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Estimation of Relative Abundance of Recreationally Important Juvenile Finfish in the Virginia Portion of Chesapeake Bay Project RFOI-3 July 2001 - June 2002

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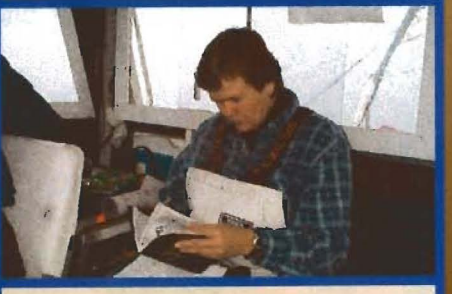

Submitted to

Virginia Marine Resources Commission

Marine Recreational Fishing Advisory Board

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VIMS

ANNUAL REPORT

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DISCLAIMER

Some of the results contained in this report have recently been completed and may contain some errors and/or need further refinement. In particular, information pertaining to gear conversions and the longer time series they provide (1955-2001) should be used with some caution until further evaluation.

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EXECUTIVE SUMMARY

In the Virginia portion of Chesapeake Bay, several annual indices of juvenile abundance have been generated from trawl survey data for species of key recreational importance (spot, croaker, weakfish, summer flounder, black sea bass and striped bass, white and channel catfish) and four species of secondary importance (scup, white perch, northern puffer, and silver perch). In recent years, juvenile indices for most species have declined.

The fisheries trawl survey conducted by the Virginia Institute of Marine Science is the oldest continuing monitoring program (48 years) for marine and estuarine fishes in the United States. This survey provides a monthly baseline assessment of the abundance of juvenile marine and estuarine fishes and invertebrates in the tidal and mainstem areas of the Chesapeake Bay. The survey provides crucial, real time data to various state fisheries management agencies, the Atlantic States Marine Fisheries Commission, the Mid-Atlantic Fisheries Management Council, and the National Marine Fisheries Service.

INTRODUCTION

A key element in the management of the Atlantic States' coastal fishery resources is the use of juvenile finfish abundance estimates. Relative interannual abundance estimates of early juvenile fish (age 0) generated from scientific (fishery-independent) survey programs provide a reliable and early estimator of future year class strength (Goodyear, 1985; Lipcius and Van Engel, 1990). The Chesapeake Bay Stock Assessment Committee (CBSAC), a federal/state committee sponsored and funded by the National Oceanic and Atmospheric Administration (NOAA) reviewed previously available indices of juvenile abundance for important fishery resource species in the Chesapeake Bay (hereafter referred to as "Bay") and recommended that "a unified, consistent trawl program should be one of the primary monitoring tools for finfish and crab stock assessment." (Chesapeake Bay Program Stock Assessment Plan, Chesapeake Executive Council, 1988). Subsequently, CBSAC supported pilot studies directed at developing a comprehensive trawl survey for Chesapeake Bay. The primary focus of this support in the Virginia portion of the Bay was the initiation in 1988 of a monthly trawl survey of the mainstem lower Bay, thereby complimenting and expanding the monthly trawl surveys of the major Virginia tributaries (James, York and Rappahannock Rivers), which had been conducted by the Virginia Institute of Marine Science (VIMS) as part of a long-term monitoring effort to assess the condition of fishery stocks in the lower Chesapeake Bay and its tributaries.

The present sampling program, which includes the Bay and its tributaries, is vital in insuring that data is of sufficient geographic resolution for the generation of annual relative estimates of recruitment success of recreationally and ecologically important finfish species. The National Marine Fisheries Service (NMFS) Marine Recreational Fisheries Statistics Survey (MRFSS),

revealed 2001 Virginia marine recreational catches were dominated by Atlantic croaker, summer flounder, black sea bass, spot, striped bass, bluefish and weakfish (Anon., 2002a). These are the top species landed (93% of the total catch) and 80% of the total weight (Table 1). These species depend upon the lower Chesapeake Bay and its tributaries as a nursery area, with all but bluefish highly vulnerable to bottom trawls. In addition to the key species above, past survey results indicate other species of recreational interest, including scup, white perch, silver perch, and freshwater catfishes (white, channel, and blue), are taken with sufficient regularity during trawling operations to provide data sets suitable for the generation of indices of juvenile abundance.

Although generation of annual juvenile (young-of-year or YOY) indices is the primary focus of this project, survey results can be used to address other aspects of finfish population biology, such as habitat utilization, early growth and survival, climate and pollutant interactions, or disease prevalence.

The development of juvenile indices requires a continuous time series of data to determine the proper area-time sequences best used in index calculations. In 1991, provisional annual juvenile abundance indices were developed for spot, weakfish, Atlantic croaker, summer flounder, and black sea bass (Colvocoresses and Geer, 1991). In 1992, a provisional index was developed for a sixth species, scup (Colvocoresses et al., 1992), with white perch and striped bass estimates developed the following year (Geer et al., 1994). Results for white and channel catfish, silver perch, northern puffer, and tautog were briefly introduced in the 1994 project report (Geer and Austin, 1994). A time series back to 1955 with the use of gear conversions and post stratification methods was provided in the 1997 report (Geer and Austin, 1997).

Many species of interest are captured in significant numbers across several year classes. As

a result, both YOY and age 1+ indices were created for white perch, white catfish and channel catfish. For Atlantic croaker, a recruit or spring index (returning young-of-year) was created.

METHODS

Field Sampling

Sampling protocol continues as described in detail in previously (Lowery et al., 2000). The gear remains a lined 30' (9.14m) semi-balloon otter trawl, 1.5" (38.1mm) stretched mesh and 0.25" (6.35mm) cod liner, and is towed along the bottom for five minutes during daylight hours. Marinovich Net Company (Biloxi, MS) supplied trawl nets for the survey for over thirty years before going out of business. Trawl nets are now built to survey specifications by Glavan Trawl Manufacturing Company (also of Biloxi, MS) .

Beginning May 1998, data was collected on habitat or substrate type (Table 2). Fish distribution and abundance may be influenced by various substrates such as shell, sponge, hydroids, and sea squirts. Three dimensional structure may be used by fish for spawning, shelter, or feeding. Categories of substrates are measured at each trawling site based upon the quantity (volume in a standard container) observed in the net. Maps of substrate distribution can be developed and compared to catch rates and fish species distribution.

Sampling in the Bay remains monthly except during January and March, when few target species are available. Sampling in the tributaries also remains monthly, with both the random stratified stations and the historical fixed mid-channel station transects continuing. The stratification system is based on depth and latitudinal regions in the Bay, or depth and longitudinal regions in the rivers. Each Bay region is 15 latitudinal miles and consists of six strata; western and eastern shore

shallow (4-12 ft.), western and eastern shoal (12-30 ft.), central plain (30- 42 ft.), and deep channel ($\geq$ 42 ft.)(Table 3). Each tributary is divided into four regions of approximately ten longitudinal miles, with four depth strata in each (4-12 ft., 12-30 ft., 30-42 ft., and $\geq$ 42 ft.) (Tables 4 - 6; Figure 1). Strata are collapsed in areas where certain depths are limited. The fixed stations have been assigned a stratum according to their location and depth.

Due to funding restrictions, the exploratory monitoring of secondary water systems (Pocomoke Sound, Mobjack Bay, Piankatank and Great Wicomico Rivers) which began in 1998, was discontinued in 2001. Each system was sampled quarterly, with a rotation to assure that over a three year period, each system would have sampling events during different times of the year. A random stratified design similar to the primary survey was used. When compared to the mainstem Bay, James, York and Rappahannock Rivers, some of these systems have shown higher catch rates of species such as summer flounder, spot and silver perch (Geer and Austin, 2000).

With the exception of the fixed river stations, trawling sites within strata are selected randomly from the National Ocean Service's Chesapeake Bay bathymetric grid, a database containing depth records measured or calculated at 15 cartographic second intervals. Two to four trawling sites are randomly selected for each Bay strata per month, the number chosen varying seasonally according to observed changes in distribution, with sampling intensity being highest in the most heavily utilized strata. Exceptions include the shallow water strata where one to two stations have been occupied for each month's survey. For each river strata, one to two stations are selected per month. The number of potential sites for the RSD of the Bay and tributaries with the approximate areas of each strata, are shown in Tables 3 - 6. The RSD of the York River which began in June 1991, has been altered slightly to make depth strata similar to the James, Rappahannock, and

mainstem Bay. Earlier segment reports (Geer et al., 1994) proposed that for the tributaries, all depths $\geq$ 30 ft. be included in one stratum, and this was modified in January 1996, to create depth strata of 30-42 ft. and $\geq$ 42 ft.) (Geer and Austin, 1996a). Since these random stratified data of the tributaries were considered conditional until all three tributaries were being sampled (March 1996), previous samples will be assigned to the appropriated strata established January 1996.

Earlier reports listed results dating back to only 1979, due to gear and sampling changes which made earlier data difficult to use in the present sampling format. With gear and vessel conversions now available for most target species, a standard measure of relative abundance can be calculated for the pre-1979 data. Survey stations before 1979 have also been post-stratified to the present sampling scheme. Although the stratification of the mainstem Bay has not changed, that of the initial random stratified surveys of the rivers has.

The fixed channel sites on the tributaries are spaced at approximately 5 mile intervals from the river mouths up to approximately the fresh water interface in each system. The fixed stations have been sampled monthly nearly continuously since 1980 (Table 9, Fig.2). From the mid-1950's (York R.) and early-1960's (James and Rappahannock Rivers) to 1972, the fixed stations were sampled monthly using an unlined 30' trawl (Gear U_N_3B_SW, gear code 010). During 1973-79, semi-annual random stratified sampling was performed by the Ichthyology Department while the Crustaceology Department continued monitoring the fixed tributary stations on a limited monthly basis (May - November). Areal weightings for the tributaries have been previously assigned by dividing each river into two approximately equal length "strata" and assuming that the stations in each strata are representative of the channel areas in those reaches (Table 8). These strata have been described in earlier segment reports (Lowery and Geer, 2000). With all three tributaries now being

sampled with a random stratified design, the fixed stations have been assigned to a stratum based on location and depth. The present tributary survey (combining fixed and random stations) provides larger spatial coverage, a long term historical reference, and is more statistically sound.

Gear Calibration Studies

Gear calibration analyses were completed in 1997 and methods and statistical analyses applied are explained in detail by Hata (1997). Conversion values can now be applied to the historical datasets providing a converted catch for each observation.

Juvenile Index Computations

Many of the key target species of this project are migratory and measurement of abundance presents special difficulties, particularly if the timing and duration of migration is not constant from year to year. Juvenile fishes which use estuarine nursery areas are especially vulnerable to the vagaries of climate, as many rely upon climatically dependent wind driven and tidal circulation patterns for semi-passive transport into the estuaries as larvae and early juveniles, and later key their outward migration from the nursery areas on such annually variable environmental cues as temperature changes. Ideally the abundance of a juvenile finfish population should be measured at that point when it is most fully recruited to the nursery area being monitored. However, in practicality this can only be accomplished if the time of maximal abundance and size of recruitment to the gear can be predicted (and surveys timed accordingly), or if surveys can be conducted on such an intense periodicity over the season of potential maximal abundance as to be certain of reasonable temporal coincidence. Neither of these two approaches is possible in the present case. The period of recruitable maximal abundance and the scope of the area being surveyed has proven to be variable between years within species. This, coupled with multi-specific monitoring objectives precludes

temporally intense surveys in the face of finite resources. The multi-species nature of this program, also makes survey timing difficult to adjust in order to maximize the usefulness of the data for all species. Consequently, the survey will continue to be conducted on a regular periodicity and juvenile indices constructed as best possible.

