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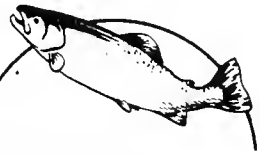

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FISH AND WILDLIFE SERVICE

United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner
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FIGURE 1.--CHANNELED WHELK LAYING EGGS.

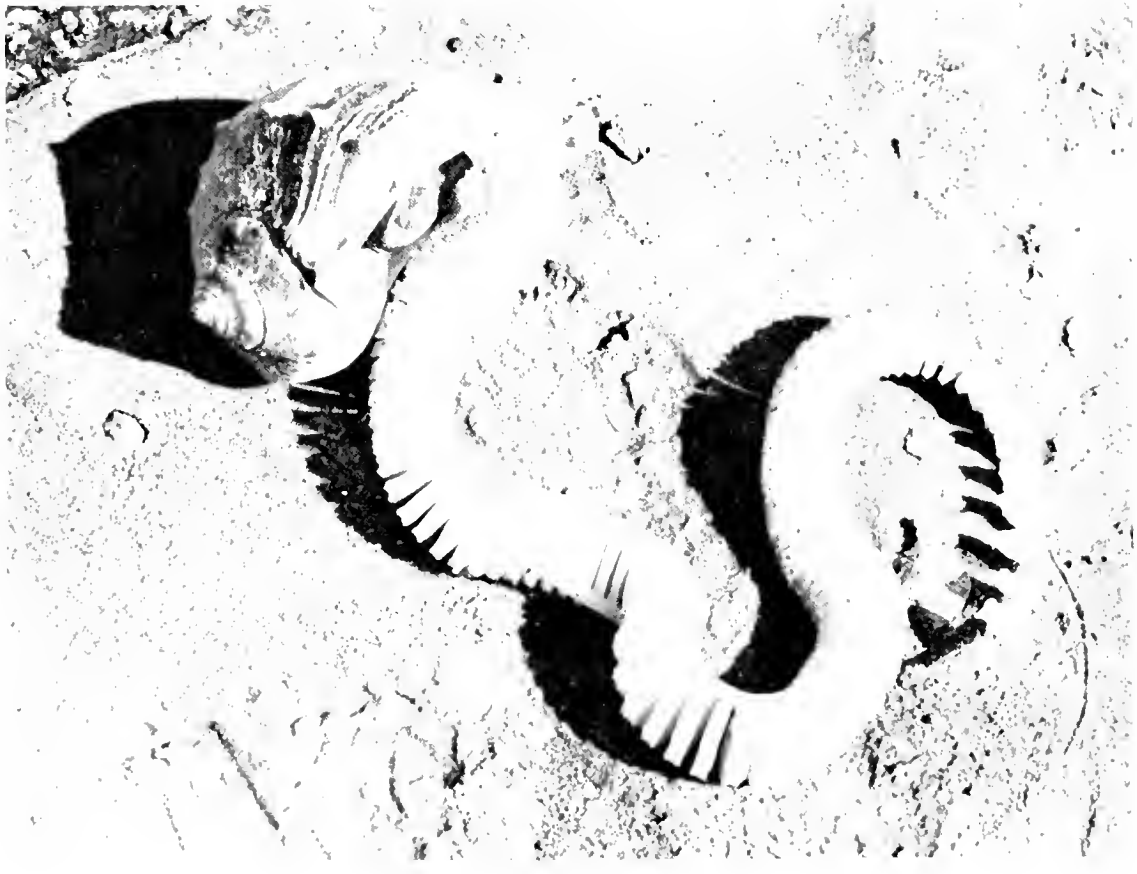

FIGURE 2.--KNOBBED WHELK LAYING EGGS.

OBSERVATIONS ON HABITS AND A METHOD OF TRAPPING CHANNELED WHELKS NEAR CHATHAM, MASSACHUSETTS

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ABSTRACT

A wooden trap for the purpose of removing the majority of channeled whelks from oyster beds was designed and successfully tested on Oyster Pond River, Chatham, Massachusetts. In 1957 and 1948, 2,174 channeled whelks were trapped from a 2-acre lease. This paper gives the design of trap, types of bait, trapping procedure, catch rate, and rate of whelk predation on oysters. It appears advisable for oyster growers to undertake trapping operations each spring to minimize oyster losses inflicted by the channeled whelk.

