	**27°50.6'**	**97°02.3'**	**2173**	7	4	SB	15	030	**25.0**	**38.8**	**26.4**	**38.8**	**B,W,P**
80-14-02	**06-26-80**	**2105 (N)**	**27°44.5'**	**96°54.8'**	**2148**	22	12	SB	30	210	**24.0**	**37.2**	**26.5**	**36.6**	**B,P**
80-14-03	06-26-80	2237 (N)	27°46.5'	97°02.2'	2143	13	7	SB	30	025	24.5	36.6	26.5	34.4	B,W,P
80-15-01	**07-07-80**	**2121 (N)**	**27°35.7'**	**96°42.1'**	**2120**	44	24	SB	30	210	23.0	37.2	28.0	37.2	B
80-15-02	**07-07-80**	**2240 (N)**	**27°38.1'**	**96°46.5'**	**2122**	35	19	SB	30	030	22.0	37.8	27.0	37.2	B
80-15-03	**07-08-80**	**0038 (N)**	**27°41.8'**	**96°52.2'**	**2135**	26	14	SB	30	210	23.5	37.8	27.0	37.2	B
80-15-04	**07-08-80**	**0225 (N)**	**27°45.1'**	**97°00.7'**	**2127**	16	9	SB	15	030	26.0	37.8	28.0	37.2	B,P
80-15-05	**07-09-80**	**1347 (D)**	**27°48.5'**	**97°02.5'**	**2153**	7	4	SB	15	210	29.0	38.3	30.0	38.3	B,W,P
80-19-01	**07-19-80**	**1750 (D)**	**27°50.8'**	**97°01.7'**	**2174**	7	4	SB	15	000	26.3	36.6	28.3	36.6	P
80-22-01	**07-22-80**	**2045 (N)**	**27°46.4'**	**96°55.6'**	**2165**	20	11	SB	15	025	24.5	36.6	27.8	35.5	B
80-23-02	**07-23-80**	**2144 (N)**	**26°45.5'**	**96°55.2'**	**1523**	48	26	SB	15	170	23.0	37.2	28.5	37.2	B
80-23-03	**07-23-80**	**2245 (N)**	**26°42.6'**	**97°00.7'**	**1461**	38	21	SB	15	170	23.0	37.2	28.0	36.6	B
80-23-04	**07-24-80**	**0030 (N)**	**26°37.6'**	**97°05.7'**	**1378**	29	16	SB	15	170	23.5	37.2	28.0	36.6	B
80-23-05	**07-24-80**	**0125 (N)**	**26°34.5'**	**97°09.7'**	**1337**	20	11	SB	15	170	24.5	37.2	27.5	36.6	B,P
80-23-06	**07-24-80**	**0240 (N)**	**26°33.3'**	**97°14.2'**	**1312**	11	6	SB	15	335	26.5	37.2	27.5	36.6	B
80-23-07	**07-24-80**	**2111 (N)**	**27°37.3'**	**96°45.6'**	**2127**	38	21	SB	15	030	24.0	37.7	28.0	36.6	B
80-23-08	**07-24-80**	**2215 (N)**	**27°40.7'**	**96°49.3'**	**2137**	29	16	SB	15	030	26.5	36.6	28.5	36.0	B
80-23-09	**07-25-80**	**0018 (N)**	**27°47.3'**	**97°02.5'**	**2139**	11	6	SB	15	015	29.0	37.2	30.0	36.6	B,W
80-24-01	**08-14-80**	**1955 (N)**	**27°35.8'**	**96°44.7'**	**2110**	40	22	SB	30	210	27.8	36.6	28.7	36.6	B,P
80-24-02	**08-14-80**	**2140 (N)**	**27°37.7'**	**96°50.0'**	**2100**	31	17	SB	30	030	28.0	36.1	29.0	35.5	B,W
80-24-03	**08-14-80**	**2128 (N)**	**27°43.5'**	**96°55.8'**	**2128**	22	12	SB	30	210	28.0	35.0	28.0	35.0	B,W
80-24-04	**08-15-80**	**0120 (N)**	**27°44.4'**	**97°03.0'**	**2105**	15	8	SB	30	030	28.2	34.4	28.4	33.3	B,W
80-25-01	**08-25-80**	**2040 (N)**	**26°47.1'**	**96°53.0'**	**1550**	53	29	SB	30	170	23.9	37.2	29.0	36.1	B
80-25-02	**08-25-80**	**2215 (N)**	**26°44.8'**	**96°56.5'**	**1510**	44	24	SB	30	065	23.8	36.6	29.0	36.6	B

Table A.1. (Cont'd.).

