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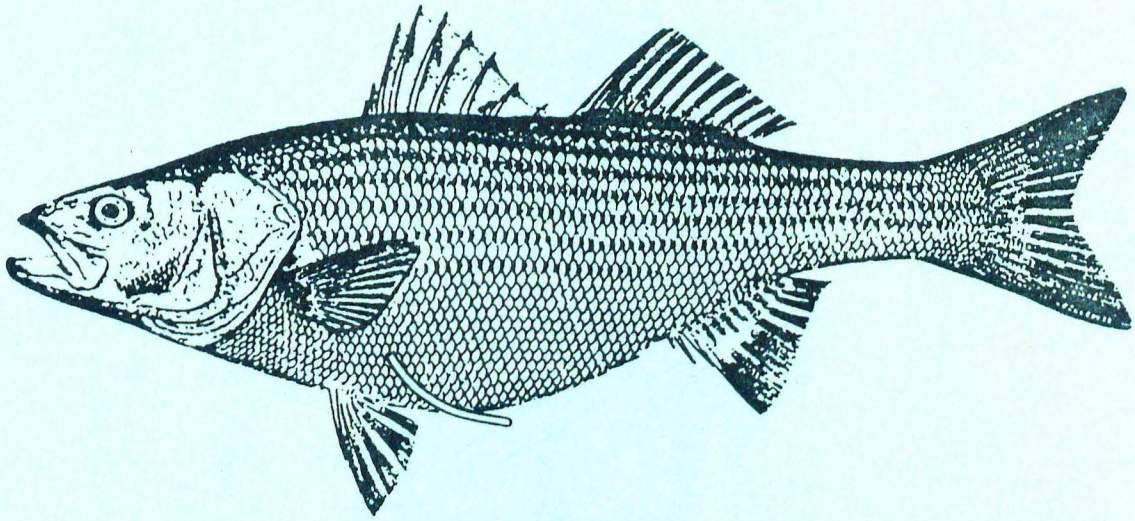

ANNUAL REPORT 1988/1989

Virginia Institute of Marine Science
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Gloucester Point, Virginia 23062

A Mark-Recapture Study of Striped Bass in the Rappahannock River, Virginia

Annual Report 1988/1989

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PREFACE

Financial support for this project was provided by the Virginia Marine Resource Commission, Research Grant F77-R.

ACKNOWLEDGMENTS

We are indebted to the following commercial fishermen on the Rappahannock River for the use of mooring facilities and the capture of striped bass for tagging in Fall 1988 and Spring 1989: Barrick & Wilmer Seafood, Allen Ingraham, Ned Morris & Son Seafood, Oliff Brothers Seafood, and S. & A. Oliff. All personnel of the VIMS Anadromous Program, and many others from within and outside of VIMS assisted in the tagging program.

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EXECUTIVE SUMMARY

1. A total of 3,892 striped bass were tagged and released in the Fall 1988 and 1,316 fish in the Spring 1989 on the Rappahannock River.

2. In the Fall, 77.6% of the tagged striped bass were less than 400 mm FL. In contrast, 81.5% of the fish were 400 mm FL or greater in the Spring.

3. The available striped bass stock in the Fall is more vulnerable to fishing than is the available stock in the Spring. Recaptures per net day of tagged striped bass in pound nets in the Fall 1987 were seven times greater than in the Spring 1988, and 113 times greater in the Fall 1988 than in the Spring 1989. The latter value, however, is inflated to some degree because of recurring high river flows in the Spring 1989. With the occurrence of frequent freshets, the fish moved downstream below the location of the nets, thereby periodically reducing their availability.

INTRODUCTION

The need for studies of striped bass (Morone saxatilis) in Chesapeake Bay was discussed by Loesch et al. (1987). For succinctness, we extracted the following from the introduction of their report.

> Striped bass production in Chesapeake Bay not only affects the commercial and recreational fisheries in Virginia but influences the degree of success attained by the fisheries in other Atlantic coastal states.
>
> Due to the concern about the decline in striped bass stocks along the Atlantic coast since the mid-1970's, an interstate fisheries management plan was developed under the auspices of the Atlantic States Marine Fisheries Commission (ASMFC) as part of their Interstate Fisheries Management Program (ASMFC 1981). Federal legislation was enacted in 1984 (Public Law #98-613, The Atlantic Striped Bass Conservation Act) which enables Federal imposition of a moratorium for an indefinite period in those states that fail to comply with the coastwide plan. To be in compliance with the plan, coastal states imposed restrictions on their commercial and recreational striped bass fisheries ranging from combinations of catch quotas, size limits, and limited moratoriums. In addition, the Striped Bass Management Board has urged the coastal states to monitor the stocks and to institute tagging programs. Mark-recapture studies of striped bass in Virginia were initiated in the James and Rappahannock rivers; elsewhere, striped bass are being tagged in Rhode Island, New York, and Maryland waters. These studies should provide information about exploitation rates, migration patterns, and the proportions of Hudson River, Maryland and Virginia striped bass in northern waters. The Maryland and Virginia studies will also provide information on the degree of striped bass movement within Chesapeake Bay. The data collected will be an important constituent of the total information base needed to assess present management strategies.

