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**Evidence for a Strong 1987 Year Class
of Striped Bass in Virginia**

by

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Acknowledgements

Mr. Rob O'Reilly, Virginia Marine Resources Commission (VMRC) kindly provided the commercial landings data; and Mr. Bruce Hill, Virginia Institute of Marine Science (VIMS) provided the unpublished data on age frequencies of tagged striped bass in the James River. The report has been strengthened by discussions with Dr's James Colvocoresses, FlaMRI and Vic Crecco, ConnDEP.

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The 1987 juvenile striped bass index in Virginia was the highest since the record 1970 Bay-wide dominant year class (Figure 1). The strength of the 1987 year class was carried by the Rappahannock and James Rivers (Figure 2) (Colvocoresses 1993), just as the James carried the 1970 year class. If the juvenile index is valid, then the 1987 cohorts should be abundant in subsequent years. In past years dominant, or failure, year classes show up the following year as late 0⁺ in the VIMS trawl survey or as 1⁺ the following winter (Austin et al 1992). Generally they are taken during December of the year of spawn through January-March the following calendar year (Figure 3). Unfortunately, the 35 year trawl survey was senescent during January-April, 1988, the very months needed to validate the 1987 young of the year index. The contribution of the 1987 year class is apparent however in the January 1988-March 1989 1⁺ trawl index. (Figure 4). The 1988-1990 year classes do not however, show up as abundant 1⁺ year classes in the trawl survey data.

Lack of a traditional commercial fishery after 1981 eliminates the possibility of validating the index the way Goodyear (1985) did for the Maryland index.

There exist however, limited VMRC fishery dependent monitoring data both state-wide and of the James River commercial harvest during 1990-1992 (O'Reilly, VMRC, personal communication); and fishery independent data from the VIMS James River tagging studies (Loesch and Hill 1992) for 1990-1992.

Comparisons of fall commercial landings state-wide and in the James (Tables 1 and 2) show that the 1987 year class was very abundant state-wide and partially recruited to the fishery in 1990 (18" minimum size limit) as three year olds, and fully recruited by 1991 at which time it was the dominant year class in the fishery. It can be misleading however, to use four year old fish since this is the first year a year class is fully recruited to the fishery, so they tend to dominate even if not a dominant year class. The 1987 year class continued to predominate in the fishery on into the fall 1992 fishery as five year olds.

The VIMS James River tagging studies (Spring, 1990-1992) used both haul seines in the lower river, and fyke nets up-river on the spawning grounds to collect fish. Figure 5 (Figure 8 from Loesch and Hill 1992) shows that in 1990 the 1987 year class was abundant down-river in haul seine catches, but not so in the up-river fyke nets where the 1985 (5 year olds) year class predominated. In 1990 the three year old 1987 year class did not move up-river to the spawning grounds where they would have been vulnerable to the fyke nets. In 1991 (Figure 6, Figure 10 from Loesch and Hill 1992), as spawning adults they

dominated both in the down-river haul seine catches early in the season, and on the spawning grounds in the fyke nets later on. All collections were made on the spawning ground by fyke net in 1992, and the abundance of five year old 1987 females is obvious in Figure 7 (Figure 12, from Loesch and Hill 1992).

The 1988 and 1989 year classes were also abundant on the spawning grounds in 1992, particularly the 1989 males which probably spawned. These may be a reflection of the also strong 1988-1989 juvenile index. A combination of two large year classes (1987 and 1988) of females on the spawning ground in combination with a large number of spawning males (1989 year class) should have produced a large year class in 1992 on the James River. While this did not appear to be the case on the James River (Figure 2) from the seine data, it is suggested by both the seine and trawl data state-wide (Figures 1 & 3).

The James River was closed to fishing in 1975 by the VMRC due to the Federal (FDA/EPA) Kepone ban. Consequently, seven years prior to ASMFC management efforts (1982), there was a striped bass moratorium in the James River. While the James River never produced more than 4.5% of the historical Virginia commercial landings, it has often produced dominant year classes that carried the Virginia juvenile index (e.g. 1970 year class), even when other rivers showed no evidence of a dominant spawn. Dominant year class production in the Rappahannock and James Rivers, as evidenced by the high

juvenile index, has often resulted in an actual stock increase, even when the index for those years was low in other rivers (Colvocoresses and Austin 1987, Kreite et al 1978); and it would appear that this is the case for the alleged large 1987 year class in Virginia.