Station	Date	Time (D/N[a])	Location			Depth		Gear[b]	Effort (min)	Tow direction degrees	Hydrology				Species[c]
			Latitude (N)	Longitude (W)	LORAN-A (3H3)	m	fm				Bottom		Surface		
											Temp. (C)	Sal. (o/oo)	Temp. (C)	Sal. (o/oo)	
	mo-da-yr														
80-25-03	08-25-80	2345 (N)	26°39.0'	97°00.9'	1420	35	19	SB	30	355	25.2	36.1	28.8	36.1	B
80-25-04	08-26-80	0135 (N)	26°39.2'	97°07.6'	1398	26	14	SB	30	165	26.5	36.6	28.3	35.5	B
80-25-05	08-26-80	0300 (N)	26°36.3'	97°12.7'	1348	16	9	SB	30	165	27.8	35.5	28.0	35.5	B,W,P
80-25-06	08-26-80	2055 (N)	27°34.5'	96°43.4'	2100	46	25	SB	30	210	23.9	36.6	29.0	35.5	B
80-25-07	08-26-80	2220 (N)	27°36.2'	96°46.8'	2101	37	20	SB	30	025	25.7	36.6	28.4	36.1	B
80-25-08	08-26-80	2355 (N)	27°39.4'	96°53.0'	2105	27	15	SB	30	025	27.5	36.1	28.9	36.1	B,P
80-25-09	08-27-80	0145 (N)	27°43.5'	97°00.6'	2115	57	30	SB	30	025	28.2	35.5	29.2	35.5	B,P,W
80-26-01	11-03-80	1127 (D)	27°48.2'	97°03.1'	2144	7	4	SB	10	210	20.1	31.6	20.5	31.6	W
80-26-02	11-03-80	1159 (D)	27°46.7'	97°02.8'	2123	13	7	SB	10	210	21.0	32.8	21.6	32.8	W,P
80-26-03	11-03-80	1315 (D)	27°49.1'	96°59.2'	2176	15	8	SB	10	025	20.2	32.8	20.2	32.8	W,B
80-26-04	11-03-80	1347 (D)	27°49.8'	97°01.0'	2173	11	6	SB	10	210	20.2	32.2	21.5	31.6	W
80-27-01	12-18-80	1045 (D)	27°51.8'	97°01.6'	2183	7	4	SB	10	005	16.8	33.3	16.9	33.3	W
80-27-02	12-18-80	1117 (D)	27°51.3'	96°59.5'	2190	11	6	SB	10	010	16.8	33.3	17.0	32.8	W
80-27-03	12-18-80	1205 (D)	27°51.6'	96°58.0'	2203	13	7	SB	10	010	16.8	33.9	17.0	33.3	W
80-27-04	12-18-80	1243 (D)	27°51.8'	97°00.7'	2197	9	5	SB	10	010	16.8	33.9	17.2	33.3	W,B
80-27-05	12-18-80	1318 (D)	27°52.3'	97°01.4'	2193	7	4	SB	30	205	16.8	33.3	17.2	33.3	W
81-01-01	01-14-81	1159 (D)	27°47.3'	96°59.1'	2155	15	8	SB	10	205	14.2	31.6	13.2	30.0	W
81-01-02	01-14-81	1251 (D)	24°47.6'	97°02.0'	2140	9	5	SB	10	005	13.6	31.1	13.4	30.0	W
81-01-03	01-14-81	1342 (D)	27°50.9'	97°01.8'	2176	7	4	SB	10	010	13.6	31.1	13.6	30.5	W
81-01-04	01-14-81	1411 (D)	27°50.7'	97°00.2'	2180	11	6	SB	10	200	13.7	31.6	13.7	31.1	W
81-02-01	02-17-81	1145 (D)	27°50.5'	97°02.0'	2170	7	4	SB	10	010	11.8	31.6	11.8	31.6	-
81-02-02	02-17-81	1233 (D)	27°50.9'	96°58.8'	2190	13	7	SB	10	210	11.5	32.8	11.8	32.2	W,P
81-02-03	02-17-81	1315 (D)	27°48.1'	97°00.0'	2158	13	7	SB	10	210	11.3	32.8	11.5	32.8	W,B,P
81-02-04	02-17-81	1355 (D)	27°47.9'	97°02.6'	2142	9	5	SB	10	030	11.8	32.2	11.8	31.6	W
81-03-01	03-30-81	1158 (D)	27°50.3'	97°01.7'	2170	9	5	SB	10	010	20.0	34.4	20.0	34.4	W,B,P
81-03-02	03-30-81	1230 (D)	27°50.2'	96°59.4'	2182	15	8	SB	10	210	18.5	36.6	19.5	36.0	W,B,P
81-03-03	03-30-81	1315 (D)	27°47.7'	97°00.3'	2150	13	7	SB	10	210	19.0	35.5	20.0	35.0	W,B,P
81-03-04	03-30-81	1358 (D)	27°47.5	97°02.9'	2136	7	4	SB	10	010	20.0	35.5	20.5	35.0	W,B

[a] D = day, N = night

[b] Fl = 51 mm mesh flat net, 13.7 m; SB = 51 mm mesh semiballoon net

[c] B = brown shrimp (P. aztecus), W = white shrimp (P. setiferus), P = pink shrimp (P. duorarum)

Appendix B. Abundance and size of penaeid shrimp in night shrimp trawls by station (October 1977-August 1980).