The 1988-1989 objectives were: 1) as available, tag and release 3,000 striped bass in the Rappahannock River in Fall 1988, and 5,000 in Spring 1989.

METHODS

Striped bass were obtained from cooperating commercial fishermen. Fish were captured with pound nets at river km 74 to 87 during Fall 1988 (Fig. 1) and river km 33 to 87 during Spring 1988 (Fig. 2). A Floy internal anchor tag 10 mm X 32 mm, with a 100 mm external tube was used with striped bass greater than or equal to 350 mm in fork length, and a Floy internal anchor tag 5 mm X 20 mm, with a 85 mm external tube was used for fish greater than or equal to 250 mm and less than 350 mm in fork length. The anchor tag was inserted into the body cavity through a small surgical incision made just posterior to the apex of the pectoral fin on the museum (left) side of the fish. Thus, the anchor was inserted into the peritoneal cavity posterior to the pericardial cavity and anterior to the spleen. The tags were treated by the Floy Company with an algaecide which reduces algae build-up, reduces drag, and increases retention (Hillman and Werme 1983).

Basically, the VIMS tagging personnel followed the fisherman to the net. One side of the pound head was lowered and the fisherman's skiff was pulled inside the head. The bottom of the head was gradually pulled into the boat, thereby concentrating the fish in the remaining portion of the head. Fish were dipped from the head and placed in the fisherman's boat, except for striped bass which were placed in a VIMS "live car" (floating pocket) attached to the net. The live car measured 1.2 m x 2.4 m x 1.2 m with a 25.4-mm mesh. The net was kept open by a float line around the outside of the surface perimeter, a spreader board (1.2 m) inside of the surface perimeter at each end, and lead lines on the bottom of the net. After the fisherman finished, the tagging vessel would retrieve the live car and together the vessel and live car drifted with the current while the fish were tagged and released. Taggers would retrieve a fish from the live car, implant a tag, and record its fork length (FL), total length (TL), and, if possible, sex. Several scales were removed from the area above the lateral line midway between the insertion of the first dorsal fin and the origin of the second. Salinity, water temperature and tidal stage were also recorded.

Scales were prepared for reading by the method described by Merriman (1941) except an acetate sheet replaced the glass slide and acetone. Scales were aged using the microcomputer program (DISBCAL) of Frie (1982), as modified for a sonic digitizer-microcomputer complex (Loesch et al. 1985). Growth increments were measured from the focus to the posterior edge of each annulus. There was little difficulty in reading the scales when a clear focus was found; however, often the first annulis, and sometimes the second, was difficult to define for fish age 6 or older.

Aging was not an objective of the study; scales were to be stored for "reading" at a later date. However, a preliminary reading (only one reader) of scales collected in the Fall of 1987 and 1988, and Spring 1988 and 1989 was accomplished. Striped bass scale annuli form between April and June in Virginia waters; therefore, year classes, other than 0 year class, are considered to be a year older on 1 July (Grant 1974). This aging scheme differs from that utilized in Maryland and North Carolina where age is incremented on 1 January. Thus, the same year class is designated one year

older in Maryland and North Carolina six months before age designations are equalized for all three states.

The U. S. Fish and Wildlife Service (FWS) supplied the Floy anchor tags for our project and to the other coastal states tagging striped bass, and it is functioning as the repository for the tag-return data. The data will be sorted and subsequently returned to the appropriate states. The external tube of the tag, as well as its anchor, is inscribed with instructions to return the tag to, or telephone, the Annapolis, Maryland, office of the FWS. The National Fish and Wildlife Foundation (Washington, D. C.) forwards a reward of $5.00 or a fisherman's cap with a striped bass logo as an acknowledgment for the recapture information.

RESULTS AND DISCUSSION

A total of 3,892 striped bass were tagged and released in the Fall 1988 on the Rappahannock River between 29 September and 3 November. The maximum number of fish tagged in a day was 735 (27 October) and the fewest was 402 (13 October). In the Spring of 1989 tagging commenced on 20 April and ended on 31 May, with a total of 1,316 fish tagged and released. The frequently recurring high river flows which moved fish down river in the Spring resulted in fewer fish being tagged than was expected. The maximum number of fish tagged in a day was 314 (27 April) and the fewest was 18 (15 May and 26 May). As of 31 May 1989, the grand total of striped bass tagged and released in the Rappahannock River since the Fall 1987 is 10,551 (Table 1).

There was a noticeable difference in size between the striped bass tagged in the Fall 1988 and Spring 1989 pound net fisheries in the Rappahannock River.

In the Fall 1988 the striped bass averaged 387 mm FL (SE = 1.21 mm), with 77.6 % of the fish less than 400 mm FL (Fig. 3). Due to the presence of mature coastal migrant striped bass which ascend the system to spawn, fish averaged 519 mm FL (SE = 3.22 mm) in the Spring 1989, with 81.5 % of the striped bass 400 mm FL or greater (Fig. 4).

