Food Habits of Sand Seatrout in Barataria Bay, Louisiana

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Abstract: Food habits of 591 sand seatrout (*Cynoscion arenarius*) (Ginsburg) from Barataria Bay, Louisiana, were characterized. Overall, fishes and crustaceans were the most important food organisms. Mysid shrimp were dominant food items in sand seatrout <100 mm whereas bay anchovy and brown shrimp were predominate in the larger fish. Sand seatrout generally preyed upon a relatively small number of species or taxonomic groups.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 38:480-487

Sand seatrout (*Cynoscion arenarius*) occurs in the Gulf of Mexico from southwest Florida to the Gulf of Campeche, Mexico (Hildebrand 1955, Miller 1965, Moore et al. 1970). The sand seatrout is a common fish along the Louisiana coast, but is largely ignored by commercial and sport fishermen in favor of the highly prized spotted seatrout (*Cynoscion nebulosus*) and red drum (*Sciaenops ocellata*). However, increased fishing pressure probably will lead to the increased utilization of sand seatrout. Moore (1965) and Moffett et al. (1979) stressed the importance of sand seatrout as a sport fish in Texas waters.

Proper management of a fishery requires knowledge of the life history of the species involved. Unfortunately, little work has been done on sand seatrout throughout its range. Abundance and food habit information in Louisiana have been reported by Gunter (1938) and Darnell (1958). Reid (1957), Benefield (1970), and Moffett et al. (1979) provided information on abundance, population structure, food habits, growth, and spawning in Texas. Sheridan (1979) and Overstreet and Heard (1982) reported on the food habits from Florida and Mississippi, respectively.

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The purpose of this paper is to present food habit data on sand seatrout from Barataria Bay, Louisiana.

Methods

A total of 591 sand seatrout ranging in size from 27 to 384 mm (TL) were collected from the Barataria Bay system. A detailed description of the area can be found in Perret et al. (1971). Samples were taken during the summer months (April–October) from 1979 to 1981, with 3.05-, 7.60-, and 12.20-m trawls, hook and line, and a 244-m beach seine. Total length (TL) in mm and weight (WT) in grams were determined in the laboratory. Stomach contents for each fish were identified to the lowest recognizable taxon. Each food component was enumerated and weighed to the nearest 0.1 g. Fish were divided into 25-mm size groups to analyze size related trends. Common and scientific names of fishes follow the American Fisheries Society 1980 checklist (Robins et al. 1980).

The most common method of presenting food habit data is with percentages of food organisms by number, weight, and frequency of occurrence. However, these 3 methods all contain certain biases which limits the usefulness of any 1 technique (Windell 1971). To overcome this, a relative importance index (RI) was calculated for each food item. George and Hadley (1979) derived the relative importance index (RI) from the absolute importance index (AI):

$$RI = 100\, AI / \sum_{a=1}^{n} AI$$

where n = number of different food items and AI = percent frequency of occurrence + percent number + percent weight for each food item.

This index is analogous to the importance values calculated in terrestial ecology to estimate the importance of tree species within a "community" (Cox 1976).

Results and Discussion

Among all fish examined, 431 (72.8%) contained food in their stomachs. Crustaceans comprised 61.6% by number, 17.1% by weight, and 40.3% by frequency of occurrence (Table 1). Mysid shrimp were the most common food item numerically (54.1%), ranked seventh in weight (2.3%), and had the highest relative importance index (28.2). The importance of mysid shrimp as a food item was noted by Darnell (1958) and Sheridan and Livingston (1979). *Penaeus* spp. were not common in stomachs (0.9% by number) but contributed 10.0% of the weight of all food items. Blue crab and grass shrimp were relatively minor food items. The only other invertebrate was squid.

Table 1. Percent by weight, number, frequency of occurrence (in stomachs containing food) and Relative Importance Index (RI) of food items in sand seatrout from Barataria Bay, Louisiana.

