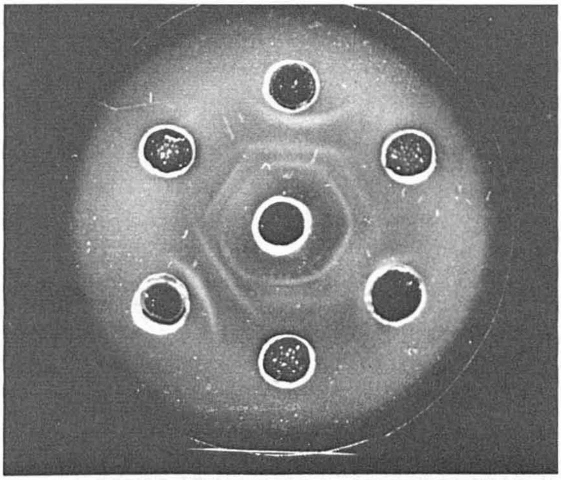

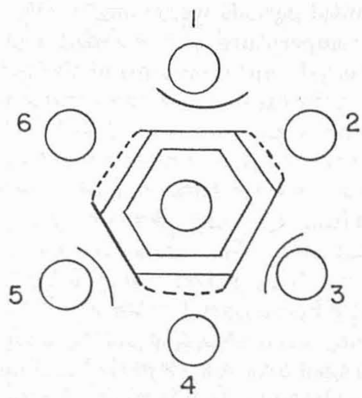

FIGURE 2.—Immunodiffusion comparison of *Vibrio anguillarum* 775 and *Vibrio* sp. 1669. Wells 1, 3, and 5 contain *V. anguillarum* 775 sonicate and wells 2, 4, and 6 contain *Vibrio* sp. 1669 sonicate. The center well contains rabbit anti-*V. anguillarum* 775 serum.

V. anguillarum 775 in rabbit anti-*Vibrio* sp. 1669 serum was removed by absorption, a titer of 16 against 1669 remained (Table 2), indicating that *Vibrio* sp. 1669 also contains antigenic determinants not present on *V. anguillarum* 775.

Whether a vaccine containing antigens from both vibrios would be more protective than vaccines containing antigens from only one of the vibrios is not known. This possibility is currently being investigated. Deoxyribonucleic acid homology experiments are also in progress to better clarify the taxonomic relation of the two vibrios.

TABLE 2. — Agglutinin titers of rabbit anti-*Vibrio* sp. 1669 serum unabsorbed and absorbed with *V. anguillarum* 775 antigen.

Condition	Titer	
	775	1669
Unabsorbed anti-1669 serum	8	32
Anti-1669 serum absorbed with 775	0	16

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RELATION OF FISH CATCHES IN GILL NETS TO FRONTAL PERIODS

A study was conducted in 1972 relating gill net catches of fishes to webbing material, time of day, and water depth in St. Andrew Bay, Fla. (Pristas and Trent[1]). While conducting the study, Pristas and Trent observed that catches in the nets appeared to be greater when atmospheric fronts moved through the area in the autumn. We decided to test the hypothesis that catches of fishes in gill nets increase during frontal periods. Experimental data were collected in September-December 1973, and the results of the analysis are presented in this paper.

[1]Pristas, P. J., and L. Trent. 1974. Comparisons of catches of fishes in gill nets in relation to webbing material, time of day, and water depth in St. Andrew Bay, Florida. Unpubl. manuscr.

Study Area and Methods

The study area was located about 300-800 m northwest of Courtney Point in St. Andrew Bay (Figure 1). Hydrological, physical, and sedimentological characteristics of the bay system were described by Ichiye and Jones (1961), Waller (1961), and Hopkins (1966). The bay system exchanges water with the Gulf of Mexico through East and West passes (Figure 1). Prevailing winds are from the southwest in the summer, north and northeast in the autumn, and north and southeast in the winter and spring. Tides are usually diurnal with a mean range of about 0.4 m in St. Andrew Bay (U.S. Department of Commerce 1967).

Eleven gill nets of different mesh sizes were fished for 87 consecutive days from 17 September to 13 December 1973. Each net was 33.3 m long and 3.3 m deep. Stretched mesh sizes ranged from 6.4 to 12.7 cm, the mesh sizes increasing by 0.6-cm increments. The nets were made of #208 monofilament nylon webbing hung to the float and lead lines on the half basis (two lengths of stretched mesh to one length of float line).