Prior to the total closure of the striped bass fishery in Virginia, there was a minimum size restriction of 24" TL (610 mm TL = 571 mm FL). If the fishery were reopened only in the Fall with a 24" TL (571 mm FL) minimum, (as it was when these data were collected), only about 1.4% of the catch could have been retained in the Fall 1988. If the minimum size were set at 22" TL (523 mm FL), about 4.7% of the available fish would have been of legal size; if the minimum were 20" TL (475 mm FL), about 10% could have been retained; and at 18" TL (427 mm FL) about 17.7% of the catch could have been retained. In the Fall 1987 the percentages of retainable fish for the same minimum size considerations were 3%, 10%, 23%, and 42%.

A biological concern about the Fall fishery is that nearly all the striped bass are immature. A minimum size limit to protect most of the immature fish would result in a de facto fishing moratorium, while the 18" limit could lead to recruitment overfishing unless the frequency of strong

year classes is much higher than it has been in the past 15 years, or other management restrictions are applied during a Fall fishery.

In the Spring (March, April, and May) the available stock contains mature fish as well as the young nonmigrant fish. Thus, if the minimum size were 24" TL (571 mm FL) in Spring 1989 about 29.8% could have been harvested. If the minimum were 18" TL (427 mm FL) over 77.3% of the fish would have been of legal size. The corresponding percentages in Spring 1988 were 22% and 80%. Since the larger striped bass tend to spawn early, and spawning is on the wane in May, an alternative management approach would be to have a Spring fishery in part or all of May with a 24" TL size limit.

The increase in mean length in Spring 1988 and 1989 was accompanied by an increase in older year classes and the modal age (Figs. 5, 6, 7, and 8).

The difference in the degrees of vulnerability of the available stock in the Fall relative to the available stock in the Spring is shown by the recaptures per net-day in pound nets during the tagging periods (Tables 2 and 3). The recapture per net-day rate was seven times greater in the Fall 1987 (1.24/net-day) than in the Spring 1988 (0.17/net-day). The recapture per net-day rate in Fall 1988 (2.27/net-day) was about 113 times greater than in the Spring 1989 (0.02/net-day). We believe the latter value to be inflated to some degree because of recurring high river flows in the Spring. The movement of striped bass down river with the occurrance of freshets commonly occurs, but it was a persistent situation in the Spring 1989.

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Table 1. Number of striped bass tagged and released in the Rappahannock River. All fish were obtained from pound nets.

Tagging Period	Number Tagged
Fall 1987	3,319
Spring 1988	2,024
Fall 1988	3,892
Spring 1989	1,316
Total	10,551

Table 2. Number of striped bass recaptured in pound nets in the Rappahannock River in the Fall 1987 and Spring 1988. Tagging periods: 24 September through 29 October, 1987 (36 days), and 18 April through 2 June, 1988 (46 days).

	Fall 1987	Spring 1988
Number of pound nets	10	7
Net-days	360	322
Number of recaptures	445	54
Recapture per net-days	1.24	0.17

Table 3. Number of striped bass recaptured in pound nets in the Rappahannock River in the Fall 1988 and Spring 1989. Tagging periods: 29 September through 3 November, 1988 (36 days), and 20 April through 31 May, 1989 (42 days).

	Fall 1988	Spring 1989
Number of pound nets	6	11
Net-days	216	462
Number of recaptures	490	9
Recapture per net-days	2.27	0.02

Fig. 1. Locations of pound nets employed to capture striped bass in the Rappahannock River, Fall 1988.

