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## **A Mark-recapture Study of Striped Bass in the James River, Virginia : Annual Report 1989**

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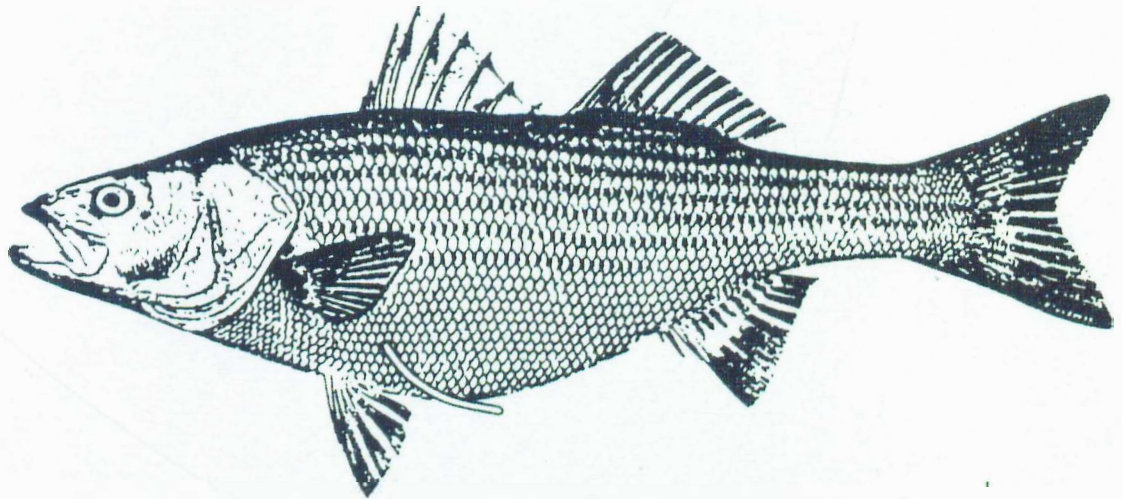
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A MARK-RECAPTURE STUDY  
OF STRIPED BASS IN THE  
JAMES RIVER, VIRGINIA



ANNUAL REPORT 1989

Virginia Institute of Marine Science  
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Prepared by

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## EXECUTIVE SUMMARY

1. In the Spring 1989, 3,360 striped bass were tagged in the James River.
2. Since the Spring of 1987, 7,491 striped bass have been tagged and released in the James River.
3. The mean size of striped bass tagged in 1989 was 436.2 mm, 84.6 mm larger than the mean size in 1988 and 33.3 mm smaller than the mean size in 1987. The difference is believed to be due to different locations and times of tagging.
3. The dominant striped bass age group in 1989 was the 1986 year class, accounting for 30.8% of the total fish tagged while the 1985 and 1987 year class accounted for 29.2% and 28.9%, respectively. This difference may also be accounted for by different locations and times of tagging.
4. The exodus of the mature striped bass out of the river after spawning and the absence of a commercial fishery resulted in only 52 tag returns within the river system from the Spring 1989 tagging. This proportion (0.015) of returns is small relative to the proportion of returns in previous tagging programs in the Chesapeake Bay when escapement was low due to high fishing pressures.
5. There have been 13 returns from outside of Virginia's jurisdiction from the total of 7,492 tagged fish.



## INTRODUCTION

Loesch et al. (1987) presented an overview of the economic and social importance of the striped bass (Morone saxatilis) in the commercial and recreational fisheries in the 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 have imposed restrictions on their commercial and recreational striped bass fisheries ranging from combinations of catch quotas, size limits, and time-limited moratoriums to year-round 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 have been 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 long-term objectives of the mark-recapture study in Virginia are:

- 1) evaluate the degree of striped bass exploitation within and outside the Chesapeake Bay region under present fishery restrictions;
- 2) assess the coastal migratory pattern of Virginia striped bass;
- 3) assess the degree of fidelity to the rivers of capture by mature, migrant fish in subsequent spawning seasons;
- and 4) contribute to the present age-growth and size-at-maturity database.

