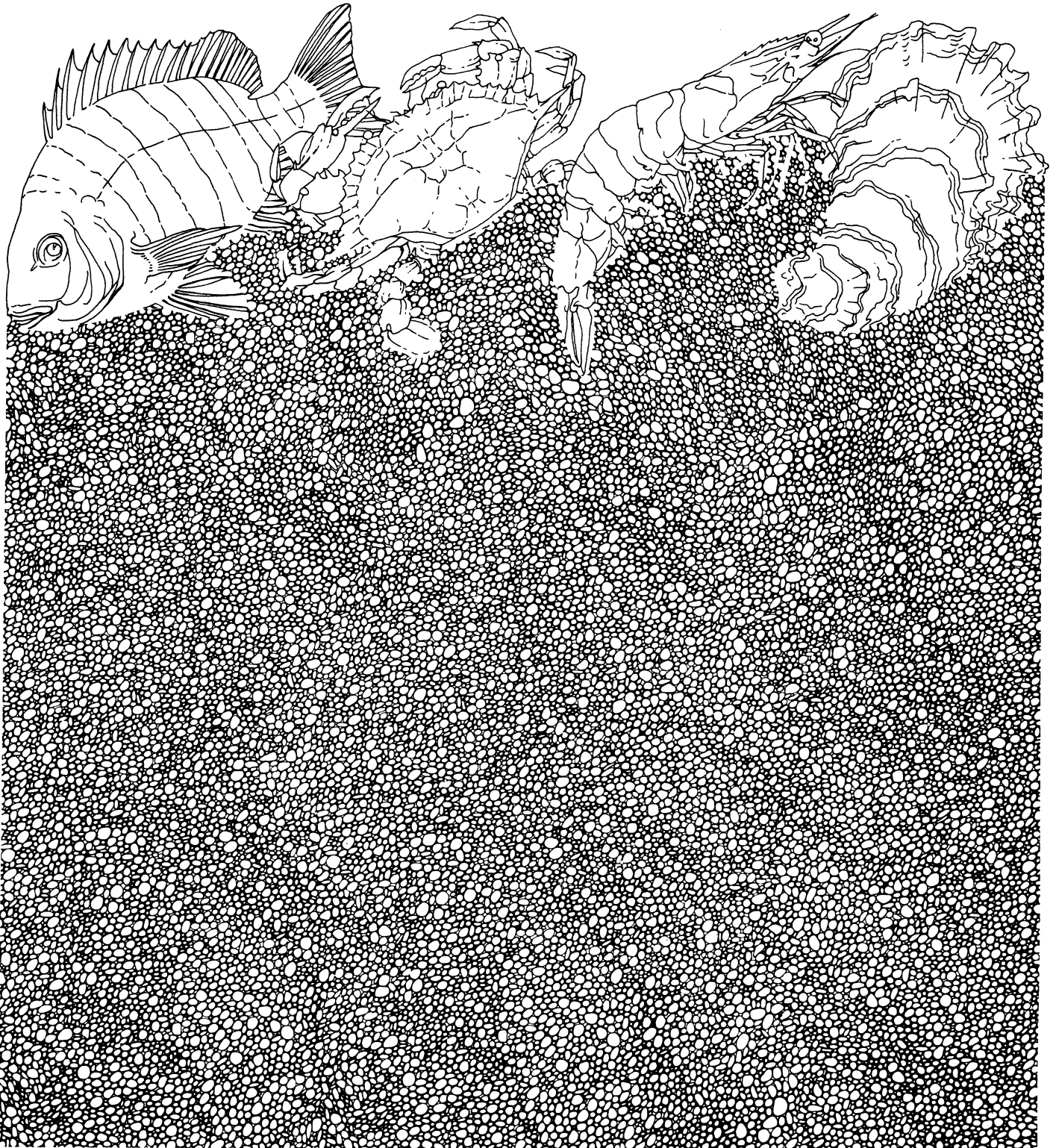


# Movement Of Emigrating Penaeid Shrimp From Aransas Pass

by Terry J. Cody and Gary C. Matlock

Management Data Series Number 128  
1988

Texas Parks and Wildlife Department  
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## ABSTRACT