Juvenile index calculation uses the following approach. A standard monthly cutoff value is applied to the length frequency information collected for each target species to separate the data into either young-of-year or older components. Cutoff values vary among months for each species and are based on modal analyses of historical composite monthly length frequency data and reviews of ageing studies for each species (Colvocoresses and Geer, 1991). For the earlier months of the biological year, cutoff values are usually arbitrary and fall in between completely discrete modal size ranges. In the later part of the biological year, when early spawned, rapidly growing individuals of the most recent year class may overtake late spawned, and slowly growing individuals of the previous year class, cutoff values are selected to preserve the correct numeric proportionality between year classes despite the misclassification of individuals (Table 10). The extent of the zone of overlapping lengths and the proportion within that range attributable to each year class is estimated based on the shapes of each modal curve during the months prior to the occurrence of overlap. A length value is then selected from within that range which will result in the appropriate proportional separation. Although this process involves considerable subjectivity and ignores possible interannual variability in average growth rates, the likelihood of significant error is small, since only a very small fraction of the total number of young-of-year individuals fall within the zone of overlap and most of the data used to construct juvenile indices is drawn from months when no overlap is present. Fish length was recorded as total length (TL), fork length (FL) or total length

centerline (TLC) depending on species meristics.

After partitioning out non young-of-year individuals, monthly catch rates of target species are map-plotted and strata-specific abundances and occurrence rates calculated. Numbers of individuals caught are logrithmetically transformed (ln(n+1)) prior to abundance calculations, since the log transform best normalizes collection data for contiguously distributed organisms such as fishes (Taylor, 1953) and has been verified as the best suited transformation for Chesapeake Bay trawl collections (Chittenden, 1991). Resultant average catch rates (and the 95% confidence intervals as estimated by $\pm$ 2 standard errors) are then back-transformed to the geometric means. Coefficient of variation is expressed as the log transformed mean catch, EY_{st} divided by the standard deviation, EY_{st} / STD (Cochran, 1977). Plots and data matrices are then examined for area-time combinations which provide the best basis for juvenile index calculations. Criteria applied during the selection process include identification of maximal abundance levels, uniformity of distribution, minimization of overall variance, and avoidance of periods in which distribution patterns indicate migratory behavior is occurring. Although identification of areas most suitable for index calculations (primary nursery zones) is generally clear, selection of appropriate time windows is more complex. Surveys are timed on regular monthly intervals which may or may not coincide with periods of maximal recruitment to the nursery areas. The use of a single (maximal) month's survey results is inappropriate, since using a very limited portion of the overall data set would decrease sample size, increase confidence intervals, and increase the risk of sampling artifacts. Conversely, the temporal series of data incorporated into index calculations should not be longer than necessary to capture the period of maximal juvenile utilization of the nursery area, since indices calculated over longer time periods risk confounding temporal persistence on the nursery area with

maximal utilization levels. With this approach, we can identify three or four month periods which provide realistic abundance data for the species examined (Table 10).

After area-time combinations are selected, annual juvenile indices are calculated as weighted geometric mean catch per tow. Strata-specific means and variances are calculated and then combined and weighed by stratum areas (Cochran, 1977). Since stratum areas are quite variable, a weighted mean provides an index that more closely mirrors actual population sizes.

The following indices are produced for each species: the original index based on the present Bay strata and the fixed mid-channel tributary stations (Bay & River Index - BRI and River Only - RO, 1979 to present); a post-stratified gear and/or vessel converted index using all spatially appropriate data (Random Stratified Converted Index - RSCI, 1955 to present); and an unconverted post-stratified index, also based on all spatially appropriate data (Random Stratified Index - RSI, 1955 to present). These multiple indices are presented for completeness, but only the RSCI and the Original Index (BRI and/or RO) will be described in detail. Results from the longer time series must be considered provisional, since concerns about missing data and conversion factors are continually being addressed.

RESULTS

Our objective was to develop and produce timely annual estimates of recruitment success of important finfish species for the major Virginia nursery areas of Chesapeake Bay

Spot (*Leiostomus xanthurus*) - Spot has often been the most abundant of the recreational species caught by the survey, however in recent years their numbers have declined. Their distribution is wide and consistent throughout the sampling area (Appendix Fig. 1). Juveniles first recruit to the gear in April and their abundance remains consistently high until December, peaking between July and October. The RSCI (1955-2001), BRI (1988-2001) and RO (1979-2001) for spot all showed significant decreases ($r^2 = 0.10$, $P = 0.027$, $r^2 = 0.57$, $P = 0.027$, and $r^2 = 0.24$, $P = 0.017$ respectively; see Table 10 and Figure 3). While the longer time series have shown great fluctuations, all indices show a dramatic and consistent decline from 1992 to the present (Figure 3).

Atlantic Croaker (*Micropogonias undulatus*). Croaker display high abundance in the survey catches but present a complex pattern of recruitment and distribution (Appendix Fig. 2). Spawning takes place over a more protracted period than other species considered, and small early juveniles (<30 mm TL) can be present in catches year-round (Norcross, 1983; Colvocoresses and Geer, 1991; Colvocoresses et al., 1992; Geer et al., 1994; Geer et al., 1995; Land et al., 1995). During some years, peak abundance occurs in the fall with animals less than 100 mm TL, but in other years the peak occurs the following spring and includes croaker either overwintering or recruiting from offshore waters. To separate these size cohorts, two estimates are generated: a juvenile fall (Oct. - Dec.) index based just on the tributaries; and a spring recruit (May - Aug.) index (Bay and tributaries combined).

Successful spawning events are evident from the very successful year classes in the fall of

1984, 1985, and 1989 (Table 11, Figure 4). However, these successful spawning events often did not result in comparably successful recruitment the following spring (Table 12 and Figure 5). There was no significant relationship between the fall YOY and spring recruit indices.

The Fall YOY RSCI (1956-2001) and RO (1979-2001) and Spring Recruit RSCI (1955-2002), BRI (1988-2002) and RO (1979-2002) for spot were analyzed for annual trends. Only the Fall YOY RSCI (1956-2001) showed significant decreases ($r^2 = 0.11$, $P = 0.024$; see Table 11 and Figure 4). For the Fall YOY indices, major peaks occurred in 1984 and 1989, with minor peaks evident during 1996 and 1998 (Figure 4). The Spring Recruit RO index has been extremely variable since 1979 (Figure 5, Table 12) with major peaks in 1991, 1993, and a minor peak in 1997. The 2002 Spring Recruit RO index was three times greater than 2001.

Weakfish (*Cynoscion regalis*) - Weakfish are less abundant than spot and croaker, but are still one of the dominant species in the survey. Juveniles have occasionally first occurred in catches as early as late May and June, with June taken as the beginning of the biological year, but most new recruitment to the nursery areas occurs July, August and September. Weakfish indices have been highly variable, with no significant trends, though increases have occurred since 1994 (Figure 6, Table 13).

The most striking observation of the weakfish time series poor recruitment between 1972 and 1977, though before and after this period, there was successful recruitment (1970 and 1978; Figure 6, Table 13).

Summer Flounder (*Paralichthys dentatus*) - Juvenile summer flounder can first appear in the catches as early as late March, which is used as the beginning of the biological year; but in most years were not taken in appreciable numbers until June (Appendix Figure 4). Young-of-year summer

flounder abundance continues to increase steadily throughout the summer and early fall to a late fall peak, and then shows evidence of emigration during December. September, October, and November usually encompass the three months of greatest abundance. During this period, juvenile flounder are broadly distributed across the mainstem Bay and are found in the lower rivers, but only rarely appear in catches in the upper rivers (Appendix Figure 4). Index calculations therefore include all Bay and the lower river strata.

The RSCI (1955-2001), BRI (1988-2001) and the RO (1979-2001) were analyzed for annual trends. Only the RO showed a significant decrease ($r^2 = 0.44$, $P = 0.001$). The RO index peaked in 1979 (mean = 7.6) and is presently (2001) at a value of 0.53. All indices remained low in 2001 (Table 14, Figure 7). Annual index values (RSCI and RO) were highest between 1980 and 1983. Minor peaks occurred in the early nineties (1990, 1991 and 1994), but the last few years have been consistently low.

Black Sea Bass (*Centropristis striata*) - Black sea bass are seldom taken in large numbers but regularly occur in survey catches. Juveniles first appear in low numbers in August. When present, young-of-year black sea bass occur throughout the Bay strata but do not appear in the tributaries on a regular basis except the lower James River (Appendix Figure 5). Index calculations have been based on all Bay strata and the lower James stratum. Although some early juveniles appear in the Bay during their first summer and fall and then emigrate with the onset of winter, more young-of-year enter the estuary during the following spring. During some years there is virtually no recruitment to the Chesapeake Bay by early juveniles spawned the same calendar year. Since abundances are higher and distribution much more consistent during the following late spring and early summer, juvenile index calculations are based on May through July, encompassing the three

months of highest abundance. Since this index is calculated from the middle portion of the calendar year but the very end of the biological year, the resultant index is for the year class spawned the previous calendar year (i.e. the 2001 index is for the 2000 year class). When the RSCI (1954-2001), BRI (1987-2001) and the RO (1978-2001) were analyzed for annual trends, the RSCI increased significantly ($r^2 = 0.16$, $P = 0.005$) with the BRI exhibiting a strong positive trend, though non-significant ($r^2 = 0.21$, $P = 0.087$; Figure 8; Table 15).

Scup (*Stenotomus chrysops*) - The scup is a primarily marine and summer spawning species and uses the Chesapeake Bay the same as black sea bass. The estuary is rarely used as a nursery area by early juveniles but many older juveniles can be found there during their second summer. Early juvenile scup (25-40 mm FL) occasionally appear in survey catches in June, but usually rapidly disappear thereafter. Older scup first appear in catches in May, and by June range from 50 to 215 mm FL. The original length cutoff criteria were based on ageing studies (Morse, 1978), with the collective trawl data indicating three size or year classes (age 0, age 1 and age 2+). Since the age 0 is annually variable and not persistent, and the age 2+ is only taken in very small numbers, index calculations are performed on age 1 individuals. This year class clearly remains present in the Bay and available to the gear for the remainder of the summer and early fall. While the data collected are not amenable to construction of a true young-of-year juvenile index, the abundance of juvenile scup just as they enter their second year can be assessed. The term, "age 1" scup was often used in earlier reports, when in actuality data were lagged one year (year - 1), referring to YOY measured in their second year. Although there has been some discussion whether animals captured in Chesapeake Bay are YOYor early age 1, based on studies along the Virginia coast, trawl catches in these size ranges represent mainly age 1 individuals (Campbell et al., unpublished manuscript).

The early age 1 nursery area is largely restricted to the two lower mainstem Bay segments (Appendix Figure 6). Catch rates for scup usually peak in July, and essentially show a July-August dome. Since sizable numbers of late juveniles have also been collected during June and September, these months were chosen as the temporal basis for index calculation.

A regression of year vs. index for RSCI (1954-2000) was not significant, but the BRI (1987 - 2000) decreased significantly (Figure 9, Table 16). Scup indices have been consistently low since 1993, but showed a slight increase in 2000.

Striped Bass (*Morone saxatilis*) - Striped bass use the upper tributaries for spawning and nursery grounds, spawning from early to mid-April through the end of May, in tidal freshwater areas just above the salt wedge. Young-of-year striped bass often appear in catches in May to July in size classes less than 50 mm FL during years of greater abundance, but then diminish in abundance until the following winter. A second, stronger, and more consistent period of abundance occurs in December and continues through to February the following year in the upper regions of the rivers (Appendix Figure 7).