An argument can be made that in spite of the fact that the 1987 juvenile index was twice the record 1970 index there was no dominant abundance by the 1987 year class with a subsequent increase in adult stock size (Crecco, personal communication), and therefore the index is suspect. The 1970 year class, which produced a record juvenile index in both Maryland and Virginia also produced a record Bay-wide commercial harvest during 1972-1975. The 1987 index, which was twice the 1970, was only large in Virginia and has not produced a Bay-wide increase in three to five year old fish in the stock. This may be explained one or more of several ways.

1. The early Virginia beach seine index (1967-1973) was conducted differently from the later index (1981-present).
2. The index is not a true indicator of later stock abundance, or
3. Apparent changes in adult (>4⁺) stock abundance and distribution are really a reflection of changes in the commercial

fishery patterns between the early mid-1970's, late 1980's, and early 1990's.

The first option has been carefully considered by Colvocoresses (1984) and rejected on the basis that there were no statistical differences between sampling gear employed during the early years and that adopted during the 1980's. The second possibility is discounted for Maryland's index by Goodyear's analysis (1985); however, the lack of a commercial time series coincident with the Virginia juvenile index precludes a similar analysis. Since the gears used by the two states are the same, so too should be the index, unless local differences in topography cause a difference.

Gibson (1990) examined the Virginia trawl index for striped bass and found that it was a reliable juvenile index. Data from both the Virginia seine and trawl surveys used here (Figures 3 & 4) demonstrate reasonable coherence as both reflect a dominant 1970 year class, a downward 1967-1973 trend in recruitment, low recruitment during the early 1980's, and a steady recovery since 1983. The trawl survey does tend to demonstrate wider anomalies in amplitude (e.g. 1970, 1981, 1992).

In order to consider the last possibility commercial landings data must be examined for the period of the peak landings (1972-1975) and lowest landings

(1979-1982). If most of the Virginia landings during the peak period were from the main stem Bay then it is possible that the large Virginia catch was on a migratory Maryland-spawned 1970 year class. Conversely, high catches in the Virginia rivers would be indicative that there was Bay-wide recruitment by the 1970 year class. Austin (1984) showed that during 1980-1982, the period of lowest landings, Virginia's commercial catch was primarily from the upper Rappahannock (Upper Rappahannock, 56%; Main stem Bay, 2-8%). As of this date (July, 1993) the VMRC has not finished recoding the data so this possibility must await examination.

Regardless of the above options, it is apparent from the 1⁺ trawl survey index that the 1987 year class was large, twice that of the 1970 year class 1⁺ index and that the 1987 year class makes a strong showing in the limited commercial fishery as four and five year olds, and it is a dominant year class in the tagging study. While no one factor concludes that 1987 was a successful year, when taken together, the preponderance of the evidence leads a reasonable person to the conclusion that the 1987 year class was strong, and that the Virginia seine index is a valid indicator of juvenile recruitment.

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Table 2 Fall commercial striped bass landings, James River, VA

Table 1

State-wide Fall Commercial Striped Bass Landings, Virginia
(Data provided by Virginia Marine Resources Commission).

Year	Year class	Age	Number
1989 (All sizes)	1982	7	8
	1983	6	26
	1984	5	23
	1985	4	16
	1986	3	37
	1987	2	96
	1988	1	35
1990 (>18")	1983	7	16
	1984	6	130
	1985	5	178
	1986	4	219
	1987	3	119
	1988	2	4
1991	1983	8	2
	1984	7	19
	1985	6	130
	1986	5	217
	1987	4	246
	1988	3	168
1992	1989	2	5
	1983	9	1
	1984	8	26
	1985	7	95
	1986	6	145
	1987	5	161
	1988	4	146
1989	3	82	

Table 2

Fall Commercial Striped Bass Landings, James River, Virginia
(Data provided by the Virginia Marine Resources Commission)