The objectives in the third segment of the study (AFC-19) were: 1) as available, tag and release approximately 2,500 striped bass in the James River in Spring 1989; 2) analyze tag return data in regard to exploitation and migration; and 3) prepare an annual report. This report will be made available to the Atlantic States Marine Fisheries Commission, the National Marine Fisheries Service, the U. S. Fish and Wildlife Service, and all other state and federal agencies directly or peripherally involved in striped bass management and research.

## METHODS

Striped bass were obtained from cooperating commercial fishermen in Spring 1989. Fish were captured with a haul seine at river km 48 from 13 March through 28 March.

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 500 mm in fork length, and a Floy internal anchor tag 5 mm X 20 mm, with a 85 mm external tube for fish greater than or equal to 250 mm and less than 500 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).

A commercial haul seine (1,000 m) was employed on six occasions during evening hours and high slack tide at river km 48. Fishes other than striped bass were removed, and the striped bass were retained in a pocket measuring 13 m x 2.0 m x 6.5 m. Fish were retrieved from the pocket, and prior to implanting a tag, total length (TL), fork length (FL), and, if possible, sex were recorded. Scales were removed from the area just 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.

Aging was not an objective of the study; scales were to be stored for "reading" at a later date. However, readings were accomplished for scales collected in 1989. Scales were prepared for reading by utilizing the method described by Merriman (1941) except that an acetate sheet replaced the glass slide and acetone. All 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. On fish that were older than age 6, the first and sometimes the second annuli were difficult to define.

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 July 1 (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 a 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 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 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

In Spring 1989, 3,360 striped bass were tagged. The grand total of striped bass tagged (1987, 1988 and 1989) was 7,491. The striped bass tagged in the James River in Spring 1989 ranged from 280 mm to 876 mm (FL) with a mean length of 436.2 mm. Length frequency histograms by count indicate that 56% of the tagged fish were between 301 to 350 mm FL (Fig. 1). The mean length of striped bass tagged in 1989 was 84.6 mm greater than the mean size in 1988 and 33.3 mm smaller than the mean size in 1987 (Loesch and Hill 1988).

The 1982 year class represented 42% of the tagged specimens in 1987 while the 1984 year class composed 56% of the tagged specimens in 1988 (Loesch and Hill 1988) and the 1986 year class represented 30.8% of the tagged specimens in 1989 (Fig. 2).

Days-at-large for tagged striped bass in 1987 ranged from zero (day of tagging) to 797 days, with over 40% of the total recaptures occurring by "hook and line," and 95.5% of all recaptures occurred within Virginia waters. The James River accounted for 86% of all the recaptures (Fig. 3; Tables 1 and 2). Days-at-large for striped bass tagged in 1988 ranged from two to 461 days, with 56.4% of the total recaptures occurring by "hook and line." The James River accounted for 64.1% of all recaptures (Fig. 4; Tables 3 and 4). Days-at-large for tagged striped bass in 1989 ranged from zero (day of tagging) to 126 days, with over 59% of the total recaptures occurring by "hook and line." Over 73% of the returns occurred within the James River (Fig. 5; Tables 5 and 6).

## DISCUSSION

The differences in striped bass mean lengths and modal ages in 1987, 1988 and 1989 appear to be related to the location and time of tagging. In 1987, striped bass were obtained from fyke nets at river km 71 to 85, but in 1988 the majority of striped bass were obtained from a haul seine at river km 48. Due to prolonged flood conditions in the James River in the Spring 1987, the planned use of the commercial haul seine was not possible. Tagging of striped bass in 1987 did not commence until 22 April and ended on 28 May, while in 1988 tagging commenced on 22 February and ended on 8 April. Tagging in 1989 commenced on 13 March and ended on 28 March. Capture by a haul seine

and retention in a large holding pen in 1988 and 1989 placed less stress on the fish than did capture and retention in the smaller fyke nets in 1987. The lower water temperatures in 1988 and 1989 (because of the the earlier tagging dates) also contributed to the robustness of captured striped bass. Due to earlier starting dates in 1988 and 1989, some smaller resident striped bass were tagged before the mature fish entered the system.