When the RSCI (1956-2001) and RO (1982-2001) were analyzed for annual trends, only the RSCI decreased significantly ($r^2 = 0.19$, $P = 0.003$; Figure 10). However, both the RSCI and the RO index have been highly variable since 1982. The 2000 RSCI and RO indices were the highest since 1993, but decreased slightly in 2001.

White Perch (*Morone americana*) - Spawning occurs in the upper tributaries from March to July with a peak occurring from late April to early May. Since white perch populations from various tributaries can exhibit significantly different growth rates (Bowen, 1987; Setzler-Hamilton, 1991a; Seaver et al., 1996), and those separations are not presently clear, for this analysis all

specimens were categorized as either age 0 or age1+. Examination of distributional data (Appendix Figures 8 and 9), reveals neither white perch cohort are found in the mainstem Bay, with the highest abundances found in upper portions of each tributary. Therefore, index calculations are confined to the upper strata of each tributary. Index months include November to February for age 1+, and December to February for YOY, though periodically some age 1+ are caught in March, and YOY caught in November and March.

The RSCI (1956-2001) and RO (1979-2001) indices for YOY showed no significant annual trends, while only the RSCI for the age 1+ during the same period decreased significantly ($r^2 = 0.21$, $P = 0.001$; Figures 11 and 12, Tables 18 and 19). The age 1+ RSCI index was fairly high from 1960-1964, and then decreased significantly. The age 1+ RSCI index from 1979 to present also decreased significantly ($r^2 = 0.19$, $P = 0.036$).

White catfish *(Ictalurus catus)* and **Channel catfish** *(I. punctatus)* - White and channel catfish are found in relatively high abundance in the upper portions of the tributaries (Appendix Figures 10-13). Although each river system is unique, spawning typically occurs in late May through early July in Virginia (Fewlass, 1980; Menzel, 1945); consequently June was selected as the start of the biological year. The survey typically catches both species up to 600 mm FL with juveniles 50 mm FL first recruiting to the gear in June. The temporal component seems very clear for the juveniles occurring from January to April for both species in the upriver strata only. The age 1+ index often indicates a higher, more stable trend than the juvenile index. Sampling is over several year classes which aid in stabilizing the index (Figures 13 - 16 and Tables 21- 24).

The YOY RSCI (1954-2001) and RO (1983-2001) white catfish indices decreased significantly ($r^2 = 0.09$, $P = 0.046$) and nearly so ($r^2 = 0.19$, $P = 0.066$), respectively. Only the 1+

RSCI (1954-2001) white catfish index decreased significantly ($r^2 = 0.08$, $P = 0.049$). Both white catfish YOY and age 1+ have exhibited extremely low indices from 1998 to the present.

The 1+ RSCI (1954-2001) and RO (1983-2001) channel catfish indices increased ($r^2 = 0.20$, $P = 0.002$) and decreased significantly ($r^2 = 0.31$, $P = 0.013$), respectively. Channel catfish YOY indices were extremely low from 1997 - 2001. The channel catfish age 1+ RSCI 2001 index was the lowest since 1976 and peaked in 1991 (Figure 16).

The channel catfish was introduced to Virginia in the late 1800's (Jenkins and Burkhead, 1994), and their population trends may be a result of the species becoming established and forming natural cycles as they become integrated into the ecosystem. The YOY declined dramatically since the mid 1980's (with the exception of the 1989 year class) (Table 22 and Figure 15), possibly as a result of another introduced catfish, the blue catfish (*Ictalurus furcatus*). This decline in juveniles is now becoming evident in the older age classes as well (Table 23 and Figure 16).

Northern Puffer *(Sphoeroides maculatus)* - The puffer is captured in small numbers primarily in the mainstem Bay (Appendix Figure 14). Spawning is somewhat protracted in Chesapeake Bay, beginning in late spring and continuing into fall, peaking in June or July (Laroche and Davis, 1973; Sibunka and Pacheco, 1981). June is the start of the biological year with puffer less than 50 mm TL collected. Puffer is first caught in the Bay in May and peaks during late summer/early fall (July to October).

When the RSCI (1955-2001) and the BRI (1988-2001) indices were analyzed for annual trends, only the BRI decreased significantly ($r^2 = 0.47$, $P = 0.007$; Figure 17, Table 24). Since 1988, northern puffer indices experienced a rapid and continuous decline until 1992, and although variable, have increased slightly in recent years (Figure 17).

Silver Perch *(Bairdiella chrysoura)* - Silver perch is found in all strata, but the York River often dominates catches (Appendix Figure 15). Spawning occurs in the deep waters of the Bay and offshore from May to July, and juveniles (100 mm TL) begin recruiting to the fishing gear by July (Chao and Musick, 1977; Rhodes ,1971). September to November had the highest catch rates for all years of the expanded survey except 1991, when August had slightly higher values. When the RSCI (1955-2001), BRI (1988-2001) and RO (1979-2001) indices were analyzed for annual trends, the RSCI significantly decreased ($r^2 = 0.24$, $P = 0.001$) while the RO significantly increased ($r^2 = 0.40$, $P = 0.001$; Figure 18, Table 25).

DISCUSSION

Four estimates of relative abundance have been developed for juvenile finfish. The values reported as the Bay and River index (BRI) were only for the historic fixed stations transects of the tributaries and the Bay survey established in 1988. Two indices were presented, one from the tributaries only (RO; 1979 to present) and the other for both the Bay and rivers (BRI;1988 to present). The long time-series have produced converted indices (random stratified converted index - RSCI) and unconverted indices (random stratified index - RSI) for the twelve target species discussed.

Efforts continue on validating older data, and comparing these historical values against data presently being collected. Additionally, the now fully implemented random stratified survey of the tributaries has enhanced the ability to produce reliable estimates of juvenile abundance. These surveys have complimented and correlated with the fixed mid-channel transects quite well since their inception in June 1991 (Geer and Austin, 1996a; Geer and Austin, 1999).

Chesapeake Bay constitutes a major nursery area for most of the species examined (except for black sea bass and scup) and is one of several along the Atlantic seaboard. With the exception of weakfish and the anadromous species, all of the juveniles recruited to the Chesapeake Bay nursery areas result from spawning activities which take place outside of the Bay. Early juveniles of the four sciaenid species are thought to be estuarine dependent, but black sea bass young-of-year also utilize nearshore continental shelf waters (Musick and Mercer, 1977) and juvenile summer flounder also frequent shallow, high salinity coastal lagoons (Wyanski, 1989). Scup do not appear in the Bay in appreciable numbers until they are nearing one year old. Conceivably, Chesapeake Bay nursery zone abundances may well be reflective of overall reproductive success. Assessment of annual

recruitment success for coastal Atlantic finfish populations should involve multi-state monitoring efforts, and would validate area-specific juvenile indices.

Declines in catches of these important recreational species are most often due to degradation of their estuarine nursery habitats, overfishing and year class failure (Murdy et al., 1997). Spot indices have declined greatly over the past 47 years, with the RSCI 1955-1978 index twice that of the 1979-2001 index. Spot are oceanic spawners and their year class strength appears to be controlled by environmental factors occurring outside the Bay (Homer and Mihursky, 1991; Bodolus, 1994). Croaker show the greatest interannual variability of the key species discussed, with fluctuations most probably weather related. Norcross (1983) and Murdy et al., (1997) suggest cold winters cause increased mortality in overwintering YOY croaker and during some years may cause the spawning population to be pushed further south, preventing the postlarval fish access to Bay nursery areas. Though slight increases in weakfish indices have occurred since 1994, it is a prized recreational species, and their decline may be attributed to both habitat degradation and overfishing (Murdy et al., 1997). Declines in summer flounder have been due to overfishing and year class failure (Murdy et al., 1997), and these were apparent in the very low 1987 trawl index. The black sea bass index has increased since 1997, though has been highly variable over the duration of the survey. The scup index has been highly variable as well, with the 1994-1999 indices being the lowest in 20 years.

Striped bass and white perch indices were very low during the 1970's and early 1980's. Striped bass display great recruitment variability and one or two strong year classes may dominate the population (Murdy et al., 1997). After closure of the fishery in the mid to late 1980's due to overfishing, poor recruitment and low stock abundance (Seltzer-Hamilton,1991b), the index has

increased, but remained highly variable through the present. White and channel catfish indices while variable, have decreased dramatically in the past five years, most probably due to overfishing.

Juvenile indices collected by the VIMS trawl survey are instrumental in helping to forecast year class strength and avoid stock collapse. For instance, the current Interstate Fisheries Management Plan for striped bass relies heavily on juvenile abundance estimates to determine action levels for the intensification or relaxation of harvest restrictions. Low year classes during much of the 1970's and mid-1980's led to a striped bass moratorium in 1985, which lasted until 1990 (Seltzer-Hamilton, 1991b). Evidence of a very poor year class of summer flounder was first detected by the VIMS Trawl Survey, is recognized by the Mid-Atlantic Fisheries Management Council (MAFMC) as the only available index of summer flounder recruitment and was instrumental in shaping more protective harvest regulations in Virginia. The trawl survey is also important for monitoring interfamily interactions. Annual catch rates of channel catfish and white catfish have declined since 1991, while those of blue catfish (*I. furcatus*), which was introduced in Virginia during the 1970's and 1980's, to enhance sportfishing, have increased dramatically (Connelly, 2001). Additionally current bistate FMP's utilize trawl survey blue crab data as the foundation for understanding blue crab population dynamics in the Chesapeake Bay, and most recently these data were used to construct the newly implemented blue crab sanctuary corridor.

The VIMS Trawl Survey is a key element for future rational management of fishery resources that use the Chesapeake Bay as spawning and nursery grounds. Because the Chesapeake Bay constitutes a major nursery area for many coastal migratory fish species, monitoring annual recruitment success is a key element in multi-state management efforts along the Atlantic Coast. These data will continue to provide managers with one of the most predictive tools for assessing the

success of present management measures.

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TABLES

(Note: Indices with an * after the year are incomplete)

Table 1. National Marine Fisheries Service's Marine Recreational Fisheries Statistic Survey for Virginia Waters for 2001.

SPECIES	Total Number of Fish (A + B1 + B2)	Rank by Number Caught	Number of Harvested Fish (A + B1)	Weight in kilograms (A + B1)	Rank by Weight
ATLANTIC CROAKER	16,422,018	1	9,335,313	3,481,248	1
SUMMER FLOUNDER	5,352,554	2	1,338,134	1,210,303	2
BLACK SEA BASS	2,411,569	3	231,368	153,418	9
SPOT	2,025,341	4	1,056,365	237,323	6
STRIPED BASS	922,100	5	301,153	971,021	3
BLUEFISH	885,906	6	260,817	211,095	7
WEAKFISH	809,315	7	175,872	169,285	8
KINGFISHES	571,853	8	294,745	37,907	12
TOADFISHES	277,175	9	5,124	0	
SKATES/RAYS	210,297	10	0	0	
OTHER FISHES	170,803	11	103,605	379,708	5
HERRINGS	168,307	12	166,943	348	31
OTHER SHARKS	161,618	13	37,991	62,160	10
SPOTTED SEATROUT	123,756	14	13,447	12,126	17
PIGFISH	66,855	15	16,359	2,119	23
PUFFERS	64,443	16	7,969	2,389	20
SPANISH MACKEREL	59,749	17	29,590	19,072	15
TAUTOG	56,442	18	28,985	57,859	11
PINFISHES	47,215	19	0	0	
OTHER TUNAS/MACKERELS	38,906	20	36,798	932,046	4
RED DRUM	37,332	21	6,967	23,537	14
FLORIDA POMPANO	33,719	22	5,594	490	30
BLACK DRUM	30,102	23	1,200	150	33
SILVER PERCH	26,898	24	15,481	1,314	28
DOLPHINS	24,395	25	24,395	36,676	13
SEAROBINS	22,172	26	315	0	
OTHER DRUM	20,917	27	19,436	0	
WHITE PERCH	19,591	28	13,809	1,780	27
MULLETS	19,077	29	19,077	1,908	25
DOGFISH SHARKS	17,473	30	966	1,919	24
FRESHWATER CATFISHES	15,951	31	9,230	11,054	18
TRIGGERFISHES/FILEFISHES	12,192	32	5,673	1,232	29
GREATER AMBERJACK	7,898	33	0	0	
LITTLE TUNNY/ATLANTIC BONITO	7,438	34	1,528	1,863	26
OTHER FLOUNDERS	7,376	35	7,376	0	
ATLANTIC MACKEREL	5,289	36	3,694	2,367	21
KING MACKEREL	4,437	37	4,437	13,576	16
EELS	3,907	38	278	0	
BLUE RUNNER	3,847	39	0	0	
SHEEPSHEAD	2,811	40	887	3,816	19
BARRACUDAS	515	41	515	2,268	22
SCUP	507	42	470	157	32
OTHER CODS/HAKES	383	43	383	96	34
Total	31,170,449		13,582,289	8,043,630	

A = Caught and Landed
B1 = Caught by Anglers & filleted or released dead
B2 = Caught and released alive

Table 2. Yearly comparison of substrate (habitat type).