Food item	% wt.	% *N*	% frequency	RI
Mysid shrimp	2.3	54.1	28.5	28.2
Grass shrimp	0.2	0.2	0.2	0.2
Blue crab	0.2	0.5	0.9	0.6
Penaeus sp.	10.0	0.9	1.6	4.2
Shrimp remains	3.4	4.0	6.5	4.6
Crustacean remains	0.7	1.8	3.5	2.0
Squid	0.3	0.1	0.2	0.2
Gulf menhaden	3.4	0.6	0.9	1.6
Bay anchovy	48.6	15.8	18.8	27.7
Sand seatrout	0.1	0.1	0.2	0.2
Atlantic bumper	0.4	0.1	0.2	0.3
Striped mullet	1.8	0.1	0.2	0.7
Fish remains	26.9	17.3	29.9	24.7
Animal detritus	2.3	4.0	7.7	4.7
Plant detritus	0.1	0.2	0.5	0.3

Fishes were found in 50.4% of sand seatrout stomachs and contributed 34.1% by number and 81.2% by weight. Fishes numerically were less common than crustaceans but contributed almost 5 times more biomass. Fishes consequently had a higher relative importance index than crustaceans (55.1 to 39.8). Unidentified fish remains occurred in 29.9% of stomachs and contributed 26.9% of the biomass. Bay anchovy (*Anchoa mitchelli*) comprised 92% of all identifiable fish species. Overall, bay anchovy occurred in 18.8% of the stomachs and contributed 48.6% of the biomass. Other fishes found in sand seatrout stomachs included Atlantic bumper (*Chloroscombrus chysurus*), gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), and sand seatrout.

The dominance of bay anchovy among ingested fish concurred with other studies (Sheridan 1979, Sheridan and Trimm 1983, Overstreet and Heard 1982). Darnell (1958), however, noted that gulf menhaden was the most conspicuous of all fishes consumed by sand seatrout. Reid et al. (1956) also found that gulf menhaden was a predominant food item of fish >100 mm. In the present study, gulf menhaden made up <1% (Table 1) of all food items and was only found in fish >326 mm.

The presence of sand seatrout in the stomach contents documents cannibalism among these fish. Cannibalism by sand seatrout has been reported in Lake Pontchartrain, Louisiana (Darnell 1958), and Galveston Bay, Texas (Reid 1956). Merriner (1975) noted cannibalism among weakfish (*Cynoscion regalis*), a cognate species of sand seatrout in the high salinity sounds and nearshore areas of North Carolina. Thomas (1971) reported weakfish as

Table 2. Size variation in Relative Importance Index of food organisms in sand seatrout from Barataria Bay, Louisiana (size group 1 = 25–50 mm, 2 = 26–75 mm, etc. to 13 = >325).

	Size group												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Mysid shrimp	93.4	72.5	16.0	4.9									
Grass shrimp			3.2										
Blue crab				3.3						3.6			
Penaeus spp.								3.0		10.7	42.5	9.2	36.3
Shrimp remains			12.8	16.7	2.9	4.1	18.9		2.3				
Crustacean remains	6.5	1.0	7.6	5.5									
Squid										5.2			
Gulf menhaden													39.7
Bay anchovy		2.9	2.7	28.2	58.6	57.4	59.0	64.0	15.7	36.7		18.8	
Sand seatrout						7.6							
Atlantic bumper							3.3						
Striped mullet												40.1	
Fish remains		21.0		41.4	38.4	28.6	16.9	32.9	81.8	40.9	57.4	31.8	24.0
Animal detritus		1.0	57.4										
Plant detritus		1.6				2.0	1.7			2.6			
Sample size	95	54	56	63	66	44	45	46	45	37	10	17	12
% empty	14.7	12.9	14.2	14.2	7.5	27.2	37.7	58.6	51.5	51.3	50.0	50.9	50.0