The exodus of the mature fish from the James River after spawning and the absence of a commercial fishery resulted in only 52 tag returns within the river system from the Spring 1989 tagging. This proportion of returns (0.015) is small relative to the proportion of returns in previous tagging programs in the Chesapeake Bay when escapement was low due to high fishing pressures. There have been 13 returns from waters outside of Virginia when all tagging episodes are combined.

Days-at-large range from zero (0) to 797, with 53% of the returns occurring within 60 days after release (Figs. 3, 4, and 5). Very few fish were reported caught by commercial fishermen due to the total moratorium placed on striped bass by the VMRC. The James River was closed to the taking of striped bass and some other species due to Kepone contamination and although the river was re-opened on 1 July 1988, the minimum size limit (610 mm) discouraged commercial fishing. A full moratorium on striped bass fishing in Virginia did commence on 1 June 1989; thus we expect the escapement rate will remain high.

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Table 1. Number of recaptures, by gear, of striped bass tagged in the James River in Spring 1987, as of 1 October 1989.

Gear	Number of Recaptures
Hook & Line	63
Anchor Gill Net	16
Trap Net	17
Seine	2
Unknown	57
Electroshocking	2
Total	157

Table 2. Number of recaptures, by river system, of striped bass tagged in the James River in Spring 1987, as of 1 October 1989.

State	River System	Number of Recaptures
	Atlantic Ocean	1
CT	Connecticut River	1
MA	Buzzard Bay	1
MA	Merrimac River	1
MD	Chesapeake Bay	1
MD	Choptank River	1
NC	Roanoke River	1
NY	Moriches Inlet	1
VA	Chickahominy River	4
VA	James River	135
VA	Nansemond River	2
VA	Pagan River	3
VA	Potomac River	1
VA	Rappahannock River	4
	Total	157

Table 3. Number of recaptures, by gear, of striped bass tagged in the James River in Spring 1988, as of 1 October 1989.

Gear	Number of Recaptures
Hook & Line	22
Anchor Gill Net	1
Trap Net	4
Gill Net	10
Unknown	1
Electroshocking	1
Total	39



Table 4. Number of recaptures, by river system, of striped bass tagged in the James River in Spring 1988, as of 1 October 1989.

State	River System	Number of Recaptures
	Atlantic Ocean	1
MA	Bass River	1
VA	James River	25
VA	Nansemond River	3
VA	Pagan River	6
VA	Rappahannock River	1
VA	Chesapeake Bay (Lower)	2
	Total	39

Table 5. Number of recaptures, by gear, of striped bass tagged in the James River in Spring 1989, as of 1 October 1989.

Gear	Number of Recaptures
Hook & Line	42
Anchor Gill Net	7
Trap Net	8
Drift Gill Net	1
Unknown	2
Electroshocking	2
Seine	9
Total	71

Table 6. Number of recaptures, by river system, of striped bass tagged in the James River in Spring 1989, as of 1 October 1989.

State	River System	Number of Recaptures
MA	Boston Harbor	1
NY	Long Island Sound	1
MD	Chesapeake Bay	1
VA	Chesapeake Bay (General)	1
VA	Elizabeth River	1
VA	Nansemond River	1
VA	James River	52
VA	York River	2
VA	Chesapeake Bay (Lower)	2
VA	Rappahannock River	9
	Total	71