Substrate Description	July 1998 - June 1999		July 1999 - June 2000		July 2000 - June 2001		July 2001 - June 2002	
	Percent of Stations[1]	Maximum Quantity	Percent of Stations[1]	Maximum Quantity	Percent of Stations[1]	Maximum Quantity	Percent of Stations[1]	Maximum Quantity
Artificial	0.67	2.0	4.28	3.0	4.61	2.0	5.85	15.0
Dead man's fingers (Bryozoan)	8.22	5.0	9.01	4.0	7.75	5.0	8.99	6.0
Detritus	30.40	6.0	40.09	10.0	36.12	4.0	36.52	6.0
Hydroids	41.08	5.0	53.81	5.0	36.12	4.0	58.78	10.0
Sea Squirts (*Mogula spp.*)	22.40	5.0	28.90	12.0	20.37	14.0	28.69	18.0
Seaweeds	15.31	4.0	24.55	10.0	24.28	5.0	31.57	30.0
Shell (oyster, clam, or mussel)	19.79	3.0	25.71	4.0	23.24	5.0	29.10	8.0
Sponges	8.29	6.0	9.44	5.0	9.49	5.0	13.36	10.0
Submerged Aquatic Vegetation	5.00	3.0	9.59	1.0	8.88	2.0	5.77	2.0
Worm Tubes	6.57	1.0	10.38	1.0	9.40	1.0	10.47	1.0
Mud[2]	7.17	---	6.75	---	9.23	---	5.19	---
Sand[2]	10.01	---	0.87	---	2.00	---	0.49	---
Unknown[3]	12.32	---	5.45	---	5.05	---	2.06	---
NUMBER OF TRAWLS:	1,339		1,377		1,149		1,213	

1. Based on the number of occurrences of a habitat type divided by the total number of trawls.
2. Sand and Mud are used when verification can be confirmed by direct observation.
3. Unknown is used when none of the categories are found in the trawl.

Abundance is estimated relative to the capacity of a commercial test note (internal dimensions 25.7" x 16.6" x 10", approximately 72 liters). Categories include: 0.5 = < 1/4 bin, 1 = 1/4 bin, 2 = 1/2 bin, 3 =3/4 bin, 4 = full bin, etc.

Table 3. Number of potential Chesapeake Bay trawl sites and approximate square miles of sampling strata. '*' indicates areas which are not presently being sampled on a monthly basis with a RSD.

Region	Stratum	Description	No .of Points	Percent of System	% of Total Sampling	Square Miles (NM)
Bottom Bay	001	West. Shoal 12-30'	1740	9.38	7.49	112.33
Region B1	002	East. Shoal 12-30'	863	4.65	3.26	55.72
	003	Central Plain 30-42'	910	4.91	3.44	58.75
	004	Deep Channel ≥42'	386	2.08	1.46	24.92
	S01	West. Shallow 4-12'	216	1.16	0.82	13.94
	S02	East. Shallow 4-12'	58	0.31	0.22	3.74
			4173	22.50	16.69	269.41
Lower Bay	005	West. Shoal 12-30'	1027	5.54	3.88	66.30
Region B2	006	East. Shoal 12-30'	398	2.15	1.50	25.69
	007	Central Plain 30-42'	1756	9.47	6.63	113.37
	008	Deep Channel ≥42'	684	3.69	2.58	44.16
	S05	West. Shallow 4-12'	215	1.16	0.81	13.88
	S06	East. Shallow 4-12'	145	0.78	0.55	9.36
			4225	22.78	15.95	272.77
Upper Bay	009	West. Shoal 12-30'	768	4.14	2.90	49.58
Region B3	010	East. Shoal 12-30'	632	3.41	2.39	40.80
	011	Central Plain 30-42'	2197	11.84	8.30	141.84
	012	Deep Channel ≥42'	844	4.55	3.19	54.49
	S09	West. Shallow 4-12'	209	1.13	0.79	13.49
	S10	East. Shallow 4-12'	216	1.16	0.82	13.94
			4866	26.23	18.39	314.15
Top Bay*	013	West. Shoal 12-30'	404	2.18	1.53	26.08
Region B4	014	East. Shoal 12-30'	1533	8.26	5.79	98.97
	015	Central Plain 30-42'	1315	7.09	4.97	84.90
	016	Deep Channel ≥42'	1273	6.86	4.81	82.18
	S13	West. Shallow 4-12'	164	0.88	0.62	10.59
	S14	East. Shallow 4-12'	597	3.22	2.26	38.54
			5286	28.50	19.98	341.26
Total Bay			18550		71.01	1197.59

Table 4. Number of potential James River trawl sites and approximate square miles of sampling strata. '*' indicates areas which are not presently being sampled with a RSD. The weight factors (No. of Points) have been altered to remove several creeks and rivers.

Region	Stratum	Description	No .of Points	Percent of System	% of Total Sampling	Square Miles (NM)
Bottom James	070	Bottom JA 4-12'	416	16.57	1.57	27.31
Region J1	071	Bottom JA 12-30'	292	11.63	1.10	18.85
	072	Bottom JA 30-42'	68	2.71	0.26	4.39
	073	Bot & Low JA ≥42'	59	2.35	0.22	3.81
	*JH1	Hampton R. 4-12'	5	0.20	0.02	0.32
	*JK1	Chuckatuck R. 4-12'	2	0.08	0.01	0.13
	*JN1	Nansemond R. 4-12'	67	2.67	0.25	4.33
	*JN2	Nansemond R. ≥ 12'	16	0.64	0.06	1.03
			925	36.28	3.49	59.72
Lower James	074	Lower JA 4-12'	389	15.50	1.47	25.11
Region J2	075	Lower JA 12-30'	230	9.16	0.87	14.85
	076	Lower JA 30-42'	25	1.00	0.09	1.61
	*JP1	Pagan R. 4-12'	47	1.87	0.18	3.03
	*JP2	Pagan R. ≥12'	10	0.40	0.04	0.65
	*JW1	Warwick R. 4-12'	50	1.99	0.19	3.23
	*JW2	Warwick R. ≥ 12'	3	0.12	0.01	0.19
			754	30.04	2.85	48.68
Upper James	077	Upper JA 4-12'	178	7.09	0.67	11.49
Region J3	078	Upper JA 12-30'	172	6.85	0.65	11.10
	079	Up & Top JA ≥ 30'	34	1.35	0.13	2.20
	*JS1	Skiffles Cr. 4-12'	25	1.00	0.09	1.61
	*JS2	Skiffles Cr. ≥12'	6	0.24	0.02	0.39
			415	16.53	1.56	26.79
Top James	080	Top JA 4-12'	264	10.52	1.00	17.04
Region J4	081	Top JA 12-30'	152	6.06	0.57	9.81
			416	16.58	1.79	26.86
TOTAL James R.			2510		9.47	162.05

Table 5. Number of potential York River trawl sites and approximate square miles of sampling strata. '*' indicates areas which are not presently being sampled with a RSD.

Region	Stratum	Description	No .of Points	Percent of System	% of Total Sampling	Square Miles (NM)
Bottom York	030	Bottom YK 4-12'	94	12.18	0.36	6.07
Region Y1	031	Bottom YK 12-30'	87	11.27	0.33	5.62
	032	Bottom YK 30-42'	66	8.55	0.25	4.26
	033	Bot & Low YK≥42	71	9.20	0.27	4.58
			318	41.19	1.21	20.53
Lower York	034	Lower YK 4-12'	111	14.38	0.42	7.17
Region Y2	035	Lower YK 12-30'	114	14.77	0.43	7.36
	036	Lower YK 30-42'	28	3.63	0.11	1.81
			253	32.77	0.96	16.33
Upper York	037	Up & Top YK 4-12'	54	6.99	0.20	3.49
Region Y3	038	Upper YK 12-30'	71	9.20	0.27	4.58
	039	Up & Top YK≥30'	29	3.76	0.11	1.87
			154	19.95	0.58	9.94
Top York*	040	Top YK 12-30'	47	6.09	0.18	3.03
Region Y4			47	6.09	0.18	3.03
TOTAL York R.			772		2.93	49.83

Table 6. Number of potential Rappahannock River trawl sites and approximate square miles of sampling strata. '*' indicates areas which are not presently being sampled with a RSD.

Region	Stratum	Description	No .of Points	Percent of System	% of Total Sampling	Square Miles (NM)
Bottom Rappahannock	050	Bottom RA 4-12'	98	7.08	0.37	6.33
Region R1	051	Bottom RA 12-30'	200	14.44	0.76	12.91
	052	Bottom RA 30-42'	66	4.77	0.25	4.26
	053	Bottom RA ≥ 42'	84	6.06	0.32	5.42
			448	32.35	1.70	28.92
Lower Rappahannock	054	Lower RA 4-12'	94	6.79	0.36	6.07
Region R2	055	Lower RA 12-30'	167	12.06	0.63	10.78
	056	Lower RA 30-42'	67	4.84	0.25	4.33
	057	Lower RA ≤ 42'	56	4.04	0.21	3.62
			384	27.73	1.45	24.79
Upper Rappahannock	058	Upper RA 4-12'	233	16.82	0.88	15.04
Region R3	059	Upper RA 12-30'	101	7.29	0.38	6.52
	060	Up & Top RA ≥30'	32	2.31	0.12	2.07
			366	26.43	1.38	23.63
Top Rappahannock	061	Top RA 4-12'	137	9.89	0.52	8.84
Region R4	062	Top RA 12-30'	50	3.61	0.19	3.23
			187	13.50	0.71	12.07
TOTAL Rapp. R.			1385		5.24	89.41
TOTAL SITES			26,474			1498.89

Table 7. Assignment of fixed tributary stations to potential random strata used in the original Bay-River index (BRI) calculations and assignment to strata of the random stratified design surveys. Alternating shaded areas represent the number of points and area used as a weighting factor for the BRI index calculations.

