MOVEMENTS OF BROWN SHRIMP, Penaeus aztecus, AND WHITE SHRIMP, Penaeus setiferus, OVER WEIRS IN MARSHES OF SOUTH LOUISIANA [1]

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ABSTRACT

The movements of brown shrimp (*Penaeus aztecus*) and white shrimp (*P. setiferus*) over weirs in a South Louisiana esturary were influenced by tides.

Brown shrimp concentrations inside the weir were greatest on incoming tides, water flowing into the weired area. The incoming water stimulated brown shrimp to the weir.

White shrimp concentrations inside the weir depended on water head differences between weired and outside waters. The head difference usually occurred with approaching cold fronts and drops in temperature.

The shrimp catch was greatest at night.

INTRODUCTION

The life histories of the commercially important brown shrimp (*Penaeus aztecus*) and white shrimp (*P. setiferus*) have been well documented in the numerous research projects in Louisiana.

In early spring brown postlarvae and in summer months white postlarvae enter the estuary or nursery area where they grow to juveniles or subadults. The shrimp then migrate from the shallow nursery area to the deeper bays and lakes where growth continues. Shrimp as subadults move offshore to complete their life cycle.

Most Louisiana shrimp research projects have dealt with sampling shrimp as indices of population size and density, either the sampling of postlarvae as they enter the passes between the barrier islands or as juveniles or subadults as they enter bays and lakes.

Little research has been done on the movements of juvenile shrimp as they leave weired nursery areas. The weired nursery areas are extremely important because the migrating shrimp from this area are those individuals sampled as population indices for the opening of the shrimp season. This paper deals with some observations on conditions which result in movements of juvenile shrimp across the weir and into the deeper estuarine lakes and bays.

DESCRIPTION OF THE STUDY AREA

The Jean LaCroix Research Area is located in Terrebonne Parish, 21 miles southeast of Houma, Louisiana, and 50 miles southwest of New Orleans, Louisiana, at approximately latitude 29° 23′ 15″ North and longitude 90° 26′ 50″ West.

The area is a typical brackish water marsh with salinities ranging between 4 and 20 ppt (parts per thousand). The average water depth of the area is 2½ feet. Approximately 1,300 acres of broken marsh and 600 acres of water are bounded by levees and controlled by a Wakefield Weir.

The Wakefield weir is a lapped double sheeting of 2 x 8 inch creosote lumber placed at a drainage outlet. The weir crest elevation is 6 inches below mean water level which allows a tidal flow of water into and out of the weired area while maintaining a minimum water level or basin of water behind the weir at all times of the year (Chabreck and Hoffpauir, 1965).

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Weirs were installed extensively in South Louisiana to control erosion, reduce turbidity, encourage vegetation growth, and to maintain water for ducks and fur bearing animals during winter months.

Approximately ¼ million acres of the South Louisiana marshlands are under control of weirs. The greater proportion of the weirs are in the upper marsh which is considered prime nursery areas for shrimp.

MATERIALS AND METHODS

Recruitment of postlarvae is accomplished by natural tidal fluctuation across the weir. The concentration of postlarval shrimp is monitored during high tides with plankton nets. When the concentration is highest, the postlarvae enter the natural marsh area over the crest of the weir. As the tide ebbs, a screen is placed across the weir to prevent exit of the shrimp. This tidal-exchange method is repeated with each high tide throughout the spring and summer months to recruit young brown and white shrimp.

Shrimp are sampled each week with 3½ foot nylon cast nets with ½ inch bar mesh to determine growth and distribution behind the weir during the growth period.

As the concentration of shrimp increases at the weir, the shrimp are harvested daily using cast nets and a wing net. A wing net is a net secured on a galvanized pipe frame and placed at the weir crest so that outgoing impounded water will flow into the net. The cast net catch is a good index of shrimp concentrated at the weir, and the wing net is an index of the movements of shrimp over the weir.

The wing net is emptied every ½ hour, and on days with low tides and a great head difference, harvesting can proceed all day and night.