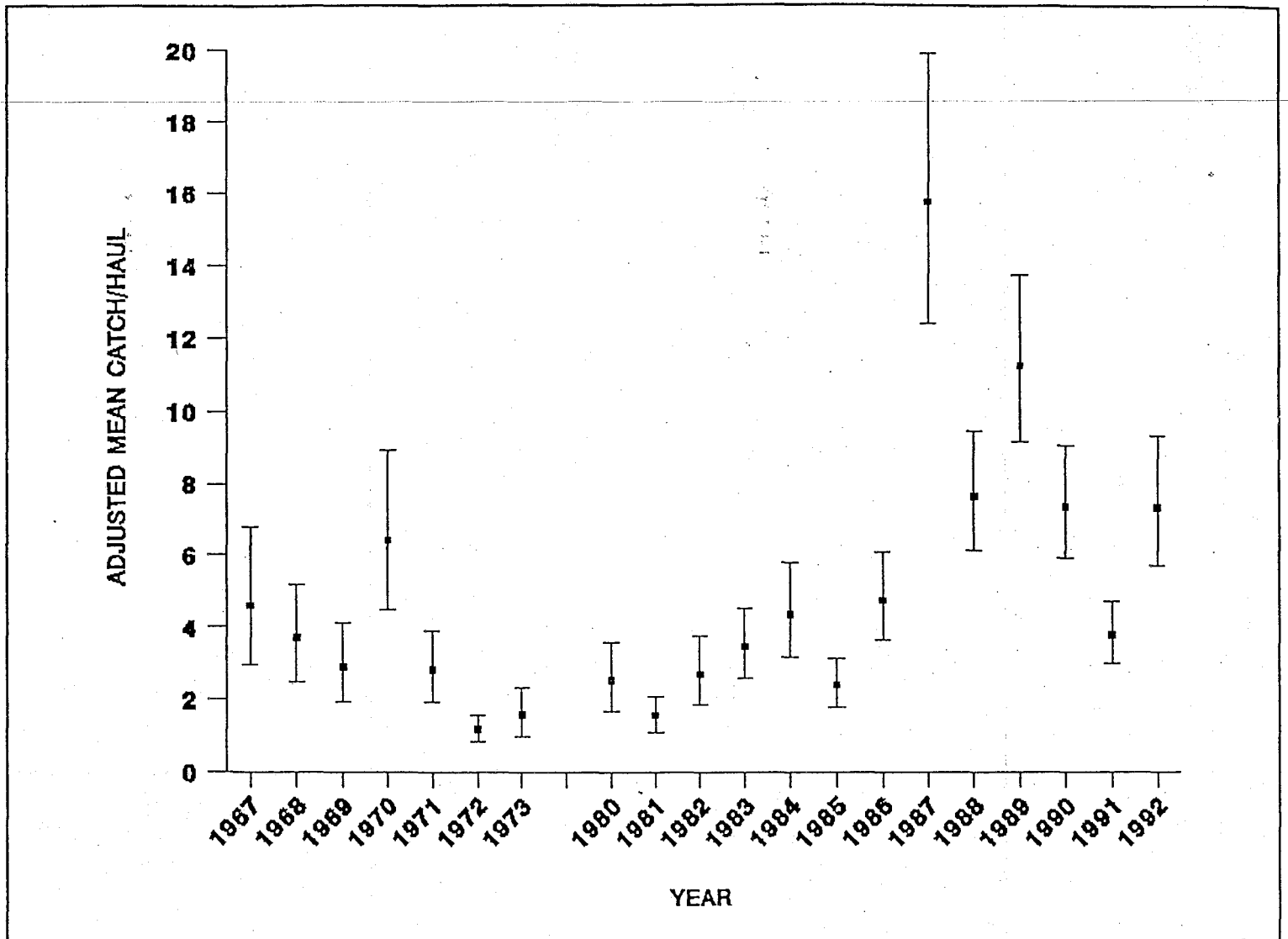
Year	1990		1991		1992	
Class	Age	Number	Age	Number	Age	Number
1983	7	1	8	ND	9	ND
1984	6	19	7	ND	8	2
1985	5	56	6	6	7	10
1986	4	84	5	36	6	18
1987	3	42	4	59	5	27
1988	2	1	3	24	4	28
1989	1	ND	2	ND	3	15

(Note: 1990 and 1992 include fish from Chickahominy and/or Elizabeth River)