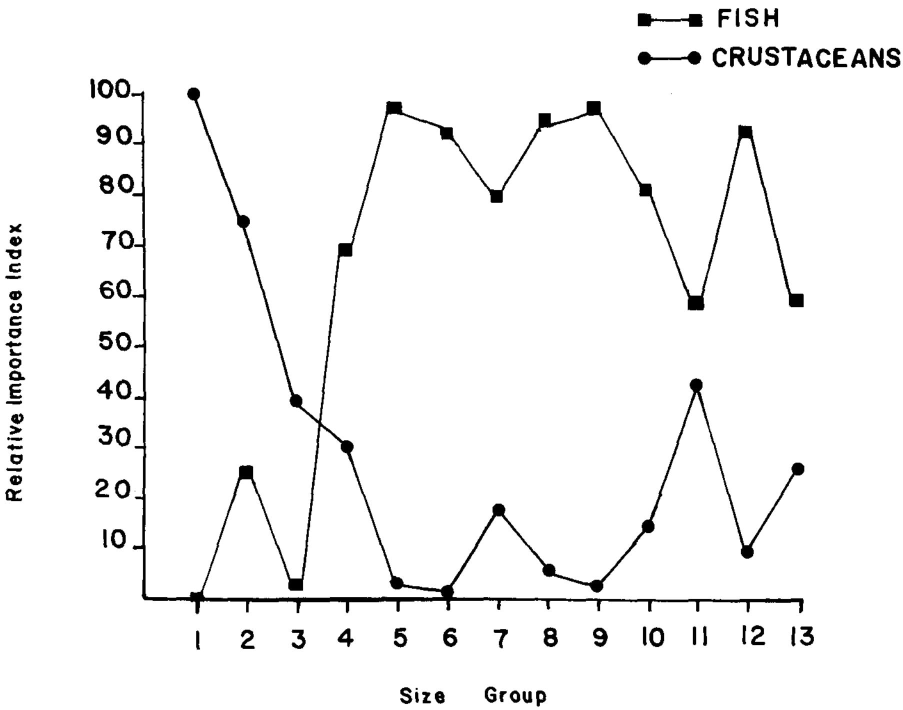

Figure 1. Changes in relative importance index of fish and crustaceans with respect to size groups (size group 1 = 25–50 mm, size group 2 = 51–75 mm, etc. to size group 13 = >325 mm).

the single most important food item of weakfish obtained from certain Delaware River habitats.

Sand seatrout were divided into 25-mm size groups to determine size-related differences in food habits (Table 2). Pronounced shifts in the percent empty stomachs, species composition, and relative abundance of prey occurred with progression of sand seatrout size.

In the 5 size classes <150 mm, the percentage of empty stomachs ranged from 7.5% to 14.7%. The percentages of empty stomachs was greater in the larger size groups; in the 6 size classes >200 mm, the percentage did not drop below 50%. Smaller fish apparently feed more often than larger fish.

The only identifiable food item in the 25- to 50-mm size group was mysid shrimp. Mysid shrimp were also a dominant food item in fish 51 to 100 mm in size, but were not found in fish >125 mm.

Brown shrimp (*Penaeus aztecus*) first appeared in sand seatrout 201 to 255 mm in length, and became an important food item in fish >251 mm. In 2 size groups (276–300 mm and >326 mm), brown shrimp had the second highest relative importance index. Divita and Creel (1982) found a direct correlation between fish size and size of consumed brown shrimp and reported that swimming speed and behavior could limit the ability of small fish to prey on the large shrimp.

Fish were first found in size group 2 (51–75 mm) (Table 2) and increased in importance until in the intermediate size groups (5–9), sand seatrout are almost exclusively piscivorous. This shift in sand seatrout food items from small non-penaeid crustaceans to fish is further illustrated in Fig. 1. Sheridan and Livingston (1979) also noted that a rapid and concurrent switch to a fish diet not only coincided with growth but with a movement of the maturing fish towards the mouths of the estuaries. This migration may be dictated by the abundance of a specific food item, thus allowing sand seatrout to occupy different areas seasonally.

Sand seatrout in Barataria Bay thus appeared to be fairly selective feeders. Ivlev (1961) concluded that selection is based on the sum total of 2 broad interrelated factors: the preference shown by the predator to consume 1 size or species of prey rather than another; and the degree of prey accessibility. However, since predator preference cannot be separated from prey accessibility (Beyerle and Williams 1968), actual preferences of sand seatrout can only be suggested. Divita and Creel (1982) presented data suggesting that sand seatrout have a preference for brown shrimp and white shrimp (*Penaeus setiferus*) in the fall which it apparently lacks in the summer. Moffett et al. (1979) found penaeid shrimp in 25 to 27 stomachs of fish obtained in the fall which he concluded, reflected the fall availability of white shrimp in Texas estuaries. Sheridan and Trimm (1983) suggested age and habitat dictated sand seatrout food habits.

Overall, sand seatrout from Louisiana have similar feeding habits as those reported from other areas of the Gulf of Mexico (Reid et al. 1956, Darnell 1958, Diener et al. 1974, Moffett et al. 1979, Sheridan 1979, Overstreet and Heard 1982, Sheridan and Trimm 1983). They feed on a relatively small number of species or taxonomic groups with fish and crustaceans being the most important food items. Sand seatrout also demonstrated a distinct shift in feeding habits from mysid shrimp to fish with progression of size.

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