In the spring of 1957 the oyster growers of Chatham, Mass. reported high losses of oysters from predation by two species of large snail, the channeled whelk, Busycon canaliculatum (fig. 1), and the knobbed whelk, Busycon carica (fig. 2). In response to their request for help the Woods Hole Biological Laboratory of the U. S. Bureau of Commercial Fisheries conducted studies in 1957 and 1958 on the habits and possible methods of controlling these predators. Trapping appeared to be the most efficient, safest, and cheapest method of removing the whelks from the oyster grounds. Since previously devised traps were inefficient, it was necessary to devise a new type and test its operation and efficiency in the field. This paper reports the results of those studies.

The author is indebted to J. C. Hammond, commercial oyster grower, whose help in the field made this project possible; and to Robert K. Brigham of the U. S. Fish and Wildlife Service for permission to publish the photographs of the channeled and knobbed whelk.

STUDY AREA

The study was conducted on Oyster Pond River, a small indentation of Stage Harbor, 2 miles west of Chatham, Mass. Depth of water on the oyster grounds ranges from 2 to 8 feet at mean low water. The average height of tide is approximately 4 feet. Water salinity ranges from 29 °/₀₀ to 32 °/₀₀. The substrate over most of the area consists of fairly hard-packed sand, but in deeper water away from shore the bottom is rather soft owing to a higher percentage of silt and clay.

This locality is near the northern limits of distribution of the whelks. According to Sumner, Osborn, and Cole (1913) the range of the channeled whelks extends from Beverly, Mass. (north of Cape Cod) to the Gulf of Mexico, and that of the knobbed from Cape Cod to St. Thomas, West Indies. Though frequently not distinguished, both species occur throughout the length of Oyster River, but most of them concentrate on the commercial oyster beds.

FOOD HABITS OF BUSYCON

The diet or Busycon consists of several species of pelecypods, annelids, and occasionally dead fishes and gastropods (Magalhaes 1948). Some of the more favored species, as observed by Magalhaes

in laboratory experiments, are stout tagelus (Tagelus gibbus), cross-barred venus (Chione cancellata), and quahaugs (Mercenaria (Venus) mercenaria). The whelks in Oyster Pond River appeared to prefer oysters (Crassostrea virginica), but were also observed feeding on quahaugs and blue mussels (Mytilus edulis).

The manner in which Busycon attacks oysters is of interest. According to Colton (1908), the whelk crawls on top of the oyster; then when the oyster opens, the snail thrusts the edge of its shell between the valves and introduces the proboscis. The oyster is eaten in 40 minutes. According to Warren (1916), the whelk opens an oyster by grasping the bivalve in its foot and chipping away the shell with the edge of its outer lip. When enough shell is chipped away, the whelk inserts its proboscis and consumes the oyster.

We do not know the feeding rate of channeled and knobbed whelks in nature. In laboratory experiments conducted by Carriker (1951) with a mixed group of whelks, each snail consumed from 0.8 to 2.7 oysters a week. Fifty percent of the oysters eaten were less than three-quarters of an inch in height; all others were larger but did not exceed 3 inches.

In 1957 studies of the feeding rate of whelks on oysters were undertaken. As knobbed whelks were practically never taken in any trap that had yet been devised, the study consequently was limited to the channeled whelk. Since most oysters on the leases in Oyster Pond River are greater than 3 inches in height, the following observation was made on the rate of feeding of channeled whelks on large oysters:

A lath box, 24 x 18 x 18 inches, containing 6 large channeled whelks, 12 oysters (each over 3 inches in height), and 6 large quahaugs was placed in Oyster Pond River on June 3, 1957. On July 1, 1957, 8 of the oysters with their shells showing signs of being chipped by whelks were dead and without meats. Four oysters and all whelks and quahaugs were alive, though 1 quahaug had marks on the edge of its shell indicating that a whelk had tried unsuccessfully to open it.

The observed rate of feeding during this experiment was 0.3 oyster per whelk per week. This rate probably is lower than that which occurs under natural conditions because on several occasions the experimental box was out of water at low tides and presumably feeding was interrupted. The oyster bottoms of this area are never exposed at low water. Reduced circulation inside the lath box may also have affected the whelks' feeding rate. Thus it is reasonable to assume that the results of this experiment yielded a minimum estimate of the natural feeding rate.