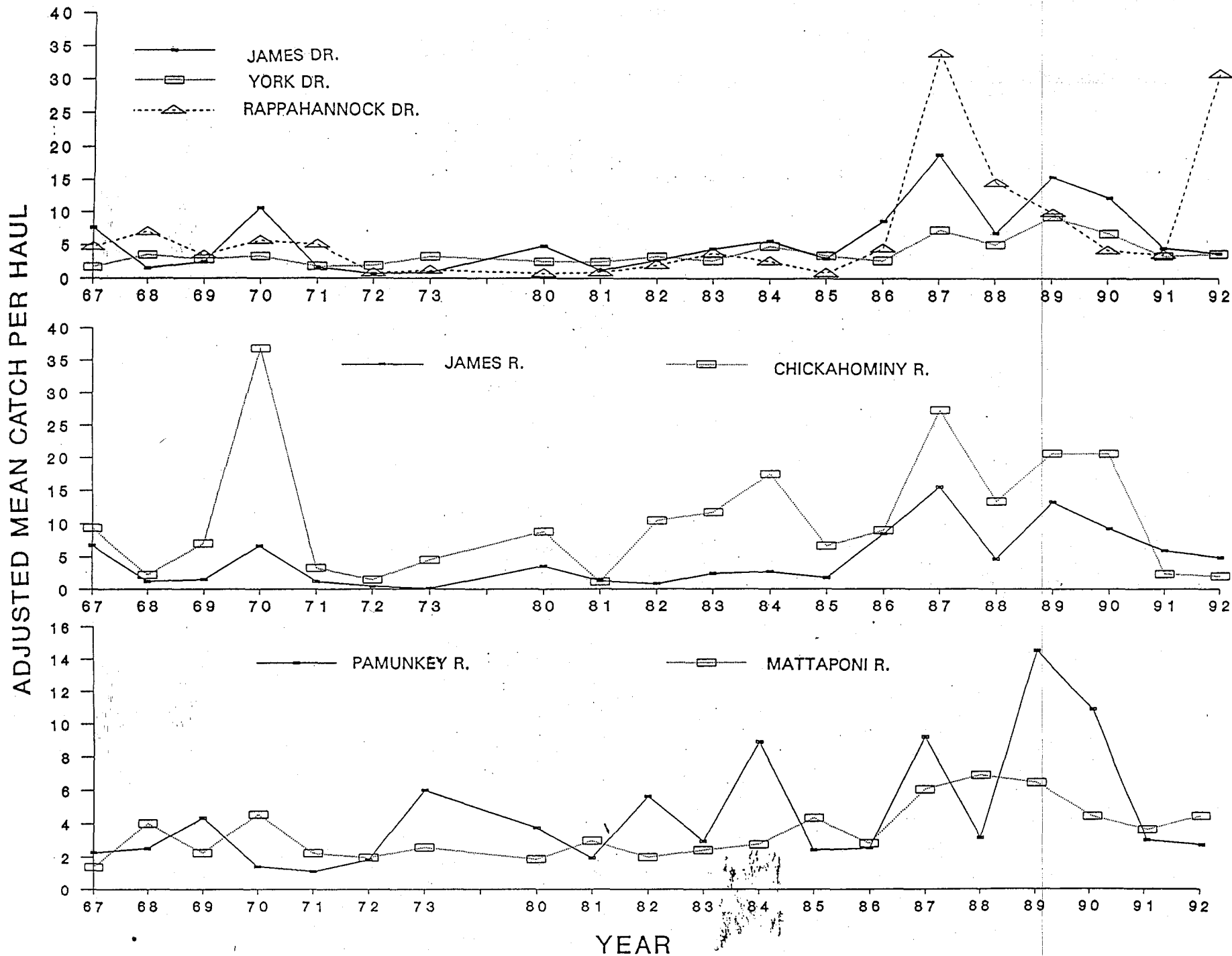
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Figure 1.



Annual Virginia striped bass adjusted mean catch per seine haul. Vertical bars are 95% confidence intervals as estimated ± 2 standard errors of the mean.



Annual Virginia juvenile striped bass seine survey catch rates by drainage and river.

Figure 3.