There does not appear to be a predominant movement north or south of penaeid shrimp entering the Gulf of Mexico from Aransas and Corpus Christi Bays. No significant difference in catch/tow between sides (north or south) of Aransas Pass were found for brown shrimp (Penaeus aztecus), white shrimp (P. setiferus) or pink shrimp (P. duorarum). There were significant differences in the catch rate for depth and day for both brown shrimp and pink shrimp, indicating a more rapid offshore movement than for white shrimp. Analyses of landings data indicate the gulf closed seasons protect emigrating penaeid shrimp but do not prohibit access to these resources by the shrimp fishery.

## INTRODUCTION

The direction penaeid shrimp move as they enter the gulf from estuaries along the Texas coast has important management implications which apply to area closures, season closures, timing of closed seasons and sampling strategies for both short- and long-term programs. Texas closes its territorial sea to brown shrimp (Penaeus aztecus) harvest for 45-60 days during May-July to protect emigrating brown shrimp, and from 15 December-1 February to protect emigrating white shrimp (P. setiferus). Gulf waters  $\leq 12.8$ -m deep are closed at night year around.

Since 1981, at least part of the Exclusive Economic Zone (EEZ) off Texas has been closed each year during the brown shrimp closed season by the Gulf of Mexico Fishery Management Council (GMFMC) to complement the annual closure of Texas waters. These waters are closed to protect emigrating penaeid shrimp until they reach a larger, more valuable size and to minimize discarding that occurs when large numbers of small shrimp are captured (Gulf of Mexico Fishery Management Council 1981). With the closing of the EEZ, concern arose that shrimp may move south immediately after leaving Texas bays and would not be available to the U. S. fishing fleet (Gulf States Marine Fisheries Commission 1985, Klima et al. 1985, Klima et al. 1986). Tagging studies by the Texas Parks and Wildlife Department (TPWD) and the National Marine Fisheries Service (NMFS) indicated no predominant short-term movement north or south as shrimp enter the gulf (Cody and Avent 1980, Cody and Fuls 1981). Long-term recaptures have been from the south in these studies. The NMFS continued to study this trend with transboundary (Texas-Mexico) tagging studies off the lower Texas coast.

Very few shrimp tagged in the bays were recovered during these studies, so movement of emigrating shrimp has not been adequately addressed. The purpose of the present study was to determine if penaeid shrimp move predominantly south as they enter the gulf from bays on the central Texas coast.

## MATERIALS AND METHODS

Fourteen cruises were made to collect samples in two areas north (7-9 m depth; 11-15 m depth) and two areas south (7-9 m depth; 11-15 m depth) in the gulf near Port Aransas, Texas during January-December 1981 (Figure 1).

Cruises were made monthly during January-March, weekly during May through mid-June, and every 3 weeks from late October through December. No cruises were made during April, July, August and September.

Ten-minute tows were made by the R/V WESTERN GULF in each of the four depth zones. Semiballon trawls were either 12.2-m or 14.3-m wide (51 mm stretched mesh) with 0.9 by 2.1-m doors. Catch per tow data were transformed to  $\log(\text{number/tow} + 1)$  and analyzed ( $P = 0.05$ ) using a three-way analysis of variance (Sokal and Rohlf 1981). Main effects were day, depth and side of pass. Separate analyses were conducted for brown shrimp, white shrimp and pink shrimp (P. duorarum).

## RESULTS

There does not appear to be a predominant movement north or south as penaeid shrimp enter the gulf (Figures 2-4). No significant difference in catch/tow between sides of the pass were found for any species (Table 1).

Brown shrimp and pink shrimp apparently move offshore more rapidly than white shrimp. There were significant differences in the catch rate for depth and day for both brown shrimp and pink shrimp; there was also a significant two-way interaction between these two factors for brown shrimp (Table 1). No significant differences were found for white shrimp.

## DISCUSSION

The results of the present study are consistent with tagging studies by the TPWD and the NMFS. Short-term movement (<60 days) showed no net movement to the north or south for the three shrimp species (Cody and Avent 1980, Cody and Fuls 1981). Long-term movement of brown shrimp (>60 days) was southerly, while pink shrimp and white shrimp were recaptured both north and south of their release locations (Cody and Fuls 1981, Klima 1984).