Fig. 1. Size Frequency of Striped Bass Tagged in the James River, Spring 1989

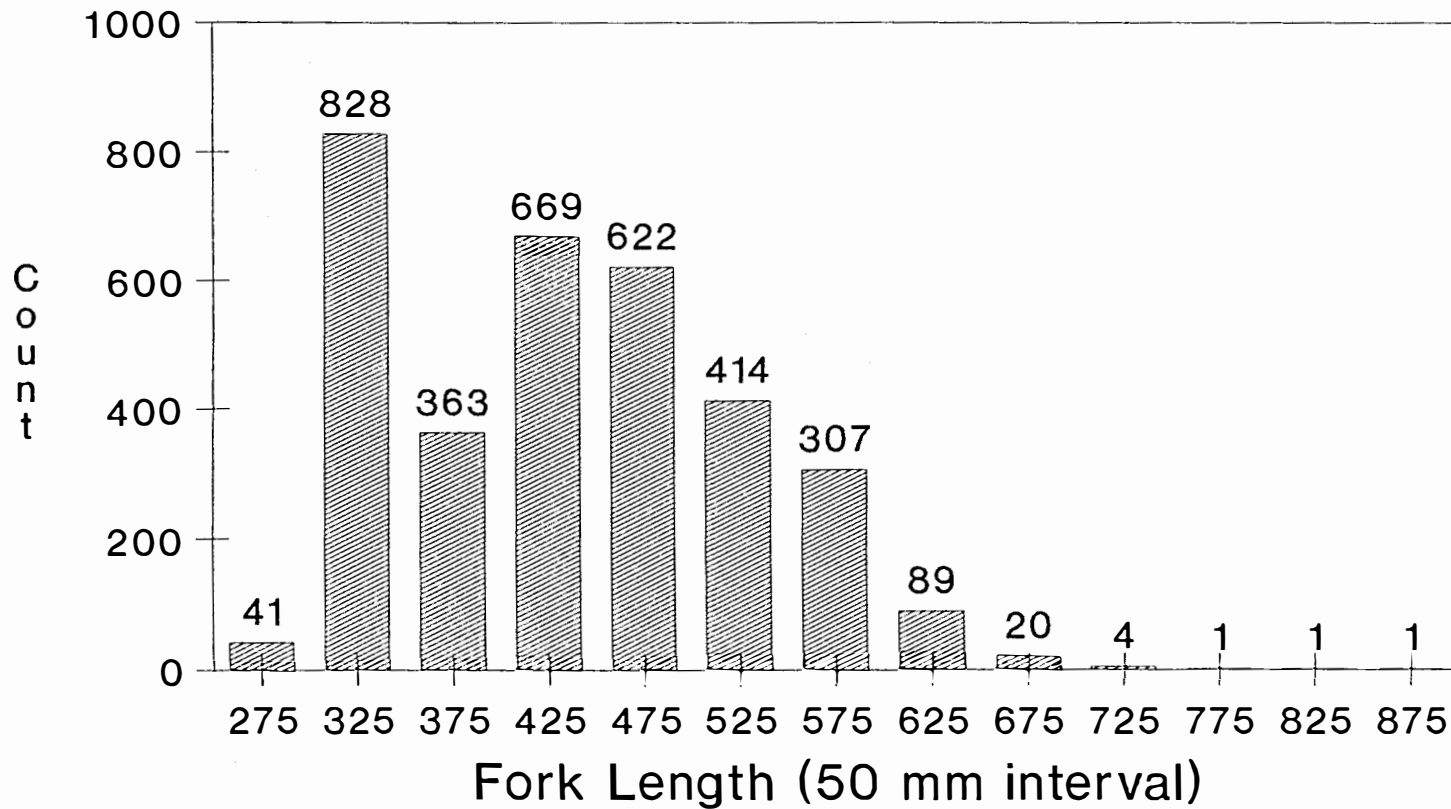


Fig. 2. Age Frequency of Striped Bass