Virginia Striped Bass Juvenile Indices

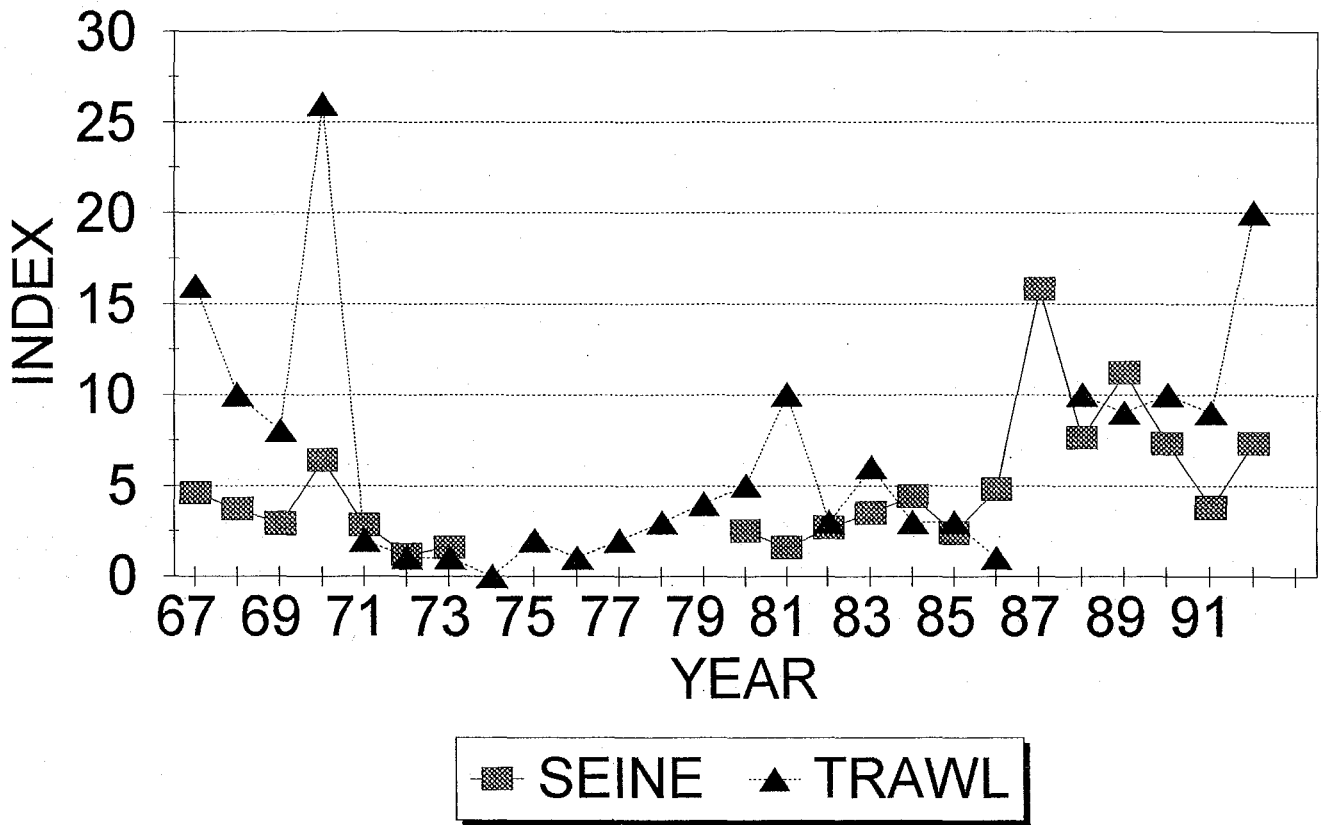


Figure 4.

VIRGINIA Striped Bass

Y-O-Y and 1-Plus Index (lagged)