Table B.1. Abundance and size of penaeid shrimp collected in individual night shrimp trawl samples off the central coast of Texas during October 1977-September 1978. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean TL (mm)	ct.	No./h	kg/h	range TL (mm)	mean TL (mm)	ct.	No./h	kg/h	range TL (mm)	mean TL (mm)	ct.	No./h	kg/h	range TL (mm)	mean TL (mm)	ct.
	mo-da-yr																								
77-01-04	10-05-77	PA	30	38	21	222	7.70	100-178	158	13						6	0.06	90-108	101	45	228	7.76	90-178	156	13
77-01-05	10-05-77	PA	30	29	16	126	3.82	85-177	145	15	2	0.04	-	140	23						128	3.86	85-177	145	15
77-01-06	10-05-77	PA	30	22	12	120	1.52	77-164	113	36	42	1.22	128-170	153	16	6	0.10	110-140	125	27	168	2.84	77-170	123	27
77-01-07	10-06-77	PA	30	11	6	26	0.24	59-119	87	49	20	0.26	94-155	130	35	78	0.60	61-149	97	59	124	1.10	59-155	100	51
77-02-03	10-25-77	PC	30	11	6						94	0.94	75-155	116	45	8	0.08	64-132	87	45	102	1.02	64-155	114	45
77-03-02	11-10-77	PA	30	11	6	146	0.60	65-101	81	110	508	7.68	104-181	125	30	684	2.60	66-110	76	119	1338	10.88	65-181	95	56
77-05-05	11-30-77	PC	30	11	6						1432	19.76	90-160	122	33	12	0.12	70-115	98	45	1444	19.88	70-115	122	33
77-05-12	12-01-77	PA	30	11	6						126	1.56	98-140	118	37	110	0.86	75-130	95	58	236	2.42	75-140	107	44
77-06-01	12-12-77	PC	30	11	6						558	5.12	80-129	106	49	24	0.26	85-124	98	42	582	5.38	80-129	106	49
77-08-08	02-14-77	PA	30	11	6						48	0.28	73-109	91	78						48	0.28	73-109	91	78
77-09-04	02-16-78	PC	30	11	6						68	0.54	74-113	95	57						68	0.54	74-113	95	57
77-11-09	03-08-78	PA	30	11	6						354	3.26	90-128	108	49	12	0.09	97-104	93	60	366	3.35	90-128	108	50
77-12-06	03-17-78	PC	30	11	6						62	1.02	85-143	127	28						62	1.02	85-143	127	28
77-16-06	05-30-78	PA	30	38	21	34	1.02	110-175	146	15											34	1.02	110-175	146	15
77-16-07	05-30-78	PA	15	31	17	44	0.56	93-149	110	36											44	0.56	93-149	110	36
77-16-08	05-30-78	PA	15	26	14	204	2.20	81-156	106	42											204	2.20	81-156	106	42
77-16-09	05-31-78	PA	15	22	12	2740	21.88	85-112	99	57											2740	21.88	85-112	99	57
77-16-10	05-31-78	PA	15	15	8	2028	14.20	81-112	94	65	48	2.14	141-194	170	10	24	0.46	88-145	116	24	2100	16.80	81-194	96	57
77-16-11	05-31-78	PA	15	11	6	496	2.76	66-120	84	82	52	2.08	145-181	163	11	16	0.32	104-148	126	23	564	5.16	66-181	92	50
77-19-01	06-08-78	PA	30	38	21	70	1.06	87-176	115	30											70	1.06	87-176	115	30
77-19-02	06-08-78	PA	30	31	17	146	1.28	82-163	102	52											146	1.28	82-163	102	52
77-19-03	06-09-78	PA	30	26	14	192	1.52	57-165	98	57											192	1.52	57-165	98	57
77-24-01	06-13-78	PA	30	22	12	4208	38.72	78-138	100	49											4208	38.72	78-138	100	49
77-24-02	06-13-78	PA	30	15	8	2854	18.19	75-132	91	71	6	0.26	164-189	176	10	18	0.32	92-129	115	26	2878	18.77	75-189	91	70
77-24-03	06-14-78	PA	30	11	6	4798	26.44	66-103	86	82	76	3.30	152-192	172	10	12	0.14	109-125	115	39	4886	29.88	66-192	87	74
77-27-06	06-28-78	PA	15	20	11	4216	35.40	71-140	97	54						4	0.12	-	133	15	4220	35.52	71-140	97	54
77-27-07	06-28-78	PA	15	15	8	2704	16.00	74-125	90	77	72	3.44	160-202	173	10						2776	19.44	74-202	92	65
77-27-08	06-29-78	PA	15	11	6	3132	18.80	71-136	88	76	156	6.76	158-191	171	10	8	0.28	130-142	136	13	3296	25.84	71-191	92	58
77-27-12	06-29-78	PA	15	53	29	332	6.32	102-192	130	24											332	6.32	102-192	130	24
77-27-13	06-29-78	PA	15	40	22	1672	19.08	70-140	108	40											1672	19.08	70-140	108	40
77-27-14	06-29-78	PA	15	33	18	1804	20.92	75-132	109	39											1804	20.92	75-132	109	39
77-27-15	06-30-78	PA	15	22	12	964	9.64	80-143	102	45						4	0.08	-	112	23	968	9.72	80-143	102	45

Table B.1. (Cont'd.).

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
77-29-01	07-12-78	PA	15	55	30	252	6.16	110-200	141	19											252	6.16	110-200	141	19
77-29-02	07-13-78	PA	15	40	22	1728	22.80	98-153	116	34											1728	22.80	98-153	116	34
77-29-03	07-13-78	PA	15	33	18	1028	11.76	82-147	107	40											1028	11.76	82-147	107	40
77-29-04	07-13-78	PA	15	22	12	1392	14.02	78-158	103	45											1392	14.02	78-158	103	45
77-29-05	07-13-78	PA	15	20	11	7688	70.84	82-142	99	49											7688	70.84	82-142	99	49
77-30-04	07-14-78	PA	15	15	8	1404	10.04	71-125	94	63	12	0.64	184-193	188	8	4	0.02	-	83	91	1420	10.70	71-193	95	60
77-30-05	07-15-78	PA	15	11	6	820	7.88	78-160	103	47	56	2.92	170-197	181	9	8	0.04	81-84	82	91	884	10.84	78-197	108	37
77-33-02	07-17-78	PA	15	38	21	1072	13.52	76-153	113	36											1072	13.52	76-153	113	36
77-33-03	07-17-78	PA	15	33	18	1224	13.44	84-161	110	41											1224	13.44	84-161	110	41
77-33-04	07-17-78	PA	15	22	12	2096	18.04	78-161	99	53											2096	18.04	78-161	99	53
77-33-05	07-18-78	PA	15	20	11	4760	39.04	74-115	95	55											4760	39.04	74-115	95	55
77-37-13	08-09-78	PA	15	24	13	408	6.08	84-157	116	30											408	6.08	84-157	116	30
77-37-21	08-10-78	PA	10	11	6	204	1.92	75-135	103	48	12	0.50	153-172	164	11	4	0.04	-	97	45	220	2.46	75-172	106	41
77-37-24	08-10-78	PA	15	38	21	636	10.00	105-170	120	29											636	10.00	105-170	120	29
77-37-25	08-10-78	PA	15	31	17	236	3.24	88-158	115	33											236	3.24	88-158	115	33
77-38-12	08-16-78	PA	15	27	15	588	9.22	96-158	122	29											588	9.22	96-158	122	29
77-38-18	08-17-78	PA	15	11	6	224	1.82	64-141	96	56											224	1.82	64-141	96	56
77-41-04	09-29-78	PA	15	38	21	52	1.40	115-160	140	17											52	1.40	115-160	140	17
77-41-05	09-29-78	PA	15	33	18	24	0.88	112-163	142	12											24	0.88	112-163	142	12
77-41-06	09-29-78	PA	15	24	13	224	3.20	78-150	112	32						8	0.12	96-128	112	30	232	3.32	78-150	112	32
77-41-07	09-30-78	PA	15	11	6	36	0.36	86-105	97	45	8	0.16	93-158	126	23	188	1.28	59-120	83	67	232	1.80	59-158	87	58
77-41-08	09-30-78	PA	15	7	4	8	0.10	89-110	100	36	24	0.60	97-165	139	18	40	0.16	57-71	69	113	72	0.86	57-165	96	38