Tagged in the James River, Spring 1989

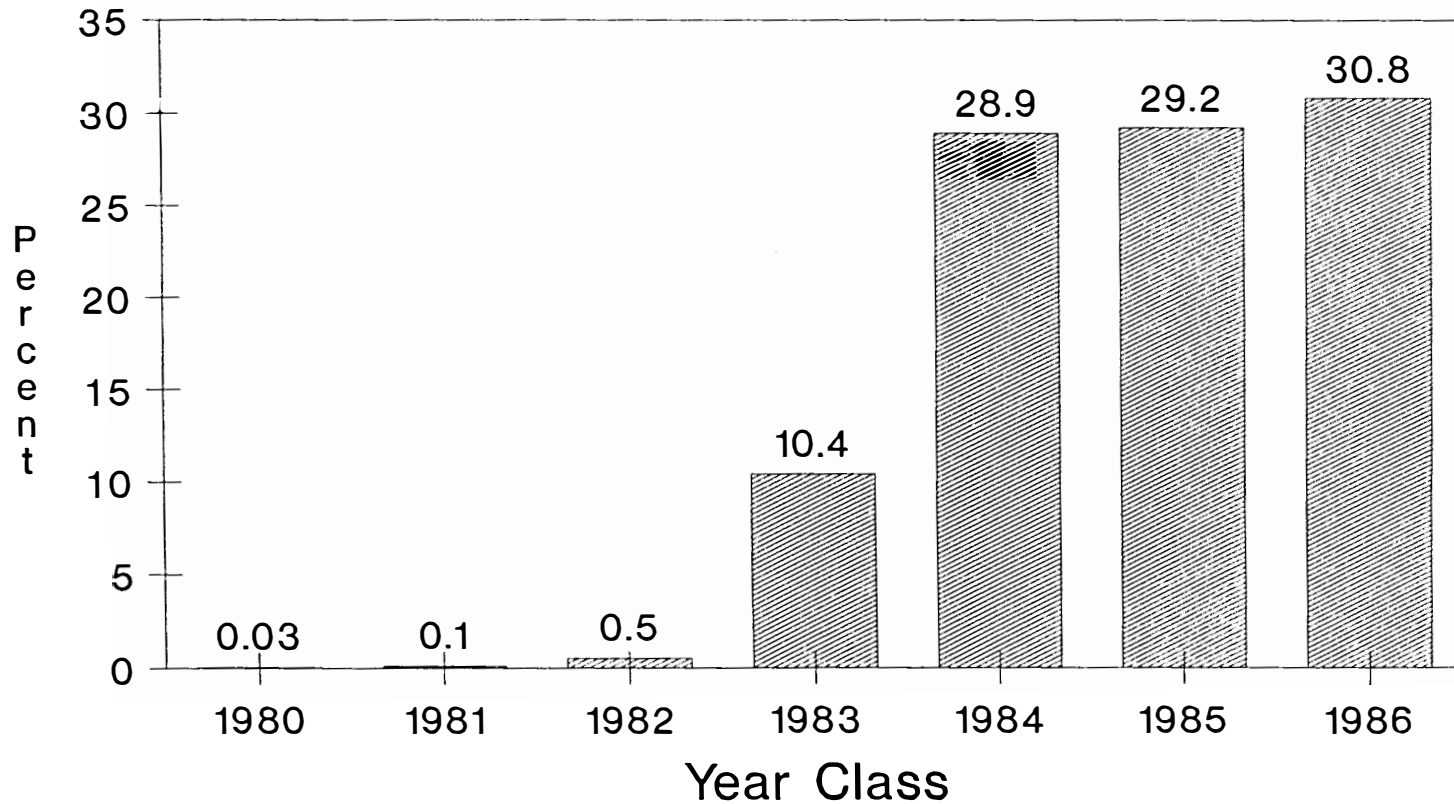