Channeled whelks are known to feed in temperatures ranging from 60° to 72° F. This range of temperature in Oyster Pond River occurs at least during 5 months, June through October, of each year. It is, therefore, probable that the feeding of whelks in the river continues throughout this period.

ESTIMATES OF CHANNELED WHELK PREDATION

Oyster growers estimate their losses by counting the numbers of dead oysters, known as clappers or boxes, they find when culling; but the percentage of these deaths that result from whelk predation is not known. By assuming that the consumption of 0.3 oysters per week per whelk is near the minimum feeding rate, and that 1.8 oysters per week per whelk (an average of Carriker's observations) approaches the maximum feeding rate, the following estimates of probably whelk damage can be made for Oyster Pond River.

Since more than 1,000 snails were trapped annually in both 1957 and 1958 from a 2-acre lease, we assume in the absence of any control a minimum of 1,000 snails on each of the 2-acre leases. At a feeding rate ranging from 0.3 to 1.8 oysters per week per whelk, 1,000 snails could consume from 300 to 1,800 oysters in 1 week, or from 6,000 to 36,000 oysters during the 5-month period. At approximately 250 oysters to the bushel, the estimated loss of each oysterman varied from 24 bushels to 144 bushels. We may assume that his actual loss is near the midpoint of the two extremes, i.e., about 80 bushels.

At the present wholesale price of $11.50 a bushel for Chatham oysters, the annual losses from channeled whelk predation can be estimated at $920 for each of the 2-acre leases. This amount may appear insignificant to large oyster companies, but the loss is considerable to the oyster

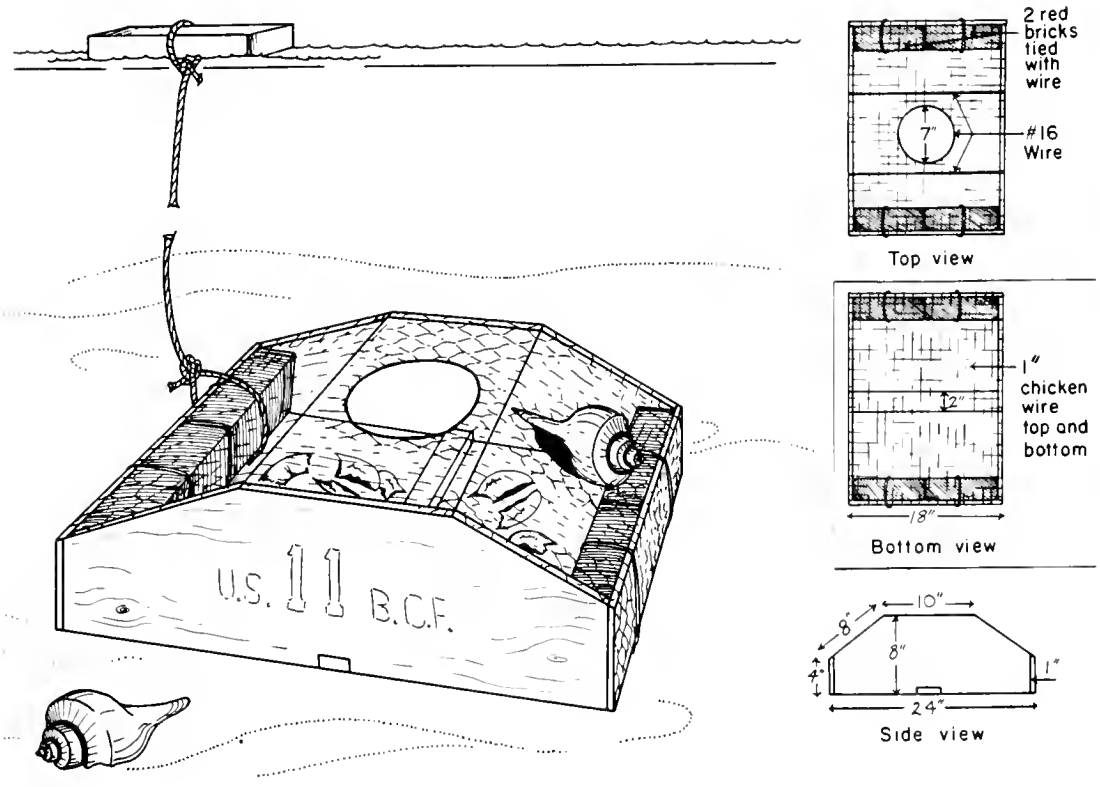

FIGURE 3.--TRAP USED TO CATCH THE CHANNELED WHELK.

grower in the Chatham area who markets only about 2,000 bushels a year.

