Evidence for Mesopelagic Feeding by the Vermilion Snapper, *Rhomboplites aurorubens*

ROBERT L. DIXON

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ROBERT L. DIXON
National Marine Fisheries Service,
Atlantic Estuarine Fisheries Center, Beaufort, N.C. 28516

Abstract

Examination of the stomachs of 17 vermilion snapper, *Rhomboplites aurorubens*, collected from Onslow Bay, North Carolina showed that crustaceans, principally amphipods, were the most frequent food. Field observations, food items, and morphological traits indicate that the vermilion snapper feeds in the water column rather than on the bottom.

Introduction

The vermilion snapper, *Rhomboplites aurorubens* (Lutjanidae, Pisces) is distributed in the deep water (25 to 150 m) of continental shelves and island margins from North Carolina to Venezuela (Brownell and Rainey, 1971). The vermilion snapper is abundant over much of its range and is a high quality seafood, but the fish is not an important commercial species. Commercial handline fishermen prefer the larger, more valuable "red" snappers (*Lutjanus campechanus*, *L. vivanus*, and others) and do not fish specifically for vermilions. However, the vermilion snapper is an important recreational fish in the Southeastern United States. Anglers fishing from headboats[1] in North and South Carolina landed 81,000 fish weighing about 108,000 pounds in 1972 (Sekavec and Huntsman, 1972).

Very little information is available on the biology of any of the species of groupers, snappers, and porgies that support the Southeastern United States headboat fishery. A list of important contributions to the knowledge of snapper life histories includes a life history study of the gray snapper, *L. griseus* (Starck and Schroeder, 1971), a brief life history of the red snapper, *L. campechanus* (Moseley, 1966), a study of food habits of reef fish (Randall, 1967), and the life history and fishery of the red snapper, *L. campechanus*, in the northwestern Gulf of Mexico (Bradley and Bryan, 1974). There is no previous work on the biology of the vermilion snapper.

A preliminary investigation of the foods of vermilion snapper was designed to place this species within the trophic structure of the outer continental shelf fish community as part of the research on demersal fishes of the Southeastern United States being conducted at the Atlantic Estuarine Fisheries Center of the National Marine Fisheries Service.

Method

Seventeen fish, caught from headboats by hook and line fishermen, were collected from Onslow Bay, North Carolina from March through November 1972. The fish were weighed to the nearest 45 g (0.1 lb) and total length measured to the nearest millimeter. Individuals ranged in total length from 281 to 568 mm. The stomachs were removed, labeled, and preserved in a 10% formalin solution as the fish were caught or at the dock after the boats returned.

In the laboratory, the contents were removed by flushing the opened stomachs with 40% isopropanol. The food organisms were identified as fish or invertebrates. As a result of digestion the fish were not identifiable. The invertebrates were identified by order or a lesser taxonomic group. Each organism was measured to the nearest millimeter.

Results

The stomach contents were tabulated to determine the number of individual foods and

[1] Headboats are vessels on which anglers pay for passage by the person, or "head," rather than by a fixed charter rate.

Table I

Stomach contents of 15 vermilion snappers (281 to 568 mm total length) collected from Onslow Bay, North Carolina, March 1972 to November 1972

Stomach Contents	Number	Relative Number (%)	Frequency of Occurrence	Relative Frequency (%)
Fishes	7	7.4	4	26.7
Unidentified	7	7.4	4	26.7
Invertebrates	88	92.6	8	53.3
Crustaceans	70	73.7	8	53.3
Copepod	7	7.4	2	13.3
Ostracod	4	4.2	1	6.7
Isopod	2	2.1	2	13.3
Rock shrimp	1	1.1	1	6.7
Euphausid shrimp	16	16.8	2	13.3
Crab, unidentified	1	1.1	1	6.7
Reptantia	1	1.1	1	6.7
Anomuran zoea	6	5.3	2	13.3
Amphipod	31	32.6	5	33.3
Stomatopod	1	1.1	1	6.7
Crustacea, unidentified	1	1.1	1	6.7
Molluscs	5	5.3	3	20.0
Squid	2	2.1	2	13.3
Gastropod	3	3.2	1	6.7
Annelids	12	12.6	1	6.7
Polychaete fragments	12	12.6	1	6.7
Sipunculid larva	1	1.1	1	6.7
Total	95		15	
Miscellaneous				
Egg mass			2	13.3
Algae, *Ceratium*	1		1	6.7
Unidentified food			3	20.0