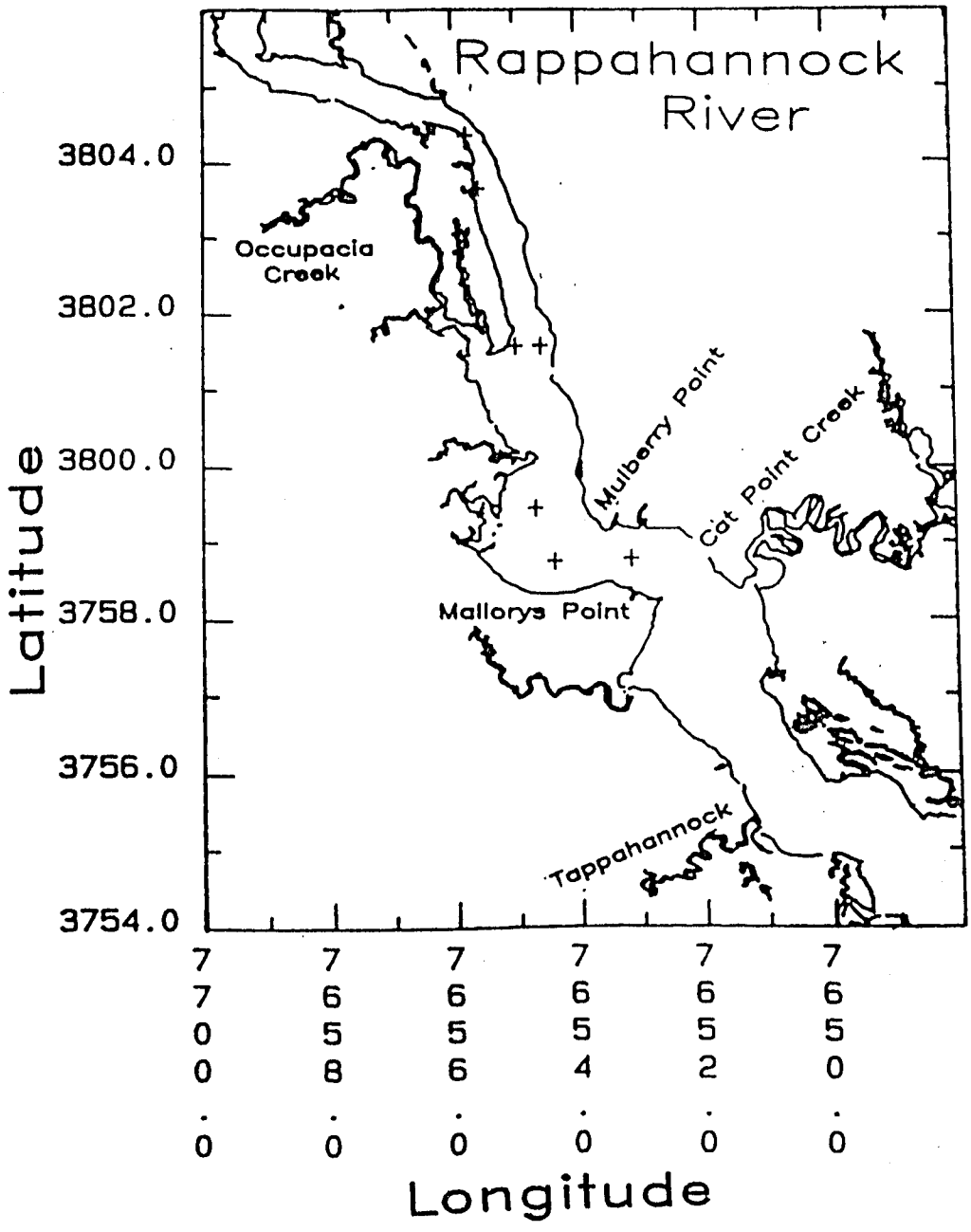

Fig. 2. Locations of pound nets employed to capture striped bass in the Rappahannock River, Spring 1989.