Table B.2. Abundance and size of penaeid shrimp collected in individual night shrimp trawl samples off the central coast of Texas during May-August 1979. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
78-12-02	05-15-79	PA	30	49	27	18	0.58	138-181	153	14											18	0.58	138-181	153	14
78-12-03	05-15-79	PA	30	40	22	10	0.30	135-182	153	15											10	0.30	135-182	153	15
78-12-04	05-15-79	PA	30	33	18	8	0.22	137-161	150	17											8	0.22	137-161	150	17
78-12-09	05-16-79	PA	30	24	13						6	0.24	158-180	168	11	10	0.16	100-122	114	28	16	0.40	100-180	134	18
78-12-10	05-16-79	PA	30	15	8	12	0.15	86-144	107	36	8	0.32	155-170	162	11	50	0.76	87-157	115	30	70	1.23	86-170	119	26
78-12-11	05-16-79	PA	30	11	6	44	0.38	78-112	93	52						250	3.34	94-131	114	34	294	3.72	78-131	111	36
78-12-12	05-17-79	PA	30	7	4	192	1.32	73-114	89	66						650	7.54	92-132	109	39	842	8.86	73-132	104	43
78-13-03	05-23-79	PA	30	40	22	32	1.44	137-185	162	10											32	1.44	137-185	162	10
78-13-04	05-23-79	PA	30	33	18	30	1.14	135-180	155	12											30	1.14	135-180	155	12
78-13-05	05-23-79	PA	30	24	13	90	1.62	82-169	121	25						2	0.06	-	140	15	92	1.68	82-169	121	25
78-13-06	05-24-79	PA	30	16	9	1306	8.20	81-107	91	72	54	2.26	153-196	166	11	14	0.22	92-135	112	29	1374	10.68	81-196	94	58
78-13-07	05-24-79	PA	30	11	6	658	4.00	74-116	90	75	42	1.40	151-175	159	14	22	0.24	91-138	108	42	722	5.64	74-175	95	58
78-14-01	06-21-79	PA	30	38	21	80	1.74	98-176	132	21											80	1.74	98-176	132	21
78-14-02	06-21-79	PA	30	31	17	94	1.42	98-167	122	30											94	1.42	98-167	122	30
78-14-03	06-22-79	PA	30	24	13	358	4.80	96-144	120	34											358	4.80	96-144	120	34
78-14-04	06-22-79	PA	30	15	8	4	0.08	129-141	135	23											4	0.08	129-141	135	23
78-16-02	07-02-79	PA	30	40	22	108	1.88	110-164	128	26	12	0.44	148-161	155	12						120	2.32	110-164	130	23
78-16-03	07-02-79	PA	30	31	17	342	5.31	82-166	121	29											342	5.31	82-166	121	29
78-16-04	07-02-79	PA	30	24	13	1560	16.34	74-157	109	43						4	0.14	133-149	141	13	1564	16.48	74-157	109	43
78-16-05	07-03-79	PA	30	15	8	850	9.30	78-148	109	41	24	1.24	158-201	175	9	2	0.06	-	145	15	876	10.60	78-201	111	38
78-17-03	08-09-79	PA	30	20	11	1232	15.68	86-149	114	36											1232	15.68	86-149	114	36
78-17-05	08-09-79	PA	30	13	7	7436	50.00	66-127	91	68											7436	50.00	66-127	91	68
78-17-10	08-10-79	PA	30	38	21	262	5.98	108-168	138	20											262	5.98	108-168	138	20
78-17-11	08-10-79	PA	30	33	18	364	6.34	88-166	128	26											364	6.34	88-166	128	26
78-18-09	08-23-79	PA	60	13	7	3295	26.24	56-139	95	57						61	1.43	-	-	19	3356	27.67	-	-	55
78-18-10	08-23-79	PA	30	20	11	226	4.48	80-158	118	27											226	4.48	80-158	118	27
78-18-11	08-23-79	PA	30	38	21	166	3.66	106-171	136	21											166	3.66	106-171	136	21
78-18-12	08-23-79	PA	30	31	17	174	3.74	98-174	135	21											174	3.74	98-174	135	21