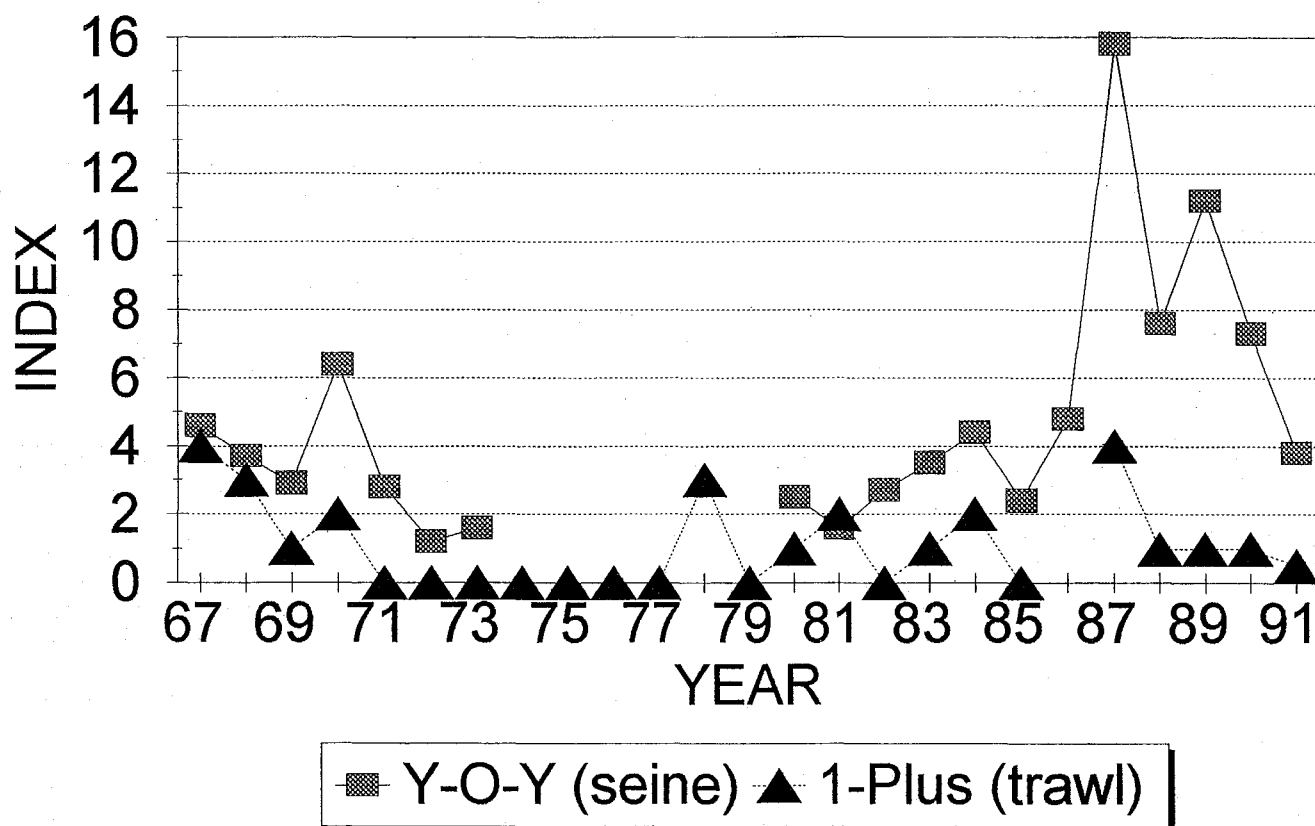


Fig. 8. Year class frequency of striped bass tagged in the James River, spring 1990