RESULTS AND DISCUSSION

Over the past 3 years the concentration and movement of shrimp behind the weir have fluctuated greatly depending on environmental conditions. Shrimp concentrate with a given set of conditions and may disappear within hours after the removal of that condition.

This apparent disappearance of shrimp has led some investigators to sampling errors when sampling near weirs on a monthly basis.

Brown Shrimp

As brown shrimp grow from postlarvae to juveniles they are randomly distributed throughout the nursery area. Night samples confirm that juveniles are scattered throughout the impounded area in the early season.

With a rise in water temperature, the shrimp growth rate per day increases and a concentration of shrimp is observed inside the weir when water temperatures are 27-29°C. After the water temperatures reach 29-30°C, the shrimp continually concentrate inside the weir.

The usual size is approximately 100 millimeters of 50 to 55 shrimp per pound when concentrations are first noted.

Brown shrimp burrow at or near the weir. After outside waters begin flowing over the weir (incoming tide), the shrimp captured contain mud and sand in their gills because they have emerged from the bottom muds.

The average number of shrimp captured per cast net throw at the onset of incoming tide may be 1 to 2 per throw, and this may increase to 200-300 shrimp per throw at the incoming tidal peak. The shrimp are concentrated just outside the maximum current flow, and incoming tidal water temperature is usually 3°C cooler than the impounded waters.

Late in the summer, when the shrimp are subadults, they seem to be in the upper water layers and have been observed darting over the weir on incoming tides but this does not represent major movements.

The major movements of shrimp across the weir occur at dusk and on into the night. Shrimp harvesting at the research area has been in

progress daily during the months of May through November for the past three years using cast nets and the wing net. A typical early season harvest with the wing net may not represent movements over the weir but rather a concentration of shrimp. In such cases, cast nets are used to harvest the shrimp.

As the season progresses a typical harvest with the wing net may be as follows:

Time	Pounds of Shrimp
8:50 a. m.-10:20 a. m.	0
10:20 -11:30	16
11:30 a. m.-12:50 p. m.	9
12:50 p. m.- 2:30	3
2:30 - 3:45	10
3:45 - 4:30	3
4:30 - 5:15	1
5:15 - 5:40 (Dusk)	76
5:40 - 6:50 (Dark)	389
8:10 - 8:30	62
8:30 - 9:20	16
9:20 -10:00	78
10:00 -10:35	82
10:35 -11:05	87
11:05 -11:30	20

Although the catch of shrimp will vary every night, the pattern of low movements during the daylight hours and migrations at dusk and on into the night is predictable. This is based on approximately 240 nights in which shrimp were harvested.

The only large catches of browns during daylight hours were associated with strong incoming tides over the weir as previously mentioned.

A strong incoming tide throughout the day, ebbing in the late afternoon and a fairly strong outgoing tide at dusk, resulted in the greatest movements of shrimp over the weir.

Pumps have been used to simutate a tide and increased water volume in 0.1 acre ponds. As the water is pumped into the ponds, the water level rises and at dusk the shrimp follow the water current over a small weir installed at the far end of the pond. This method has proved an effective way to harvest shrimp from impoundments.

White Shrimp

The white shrimp are very elusive. As was noted by Broom in the 11th Louisiana Wild Life and Fisheries Commission Biannual Report (1964-1965), "the white shrimp are there in numbers or not at all."

Distribution samples in our research area may reveal low or no concentrations of white shrimp but on harvesting, large quantities have been netted.

The white shrimp have not been studied in as much detail as brown shrimp although studies by Broom (1966) indicate that whites grow at a faster rate than browns.

The greatest migration and catch, of whites is associated with the passage of cold fronts through the area. The catch increases on the day previous to and continues the day after the front passes.

Other factors associated with white shrimp movements include the following: (1) shifting of winds to North or Northwest, (2) increased velocity of wind, (3) drastic reduction in air and water temperatures, (4) drop in barometric pressure and (5) low tide outside weir. The tidal drop offers a great head difference between outside and weired waters.

Like the browns more whites are caught at night rather than during daylight hours.

The greatest catch of whites result with the greatest water head difference and drop in temperature.

LITERATURE CITED

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