TRAPPING

Oyster Pond River fishermen have used wooden traps of various designs to catch whelks. The efficiency of these traps was unknown, so in the spring of 1957, the Bureau of Commercial Fisheries began to test several types. The shapes of the traps ranged from sides perpendicular to the base to sides sloping towards the center; heights ranged from 6 to 24 inches; and bases ranged from 18 x 18 inches to 4 x 4 feet. The author considers the one shown in figure 3 to be the most effective of the traps tested.

Trap Construction

Over-all dimensions of the trap are 24 inches x 18 inches x 18 inches with sides perpendicular to the base and ends sloped. The framing is made of No. 2 grade pine 1 inch x 4 inches and 1 inch x 8 inches, plus a 2-inch brace across the bottom and two pieces of No. 16 guage wire across the top. The frame is covered with 1-inch-mesh galvanized chicken wire, 18 inches in width. A piece of 16-gauge wire is woven around the entrance to prevent the trapper's hand from being cut on jagged ends of chicken wire when removing the catch. Four bricks are used to sink the trap to the bottom. A buoy is fastened to each trap for the purpose of locating and hauling it.

Traps higher than 8 inches seemed to discourage snails from crawling up to the opening in the top. Traps lower than 8 inches decreased the holding capacity; occasionally they became so crowded with snails that some were unable to enter. The width of 18 inches was selected because chicken wire is available in this size and could be tacked to the frame without trimming. Chicken wire 24 inches in width is also available on the market but was considered impractical because it would require a larger trap and increase the cost of construction.

The cost of building 12 traps used in the experiments was $45.38. Materials and labor costs follow:

18 feet of 1 x 2 inch No. 2 grade pine ($.03/lineal foot) . . .	$ 0.54
36 feet of 1 x 4 inch No. 2 grade pine ($.09/lineal foot) . . .	3.24
48 feet of 1 x 8 inch No. 2 grade pine ($.19/lineal foot) . . .	9.12
58 feet of 18-inch wide, 1-inch mesh chicken wire ($9.00/150-foot roll)	3.48
Miscellaneous (rope, bricks, staples, and buoys)	5.00
Total cost of materials	$21.38
Total labor (16 hours at $1.50/hour)	24.00
Grand total	$45.38

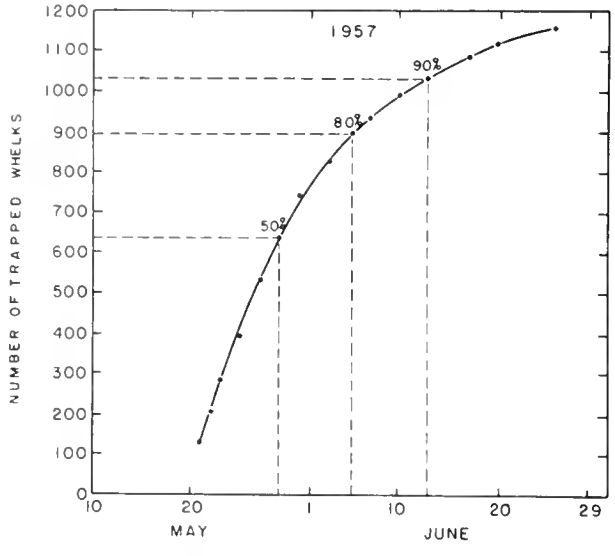

FIGURE 4.--CUMULATIVE CURVE OF CHANNELED WHELKS TRAPPED IN 1957.

Bait

Mussels, quahaugs, and horseshoe crabs (Limulus polyphemus) were all tried as bait. Only horseshoe crabs with their shells broken to expose the meat proved effective in attracting the channeled whelk; the other baits tested failed to attract snails. Each trap was baited with one or two horseshoe crabs. When traps were hauled old bait was removed and fresh crabs added.