River	River Mile	Depth (ft)	Index Strata	No. Of Points	Sq. Naut. Miles	RSD Strata
James R.	J01	25.0	JA01			071
	J05	20.0	JA01			071
	J13	30.2	JA01			076
	J17	22.0	JA01	687	44.35	075
	J24	35.0	JA02			079
	J27	28.0	JA02			078
	J35	29.0	JA02			081
	J40	12.0	JA02	364	23.50	081
York R.	Y02	35.0	YK01			032
	Y05	40.0	YK01			032
	Y10	29.9	YK01			035
	Y15	25.0	YK01	372	24.02	035
	Y20	20.0	YK02			038
	Y25	25.0	YK02			038
	Y30	20.0	YK02			040
	Y35	20.0	YK02			040
	Y40	13.0	YK02	184	11.88	040
Rappahannock R.	R02	60.0	RA01			053
	R10	60.0	RA01			053
	R15	50.0	RA01			057
	R20	50.0	RA01	283	18.27	057
	R25	29.9	RA02			059
	R30	20.0	RA02			062
	R35	20.0	RA02			062
	R40	12.1	RA02	190	12.26	062

James River: JA01 - Lower $\geq$ 12ft. JA02 - Upper $\geq$ 12ft.
York River: YK01 - Lower $\geq$ 12ft. YK02 - Upper $\geq$ 12ft.
Rapp. River: RA01 - Lower $\geq$ 30ft. RA02 - Upper $\geq$ 12ft.

Table 8. Summary of samples collected, 1955 - August 2002. Includes sampling from the recent RSD surveys of the tributaries (June 1991 to present).

KEY

Sample Type:	ALL	All fish species and blue crabs sampled, VIMS code 104
	CRAB	Only blue crabs sampled, VIMS code 102
	FISH	Only fish species sampled, VIMS code 090
System:	CL	Lower Chesapeake Bay (Virginia Portion)
	JA	James River
	PO	Potomac River
	RA	Rappahannock River
	YK	York River
	ZZ	includes: Atlantic Ocean (AT) - 1971, 78-79; Piankatank R. (PK) - 1970-71, 98-00; Mobjack Bay (MB) - 1970-73, 98-01; Pocomoke Sound (CP) -1973-81, 98-01; Great Wicomico R. (GW) - 1998-00.
Vessel:	BR	W.K. Brooks
	FH	Fish Hawk
	JS	Captain John Smith, J1 prior to 1986.
	LA	Langley
	PA	Pathfinder
	RE	Restless
	OT	Includes: Aquarius (AQ) - 1978; Investigator (IN) - 1970; Judith Ann (JA) - 1981; Langley II (LN) - 1985,2001; Sally Jean (SJ) - 1981; Outboard Skiff (SK) - 1970-71; Three Daughters (TD) - 1978; Virginia Lee (VL) - 1955-57; Edith May (EM) - 1984.
Gear Code:	010	Unlined, no tickler chain, 30' bridle, 48"x22" otter board doors, U_N_3B_SW
	033	Lined, no tickler chain, 30' bridle, 48"x22" doors, L_N_3B_SW
	043	Unlined, tickler chain, 30' bridle, 54"x24" doors, U_T_3B_LW
30' Gears	068	Lined, tickler chain, 30' bridle, 54"x24" otter board doors, L_T_3B_LW
	070	Lined, tickler chain, 60' bridle, 54"x24" doors, L_T_6B_LW
	108	Lined, tickler chain, 60' bridle, metal china-v doors, L_T_6B_CV

OT includes 3 configurations of 16 foot nets.

035: Lined, no tickler chain, 23' bridle, 24"x12" otter board doors, 16L_N_2B_SW. Main Gear used

009: Unlined, no tickler chain, 16U_N_2B_SW. 19 tows in 1972.

067: Lined, w/ tickler chain, 16L_T_2B_SW. 60 samples on the Elizabeth River in 1982-83.

Station Type: F - Fixed
R - Random

Tow Type: OT is tow duration in minutes for those not listed.
DIS is distance, always 0.25 nautical miles. Equates well to 5 minute duration.

All Codes found on table are in Wojcik and Van Engel, 1988. Appendices A – C

Table 8 (continued). Sample collection history of the VIMS Trawl Survey, 1955 – 2002 (partially completed). Codes are on previous page.

YR	TOT	SAMPLE TYPE			MONTH												WATER SYSTEM						RESEARCH VESSEL							GEAR CODE							STAT. TYPE		TOW DURATION/DISTANCE				
		ALL	CRAB	FISH	J	F	M	A	M	J	J	A	S	O	N	D	CL	JA	PO	RA	YK	ZZ	BR	FH	JS	LA	PA	RE	ZZ	10	33	43	68	70	108	OT	F	R	5	7.5	15	OT	DIS
1955	31	0	0	31	0	3	1	3	1	5	14	1	3	0	0	0	6	0	0	0	25	0	0	0	0	0	0	0	31	31	0	0	0	0	0	0	31	0	0	12	17	2	0
1956	135	103	0	32	0	0	0	16	17	0	17	20	17	16	16	16	43	0	0	0	92	0	0	0	0	0	0	0	135	135	0	0	0	0	0	0	135	0	0	6	127	2	0
1957	141	113	0	28	12	16	16	0	12	0	4	16	17	16	16	16	46	0	0	0	95	0	0	0	0	0	85	0	56	141	0	0	0	0	0	0	141	0	0	44	97	0	0
1958	192	167	0	25	16	16	13	16	19	16	15	17	16	16	16	16	56	0	0	0	136	0	0	0	0	0	192	0	0	192	0	0	0	0	0	0	192	0	0	58	134	0	0
1959	117	86	2	29	0	0	0	14	3	16	19	16	16	16	17	0	32	0	0	0	85	0	0	0	0	0	117	0	0	117	0	0	0	0	0	0	117	0	0	34	83	0	0
1960	57	42	0	15	0	0	0	0	16	14	14	13	0	0	0	0	19	0	0	0	38	0	0	0	0	0	57	0	0	57	0	0	0	0	0	0	57	0	0	10	44	3	0
1961	89	19	16	54	6	0	0	4	10	12	8	8	11	12	10	8	15	0	0	0	74	0	0	0	0	0	89	0	0	89	0	0	0	0	0	0	89	0	0	26	63	0	0
1962	116	6	35	75	8	8	8	5	12	19	8	8	11	11	11	7	18	0	0	17	81	0	0	0	0	22	94	0	0	116	0	0	0	0	0	0	116	0	0	31	84	1	0
1963	142	25	45	72	6	8	9	13	16	18	14	9	19	13	9	8	19	0	0	22	101	0	0	0	0	0	63	79	0	0	142	0	0	0	0	0	0	142	0	0	37	102	3	0
1964	190	104	36	50	23	9	9	12	20	22	18	15	14	19	14	15	24	62	0	0	104	0	0	0	0	0	75	115	0	0	190	0	0	0	0	0	0	190	0	1	36	149	4	0
1965	189	106	5	78	22	13	17	14	14	14	14	19	14	15	12	21	1	71	0	23	94	0	0	0	0	0	44	145	0	0	189	0	0	0	0	0	0	189	0	0	38	145	6	0
1966	214	138	3	73	14	21	25	16	17	17	17	23	13	18	16	17	21	70	0	9	114	0	0	0	0	0	184	30	0	0	214	0	0	0	0	0	0	214	0	0	51	163	0	0
1967	259	195	2	62	15	17	31	17	17	24	23	23	23	23	23	23	23	67	0	61	108	0	0	0	0	0	16	243	0	0	259	0	0	0	0	0	0	259	0	0	58	192	9	0
1968	262	215	2	45	14	16	16	23	23	23	21	31	23	23	23	26	23	70	0	65	104	0	0	0	0	0	4	258	0	0	259	3	0	0	0	0	0	262	0	10	66	180	6	0
1969	286	281	1	4	23	23	24	24	24	24	24	24	24	24	24	24	23	72	0	83	108	0	0	0	0	0	0	286	0	0	286	0	0	0	0	0	0	286	0	1	86	189	10	0
1970	359	276	1	82	17	24	24	24	24	24	51	24	51	23	51	22	23	70	0	80	105	81	14	0	0	0	0	314	0	31	305	0	0	0	0	0	54	359	0	3	173	177	6	0
1971	804	346	57	401	51	18	51	55	61	63	103	82	74	82	82	82	24	80	0	96	449	155	154	0	0	50	358	234	8	372	0	32	0	0	0	400	572	232	440	172	189	3	0
1972	851	168	97	586	73	73	73	56	56	75	71	85	43	98	94	54	14	86	0	95	545	111	73	0	0	154	193	431	0	246	0	101	0	0	0	504	506	345	657	104	89	1	0
1973	871	179	0	692	54	53	11	56	80	202	91	91	105	105	23	0	88	67	0	80	591	45	126	0	0	64	237	444	0	0	122	179	0	0	0	570	304	567	751	0	0	120	0
1974	748	175	0	573	156	137	75	0	27	26	166	62	55	26	18	0	138	147	73	174	216	0	0	0	0	568	105	75	0	0	498	175	0	0	0	75	478	270	257	0	0	38	453
1975	795	435	7	353	194	128	16	0	18	18	349	18	18	18	18	0	162	148	60	194	231	0	117	0	0	429	176	73	0	0	535	126	0	0	0	134	126	669	471	0	0	2	322
1976	1141	308	0	833	184	141	23	40	40	40	525	40	40	36	32	0	174	340	60	318	249	0	230	0	6	466	262	177	0	0	426	308	0	0	0	407	308	833	816	0	0	0	325
1977	876	182	0	694	0	0	182	0	26	26	493	71	26	26	26	0	113	243	8	284	228	0	172	0	23	269	130	282	0	0	240	182	0	0	0	454	182	694	771	0	0	0	105
1978	1130	208	0	922	94	214	79	0	26	90	396	66	26	26	26	87	171	366	78	220	285	10	22	0	73	544	153	179	159	0	583	181	0	0	0	366	181	949	551	0	16	2	561
1979	810	321	0	489	282	70	124	0	36	41	47	46	37	44	44	39	60	267	63	159	260	1	0	0	43	371	333	63	0	2	461	0	284	0	0	63	285	525	485	0	0	2	323
1980	559	248	0	311	28	48	46	18	49	51	50	50	58	52	52	57	129	145	0	115	170	0	0	0	367	0	192	0	0	0	140	0	0	419	0	0	362	197	558	0	0	1	0
1981	486	243	1	242	41	34	52	17	52	46	52	24	39	42	38	49	52	146	18	97	173	0	0	0	424	0	16	0	46	0	0	0	0	486	0	0	295	191	478	0	0	8	0
1982	580	261	0	319	11	67	80	54	53	40	40	45	50	46	46	48	43	180	37	140	180	0	0	0	580	0	0	0	0	0	0	0	0	538	0	42	364	216	577	0	0	3	0
1983	482	295	0	187	32	54	14	15	40	39	39	38	38	65	50	58	0	162	19	118	183	0	0	0	482	0	0	0	0	0	0	0	0	465	0	17	367	115	478	0	0	4	0
1984	475	261	1	213	19	13	38	45	50	49	47	46	37	49	49	33	0	212	21	95	147	0	0	0	461	0	0	0	14	0	3	0	0	472	0	0	475	0	471	0	0	4	0
1985	335	191	0	144	36	26	26	26	35	12	38	39	27	45	0	25	0	120	17	75	123	0	0	0	285	0	0	0	50	0	0	0	0	335	0	0	335	0	333	0	0	2	0
1986	374	374	0	0	22	24	25	24	37	35	37	37	37	37	36	23	0	135	0	117	122	0	0	0	374	0	0	0	0	0	0	0	0	374	0	0	374	0	374	0	0	0	0
1987	334	334	0	0	23	24	23	24	36	37	33	34	32	34	34	0	0	108	0	108	118	0	0	0	334	0	0	0	0	0	0	0	0	334	0	0	334	0	333	0	0	0	1
1988	889	802	87	0	69	69	62	48	82	82	82	82	82	82	80	69	576	97	0	105	111	0	0	0	889	0	0	0	0	0	0	0	0	889	0	0	313	576	885	0	0	0	4
1989	840	749	91	0	61	61	61	66	76	76	76	76	76	76	59	479	108	0	124	129	0	0	0	840	0	0	0	0	0	0	0	0	0	840	0	0	361	479	840	0	0	0	0
1990	827	739	88	0	61	61	61	61	76	76	77	75	76	69	76	58	473	108	0	119	127	0	0	279	548	0	0	0	0	0	0	0	0	827	0	0	354	473	826	0	0	0	1
1991	930	840	90	0	61	25	61	61	73	94	95	95	97	97	97	74	411	108	0	120	291	0	0	930	0	0	0	0	0	0	0	0	0	0	930	0	357	573	928	0	0	1	1
1992	982	891	91	0	79	47	79	79	97	88	88	88	89	88	88	72	404	110	0	124	344	0	0	982	0	0	0	0	0	0	0	0	0	0	982	0	361	621	975	0	0	7	0
1993	915	824	91	0	40	73	40	71	88	89	88	88	88	88	87	75	370	110	0	126	309	0	0	915	0	0	0	0	0	0	0	0	0	0	915	0	365	550	914	0	0	1	0
1994	911	820	91	0	40	73	40	73	88	88	88	88	88	88	88	69	368	110	0	124	309	0	0	911	0	0	0	0	0	0	0	0	0	0	911	0	363	548	906	0	0	5	0
1995	993	980	13	0	40	73	40	73	92	88	88	88	105	105	99	102	411	96	0	201	285	0	0	993	0	0	0	0	0	0	0	0	0	0	993	0	314	679	984	0	0	9	0
1996	1176	1176	0	0	52	91	71	106	106	107	108	108	107	108	107	105	435	228	0	258	255	0	0	1176	0	0	0	0	0	0	0	0	0	0	1176	0	279	897	1168	0	0	6	2
1997	1220	1220	0	0	68	105	66	98	110	111	111	112	111	112	111	105	425	265	0	264	266	0	0	1220	0	0	0	0	0	0	0	0	0	0	1220	0	302	918	1217	0	0	3	0
1998	1262	1262	0	0	66	105	66	105	111	111	128	59	138	124	130	119	388	265	0	256	264	89	0	1262	0	0	0	0	0	0	0	0	0	0	1262	0	322	940	1261	0	0	1	0
1999	1382	1382	0	0	79	122	80	122	120	118	119	118	122	124	131	127	402	264	0	264	265	187	0	1382	0	0	0	0	0	0	0	0	0	0	1382	0	363	1019	1380	0	0	2	0
2000	1367	1367	0	0	52	129	85	101	158	111	128	125	121	141	111	105	433	250	17	266	265	136	0	1367	0	0	0	0	0	0	0	0	0	0	1367	0	363	1004	1367	0	0	0	0
2001	1117	1117	0	0	30	30	30	75	111	142	111	111	134	136	111	96	381	230	34	230	230	12	0	1012	0	0	0	0	0	105	0	0	0	0	0	1117	0	275	842	1114	0	0	1	2
2002	726	726	0	0	66	90	66	90	96	106	96	97	19	0	0	0	188	176	0	176	176	10	0	726	0	0	0	0	0	0	0	0	0	0	726	0	198	528	726	0	0	0	0
TOT	29967	21300	953	7714	2340	2452	2039	1860	2451	2625	4341	2551	2467	2514	2318	2009	7704	5959	505	5602	9360	837	908	13155	5729	3323	4259	1958	635	3342	3011	1284	284	5979	12255	3086	13517	16450	23581	1042	2240	278	2100