Based on the present findings and tagging data from the TPWD and the NMFS studies, historical catch data used by the TPWD for long-term gulf trend information has not been biased by taking samples on only one side of the pass. Data collected in the current routine monitoring program should be comparable to data collected in previous programs that sampled only one side of the pass.

The higher catch rates of both brown shrimp and pink shrimp in the deeper depths indicate a more rapid offshore movement than for white shrimp which mature and spawn much closer to shore. A similar pattern has been reported by the TPWD in their routine monitoring program (Benefield et al. 1983, Cody and Fuls 1984, Benefield et al. 1986). If movement is similar off Brazos Santiago Pass on the lower Texas coast, then all shrimp entering the gulf from the Laguna Madre do not immediately enter Mexican waters.

Analyses of data collected in the Southeast Area Monitoring and Assessment Program (SEAMAP) and the TPWD's routine monitoring programs indicate the closure of Texas waters has been successful in protecting small shrimp and increasing the value of shrimp harvested from Texas gulf waters (Klima et al. 1985, Klima et al. 1986). This increased value to U.S. fishermen indicates that the closing of Texas waters to protect emigrating penaeid shrimp does not prohibit access to these resources by the shrimp fishery, but does delay access until shrimp reach a more valuable size.

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Table 1. Summary of three-way analysis of variance of catch rates ( $\log_{10}$  no./tow + 1) of penaeid shrimps collected in 10-minute daytime tows, with a 12.2- or 14.3-m trawl in 7-9 m and 11-15 m depth zones north and south of the jetties at Port Aransas, Texas during January-December 1981.

Species	Source of variation	Degrees of freedom	Sums of squares	F s	
Brown shrimp	Total	55	48.350		
	Sides of pass	1	0.003	0.03	
	Depth	1	3.550	9.92	**
	Days	13	35.617	7.66	**
	Sides X depth	1	0.001	0.01	
	Sides X days	13	3.116	2.21	
	Depth X days	13	4.651	3.30	*
	Sides X depth X days	13	1.411		
White shrimp	Total	55	25.015		
	Sides of pass	1	0.323	0.86	
	Depth	1	0.945	2.52	
	Days	13	11.452	2.35	
	Sides X depth	1	0.001	0.00	
	Sides X days	13	3.527	0.72	
	Depth X days	13	3.892	0.80	
	Sides X depth X days	13	4.875		
Pink shrimp	Total	55	14.014		
	Sides of pass	1	0.150	1.13	
	Depth	1	2.954	22.14	**
	Days	13	5.035	2.90	*
	Sides X depth	1	0.000	0.00	
	Sides X days	13	2.035	1.17	
	Depth X days	13	2.105	1.21	
	Sides X depth X days	13	1.735		

\* Significant at  $P < 0.05$

\*\* Significant at  $P < 0.01$



Figure 1. Penaeid shrimp sampling areas near Aransas Pass, Texas during 1981.