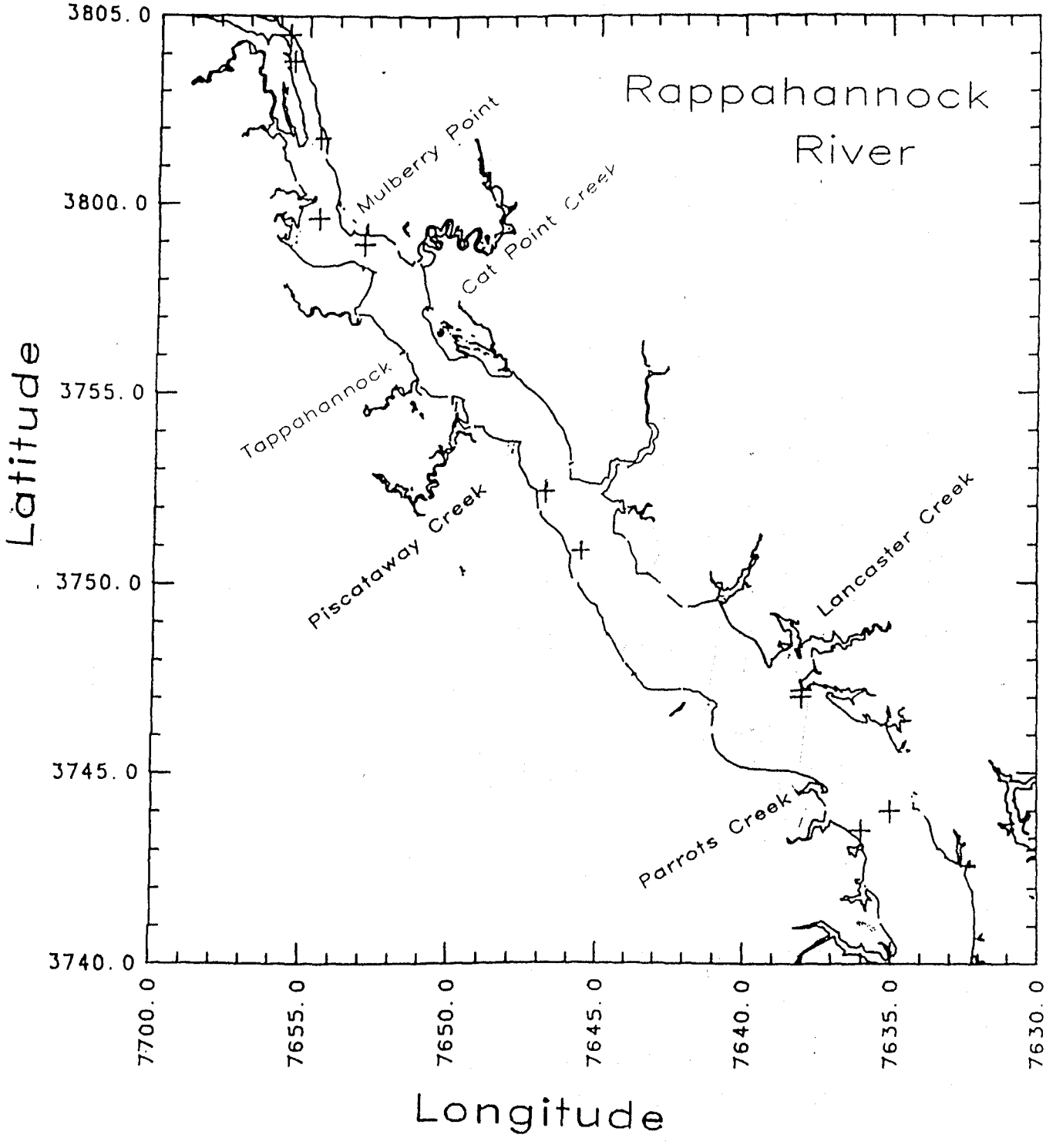

Fig. 3. Size Frequency of Striped Bass Tagged in the Rappahanncock River, Fall 1988

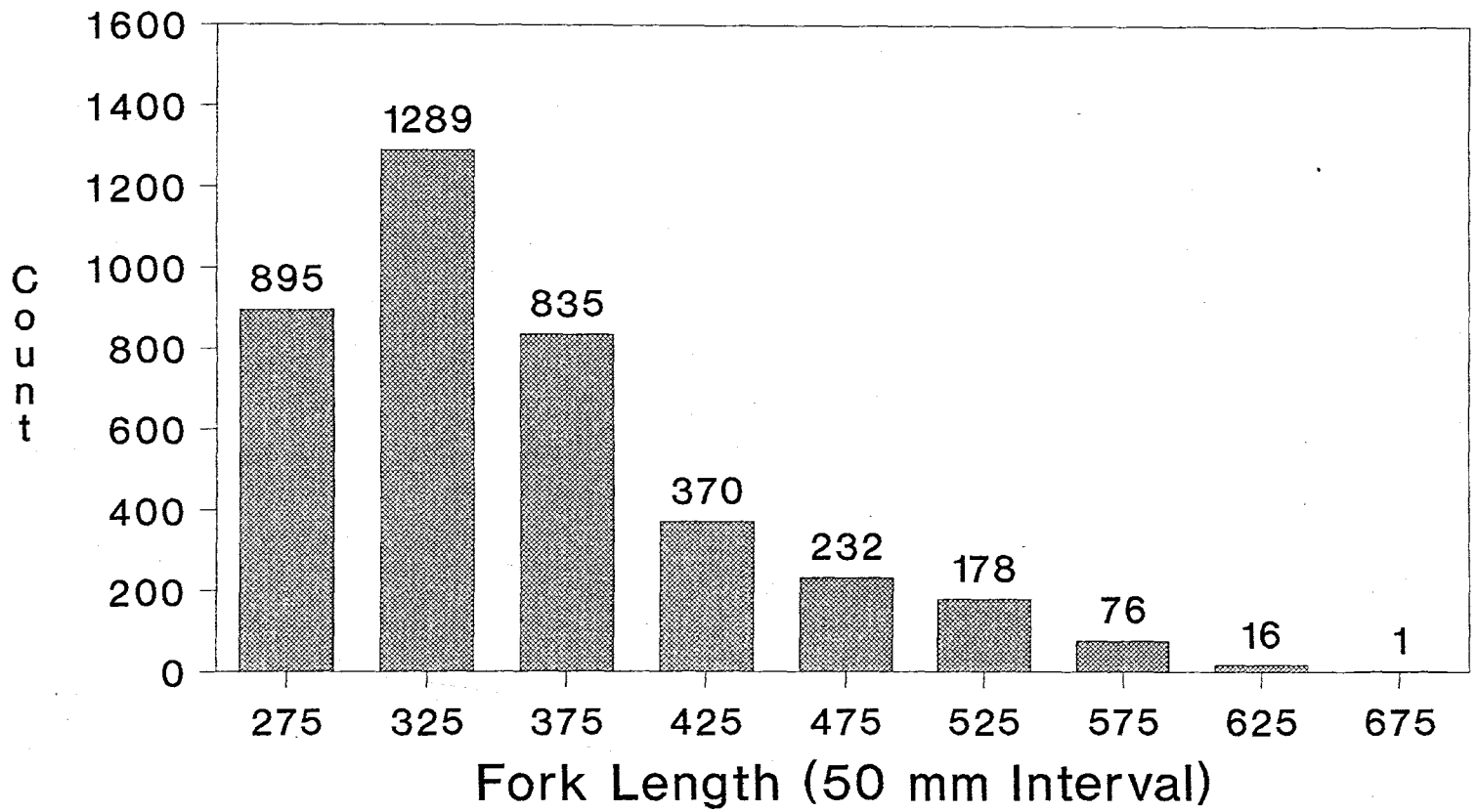

Fig 4. Size Frequency of Striped Bass Tagged in the Rappahannock River, Spring 1989