Table B.3. Abundance and size of penaeid shrimp collected in individual night shrimp trawl samples off the central coast of Texas during May-August 1980. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
80-06-01	05-19-80	PA	30	40	22	48	1.70	134-183	156	13						2	0.04	-	136	23	50	1.74	134-183	155	13
80-06-02	05-19-80	PA	30	31	17	18	0.52	134-168	151	16						16	0.34	88-158	124	21	34	0.86	88-168	138	18
80-06-03	05-19-80	PA	30	22	12	14	0.34	115-159	136	19	8	0.36	151-176	164	10	8	0.12	78-129	100	30	30	0.82	78-176	134	17
80-06-04	05-20-80	PA	30	13	7	16	0.16	69-138	95	45	14	0.50	149-168	157	13	60	0.78	68-146	108	35	90	1.44	68-168	113	28
80-06-05	05-20-80	PM	30	48	26	32	1.36	143-188	169	11											32	1.36	143-188	169	11
80-06-06	05-20-80	PM	30	40	22	44	1.96	152-177	167	10											44	1.96	152-177	167	10
80-06-07	05-21-80	PM	30	29	16	200	5.02	79-180	137	18	4	0.16	163-177	170	11	18	0.32	100-148	126	26	222	5.50	79-180	137	18
80-06-08	05-21-80	PM	30	20	11	616	3.94	72-133	90	71						238	3.44	73-167	109	31	854	7.38	72-167	95	52
80-06-09	05-21-80	PM	30	11	6	346	0.76	57-142	72	207	2	0.06	-	166	15	174	2.96	60-176	119	27	522	3.78	57-176	88	63
80-08-03	06-05-80	PA	30	40	22	32	0.90	73-166	137	16											32	0.90	73-166	137	16
80-08-04	06-05-80	PA	30	33	18	180	3.98	77-183	132	21											180	3.98	77-183	132	21
80-08-05	06-05-80	PA	30	24	13	2476	20.64	72-139	92	54											2476	20.64	72-139	92	54
80-08-06	06-05-80	PA	30	15	8	106	0.56	68-156	84	86	222	8.74	138-188	164	12	28	0.24	70-133	97	53	356	9.54	68-188	135	17
80-09-01	06-17-80	PM	30	48	26	8	0.42	142-158	150	9											8	0.42	142-158	150	9
80-09-02	06-17-80	PM	30	40	22	40	1.40	110-194	158	13											40	1.40	110-194	158	13
80-09-03	06-18-80	PM	30	31	17	414	3.90	82-198	114	48											414	3.90	82-198	114	48
80-09-04	06-18-80	PM	30	22	12	1186	9.44	65-135	90	57						80	1.74	101-161	130	21	1266	11.18	65-161	93	51
80-09-05	06-18-80	PM	30	13	7	80	0.44	62-114	76	82						38	0.92	97-157	128	19	118	1.36	62-157	93	39
80-09-06	06-18-80	PA	30	42	23	118	2.30	89-179	128	23											118	2.30	89-179	128	23
80-09-07	06-18-80	PA	30	31	17	1328	13.02	78-168	106	46						2	0.09	-	172	10	1330	13.11	78-172	106	46
80-14-02	06-26-80	PA	30	22	12	640	7.68	92-142	108	38						2	0.04	-	110	23	642	7.72	92-142	108	38
80-14-03	06-26-80	PA	30	13	7	5108	49.04	81-135	104	47	18	0.86	156-176	168	10	26	0.56	104-145	126	21	5152	50.46	81-176	104	46
80-15-01	07-07-80	PA	30	44	24	184	3.84	101-183	135	22											184	3.84	101-183	135	22
80-15-02	07-07-80	PA	30	35	19	668	10.30	92-163	123	29											668	10.30	92-163	123	29
80-15-03	07-08-80	PA	30	26	14	350	4.62	88-198	117	34											350	4.62	88-198	117	34
80-15-04	07-08-80	PA	15	16	9	3988	32.72	77-144	95	55						24	0.68	122-151	140	16	4012	33.40	77-151	95	54
80-22-01	07-22-80	PA	15	20	11	480	7.04	82-158	116	31											480	7.04	82-158	116	31
80-23-02	07-23-80	PM	15	48	26	140	4.20	123-192	150	15											140	4.20	123-192	150	15
80-23-03	07-23-80	PM	15	38	21	480	7.20	96-176	120	30											480	7.20	96-176	120	30
80-23-04	07-24-80	PM	15	29	16	2308	25.40	83-142	108	41											2308	25.40	83-142	108	41
80-23-05	07-24-80	PM	15	20	11	984	9.48	73-128	98	47						68	1.48	119-165	134	21	1052	10.96	73-165	100	44
80-23-06	07-24-80	PM	15	11	6	2868	11.48	62-128	78	113											2868	11.48	62-128	78	113
80-23-07	07-24-80	PA	15	38	21	864	13.88	95-156	120	28											864	13.88	95-156	120	28
80-23-08	07-24-80	PA	15	29	16	448	7.24	90-161	123	28											448	7.24	90-161	123	28
80-23-09	07-25-80	PA	15	11	6	696	5.80	72-141	96	54	16	0.76	164-182	174	10						712	6.56	72-182	98	49
80-24-01	08-14-80	PA	30	40	22	444	12.44	113-180	138	16						2	0.06	-	130	15	446	12.50	113-180	138	16

Table B.3. (Cont'd.).

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
80-24-02	08-14-80	PA	30	31	17	86	2.43	91-171	139	16	4	0.19	159-168	164	10						90	2.62	91-171	140	16
80-24-03	08-14-80	PA	30	22	12	506	8.72	76-153	115	26											506	8.72	76-153	115	26
80-24-04	08-15-80	PA	30	15	8	242	1.88	58-134	88	58	16	0.32	85-160	129	23	2	0.04	-	130	23	260	2.24	58-160	91	53
80-25-01	08-25-80	PM	30	53	29	118	3.32	109-183	146	16											118	3.32	109-183	146	16
80-25-02	08-25-80	PM	30	44	24	280	6.46	100-176	137	20											280	6.46	100-176	137	20
80-25-03	08-25-80	PM	30	35	19	482	9.66	105-184	135	23											482	9.66	105-184	135	23
80-25-04	08-26-80	PM	30	26	14	990	19.20	100-173	131	23											990	19.20	100-173	131	23
80-25-05	08-26-80	PM	30	16	9	2710	39.01	78-144	113	32	4	0.28	186-201	194	6	116	1.76	58-157	96	30	2830	41.05	58-201	112	31
80-25-06	08-26-80	PA	30	46	25	230	5.52	86-178	141	19											230	5.52	86-178	141	19
80-25-07	08-26-80	PA	30	37	20	248	5.72	73-173	134	20											248	5.72	73-173	134	20
80-25-08	08-26-80	PA	30	27	15	420	8.02	102-168	131	24						4	0.08	128-133	131	23	424	8.10	102-168	131	24
80-25-09	08-27-80	PA	30	18	10	2824	28.82	68-176	99	44	28	0.84	97-197	147	15	4	0.02	77- 82	80	101	2856	29.68	68-197	99	44

Appendix C. Abundance and size of penaeid shrimp in day shrimp trawls by station (October 1977-March 1981).