Table 9. Spatial, temporal, and length criteria used to calculate indices.

VIMS Trawl Survey - Area/Time/Size Values by Species																							
Species-Age	VIMS	Strata Used[1]									Month												
	SP. CODE	Bay			James		York		Rapp		Size Cutoff Values - Darkened Areas Represent Index Months												
		Bot'm	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	January	February	March	April	May	June	July	August	September	October	November	December	
Atlantic Croaker Y-O-Y	0005										0-100	0-100	0-100	0-110	0-135	0-160	0-180	0-220	0-50	0-80	0-100	0-100	
Atlantic Croaker Recruits	0005										0-100	0-100	0-100	0-110	0-135	0-160	0-180	0-220	0-50	0-80	0-100	0-100	
Black Seabass Y-O-Y	0002										0-110	0-110	0-110	0-110	0-110	0-150	0-175	0-70	0-85	0-100	0-105	0-110	
Channel Catfish Y-O-Y	0040										0-130	0-130	0-130	0-140	0-150	0-50	0-80	0-105	0-120	0-130	0-130	0-130	
Channel Catfish 1+	0040										>130	>130	>130	>140	>150	>50	>80	>105	>120	>130	>130	>130	
Northern Puffer Y-O-Y	0050										0-140	0-140	0-140	0-160	0-185	0-50	0-85	0-120	0-130	0-135	0-140	0-140	
Scup 1+ (?)	0001										90-170	90-170	90-170	90-170	35-90	40-100	50-125	60-145	75-160	85-170	90-170	90-170	
Silver Perch Y-O-Y	0213										0-160	0-160	0-160	0-160	0-165	0-170	0-100	0-130	0-150	0-160	0-160	0-160	
Spot - Y-O-Y	0033										0-200	0-200	0-50	0-75	0-100	0-135	0-160	0-180	0-200	0-200	0-200	0-200	
Striped Bass Y-O-Y	0031										0-200	0-200	0-200	0-200	0-50	0-80	0-100	0-120	0-135	0-150	0-175	0-190	
Sum. Flounder Y-O-Y	0003										0-290	0-290	0-60	0-100	0-140	0-170	0-200	0-225	0-250	0-275	0-290	0-290	
Weakfish - Y-O-Y	0007										0-200	0-200	0-200	0-225	0-240	0-90	0-120	0-150	0-180	0-200	0-200	0-200	
White Catfish Y-O-Y	0039										0-110	0-110	0-110	0-110	0-120	0-50	0-65	0-80	0-90	0-100	0-110	0-110	
White Catfish 1+	0039										>110	>110	>110	>110	>120	>50	>65	>80	>90	>100	>110	>110	
White Perch Y-O-Y	0032										0-85	0-85	0-85	0-95	0-35	0-65	0-73	0-80	0-85	0-85	0-85	0-85	
White Perch 1+	0032										86-300	86-300	86-300	96-300	36-300	66-300	74-300	81-300	86-300	85-300	86-300	86-300	

Table 10.

SPOT INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	1.58	1.27-1.92	6.61	1.48	1.24-1.75	5.65	17				
1956	98.77	50.85-190.95	7.11	37.41	19.41-71.31	8.67	62				
1957	24.87	6.38-89.67	19.28	8.09	2.22-24.68	23.52	47				
1958	7.22	3.41-14.33	14.78	2.86	1.15-5.93	21.62	56				
1959	13.01	5.14-30.97	15.63	3.23	1.11-7.48	24.10	59				
1960	9.30	0.33-78.52	43.83	4.56	0.21-24.55	44.45	27				
1961	8.81	2.03-30.81	25.75	2.76	0.48-8.52	35.07	27				
1962	191.03	30.41-1172.8	17.22	57.43	6.14-476.82	25.83	20				
1963	13.25	1.02-99.35	36.74	5.67	0.48-29.06	39.70	32				
1964	37.85	17.32-81.36	10.27	10.14	4.71-20.73	13.86	54				
1965	2.20	0.86-4.49	23.24	0.96	0.43-1.7	23.69	52				
1966	37.96	15.86-89.01	11.43	17.80	6.34-47.17	16.04	63				
1967	6.02	1.34-20.08	28.22	2.01	0.4-5.45	34.70	88				
1968	143.77	58.12-353.49	9.00	45.03	16.33-121.25	12.75	87				
1969	52.50	25.53-106.89	8.81	19.38	9.56-38.32	10.90	91				
1970	5.59	0.1-38.52	47.51	2.67	0-14.4	55.07	91				
1971	82.09	56.47-119.15	4.17	24.26	16.42-35.63	5.75	265				
1972	98.08	91.85-104.73	0.71	40.46	37.97-43.12	0.83	211				
1973	13.57	9.87-18.53	5.46	11.19	8.26-15.06	5.51	348				
1974	15.62	6.85-34.21	13.35	9.72	4.12-21.44	15.58	243				
1975	33.24	21.82-50.36	5.74	20.90	13.6-31.83	6.56	334				
1976	14.03	10.06-19.42	5.65	7.41	5.36-10.12	6.55	587				
1977	28.75	20.47-40.23	4.81	15.62	11.39-21.31	5.23	530				
1978	9.79	6.4-14.71	7.91	5.54	3.73-8.05	8.64	413				
1979	49.03	42.94-55.95	1.66	25.68	22.39-29.43	2.00	127			17.29	123
1980	16.46	10.92-24.6	6.68	19.09	13.01-27.83	6.01	158			8.94	146
1981	31.69	25.22-39.76	3.16	44.59	35.32-56.23	2.98	146			31.06	137
1982	58.50	30.94-109.84	7.61	76.95	39.99-147.22	7.38	156			36.52	151
1983	14.99	12.06-18.59	3.65	21.42	17.19-26.65	3.37	151			21.51	151
1984	41.62	22.86-75.15	7.73	56.84	31.93-100.58	6.94	127			50.28	132
1985	11.90	6.98-19.84	9.38	15.97	9.46-26.55	8.55	117			19.59	118
1986	21.07	16.1-27.48	4.12	30.68	23.27-40.35	3.85	144			26.32	144
1987	8.96	7.1-11.24	4.50	12.96	10.32-16.21	3.97	133			20.45	133
1988	50.91	35.51-72.8	4.45	67.01	46.36-96.67	4.29	231	67.45	231	50.20	84
1989	22.46	17.7-28.45	3.60	31.41	24.51-40.18	3.44	252	32.27	252	54.19	84
1990	33.88	24.63-46.46	4.34	44.78	32.34-61.85	4.14	248	45.28	248	53.06	81
1991	16.83	12.75-22.08	4.48	16.83	12.78-22.08	4.48	334	16.56	238	21.44	83
1992	2.02	1.54-2.58	7.78	2.02	1.54-2.58	7.78	301	1.96	238	4.39	82
1993	9.99	7.45-13.3	5.48	9.99	7.45-13.3	5.48	300	9.74	240	11.85	84
1994	9.68	7.28-12.79	5.38	9.68	7.28-12.79	5.38	300	9.07	240	8.88	84
1995	1.81	1.39-2.3	7.87	1.81	1.39-2.3	7.87	352	1.52	248	2.37	92
1996	5.26	4.15-6.60	5.30	5.26	4.15-6.60	5.30	407	4.52	244	4.84	88
1997	11.50	9.11-14.45	4.20	11.50	9.11-14.45	4.20	421	8.63	256	19.68	100
1998	2.51	1.92-3.23	7.36	2.51	1.92-3.23	7.36	374	1.88	214	3.04	96
1999	4.72	3.63-6.07	6.07	4.72	3.63-6.07	6.07	402	3.98	238	6.61	100
2000	3.32	2.57-4.23	6.51	3.32	2.57-4.23	6.51	421	2.70	253	4.94	97
2001	3.03	2.40-3.79	6.14	3.03	2.40-3.79	6.14	432	2.83	263	3.69	100
2002*	3.41	2.28-4.92	9.99	3.41	2.28-4.92	9.99	196	2.52	112	3.95	48

Table 11.