percentage frequency of occurrence of each food. Crustaceans were the predominant food item in the 15 (88 percent) of the stomachs that contained food. They occurred in 53 percent of the stomachs containing food, and represented 74 percent of the total food items (Table I). Amphipods were the most frequently occurring crustacean (33 percent of total food items and 44 percent of crustaceans by number), and were found in 33 percent of the stomachs. Euphausid shrimps were second highest in number while other invertebrates included molluscs, annelids, polychaetes, and a sipunculid larva. Fish remains were found in 26.7 percent of the stomachs but represented only 7 percent of the food items by number. Unidentified foods occurred in 20 percent of the stomachs.

There appeared to be no relationship between size of fish and the size of food consumed. Frequently, the larger fish ate the small food items and conversely (Table II). Approximately 52 percent of the foods were 1 to 10 mm in total length and 89 percent were 30 mm or less.

Discussion

Vermilion snapper are usually caught with relatively large baits, often cut squid, fished on the bottom, but apparently they normally feed on small mesopelagic organisms. Most (72.6 percent) of the food items were crustaceans smaller than 20 mm in total length. The frequency of these animals in the stomachs may be higher than that observed, but many are so fragile that they are digested rapidly.

Two other observations indicate that vermilion snapper are primarily mesopelagic

Table II

Comparison of size of foods eaten to total length of vermilion snapper

Length of Food Item (mm)	Number	Relative Number (%)	Total Length of Fish (mm)
< 1.0	1	1.1	485
1.0–10.0	49	51.6	281, 383, 391, 431, 486, 492, 500, 568
10.1–20.0	30	31.6	344, 397, 431, 475, 482, 492, 568
20.1–30.0	5	5.3	383, 568
30.1–40.0	2	2.1	568
40.1–50.0	1	1.1	568
50.1–60.0	0	0.0	
60.1–70.0	1	1.1	365
70.1–80.0	0	0.0	
80.1–90.0	4	4.2	348, 359, 365
90.1–100.0	1	1.1	365
100.1–110.0	0	0.0	
110.1–120.0	0	0.0	
120.1–130.0	1	1.1	344
Total	95	100.3	

feeders. First, schools of vermilion snapper, located by depth recorders and identified by angling, usually occur 2 to 6 m up in the water column rather than on the bottom. Second, the morphology of the vermilion snapper is strongly indicative of mesopelagic feeding. Davis and Birdsong (1973) listed ten morphological characteristics common to fish which forage in the water column associated with coral reefs, and pointed out that some fishes from at least five families (Labridae, Lutjanidae, Serranidae, Pomadasyidae, and Pomacentridae) share these characteristics. The characteristics are: (1) a more lunate (relative to the familiar pattern) caudal fin, (2) a more falciform pectoral fin, (3) a more terete body form, (4) finer squamation, (5) a larger eye size, proportional to the head size, (6) finer dentition on the jaws, (7) finer teeth on the pharyngeal plates, (8) longer, more numerous, and finely toothed gill rakers, (9) reduced ossification of jaw and head bones, and (10) longer premaxillary processes together with greater protrusibility of the jaw. The vermilion snapper has these ten characteristics.

The data indicate that the vermilion snapper primarily feeds on small mesopelagic organisms and does not substantially compete with bottom foraging species. Davis and Birdsong (1973) recognized the yellowtail snapper as a lutjanid that forages in the water column. The vermilion snapper apparently feeds similarly to the yellowtail and replaces it in deep water.

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