Table C.1. Abundance and size of penaeid shrimp collected in individual day shrimp trawl samples off the central coast of Texas during October 1977-September 1978. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
77-01-01	10-05-77	PA	30	7	4	2	0.01	-	88	91	10	0.14	107-161	139	32						12	0.15	88-161	130	36
77-01-02	10-05-77	PA	30	15	8	18	0.14	73-110	97	58	64	1.66	112-170	137	17						82	1.80	73-170	128	21
77-01-03	10-05-77	PA	30	22	12	236	2.64	72-172	113	41	60	1.86	135-178	147	15						296	4.50	72-178	120	30
77-02-01	10-25-77	PC	30	27	15	118	1.86	90-169	124	29											118	1.86	90-169	124	29
77-02-02	10-25-77	PC	30	18	10	30	0.34	85-148	113	40	64	1.78	90-211	146	16						94	2.12	85-211	135	20
77-02-04	10-26-77	PC	30	7	4																No shrimp caught				
77-03-01	11-10-77	PA	30	7	4	46	0.21	76-100	85	99	374	5.90	99-159	126	29	66	0.39	73-132	85	77	486	6.50	73-159	117	34
77-03-03	11-11-77	PA	30	24	13	10	0.09	78-129	97	50	6	0.14	120-171	146	19						16	0.23	78-171	115	32
77-03-04	11-11-77	PA	30	20	11	12	0.10	78-116	98	54	126	3.38	121-179	149	17						138	3.48	78-179	145	18
77-03-05	11-11-77	PA	30	18	10	284	1.76	71-114	92	73	702	12.76	106-163	134	25	6	0.04	81-100	88	68	992	14.56	71-163	122	31
77-03-06	11-11-77	PA	30	13	7	82	0.46	66-102	85	81	310	5.08	72-150	125	27	26	0.18	72- 99	85	66	418	5.72	66-150	115	33
77-05-01	11-30-77	PC	30	24	13	222	3.68	90-165	126	27	114	3.92	141-188	162	13	4	0.08	90-137	114	23	340	7.68	90-188	138	20
77-05-02	11-30-77	PC	30	20	11	6	0.06	114-115	114	45	86	1.94	120-186	138	20	4	0.08	122-135	128	23	96	2.08	114-186	136	21
77-05-03	11-30-77	PC	30	18	10						176	3.30	90-180	135	24						176	3.30	90-180	135	24
77-05-04	11-30-77	PC	30	13	7	28	0.22	89-115	97	58	386	5.84	95-159	120	30	4	0.04	95-120	108	45	418	6.10	89-159	118	31
77-05-06	12-01-77	PC	30	7	4						584	9.24	94-150	123	29	42	0.38	84-128	99	50	626	9.62	84-150	121	30
77-05-07	12-01-77	CB	30	24	13	48	0.84	95-162	134	26	88	1.92	113-178	143	21	2	0.02	-	85	45	138	2.78	85-178	139	23
77-05-08	12-01-77	PA	30	20	11	2	0.02	-	131	45	186	4.00	114-175	142	21	10	0.12	89-150	115	38	198	4.14	89-175	141	22
77-05-09	12-01-77	PA	30	18	10	2	0.02	-	100	45	138	3.00	115-170	136	21	6	0.10	80-160	118	27	146	3.12	80-170	135	21
77-05-10	12-01-77	PA	30	13	7						84	1.32	100-153	125	29	54	0.76	73-165	109	32	138	2.08	73-165	119	30
77-05-11	12-01-77	PA	30	7	4						728	8.74	93-148	118	38	86	0.82	73-126	100	48	814	9.56	73-148	116	39
77-06-02	12-14-77	PC	30	7	4						336	2.48	86-127	106	61	12	0.12	80-115	100	45	348	2.60	80-127	106	61
77-06-03	12-14-77	PC	30	13	7						1170	14.06	89-136	116	38	4	0.04	95- 96	96	45	1174	14.10	89-136	116	38
77-07-01	01-27-78	PA	30	7	4						26	0.15	68-106	85	79	2	0.02	-	87	45	28	0.17	68-106	85	75
77-08-01	02-14-78	PA	30	7	4						20	0.13	79-102	94	70						20	0.13	79-102	94	70
77-08-03	02-14-78	PA	30	15	8						308	2.28	82-124	100	61	4	0.03	93-102	98	60	312	2.31	82-124	100	61
77-08-06	02-14-78	PA	30	22	12						276	3.55	98-135	118	35	12	0.27	108-164	132	20	288	3.82	98-164	119	34
77-09-01	02-16-78	PC	30	7	4						136	0.72	67-113	90	86						136	0.72	67-113	90	86
77-09-02	02-16-78	PC	30	15	8						338	3.92	88-128	109	39	4	0.04	120-121	120	45	342	3.96	88-128	109	39
77-09-03	02-16-78	PC	30	22	12						318	4.64	97-140	122	31						318	4.64	97-140	122	31
77-11-01	03-08-78	PA	30	22	12						28	0.50	119-146	132	25						28	0.50	119-146	132	25
77-11-03	03-08-78	PA	30	18	10						198	2.54	101-149	120	35	6	0.07	91-126	112	39	204	2.61	91-149	120	35

Table C.1. (Cont'd.).

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No/h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
77-11-05	03-08-78	PA	30	15	8						20	0.20	97-122	110	45	2	0.03	-	132	30	22	0.23	97-132	112	43
77-11-07	03-08-78	PA	30	7	4						774	4.80	78-113	95	73	6	0.04	70-100	82	68	780	4.84	70-113	95	73
77-12-07	03-17-78	PC	30	7	4						64	1.08	115-147	127	27						64	1.08	115-147	127	27
77-12-08	03-17-78	PC	30	15	8						30	0.40	98-146	127	34						30	0.40	98-146	127	34
77-12-09	03-17-78	PC	30	22	12						4	0.08	121-162	142	23						4	0.08	121-162	142	23
77-16-01	05-30-78	PA	30	7	4																No Shrimp Caught				
77-16-02	05-30-78	PA	15	11	6	60	0.30	68-100	80	91	8	0.28	160-180	170	13						68	0.58	68-180	91	53
77-16-03	05-30-78	PA	30	15	8	1032	6.20	73-101	87	76	10	0.38	152-174	167	12						1042	6.58	73-174	88	72
77-16-04	05-30-78	PA	30	18	10	214	1.18	69-104	86	82	2	0.06	-	146	15						216	1.24	69-146	87	79
77-16-05	05-30-78	PA	30	22	12	788	4.26	78-101	89	84											788	4.26	78-101	89	84
77-24-04	06-14-78	PA	15	7	4	16	0.16	89-128	109	45											16	0.16	89-128	109	45
77-24-05	06-14-78	PA	15	15	8	384	2.84	74-141	97	61											384	2.84	74-141	97	61
77-24-06	06-14-78	PA	15	22	12	44	0.32	83-125	99	62											44	0.32	83-125	99	62
77-27-01	06-28-78	PA	15	7	4	140	0.68	65-108	83	93	16	0.60	179-189	184	12						156	1.28	65-189	93	55
77-27-02	06-28-78	PA	15	15	8	1988	14.80	73-145	93	61	44	1.88	152-172	166	11	4	0.12	-	144	15	2036	16.80	73-172	95	55
77-27-03	06-28-78	PA	15	20	11	220	1.48	76-118	92	67	4	0.28	-	173	6						224	1.76	76-173	93	58
77-30-01	07-14-78	PA	15	7	4																No Shrimp Caught				
77-30-02	07-14-78	PA	15	15	8	148	1.40	78-132	104	48	4	0.16	-	181	11						152	1.56	78-181	106	44
77-30-03	07-14-78	PA	15	20	11	4840	41.08	82-137	101	53											4840	41.08	82-137	101	53
77-33-01	07-17-78	PA	15	22	12	48	0.48	87-114	100	45											48	0.48	87-114	100	45
77-35-01	07-19-78	PA	15	7	4																No Shrimp Caught				
77-35-02	07-19-78	PA	15	15	8	48	0.53	98-170	120	41											48	0.53	98-170	120	41
77-37-01	08-08-78	PA	30	7	4	34	0.42	91-125	110	37	16	0.59	80-196	139	12	12	0.50	137-177	155	11	62	1.51	80-196	126	19
77-37-02	08-08-78	PA	30	15	8	134	1.48	80-176	108	41						2	0.10	-	192	9	136	1.58	80-192	109	39
77-37-11	08-09-78	PA	15	22	12	4	0.04	-	120	45											4	0.04	-	120	45
77-38-09	08-16-78	PA	15	7	4	52	0.56	78-135	101	42	20	0.78	127-196	161	12						72	1.34	78-196	118	24
77-38-10	08-16-78	PA	15	15	8	84	0.96	80-145	107	40											84	0.96	80-145	107	40
77-38-11	08-16-78	PA	15	22	12	4	0.04	-	116	45											4	0.04	-	116	45
77-40-01	09-21-78	PA	30	7	4						4	0.12	153-158	156	15						4	0.12	153-158	156	15
77-40-02	09-21-78	PA	30	11	6	36	0.32	85-135	99	51	208	6.40	123-195	155	15	78	0.76	65-161	95	47	322	7.48	65-195	134	20
77-40-03	09-21-78	PA	30	22	12	86	1.10	72-158	113	35											86	1.10	72-158	113	35
77-41-01	09-29-78	PA	30	9	5	8	0.06	85- 97	90	60	138	4.04	82-184	151	15	8	0.06	83-100	91	60	154	4.16	82-184	145	17
77-41-02	09-29-78	PA	15	15	8																No Shrimp Caught				
77-41-03	09-29-78	PA	15	20	11	20	0.30	99-120	110	30											20	0.30	99-120	110	30