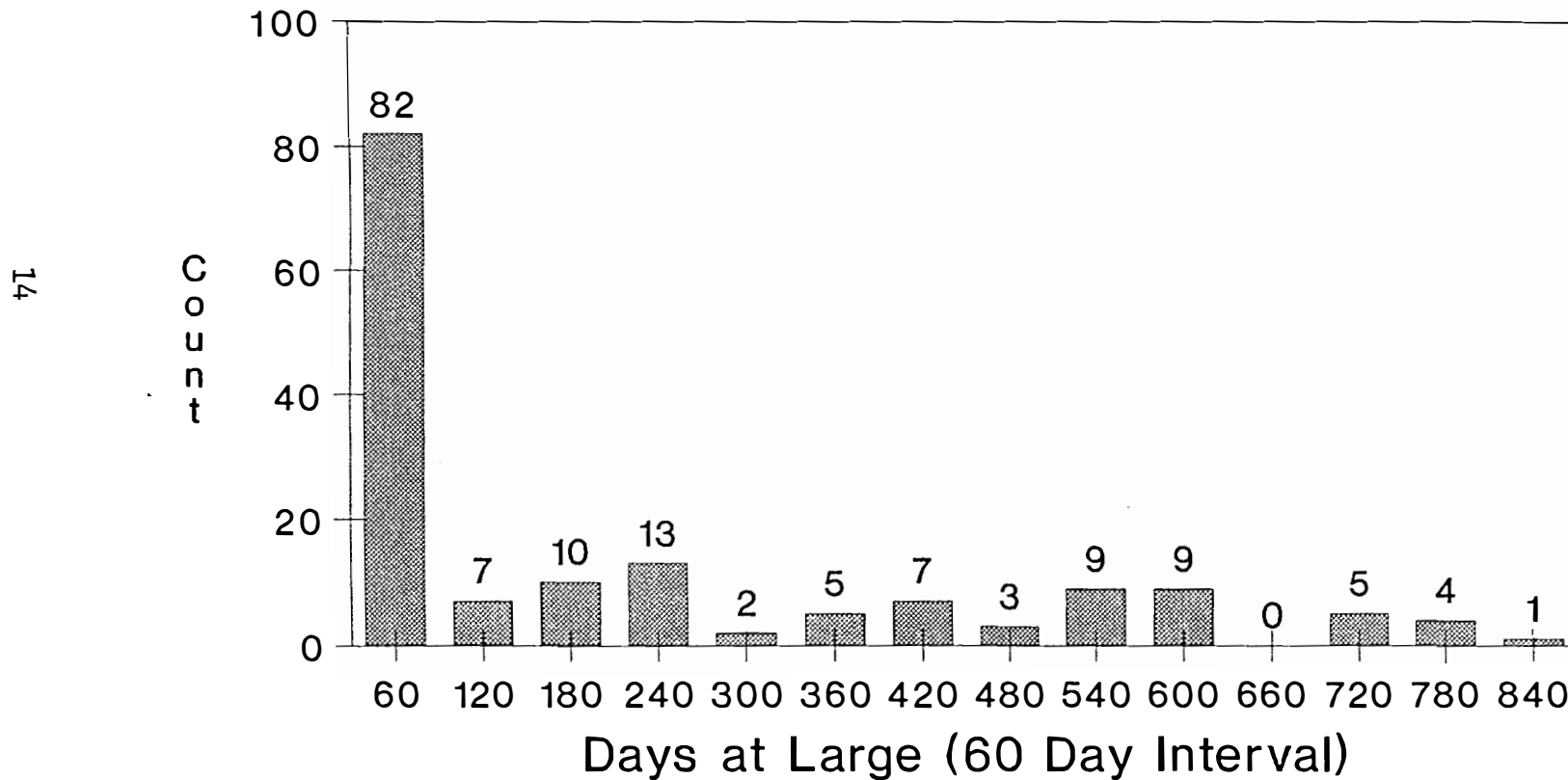
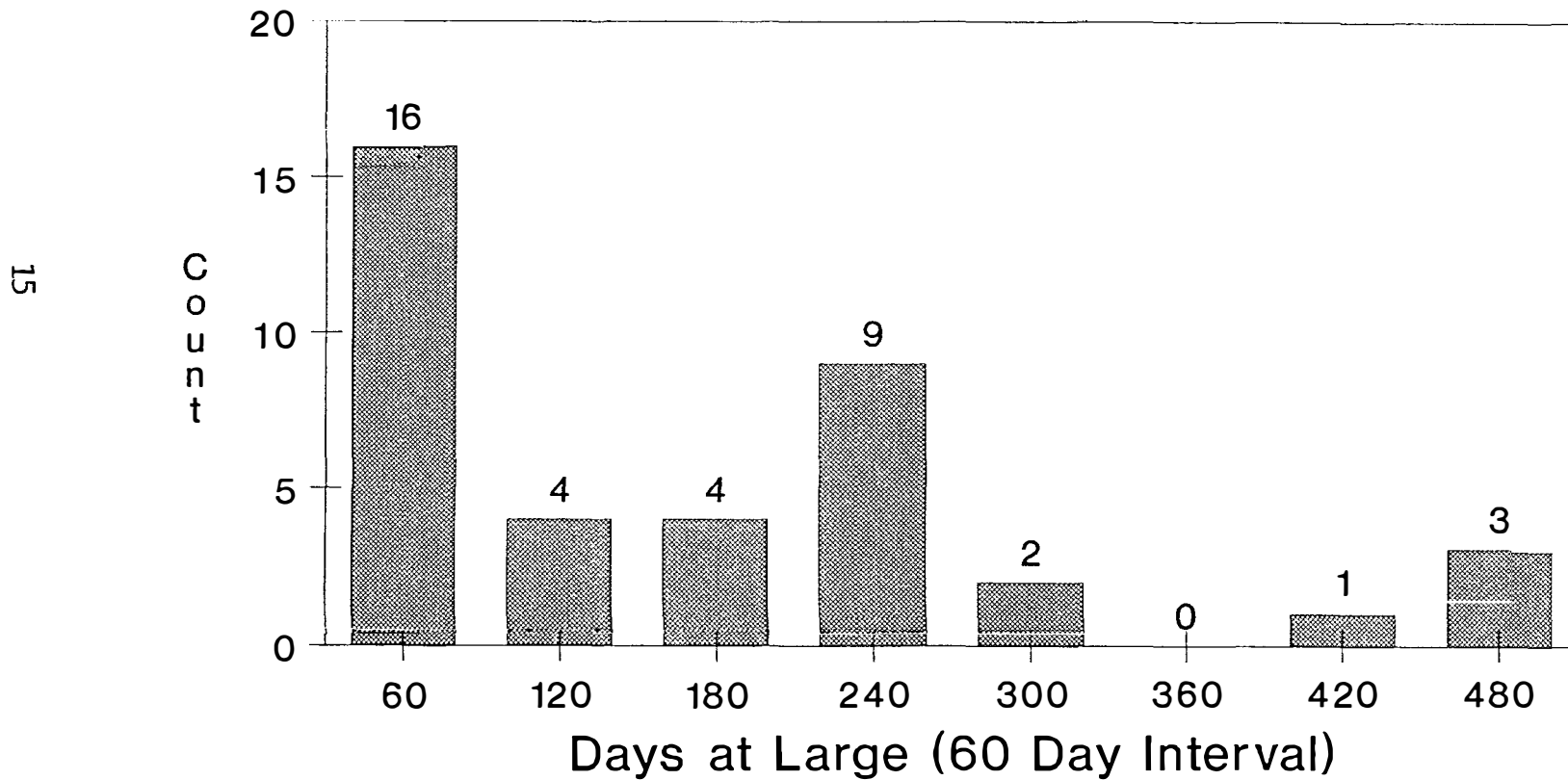