Nets were set parallel to each other about 50 m apart, perpendicular to shore, and in water depths (mean low tide) of 2.2 to 2.6 m (Figure 1). Nets remained in the water continuously except for 12 brief periods when they were randomly reset among net locations during the 87-day period. Damaged webbing never exceeded 5% of the total surface area of each net.

Fishes were removed from the nets at sunrise ±2 h and occasionally at sunset ±1 h. The total number of each species caught, including the damaged specimens, was counted. Lengths of the undamaged specimens were determined on a measuring board to the nearest 0.5 cm in fork length (tip of snout to fork of tail) for those fishes having forked tails and in total length (tip of snout to extremity of caudal fin) for Atlantic croaker and sharks.

Total catch and catches of each of the 10 most abundant species per 24-h period (catches per day) during and between frontal periods were compared using a *t*-test for unpaired observations (Steel and Torrie 1960). We tested the hypothesis that the mean catch during frontal periods (n = 23) equaled the mean catch between frontal periods (n = 64). We also used the *t*-test to test the hypothesis that the mean lengths of each of the 10 most abundant species caught during and between frontal periods were equal.

Water temperature was recorded continuously by a Peabody-Ryan[2] thermograph (Model F; accurate within 2% on time and temperature) about 1 m below the water surface at a dockside location about 100 m from the south end of the study area. Mean water temperatures per 24-h period were computed from readings taken every 6 h from the continuous data. Air temperatures, measured hourly, were obtained from the weather station at Tyndall Air Force Base located about 13 km east of the study area. Air and water temperatures were averaged over a 24-h period ending at 0600 h. Changes in water temperature per 24-h period were determined from these means.

Species and Numbers of Fish Caught

A total of 15,398 individuals representing at least 65 species (not all species of *Sphyrna* and none of *Scorpaena* were specifically identified) of marine fishes was caught during the study (Table 1). Catch per day ranged from 10 to 967 individuals and from 6 to 25 species; increases and decreases in the total number of fish caught per day were generally accompanied by similar changes in the number of species of fish caught per day (Figure 2).

The 10 most abundant species comprised 88% of the total catch. The 10 were: Gulf menhaden, *Brevoortia patronus*; spot, *Leiostomus xanthurus*; Atlantic croaker, *Micropogon undulatus*; pinfish, *Lagodon rhomboides*; pigfish, *Orthopristis*

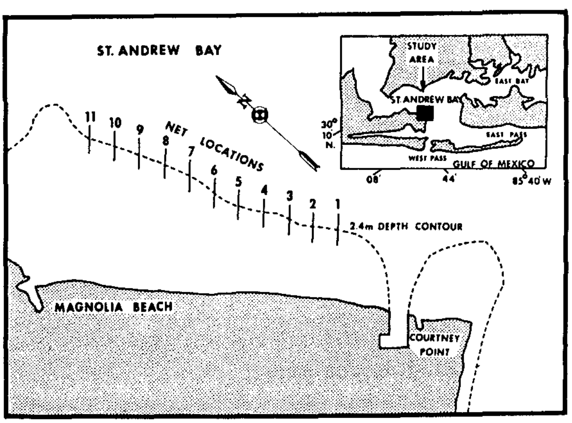

FIGURE 1.—Study area and net locations in St. Andrew Bay, Fla.

[2]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

TABLE 1.—Species and numbers of fish caught in gill nets during September-December 1973 in St. Andrew Bay, Fla.