Table C.2. Abundance and size of penaeid shrimp collected in individual day shrimp trawl samples off the central coast of Texas during November 1978-August 1979. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
78-04-02	11-08-78	PA	30	7	4						2605	26.31	77-130	109	45						2605	26.31	77-130	109	45
78-04-03	11-08-78	PA	30	13	7						388	4.28	85-155	110	41						388	4.28	85-155	110	41
78-04-05	11-08-78	PA	30	20	11						196	4.28	97-175	138	21						196	4.28	97-175	138	21
78-06-01	12-12-78	PA	30	9	5						2556	20.87	87-118	103	56						2556	20.87	87-118	103	56
78-06-02	12-12-78	PA	30	15	8						132	1.74	85-150	120	34	10	0.13	81-153	104	35	142	1.87	81-153	119	34
78-06-04	12-12-78	PA	30	22	12						130	2.59	106-165	135	23	4	0.04	94-108	101	45	134	2.63	94-165	134	23
78-07-03	01-17-79	PA	50	15	8						251	2.18	81-126	107	52	13	0.10	80-119	99	59	264	2.28	80-126	105	53
78-11-01	03-05-79	PA	45	9	5						41	0.51	93-130	114	37	1	0.01	-	90	45	42	0.52	90-130	113	37
78-11-02	03-05-79	PA	40	11	6						9	0.14	100-140	120	29	8	0.14	94-148	120	26	17	0.28	94-148	120	28
78-12-01	05-15-79	PA	30	7	4	86	0.32	60-92	77	122											86	0.32	60- 92	77	122
78-12-05	05-16-79	PA	30	9	5	94	0.62	72-104	85	69						94	1.06	85-130	105	40	188	1.68	72-130	95	51
78-12-06	05-16-79	PA	30	13	7	2	0.01	-	78	91						6	0.08	86-107	96	34	8	0.09	78-107	92	40
78-12-07	05-16-79	PA	30	20	11						2	0.08	-	157	11						2	0.08	-	157	11
78-12-08	05-16-79	PA	30	24	13											4	0.06	96-115	106	30	4	0.06	96-115	106	30
78-13-01	05-23-79	PA	30	16	9	982	5.96	76-109	94	75	14	0.56	161-175	167	11	16	0.26	92-131	118	28	1012	6.78	76-175	95	68
78-13-02	05-23-79	PA	30	22	12	52	0.40	84-159	96	59											52	0.40	84-159	96	59
78-13-08	05-24-79	PA	30	7	4	12	0.12	68- 97	86	45	44	1.62	140-189	160	12						56	1.74	68-189	144	15
78-13-09	05-24-79	PA	30	11	6	462	2.54	75-108	88	83	54	2.18	154-178	163	11	12	0.24	90-172	123	23	528	4.96	75-178	96	48
78-15-01	07-30-79	PA	30	7	4	808	5.60	63-122	91	65	46	1.88	73-205	154	11						854	7.48	63-205	94	52
78-15-02	07-30-79	PA	30	13	7	1612	14.18	77-134	104	52	20	1.12	170-202	184	8	8	0.24	132-155	143	15	1640	15.54	77-202	105	48
78-16-01	07-02-79	PA	30	9	5	304	2.97	71-153	104	46	8	0.22	169-180	174	8	18	0.60	94-167	146	14	326	3.79	71-180	107	39
78-17-01	08-09-79	PA	30	11	6	176	1.38	73-148	95	58	34	0.50	81-148	118	31						210	1.88	73-148	99	51

Table C.3. Abundance and size of penaeid shrimp collected in individual day shrimp trawl samples off the central coast of Texas during December 1979-July 1980. (Blanks = no shrimp caught.)