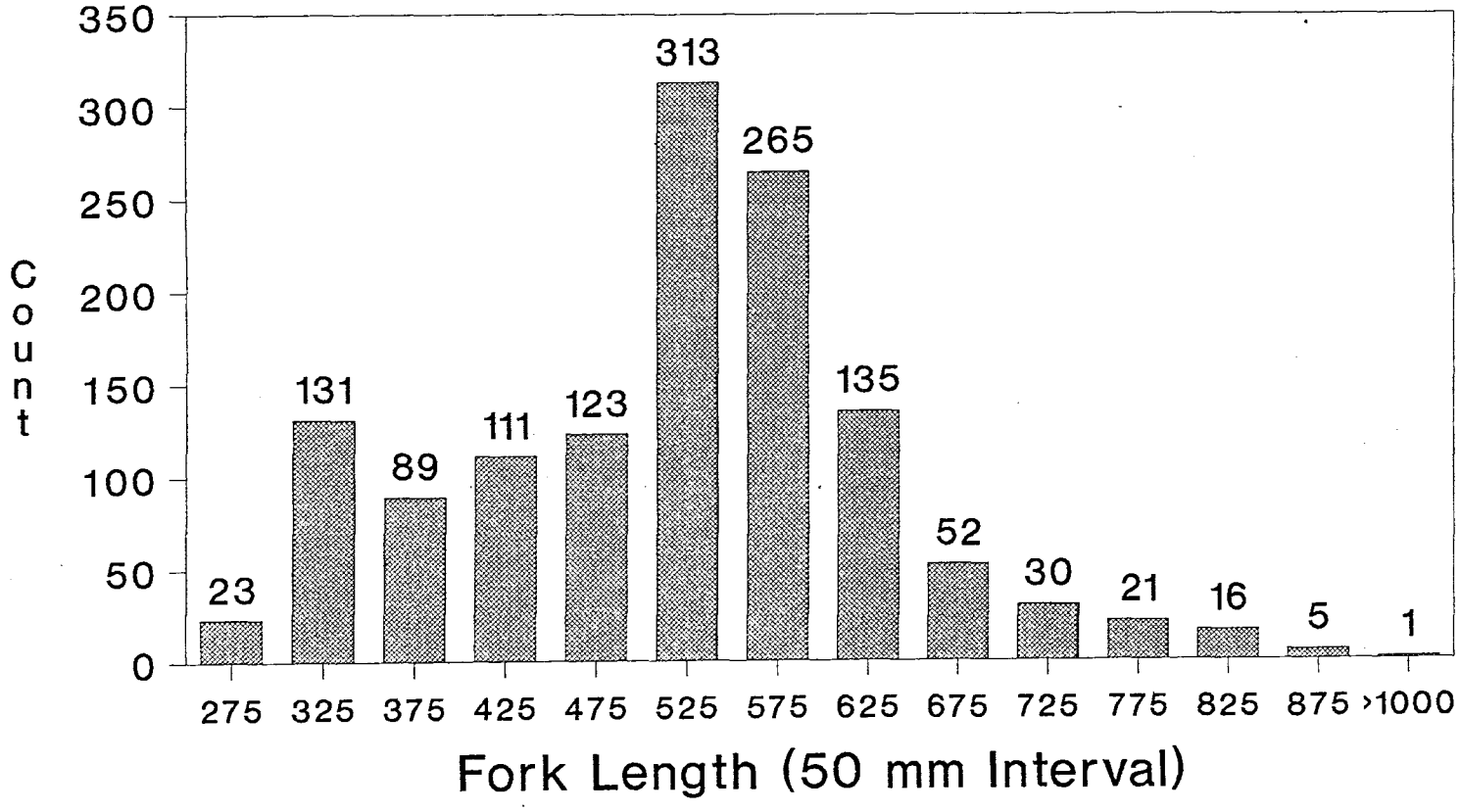

Fig 5. Age Frequency of Striped Bass Tagged in the Rappahannock River, Fall 1987

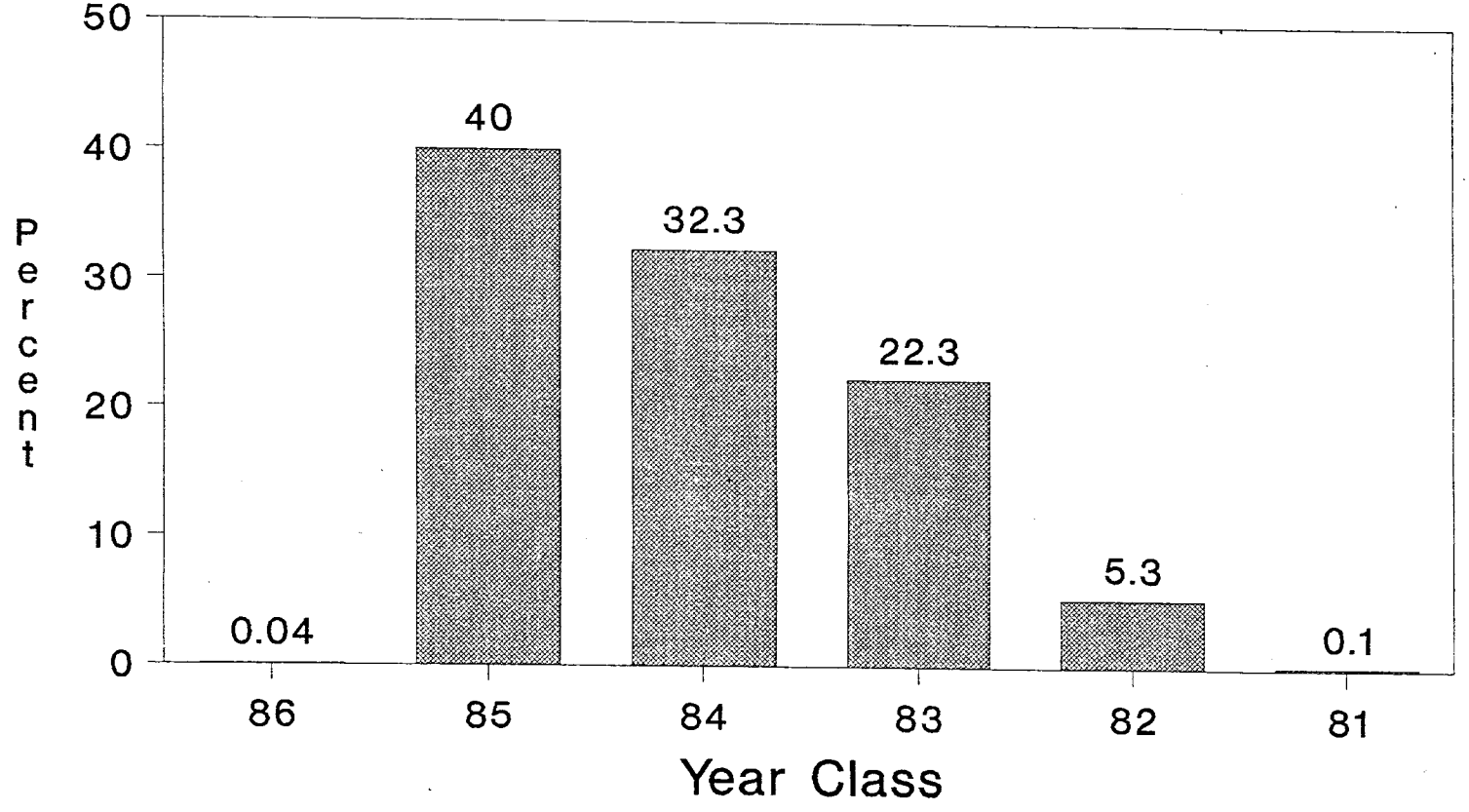

Fig 6. Age Frequency of Striped Bass Tagged in the Rappahannock River, Spring 1988