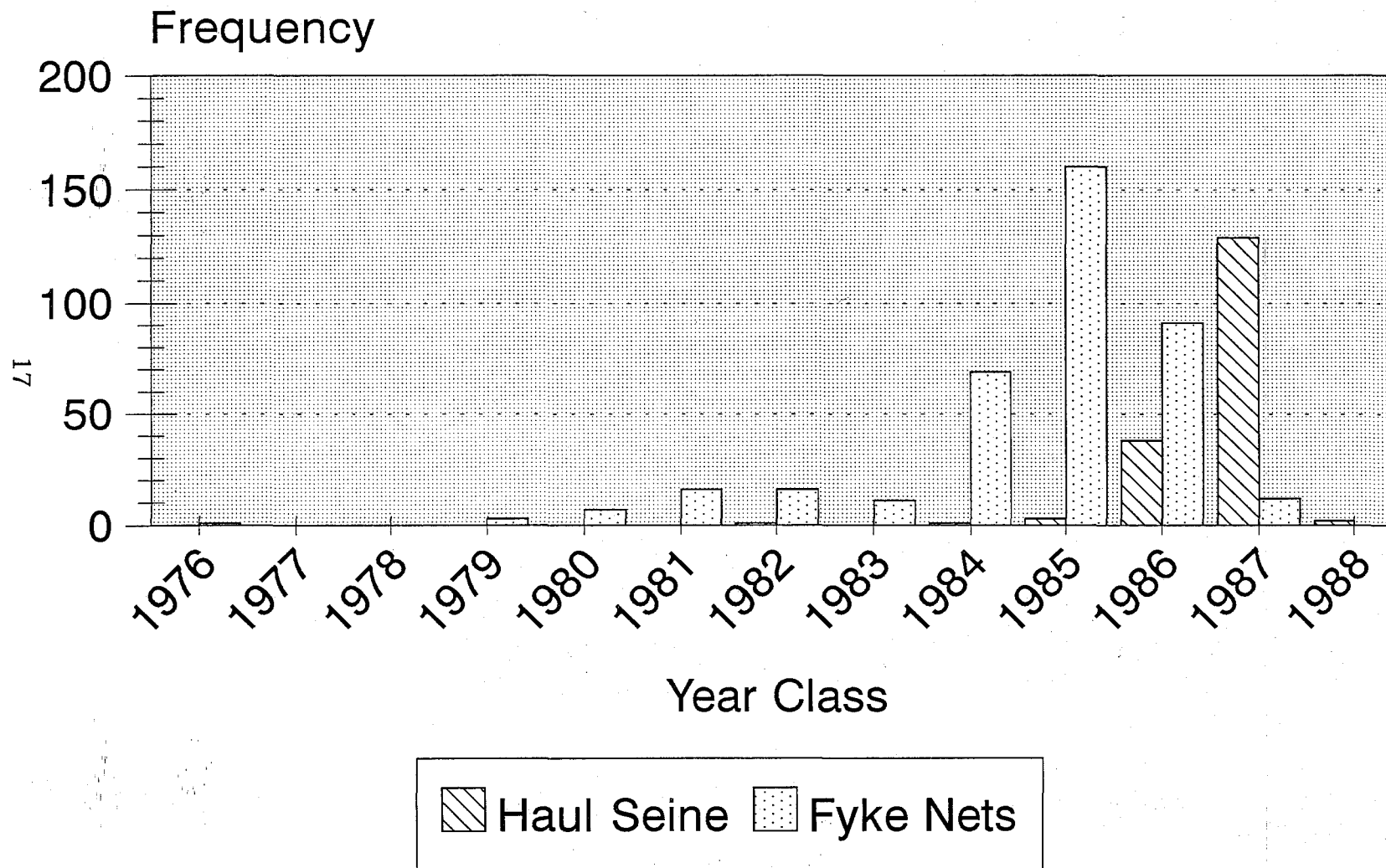


Figure 5.

N = 560
Unable to age 10

Fig. 10. Year class frequency of striped bass tagged in the James River, spring 1991