Species	Number caught
Gulf menhaden, *Brevoortia patronus*	3,467
Spot, *Leiostomus xanthurus*	2,504
Atlantic croaker, *Micropogon undulatus*	2,335
Pinfish, *Lagodon rhomboides*	1,661
Pigfish, *Orthopristis chrysoptera*	905
Sea catfish, *Arius felis*	853
Bluefish, *Pomatomus saltatrix*	594
Spanish mackerel, *Scomberomorus maculatus*	563
Yellowfin menhaden, *Brevoortia smithi*	473
Gafftopsail catfish, *Bagre marinus*	239
Crevalle jack, *Caranx hippos*	212
Blue runner, *Caranx crysos*	211
Little tunny, *Euthynnus alletteratus*	170
Inshore lizardfish, *Synodus foetens*	123
Atlantic sharpnose shark, *Rhizoprionodon terraenovae*	94
Bonnethead, *Sphyrna tiburo*	91
Gulf flounder, *Paralichthys albigutta*	89
Florida pompano, *Trachinotus carolinus*	86
Atlantic bumper, *Chloroscombrus chrysurus*	78
Ladyfish, *Elops saurus*	74
Cobia, *Rachycentron canadum*	46
Blacktip shark, *Carcharhinus limbatus*	40
Blacknose shark, *Carcharhinus acronotus*	39
Harvestfish, *Peprilus alepidotus*	34
Yellow jack, *Caranx bartholomaei*	34
Remora, *Remora remora*	32
Hybrid menhaden, *Brevoortia smithi* × *patronus*	29
Sand seatrout, *Cynoscion arenarius*	29
Skipjack herring, *Alosa chrysochloris*	28
Bighead searobin, *Prionotus tribulus*	22
Spotted seatrout, *Cynoscion nebulosus*	22
Striped mullet, *Mugil cephalus*	22
Leatherjacket, *Oligoplites saurus*	22
Atlantic thread herring, *Opisthonema oglinum*	17
Longnose gar, *Lepisosteus osseus*	16
Florida smoothhound, *Mustelus norrisi*	15
Black drum, *Pogonias cromis*	12
Alabama shad, *Alosa alabamae*	11
Gray snapper, *Lutjanus griseus*	10
Atlantic spadefish, *Chaetodipterus faber*	10
Southern sea bass, *Centropristis melana*	8
Atlantic threadfin, *Polydactylus octonemus*	7
Finetooth shark, *Aprionodon isodon*	7
Sheepshead, *Archosargus probatocephalus*	6
Gulf toadfish, *Opsanus beta*	6
Orange filefish, *Aluterus schoepfi*	5
Gag, *Mycteroperca microlepis*	5
Sand perch, *Diplectrum formosum*	5
Atlantic moonfish, *Vomer setapinnis*	5
Hogchoker, *Trinectes maculatus*	4
White mullet, *Mugil curema*	4
Hammerhead shark, *Sphyrna* sp.	3
Southern stargazer, *Astroscopus y-graecum*	3
Smooth dogfish, *Mustelus canis*	3
Scorpionfish, *Scorpaena* sp.	2
Guaguanche, *Sphyraena guachancho*	2
Striped burrfish, *Chilomycterus schoepfi*	2
Dusky flounder, *Syacium papillosum*	2
Tarpon, *Megalops atlantica*	1
Bull shark, *Carcharhinus leucas*	1
Tripletail, *Lobotes surinamensis*	1
Shrimp eel, *Ophichthus gomesi*	1
Sandbar shark, *Carcharhinus milberti*	1
Bonefish, *Albula vulpes*	1
Halfbeak, *Hyporhamphus unifasciatus*	1
Total	15,398

chrysoptera; sea catfish, *Arius felis*; bluefish, *Pomatomus saltatrix*; Spanish mackerel, *Scomberomorus maculatus*; yellowfin menhaden, *Brevoortia smithi*; and gafftopsail catfish, *Bagre marinus* (Table 1). Catches per day of each of these are shown in Figure 3.

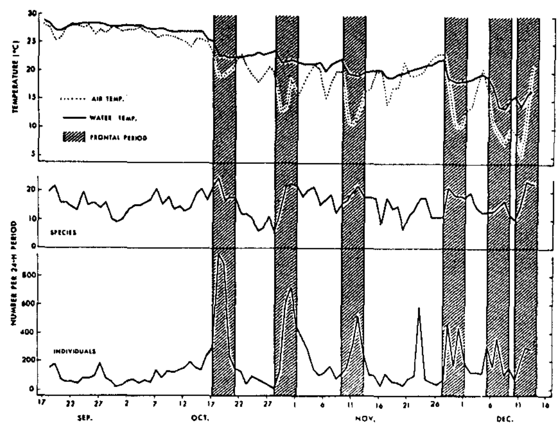

FIGURE 2.—Frontal periods, mean air and water temperatures, and numbers of species and individuals caught per 24-h period in St. Andrew Bay, Fla., September-December 1973.