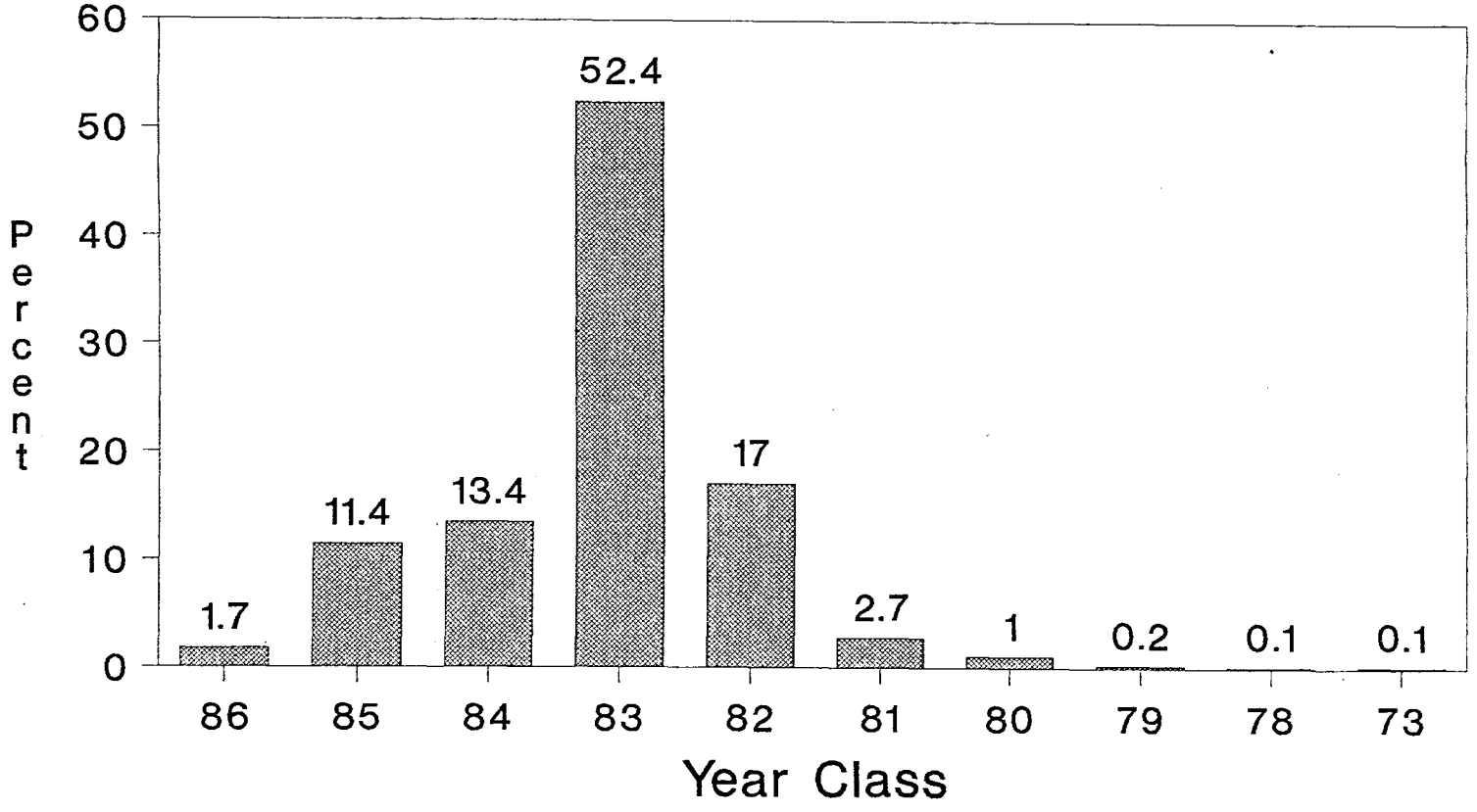

Fig 7. Age Frequency of Striped Bass Tagged in the Rappahannock River, Fall 1988