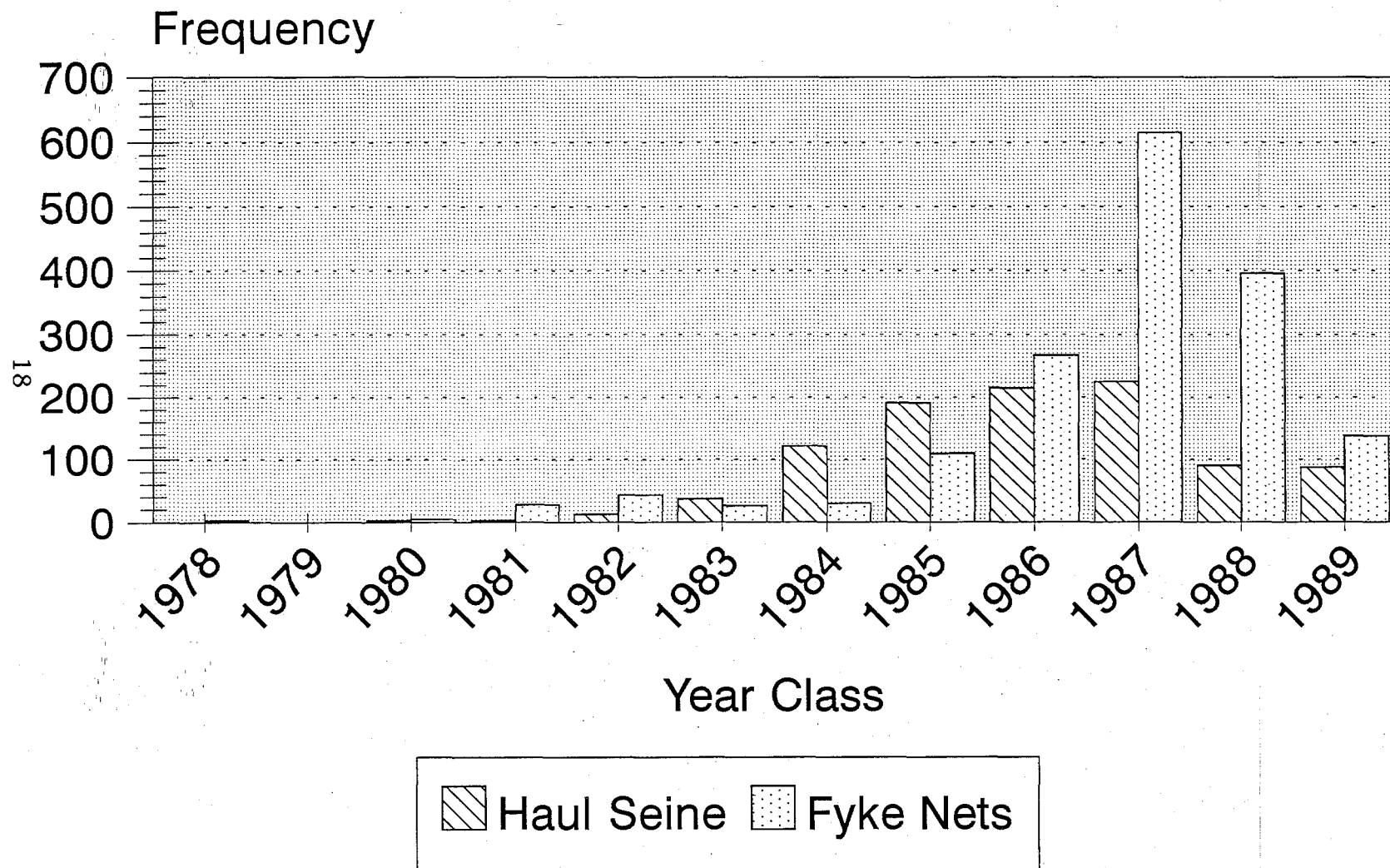
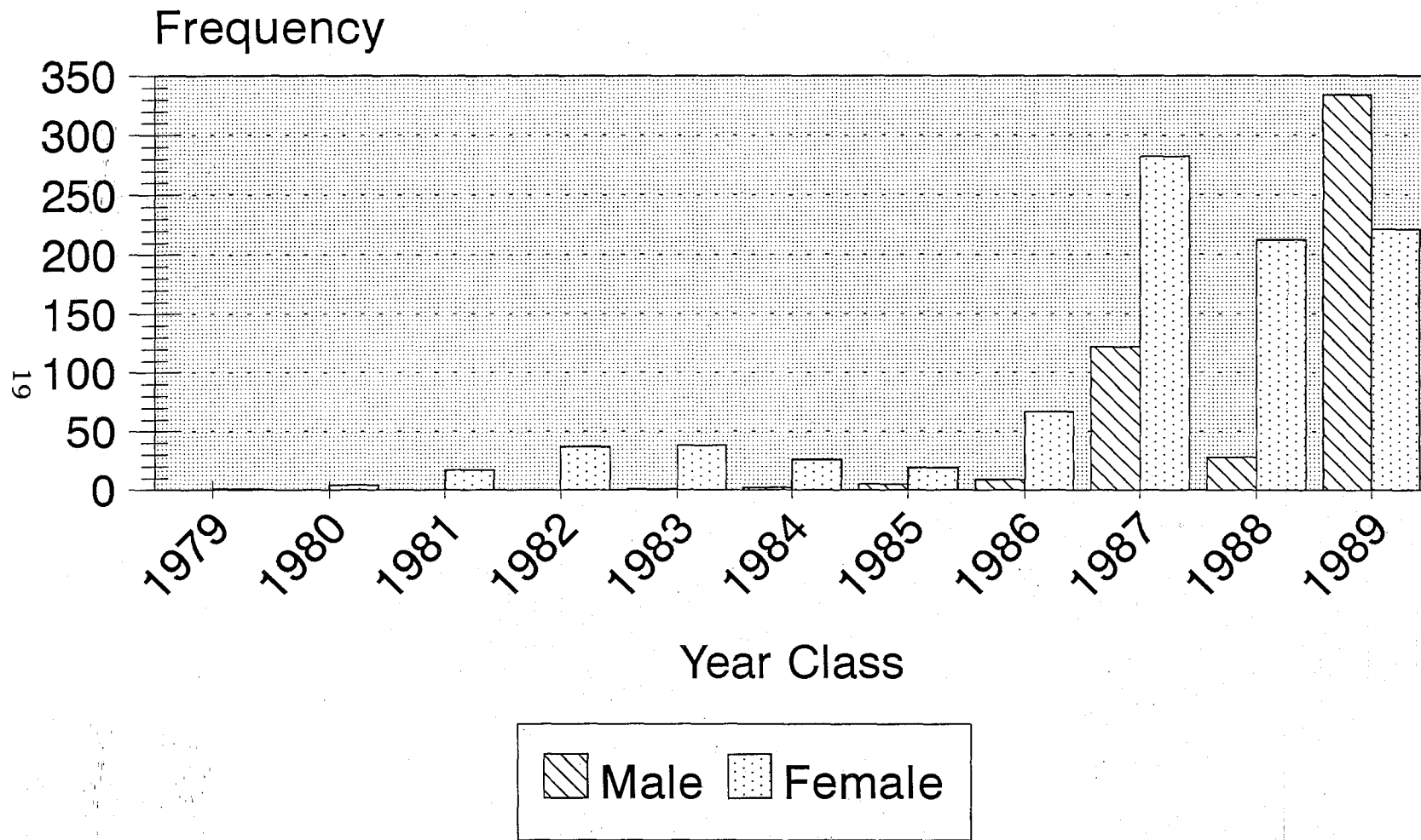


Figure 6.

N = 2,644

Unable to age 84

Fig. 12. Year class frequency of striped bass tagged in the James River, spring 1992



N = 1,477
Unable to age 219
Fyke Nets