The trapping of whelks correspond with the period when horseshoe crabs were migrating from the open ocean to the shallow water of Oyster Pond River. Since the crabs visited the river for only a short duration, less than 2 months, it was necessary to collect a good supply just before trapping was initiated. A wire pen was installed near the trapping area to hold the crabs. To prevent them from escaping, the bottom of the pen was buried a foot below the surface and the top bent inward to form an inverted V.

Trapping Procedure

Trapping was conducted on one of the 2-acre leases in Oyster Pond River from May 20 to June 27, 1957, and from May 12 to June 30, 1958. Initially, one row of six traps with 70 feet between traps was placed on the lease. It was 100 feet offshore and in line with the river flow. As more traps were built, we used 12, which were set in the direction of river flow in two parallel rows, one row 70 feet offshore and the other 130 feet.

The traps were fished and reset on Monday, Wednesday, and Friday of each week. Daily catches were less in fouled traps than in clean ones; therefore, traps heavily fouled with algae were taken out of water for a day to be dried and cleaned.

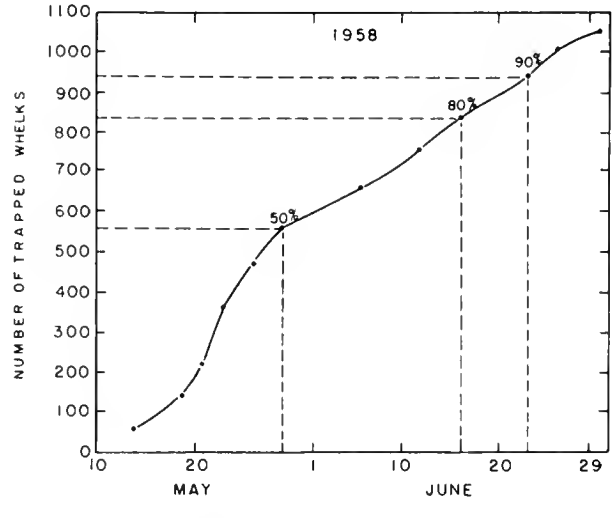

FIGURE 5.--CUMULATIVE CURVE OF CHANNELED WHELKS TRAPPED IN 1958.

In the 2 years of trapping, 2,174 channeled whelks were caught, 1,122 in 1957 and 1,052 in 1958. The cumulative curves for total numbers of channeled whelks caught in 1957 and in 1958 (figs. 4 and 5) indicate that after 50 percent of the total catch was taken, the rate of trapping gradually declined. In 1957, more than 80 percent of the total catch was attained during the first 2 weeks of trapping; in 1958 a month passed before the same percentage was reached.

Because almost equal numbers of snails were caught in 1957 and in 1958 from the same oyster bed, it appeared that whelks were moving to the oyster bed from other localities. When trapping was terminated in 1957, the rate of capture was less than 2 snails per trap per day (fig. 6), yet during the first 10 days of trapping in 1958, the rate was as high as 6 snails per trap per day (fig. 7). It is probable the high initial rate in 1958 was due to an influx of snails from other localities. When trapping was terminated in 1957, very few channeled whelks were observed on the study area. This suggests that the success in trapping in 1958 is related to snail movement; therefore, it is advisable for oyster growers to undertake trapping operations each spring to minimize whelk predation.