FALL ATLANTIC CROAKER (YOY) INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955		0			0		0				
1956	2.68	1.22-5.11	19.41	3.98	1.92-7.52	16.68	27				
1957	3.62	1.54-7.4	19.54	4.04	1.98-7.52	16.26	27				
1958	1.32	0.41-2.81	29.54	1.6	0.5-3.5	28.67	27				
1959	2.14	1.15-3.58	16.52	1.11	0.58-1.82	19.45	18				
1960		0			0		0				
1961	1.2	1.02-1.39	5.40	0.77	0.67-0.88	4.94	15				
1962	0.3	0-1.02	83.36	0.3	0-1.02	83.36	12				
1963	0.72	0.06-1.8	45.00	0.81	0.07-2.04	44.14	17				
1964	0.67	0.32-1.11	22.99	0.67	0.33-1.11	22.59	27				
1965	2.17	1.16-3.67	16.71	1.66	0.95-2.64	15.97	43				
1966	2	1.13-3.25	15.73	1.91	1.09-3.05	15.54	42				
1967	0.04	0-0.11	100.00	0.02	0-0.06	100.00	60				
1968	2.1	0.57-5.12	30.01	1.45	0.39-3.32	31.69	60				
1969	27.98	18.79-41.44	5.67	12.75	8.63-18.65	6.80	63				
1970	3.4	1.74-6.05	15.97	1.96	1.03-3.32	17.38	61				
1971	4.7	2.85-7.44	11.29	2.45	1.55-3.68	12.31	177				
1972	6.1	4.59-8.02	6.11	4.94	3.69-6.52	6.63	188				
1973	5.88	4.1-8.27	7.75	3.89	2.69-5.47	8.82	116				
1974	0.87	0.54-1.27	15.46	0.87	0.54-1.27	15.46	44				
1975	7.64	4.82-11.83	9.15	7.64	4.82-11.83	9.15	36				
1976	5.8	3.6-9.05	10.18	9.09	5.57-14.48	9.26	68				
1977	2.97	1.89-4.45	11.49	2.97	1.89-4.45	11.49	52				
1978	6.91	5.32-8.89	5.41	5.17	3.97-6.66	5.93	128				
1979	5.37	3.9-7.27	7.06	3.86	2.81-5.19	7.65	100			4.69	63
1980	3.35	2.33-4.67	9.05	2.01	1.43-2.74	9.76	117			2.53	70
1981	4.78	3.3-6.77	8.44	3.52	2.43-4.96	9.16	122			2.86	75
1982	6.19	4.64-8.15	6.13	4.93	3.72-6.45	6.42	114			3.20	102
1983	8.11	5.24-12.3	8.56	6.37	4.24-9.36	8.52	102			7.32	103
1984	54.69	41.51-71.95	3.36	39.91	30.2-52.64	3.65	83			45.77	86
1985	89.77	72.21-111.54	2.38	71.76	56.56-90.97	2.73	57			74.98	57
1986	20.53	13.76-30.4	6.15	15.94	10.5-23.97	6.85	94			12.63	94
1987	7.21	4.87-10.49	7.98	5.47	3.77-7.76	8.14	68			6.49	68
1988	9.35	5.76-14.84	9.11	7.46	4.68-11.6	9.33	65			9.05	65
1989	60.27	35.47-101.95	6.30	45.95	27.78-75.59	6.36	65			64.78	65
1990	11.68	7.8-17.28	7.20	9.41	6.36-13.74	7.42	60			13.15	60
1991	5.71	3.94-8.1	8.02	5.71	3.94-8.1	8.02	132			9.57	63
1992	10.54	6.95-15.75	7.62	10.54	6.95-15.75	7.62	112			14.60	67
1993	4.54	2.84-7.0	10.72	4.54	2.84-7.0	10.72	113			5.42	69
1994	10.45	6.7-16.04	8.15	10.45	6.7-16.04	8.15	112			13.48	67
1995	12.75	9.61-16.81	4.94	12.75	9.61-16.81	4.94	180			11.79	69
1996	32.46	20.05-52.17	6.60	32.46	20.05-52.17	6.60	191			31.06	69
1997	7.94	5.08-12.12	8.77	7.94	5.08-12.12	8.77	199			10.41	75
1998	24.15	16.74-34.65	5.41	24.15	16.74-34.65	5.41	199			21.26	75
1999	11.27	7.25-17.23	7.90	11.27	7.25-17.23	7.90	198			14.30	75
2000	7.68	5.50-10.60	6.70	7.68	5.50-10.60	6.70	197			5.96	74
2001	5.75	4.07-8.00	7.51	5.75	4.07-8.00	7.51	198			7.05	75
2002											

Table 12.

SPRING ATLANTIC CROAKER (RECRUITS) INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	0.31	0.17-0.45	20.15	0.45	0.3-0.61	14.47	20				
1956	3.28	1.2-7.3	22.81	4.92	2.05-10.48	18.66	48				
1957	13.62	0.11-191.83	48.08	11.70	0.15-139.59	47.30	28				
1958	0.30	0-0.88	71.25	0.40	0-1.22	68.83	59				
1959	0.04	0-0.88	46.61	0.04	0.01-0.07	41.19	48				
1960	0.24	0-0.6	57.76	0.35	0-0.97	62.28	54				
1961	0.36	0-1.05	67.92	0.24	0-0.62	63.83	28				
1962	0.79	0.56-1.05	11.74	0.67	0.47-0.91	12.66	28				
1963	0.01	0-0.04	86.67	0.01	0-0.03	70.15	28				
1964	0.35	0.16-0.57	25.21	0.32	0.18-0.48	20.50	55				
1965	4.01	1.98-7.4	16.06	2.93	1.58-4.98	15.33	48				
1966	0.00	0-0.01	-332.05	0.00	0-0.01	100.00	66				
1967	0.34	0.19-0.5	19.83	0.26	0.15-0.38	19.42	83				
1968	0.11	0.03-0.2	35.79	0.07	0.02-0.14	39.09	87				
1969	0.26	0.15-0.39	20.62	0.18	0.1-0.26	21.44	91				
1970	0.06	0-0.12	52.38	0.03	0-0.06	49.09	92				
1971	0.23	0.12-0.34	21.94	0.15	0.08-0.24	24.38	228				
1972	4.37	0-31.89	53.90	3.63	0-24.42	55.62	210				
1973	0.12	0.09-0.16	14.60	0.09	0.07-0.13	14.98	417				
1974	2.04	1.2-3.19	14.45	1.68	1.03-2.54	14.09	241				
1975	2.63	1.64-3.98	12.28	2.00	1.29-2.94	12.40	334				
1976	1.08	0.84-1.37	8.65	0.78	0.6-0.97	9.00	591				
1977	0.15	0.1-0.2	16.42	0.11	0.06-0.15	20.39	530				
1978	0.08	0.05-0.11	16.61	0.05	0.03-0.07	17.94	413				
1979	2.18	1.44-3.14	11.43	1.30	0.9-1.79	11.44	119			2.06	117
1980	0.52	0.39-0.66	10.98	0.44	0.34-0.55	10.12	152			1.85	137
1981	0.07	0.04-0.1	19.67	0.07	0.04-0.1	20.36	140			0.24	132
1982	0.11	0.07-0.14	14.68	0.11	0.07-0.14	15.05	168			1.23	148
1983	6.59	4.94-8.71	6.06	6.67	4.98-8.84	6.10	156			9.49	156
1984	1.63	0.83-2.77	18.72	1.61	0.83-2.73	18.59	140			1.23	144
1985	4.98	4.18-5.92	4.05	5.33	4.4-6.42	4.31	106			4.07	106
1986	2.97	2.25-3.84	7.18	3.33	2.52-4.32	7.03	142			3.19	142
1987	4.24	3.47-5.14	4.81	4.24	3.47-5.14	4.80	139			5.47	139
1988	0.32	0.21-0.44	15.52	0.36	0.23-0.49	16.05	234	0.38	234	2.22	84
1989	0.60	0.38-0.85	15.51	0.65	0.41-0.93	15.63	252	0.78	252	4.63	84
1990	0.43	0.23-0.67	21.19	0.48	0.26-0.74	20.56	252	0.52	252	2.98	85
1991	4.41	3.08-6.18	8.36	4.41	3.08-6.18	8.36	307	4.35	238	12.87	83
1992	1.28	0.87-1.78	12.10	1.28	0.87-1.78	12.10	309	1.34	240	10.26	84
1993	2.17	1.5-3.02	10.34	2.17	1.5-3.02	10.34	301	2.21	240	19.40	84
1994	0.90	0.6-1.26	13.54	0.90	0.6-1.26	13.54	300	0.95	240	2.98	84
1995	1.06	0.77-1.39	10.40	1.06	0.77-1.39	10.40	306	0.93	246	5.55	90
1996	0.19	0.11-0.28	19.63	0.19	0.11-0.28	19.63	405	0.16	242	0.36	88
1997	1.47	1.15-1.85	7.78	1.47	1.15-1.85	7.78	419	0.87	255	7.78	100
1998	1.19	0.95-1.47	7.51	1.19	0.95-1.47	7.51	374	0.48	214	6.21	96
1999	1.50	1.05-2.05	10.83	1.50	1.05-2.05	10.83	397	1.28	232	4.08	100
2000	0.60	0.42-0.80	12.68	0.60	0.42-0.80	12.68	413	0.44	245	1.39	97
2001	0.36	0.24-0.49	14.65	0.36	0.24-0.49	14.65	420	0.32	253	1.18	98
2002	1.59	1.07-2.22	11.59	1.59	1.07-2.22	11.59	361	1.10	195	4.59	98

Table 13.