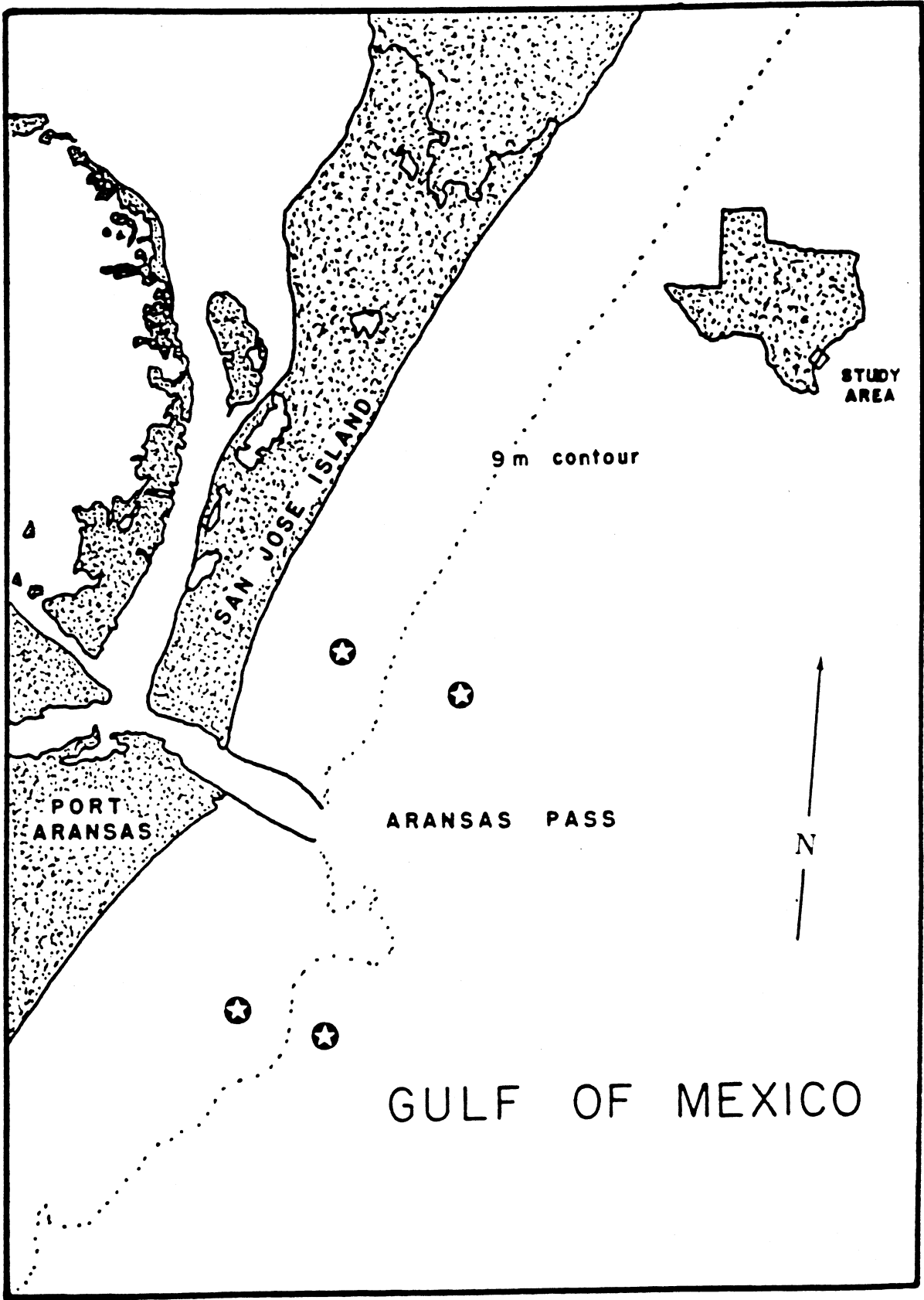