Station	Date	Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.	No./h	kg/h	range TL (mm)	mean	ct.
	mo-da-yr																								
79-03-01	12-19-79	PA	20	7	4	3	0.03	-	98	45	1128	7.38	64-107	90	69	15	0.09	71-131	91	76	1146	7.50	64-131	90	69
79-03-02	12-19-79	PA	15	13	7						716	6.16	72-179	101	53	8	0.06	76- 96	86	60	724	6.22	72-179	101	53
79-03-06	12-20-79	PA	30	20	11	8	0.06	86- 96	92	60	24	0.86	138-167	155	13						32	0.92	86-167	139	16
79-03-09	12-20-79	PA	30	33	18	18	0.34	102-168	137	24											18	0.34	102-168	137	24
80-01-01	01-15-80	PA	30	7	4	2	0.01	-	73	91	238	1.58	73-116	97	68						240	1.59	73-116	97	68
80-01-04	01-15-80	PA	60	15	8	1	0.01	-	97	45	148	1.92	86-141	118	35	18	0.22	83-135	110	37	167	2.15	83-141	117	35
80-03-01	02-21-80	PA	30	7	4						290	2.96	75-133	108	44	4	0.03	84- 98	91	60	294	2.99	75-133	108	45
80-03-02	02-21-80	PA	30	7	4	8	0.04	82- 96	87	91	488	4.56	85-130	104	49	16	0.08	79-111	90	91	512	4.68	79-130	103	50
80-03-03	02-21-80	PA	30	13	7						148	2.22	108-157	126	30	2	0.02	-	92	45	150	2.24	92-157	126	30
80-03-04	02-21-80	PA	30	13	7						240	3.44	94-167	123	32	6	0.04	95-140	113	68	246	3.48	94-167	123	32
80-03-05	02-21-80	PA	60	11	6						500	5.12	76-144	109	44	6	0.06	82-119	102	45	506	5.18	76-144	109	44
80-03-06	02-21-80	PA	60	11	6						571	5.41	89-141	110	48	4	0.02	97-108	102	91	575	5.43	89-141	110	48
80-08-01	06-05-80	PA	15	7	4	252	1.44	67-116	82	79	44	1.88	142-184	161	11						296	3.32	67-184	94	40
80-08-02	06-05-80	PA	15	7	4																				
80-10-01	06-22-80	PA	15	7	4	Kept alive - no wt. or meas.					396	15.92	142-198	153	11						N/A				
80-13-01	06-25-80	PA	15	7	4	1788	13.12	71-138	93	62	444	18.08	149-189	168	11	76	1.04	78-153	111	33	2308	32.24	71-189	108	32
80-15-05	07-08-80	PA	15	7	4	4	0.12	-	129	15	4	0.20	-	183	9	4	0.16	-	142	11	12	0.48	129-183	151	11
80-19-01	07-19-80	PA	15	7	4						4	0.12	-	158	15						4	0.12	-	158	15

Table C.4. Abundance and size of penaeid shrimp collected in individual day shrimp trawl samples off the central coast of Texas during November 1980-March 1981. (Blanks = no shrimp caught.)

Station		Area	Effort	Depth		Penaeus aztecus					Penaeus setiferus					Penaeus duorarum					Mixed Penaeus spp.				
			min.	m	fm	No./h	Kg/h	Range TL (mm)	Mean	Ct.	No./h	Kg/h	Range TL (mm)	Mean	Ct.	No./h	Kg/h	Range TL (mm)	Mean	Ct.	No./h	Kg/h	Range TL (mm)	Mean	Ct.
	mo-da-yr																								
80-26-01	11-03-80	PA	10	7	4						276	2.28	84-172	112	55						276	2.28	84-172	112	55
80-26-02	11-03-80	PA	10	13	7						90	1.56	97-157	123	26	6	0.03	-	88	91	96	1.59	88-157	121	27
80-26-03	11-03-80	PA	10	15	8	12	0.06	82- 83	82	91	474	7.29	88-185	126	30						486	7.35	82-185	125	30
80-26-04	11-03-80	PA	10	11	6						48	0.69	112-142	132	32						48	0.69	112-142	132	32
80-27-01	12-18-80	PA	10	7	4						558	6.06	80-153	113	42						558	6.06	80-153	113	42
80-27-02	12-18-80	PA	10	11	6						192	2.22	89-158	114	39						192	2.22	89-158	114	39
80-27-03	12-18-80	PA	10	13	7						36	0.42	107-141	116	39						36	0.42	107-141	116	39
80-27-04	12-18-80	PA	10	9	5	6	0.02	-	97	109	276	3.06	82-141	113	41						282	3.08	82-141	113	42
80-27-05	12-18-80	PA	30	7	4						118	1.56	80-165	115	34						118	1.56	80-165	115	34
81-01-01	01-14-81	PA	10	15	8						24	0.48	120-143	128	23						24	0.48	120-143	128	23
81-01-02	01-14-81	PA	10	9	5						42	0.66	100-135	117	29						42	0.66	100-135	117	29
81-01-03	01-14-81	PA	10	7	4						174	2.10	82-125	108	38						174	2.10	82-125	108	38
81-01-04	01-14-81	PA	10	11	6						30	0.36	94-125	108	38						30	0.36	94-125	108	38
81-02-01	02-17-81	PA	10	7	4																				
81-02-02	02-17-81	PA	10	13	7						330	3.30	82-131	106	45	24	0.18	82-103	92	60	354	3.48	82-131	105	46
81-02-03	02-17-81	PA	10	13	7	6	0.06	-	81	45	252	2.94	88-151	112	39	18	0.12	88-109	95	68	276	3.12	81-151	110	40
81-02-04	02-17-81	PA	10	9	5						12	0.18	104-133	118	30						12	0.18	104-133	118	30
81-02-01	03-30-81	PA	10	9	5	108	1.14	84-118	105	43	306	5.16	95-165	124	27	120	0.90	82-118	93	60	534	7.20	82-165	113	34
81-03-02	03-30-81	PA	10	15	8	36	0.72	112-137	123	23	120	2.52	89-165	132	22	114	0.90	75-115	93	58	270	4.14	75-165	114	30
81-03-03	03-30-81	PA	10	13	7	12	0.18	120-132	126	12	132	2.94	125-146	137	20	126	1.68	93-176	108	34	270	4.80	93-176	123	26
81-03-04	03-30-81	PA	10	7	4	12	0.24	116-121	118	23	6	0.18	-	120	15						18	0.42	116-121	119	19

PWD Rpt 3000-190
December 1984