Fig. 3. Days at Large of Recaptured Striped Bass Tagged in the James River, Spring 1987



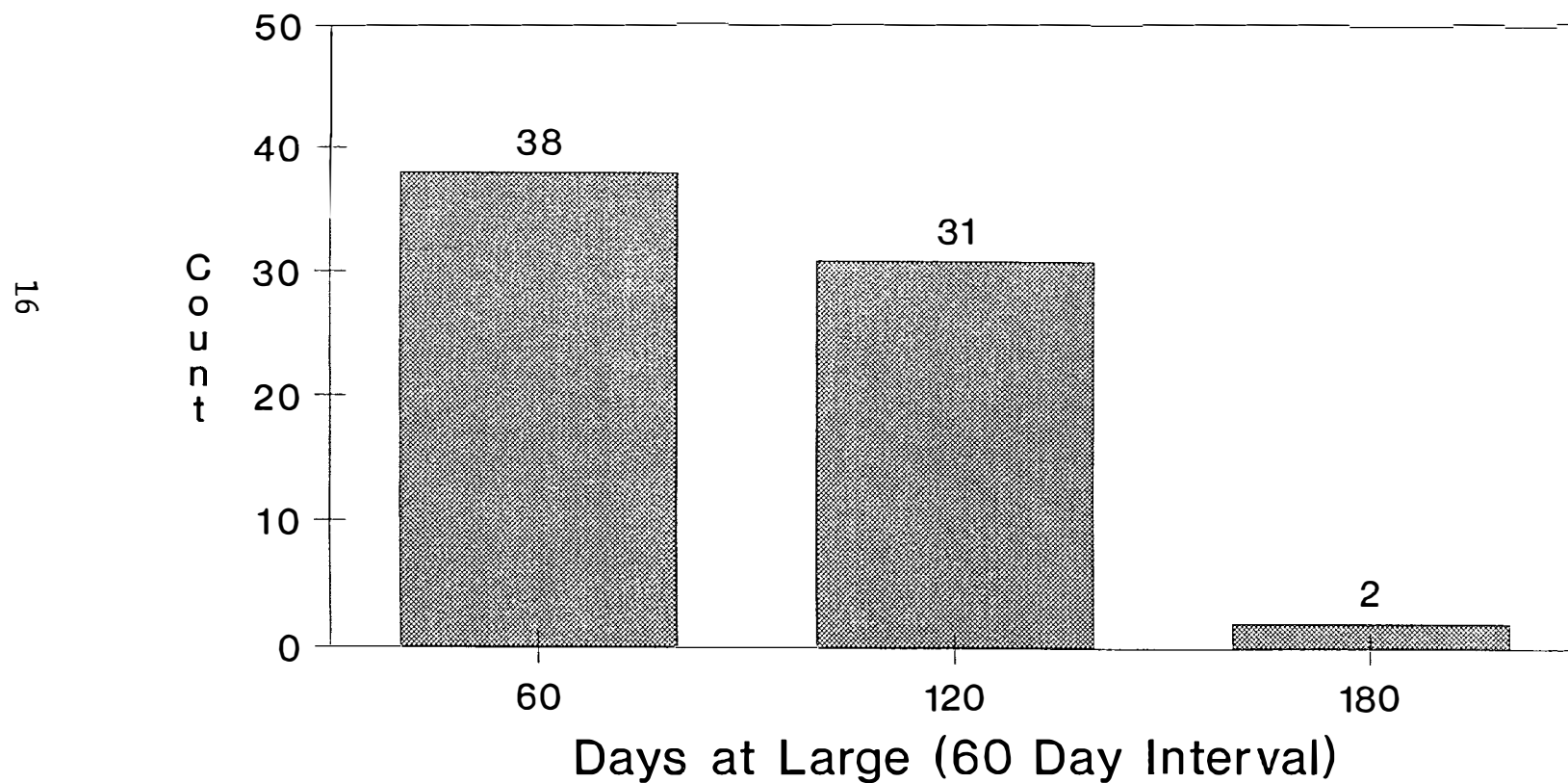
As of October 1, 1989

Fig. 4. Days at Large of Recaptured Striped Bass Tagged in the James River, Spring 1988



As of October 1, 1989

Fig. 5. Days at Large of Recaptured Striped Bass Tagged in the James River, Spring 1989



As of October 1, 1989