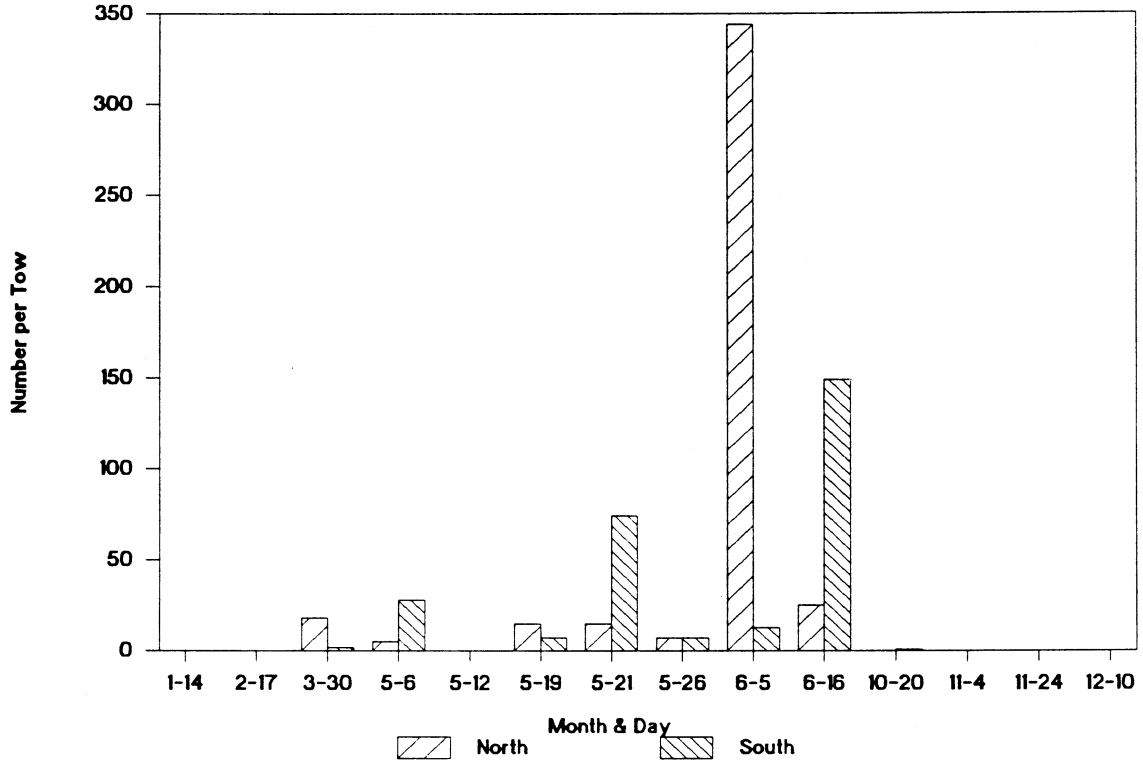