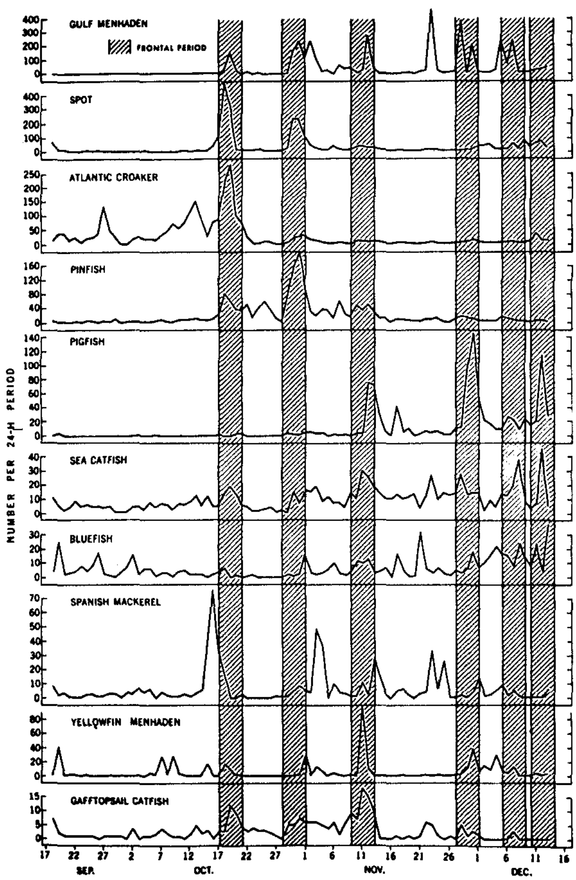

FIGURE 3.—Frontal periods and number of individuals caught by species per 24-h period in St. Andrew Bay, Fla., September-December 1973.

Frontal Periods

A frontal period was arbitrarily defined as any four consecutive days the first of which the water temperature dropped 2°C or more. Four days were selected, because fish catches were generally affected for 2 to 4 days following the initial temperature drop on the first day of a frontal period. Six frontal periods occurred in the study area from 17 September to 13 December (Figure 2). Fronts moved through the study area on 17 October, 28 October, 9 November, 27 November, 5 December, and 10 December (Figure 2). The average decrease of water and air temperatures per 24-h period for the above dates was 2.5°C and 6.4°C, respectively. In addition to decreases of temperatures, fronts passing through estuaries of the northern Gulf of Mexico are also characterized by: 1) rapid changes in barometric pressure, 2) shifts in wind direction and wind speed, 3) changes in tidal heights, and 4) increases in turbidity and velocity of tidal currents (E. J. Pullen, pers. commun., U.S. Corps of Engineers, Galveston, Tex.).

Catch Related to Frontal Periods

Each front was characterized by a marked increase in the numbers of individuals caught. Such a marked increase occurred only once (22-24 November) during a nonfrontal period (Figure 2). The mean number (all species combined) of fish caught per day was 354.7 during frontal periods and 113.1 between frontal periods (Table 2). Mean catches were significantly higher during frontal periods for all species combined and for 8 of the 10 most abundant species., Atlantic croaker and Spanish mackerel (Table 2, Figure 3) were the exceptions. Spanish mackerel was the only species caught in greatest numbers between frontal periods. Mean catches of the nine species ranged from 1.7 to 9.5 times greater during frontal periods than between frontal periods.

Mean lengths of fish caught during frontal periods were not significantly different from those caught between frontal periods for each of the 10 most abundant species (Table 2).

These results suggest that many species of marine fishes become more vulnerable to capture by gill nets in shallow areas of coastal bays during frontal periods in autumn. This increased vulnerability probably results from increased activity, migration, a lessening ability to avoid the net, and one or more of the factors associated with fronts, e.g., changes in temperature, tidal height, turbidity, and current velocity.

Acknowledgments

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TABLE 2.—Comparisons of mean catches per day and mean lengths during and between frontal periods, September-December 1973, St. Andrew Bay, Fla.

Species group or species	Mean number caught per day: During frontal periods	Between frontal periods	t-value	Mean length (cm): During frontal periods	Between frontal periods	t-value
All fish	354.7	113.1	−6.60**	(1)	(1)	(1)
Gulf menhaden	90.4	21.7	−3.46**	21.0	21.5	1.26
Spot	81.7	9.8	−4.66**	20.2	19.6	−1.85
Atlantic croaker	38.6	22.6	−1.43	26.2	25.6	−1.06
Pinfish	41.6	11.0	−4.46**	17.0	16.5	−0.64
Pigfish	30.4	3.2	−5.28**	18.2	18.9	1.36
Sea catfish	16.7	7.3	−5.68**	30.2	30.9	0.78
Bluefish	10.4	5.5	−2.74**	33.6	35.9	0.89
Spanish mackerel	5.0	7.0	0.70	34.9	36.9	1.15
Yellowfin menhaden	10.5	3.6	−2.22*	25.8	26.0	0.65
Gafftopsail catfish	5.0	2.0	−3.98**	42.7	44.2	1.06

[1]Not determined.
*Significant at 5% level.
**Significant at 1% level.