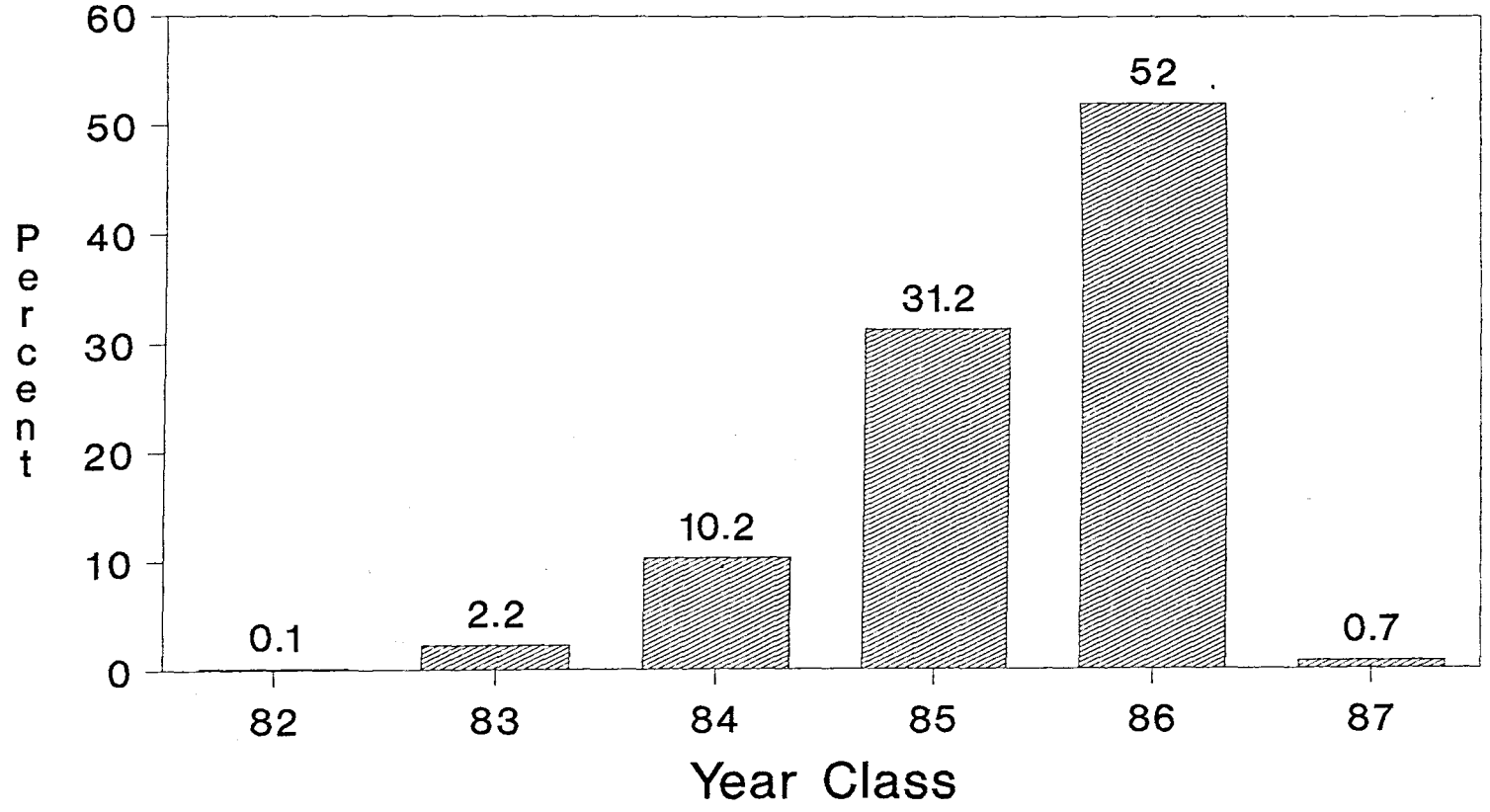

Fig 8. Age Frequency of Striped Bass Tagged in the Rappahannock River, Spring 1989