Figure 2. Number of brown shrimp per 10-minute tow by day, depth zone and direction from jetties at Aransas Pass, Texas.

# Brown Shrimp

7-9 Meters



11-15 Meters

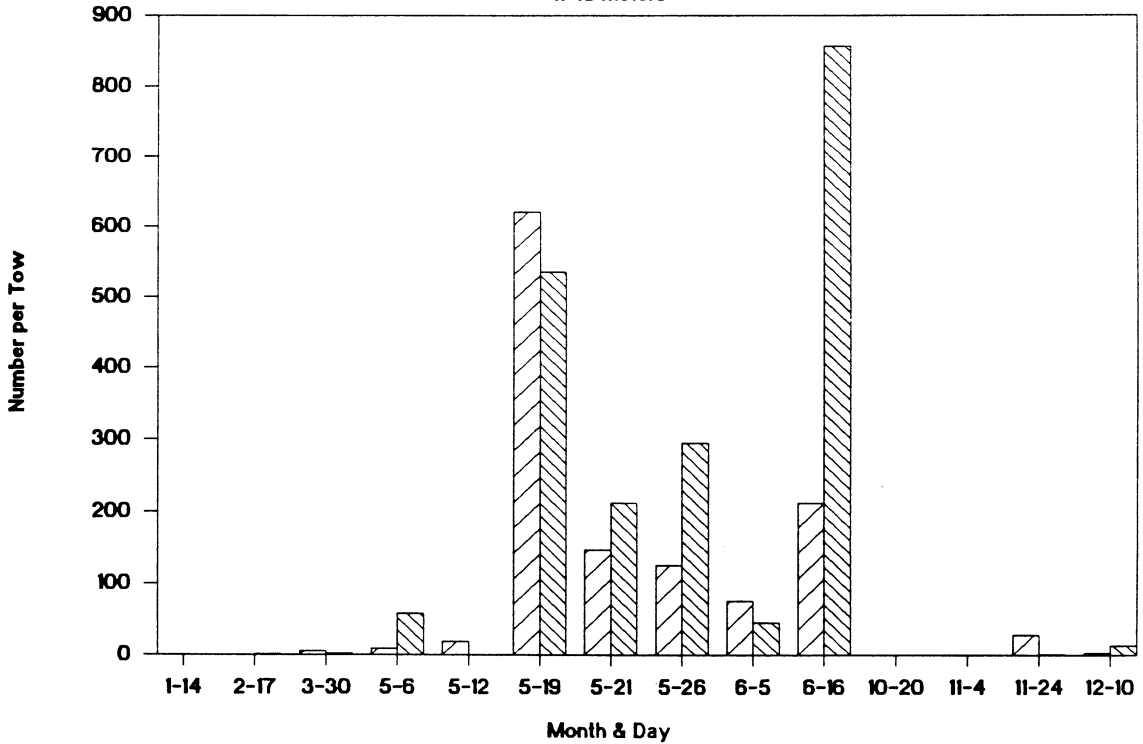
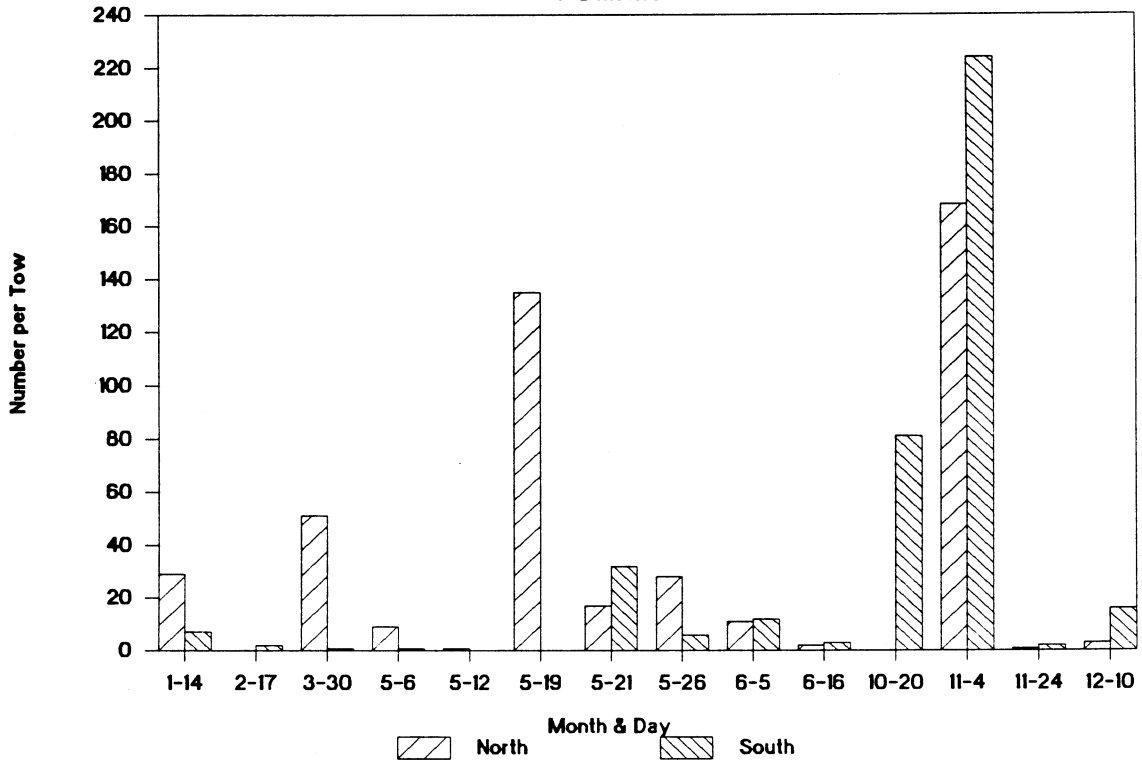


Figure 3. Number of white shrimp per 10-minute tow by day, depth zone and direction from jetties at Aransas Pass, Texas.