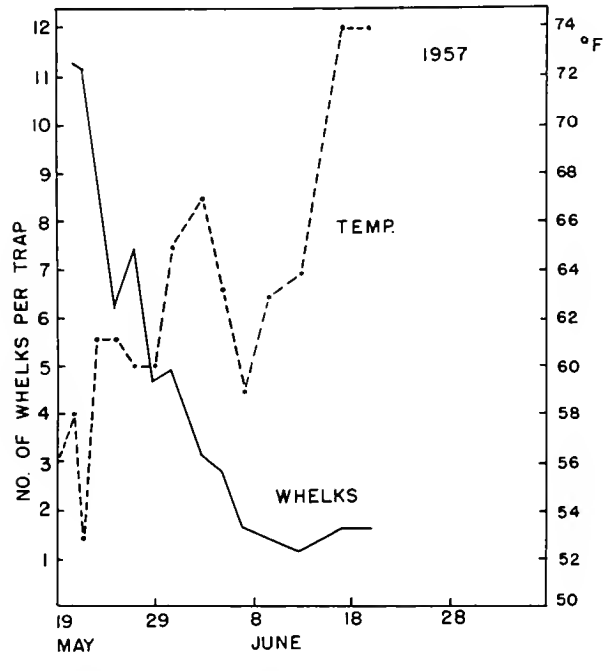

FIGURE 6.--THE NUMBER OF CHANNELED WHELKS CAUGHT PER DAY PER TRAP IN 1957. (SURFACE TEMPERATURE WAS TAKEN WHEN TRAPS WERE FISH.)

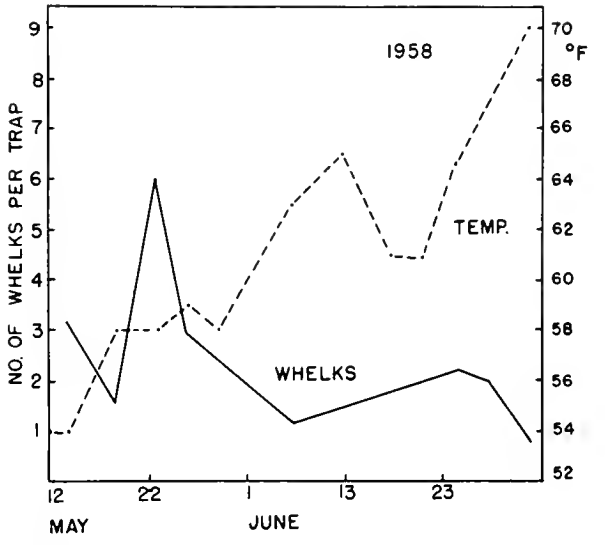

FIGURE 7.--THE NUMBER OF CHANNELED WHELKS CAUGHT PER DAY PER TRAP IN 1958. (SURFACE TEMPERATURE WAS TAKEN WHEN TRAPS WERE FISHED.)

Trapping was initiated when the rising water temperature reached a 50° F. level. There is some indication that as the temperature rises the number of whelks per day per trap decline (figs. 6 and 7). Generally, the greatest number of whelks were caught when the traps were first placed on the beds, after which a slow decline occurred. Although temperature may have some effect on the behavior of snails, a more logical explanation is that the decline in catch rate resulted from a decrease in the abundance of snails. Trapping was terminated for the year when the rate fell below 1 snail per trap per day or when the rate was below 2 snails per trap per day for more than 2 consecutive weeks.

During the 2 years of trapping only 2 knobbed whelks were caught, although from visual observations the beds were heavily populated with this species. Hence there is no known method for trapping knobbed whelks, they must be controlled by mechanical methods, such as dredging and tonging, or be picked up by skin divers.

CONCLUSION

The damage caused by whelk predation is often overlooked by many oyster growers. When drills and starfish are present on oyster beds, little concern is given to the whelk as a serious predator. From laboratory and field observations it is apparent

that whelks can do a considerable amount of damage; and if they are present on the oyster beds, trapping should be conducted each spring to keep them under control.

By using the method of trapping described in this report most channeled whelks can be removed from an oyster bed. Because each oyster lease varies in size and shape, the oyster grower can determine by trial the number of traps to be used on his grounds and their most effective arrangement.

LITERATURE CITED

CARRIKER, MELBOURNE ROMAINE.
1951. Observations on the penetration of tightly closing bivalves by Busycon and other predators. Ecology, vol. 32, No. 1, pp. 73-83.

COLTON, H. S.
1908. How Fulgur and Sycotypus eat oysters, mussels, and clams. Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 60, pp. 3-10.

MAGALHAES, HULDA.
1948. An ecological study of snails of the genus Busycon at Beaufort, North Carolina. Ecological Monographs, vol. 18, pp. 377-409.

SUMNER, F. B., R. C. OSBURN, AND L. J. COLE.
1913. A biological survey of the waters of Woods Hole and vicinity. Bulletin of the Bureau of Fisheries, vol. 31, (part I), (1911), 544 pp.

WARREN, S.
1916. Feeding habits of Busycon. Nautilus, vol. 30, pp. 66-68.

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