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PHOSPHOGLUCOMUTASE POLYMORPHISM IN TWO PENAEID SHRIMPS, *PENAEUS BRASILIENSIS* AND *PENAEUS AZTECUS SUBTILIS*

In a search for subpopulation differences within species of penaeid shrimp in the northern Gulf of Mexico, Proctor et al. (1974) and Marvin and Caillouet (1976) reported genetically controlled polymorphism in the enzyme phosphoglucomutase (PGM) in *Penaeus aztecus* (brown shrimp) and *P. setiferus* (white shrimp). The brown shrimp were collected in the northern Gulf of Mexico, so they are *P. aztecus aztecus* Ives, according to Pérez Farfante (1969). The white shrimp, collected both from the northern Gulf and from the North Edisto River, S.C., are *P. setiferus* (Linnaeus), according to Pérez Farfante (1969). Our paper describes similar polymorphisms in PGM in two more penaeids, *P. brasiliensis* Latreille and *P. aztecus subtilis* Pérez Farfante.

Methods

Specimens were collected off the coasts of Guyana, Surinam, and French Guiana, South America, on cruise 49 of the *Oregon II*, between lat. 6°13′ and 6°29′N and between long. 53°10′ and 53°36′W, at 22-29 fathoms, on 9 and 10 February 1974. They were stored at −20°C or below until analyzed. Preparation of abdominal muscle extracts, electropherograms of general protein patterns, and PGM zymograms followed procedures used by Procter et al. (1974). Each specimen was identified to species by morphological characteristics, then their distinctive general protein patterns (Figure 1) were used to confirm this identification. To do so, each gel was sliced horizontally into two halves after electrophoresis was complete. One half was treated with PGM specific stain and the other half was stained with Coomassie Blue.[1] Specimens of *P. aztecus aztecus*

[1]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

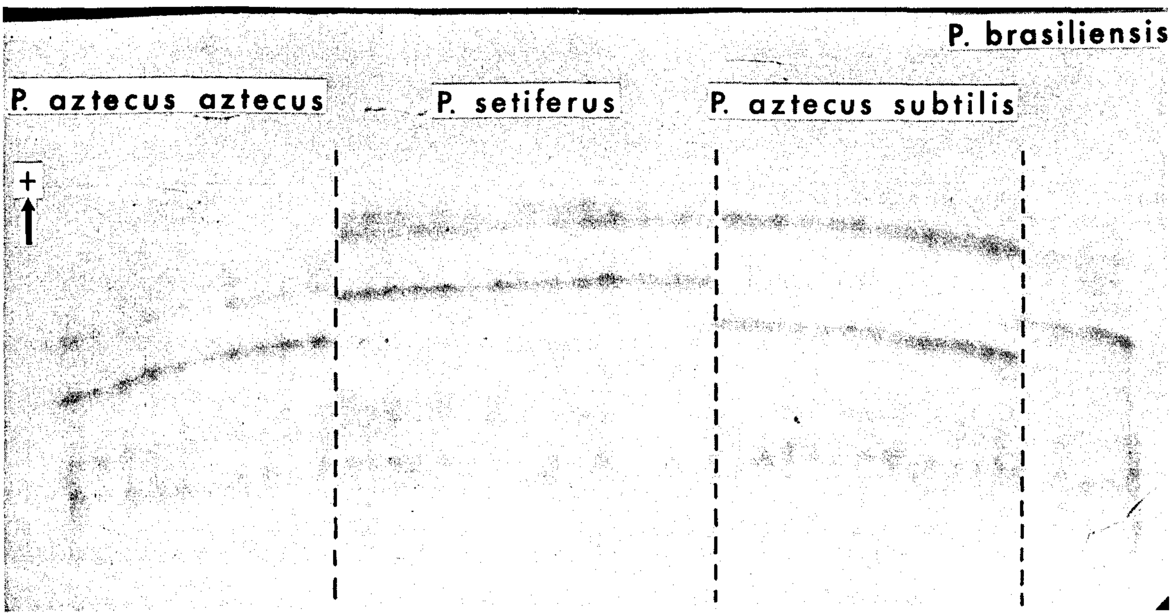

FIGURE 1. — Electropherogram showing general protein pattern of *Penaeus brasiliensis, P. aztecus subtilis, P. aztecus aztecus,* and *P. setiferus.* Stain used was Coomassie Blue. Direction (↑) of protein migration toward the anode (+) is shown.