# White Shrimp

7-9 Meters



11-15 Meters

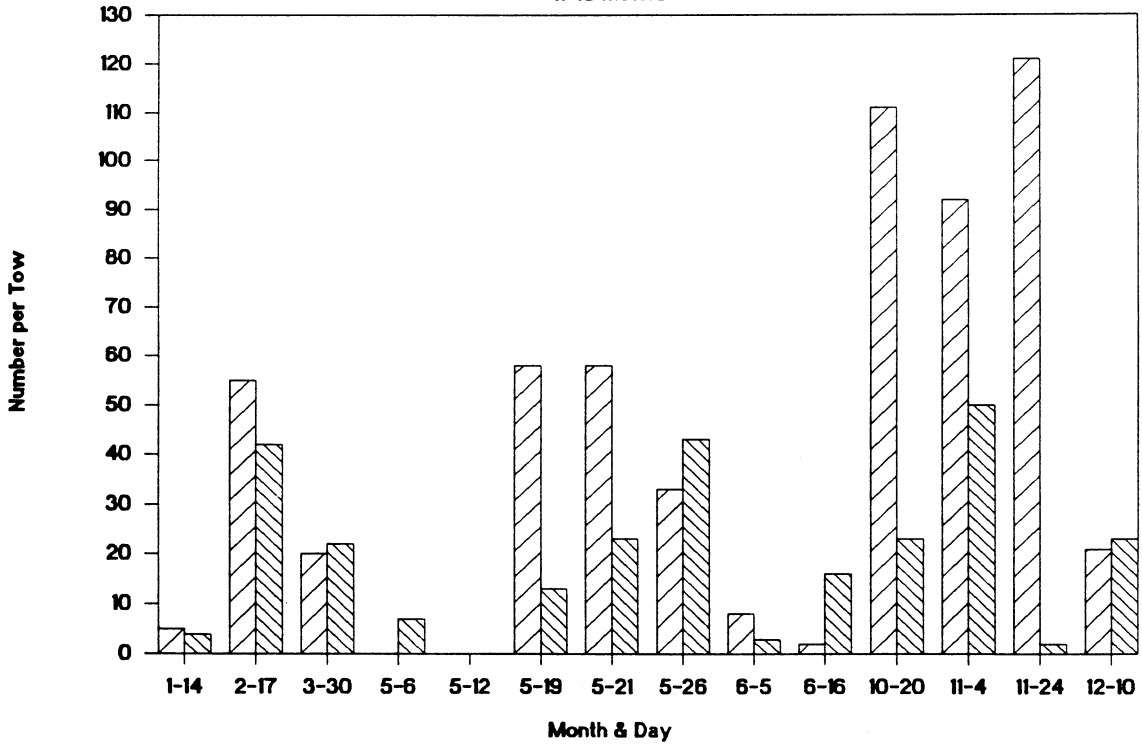
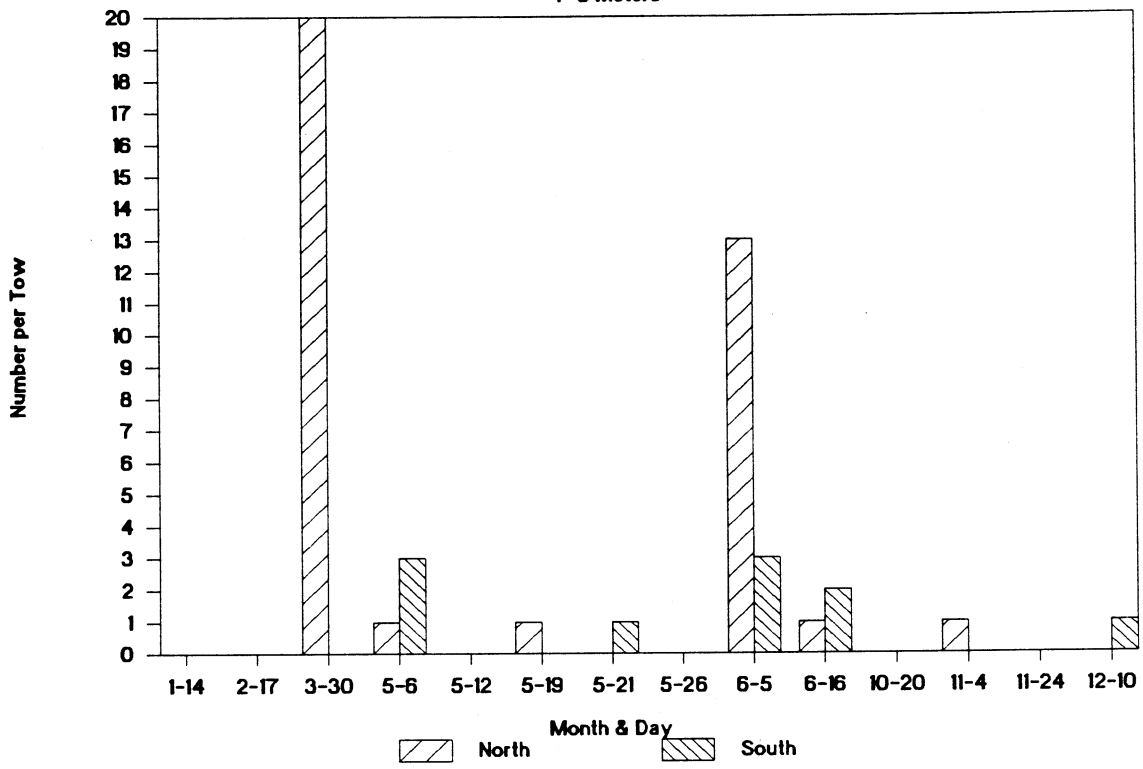


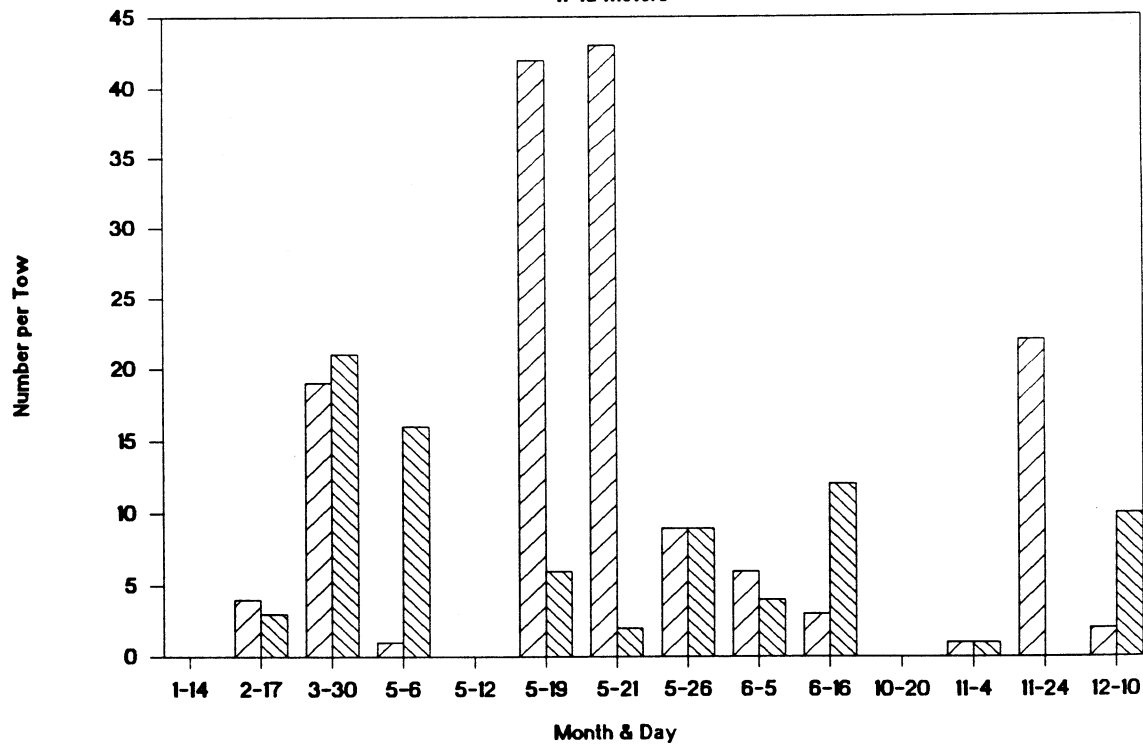
Figure 4. Number of pink shrimp per 10-minute tow by day, depth zone and direction from jetties at Aransas Pass, Texas.

# Pink Shrimp

7-9 Meters



11-15 Meters





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