WEAKFISH INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	2.35	0		3.07	0		4				
1956	24.49	10.4-56.02	12.43	39.89	17.24-90.67	10.88	47				
1957	23.10	13.45-39.19	8.03	29.32	19.76-43.28	5.55	43				
1958	1.13	0.36-2.32	29.56	2.12	0.91-4.1	21.62	43				
1959	18.34	8.33-39.11	12.31	10.10	1.47-48.79	31.19	42				
1960	1.38	0.76-2.21	17.25	1.91	1.14-2.96	14.45	13				
1961	1.77	0.32-4.81	36.44	3.12	0.79-8.47	29.39	20				
1962	3.58	2.86-4.43	5.59	3.59	2.87-4.44	5.58	13				
1963	6.50	0-88.61	61.59	9.12	0-188.19	63.23	24				
1964	23.60	7.08-73.94	17.39	21.85	6.46-69.03	17.90	39				
1965	4.19	2.74-6.2	9.97	4.47	3.04-6.4	8.91	40				
1966	11.34	3.19-35.34	21.50	11.54	3.61-33.16	19.80	48				
1967	0.49	0.13-0.96	34.48	0.45	0.13-0.86	33.93	66				
1968	6.45	0.81-29.6	35.17	6.97	1.16-28.37	21.41	67				
1969	8.96	3.31-22	18.22	5.02	0.58-21.87	37.22	68				
1970	26.65	24.06-29.51	1.48	18.82	4.93-65.26	20.20	68				
1971	12.10	8.8-16.52	5.64	11.49	6.96-18.61	8.93	183				
1972	0.70	0.58-0.82	6.87	0.51	0.41-0.61	8.06	157				
1973	1.75	1.2-2.43	10.90	1.05	0.71-1.46	12.59	267				
1974	0.31	0.28-0.34	3.73	0.25	0.23-0.28	3.89	102				
1975	0.20	0.04-0.4	40.21	0.20	0.04-0.4	40.21	54				
1976	1.62	1.14-2.2	10.41	1.79	1.3-2.39	9.49	116				
1977	1.47	0.92-2.17	13.82	1.01	0.71-1.37	11.75	114				
1978	32.94	27.14-39.93	2.66	21.94	17.74-27.07	3.22	91				
1979	22.62	20.09-25.44	1.79	22.63	20.1-25.46	1.79	99			7.18	95
1980	6.45	3.53-11.24	12.39	6.43	3.46-11.36	12.70	120			9.87	111
1981	30.34	12.11-73.89	12.64	31.27	12.12-78.36	12.95	104			6.02	99
1982	17.86	8.98-34.63	10.83	18.41	9.46-35	10.42	116			10.95	113
1983	11.18	8.8-14.15	4.36	10.82	8.45-13.77	4.52	112			10.85	112
1984	4.99	3.26-7.44	9.55	4.73	3.1-7.01	9.60	93			6.05	97
1985	30.23	20.04-45.36	5.74	29.23	19.36-43.88	5.79	80			37.04	81
1986	4.95	3.18-7.45	9.86	4.71	3.05-7.05	9.85	108			4.62	108
1987	12.33	9.53-15.88	4.55	12.58	9.83-16.03	4.34	100			17.85	100
1988	8.05	5.31-11.96	8.17	8.13	5.37-12.07	8.12	173	8.89	173	21.72	63
1989	11.91	8.33-16.86	6.34	11.74	8.18-16.88	6.44	189	12.22	189	21.27	63
1990	4.29	2.99-6.03	8.52	4.46	3.1-6.26	8.44	184	4.87	184	30.01	59
1991	3.21	2.38-4.25	7.64	3.21	2.38-4.25	7.64	252	3.56	179	15.32	62
1992	6.78	4.79-9.47	7.21	6.78	4.79-9.47	7.21	226	6.93	178	15.91	61
1993	5.84	4.12-8.15	7.55	5.84	4.12-8.15	7.55	225	6.12	180	15.42	63
1994	2.60	1.84-3.55	9.21	2.60	1.84-3.55	9.21	225	2.67	180	7.04	63
1995	6.62	4.89-8.86	6.34	6.62	4.89-8.86	6.34	275	6.07	186	11.00	69
1996	7.26	5.33-9.78	6.31	7.26	5.33-9.78	6.31	305	7.85	183	7.42	66
1997	6.81	5.26-8.74	5.38	6.81	5.26-8.74	5.38	316	7.15	192	14.82	75
1998	7.60	5.46-10.45	6.65	7.60	5.46-10.45	6.65	269	8.18	150	9.95	71
1999	6.78	5.01-9.06	6.28	6.78	5.01-9.06	6.28	303	7.38	180	16.25	75
2000	8.35	6.34-10.92	5.42	8.35	6.34-10.92	5.42	316	9.39	191	11.09	74
2001	5.09	3.74-6.82	6.93	5.09	3.74-6.82	6.93	327	5.13	200	11.40	75
2002*	18.47	12.76-26.55	5.85	18.47	12.76-26.55	5.85	106	17.35	65	22.03	25

Table 14.

SUMMER FLOUNDER INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	0.00	0.00	.	0.00	0.00	.	2				
1956	4.44	2.91-6.56	9.76	1.29	0.75-2	16.26	29				
1957	2.14	1.22	15.07	0.69	0.46-0.96	13.88	28				
1958	1.48	0.23-4	38.64	0.42	0.09-0.85	38.03	27				
1959	0.06	0-0.16	75.33	0.03	0-0.06	66.23	27				
1960	.	0.00	.	.	0.00	.	0				
1961	0.19	0-0.61	85.91	0.01	0-0.03	100.00	11				
1962	0.00	0.00	.	0.00	0	.	7				
1963	2.07	24.24	1.09	1.09	0.43-2.05	25.73	12				
1964	0.65	0.55-0.77	6.77	0.39	0.25-0.54	16.05	16				
1965	0.74	0.27-1.39	28.63	0.45	0.16-0.82	30.37	13				
1966	0.00	0.00	.	0.00	0.00	.	17				
1967	0.43	0-1.67	76.12	0.26	0-0.78	74.97	27				
1968	0.14	0-0.37	67.30	0.10	0-0.26	66.24	27				
1969	0.19	0.03-0.037	41.25	0.13	0.02-0.25	40.27	27				
1970	0.03	0-0.07	79.32	0.02	0-0.06	82.08	29				
1971	3.71	3.41-4.03	2.10	2.05	1.9-2.22	2.38	129				
1972	0.85	0.79-0.92	2.72	0.80	0.77-0.82	1.31	84				
1973	1.27	0.77-1.89	14.97	0.99	0.62-1.46	15.20	94				
1974	0.82	0.31-1.51	27.15	0.82	0.31-1.51	27.15	32				
1975	0.14	0-0.3	51.20	0.14	0-0.3	51.20	22				
1976	0.57	0.32-0.86	19.17	0.65	0.41-0.93	15.75	68				
1977	1.67	1.16-2.31	10.81	1.67	1.16-2.31	10.81	36				
1978	1.24	0.47-2.4	25.89	1.24	0.47-2.4	25.89	36				
1979	2.94	2.74-3.15	1.88	2.94	2.74-3.15	1.88	50			1.01	48
1980	10.69	6.49-17.25	9.05	10.25	6.24-16.47	9.09	70			7.60	58
1981	3.97	2.39-6.31	12.00	3.91	2.35-6.21	12.04	67			5.10	61
1982	2.27	1.54-3.21	10.66	2.27	1.54-3.21	10.66	64			4.30	60
1983	5.01	3.62-6.82	7.34	5.01	3.62-6.82	7.34	60			5.21	62
1984	1.58	0.96-2.39	14.50	1.58	0.96-2.4	14.46	41			1.90	45
1985	1.26	0.52-2.37	24.41	1.26	0.52-2.37	24.41	27			1.11	27
1986	1.26	0.77-1.89	15.00	1.26	0.77-1.89	15.00	53			1.27	53
1987	0.39	0.2-0.63	23.05	0.39	0.2-0.63	23.05	52			0.45	52
1988	0.54	0.35-0.75	14.99	0.54	0.35-0.75	14.99	143	0.53	143	0.54	36
1989	1.24	0.94-1.58	8.77	1.24	0.94-1.58	8.77	162	1.23	162	0.96	36
1990	2.54	2.06-3.09	5.73	2.54	2.06-3.09	5.73	162	2.54	162	2.61	36
1991	2.81	2.28-3.41	5.51	2.81	2.28-3.41	5.51	207	2.78	153	1.42	36
1992	0.92	0.7-1.16	9.09	0.92	0.7-1.16	9.09	187	0.91	153	0.49	36
1993	0.52	0.37-0.67	11.77	0.52	0.37-0.67	11.77	185	0.53	153	0.49	36
1994	2.50	1.99-3.1	6.30	2.50	1.99-3.1	6.30	186	2.50	153	1.08	36
1995	0.71	0.53	10.21	0.71	0.53-0.91	10.21	218	0.72	149	0.74	36
1996	0.81	0.62-1.02	9.32	0.81	0.62-1.02	9.32	224	0.86	153	0.62	36
1997	0.89	0.69-1.12	8.77	0.89	0.69-1.12	8.77	226	0.97	153	0.70	36
1998	0.73	0.55-0.93	9.92	0.73	0.55-0.93	9.92	226	0.78	153	0.17	36
1999	0.53	0.41-0.67	9.94	0.53	0.41-0.67	9.94	219	0.58	147	0.36	36
2000	0.57	0.43-0.73	10.81	0.57	0.43-0.73	10.81	227	0.62	154	0.52	36
2001	0.47	0.34-0.61	11.84	0.47	0.34-0.61	11.84	236	0.51	161	0.53	36
2002*	0.87	0.42-1.46	21.95	0.87	0.42-1.46	21.95	15	0.87	15		

Table 15.

BLACK SEA BASS INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.11	0-0.36	100.00	0.11	0-0.36	100.00	5				
1955	0.75	0.03-1.95	46.95	0.75	0.03-1.95	46.95	10				
1956	0.15	0.15-0.15	0.00	0.15	0.15-0.15	0.00	5				
1957	0.00	0.00	.	0.00	0.00	.	14				
1958	0.00	0.00	.	0.00	0.00	.	9				
1959	0.16	0-0.34	48.64	0.16	0-0.34	48.64	14				
1960	0.00	0.00	.	0.00	0.00	.	6				
1961	0.48	0-1.66	73.88	0.48	0-1.66	73.88	6				
1962	0.00	0.00	.	0.00	0.00	.	3				
1963	0.83	0-3.85	80.75	0.83	0-3.85	80.75	14				
1964	0.00	0.00	.	0.00	0.00	.	7				
1965	0.29	0-0.78	63.47	0.29	0-0.78	63.47	11				
1966	0.03	0-0.08	100.00	0.03	0-0.08	100.00	13				
1967	0.00	0.00	.	0.00	0.00	.	12				
1968	0.00	0.00	.	0.00	0.00	.	12				
1969	0.23	0-0.74	82.98	0.23	0-0.74	82.98	12				
1970	0.38	0-1.35	81.42	0.38	0-1.35	81.42	14				
1971	0.52	0.45-0.59	5.63	0.52	0.45-0.59	5.63	17				
1972	0.22	0.08-0.37	30.40	0.13	0.05-0.22	30.25	102				
1973	2.31	1.67-3.11	8.98	1.43	1.06-1.87	9.38	93				
1974	0.89	0.49-1.39	18.60	0.55	0.32-0.83	18.77	96				
1975	0.40	0.23-0.6	19.23	0.26	0.15-0.38	19.34	201				
1976	1.57	1.13-2.1	9.88	0.91	0.64-1.21	11.51	182				
1977	0.23	0.08-0.41	31.94	0.14	0.05-0.25	31.82	160				
1978	2.75	0.35-9.41	38.61	2.75	0.35-9.41	38.61	16			0.86	16
1979	0.11	0-0.24	56.90	0.11	0-0.24	56.90	34			0.15	23
1980	1.48	0.87-2.31	15.73	1.48	0.87-2.31	15.73	31			0.31	23
1981	0.29	0.14-0.45	23.47	0.29	0.14-0.45	23.47	42			0.30	22
1982	0.46	0.16-0.83	30.13	0.46	0.16-0.83	30.13	25			0.40	25
1983	0.67	0.12-1.49	38.63	0.67	0.12-1.49	38.63	16			0.44	16
1984	1.29	0.63-2.21	20.63	1.29	0.63-2.21	20.63	12			0.73	12
1985	2.04	0.95-3.75	20.01	2.04	0.95-3.75	20.01	18			1.19	18
1986	0.61	0.39-0.88	15.68	0.61	0.39-0.88	15.68	18			0.27	18
1987	1.58	1.08-2.2	11.43	1.58	1.08-2.2	11.43	124	1.58	124	0.95	12
1988	0.84	0.59-1.13	11.89	0.84	0.59-1.13	11.89	138	0.83	138	1.04	12
1989	2.36	1.7-3.17	8.93	2.36	1.7-3.17	8.93	138	2.36	138	1.52	12
1990	1.12	0.78-1.53	11.63	1.12	0.78-1.53	11.63	128	1.12	128	0.50	12
1991	1.28	0.91-1.72	10.76	1.28	0.91-1.72	10.76	129	1.29	129	2.35	12
1992	0.22	0.13-0.32	18.86	0.22	0.13-0.32	18.86	129	0.22	129	0.19	12
1993	1.05	0.74-1.42	11.46	1.05	0.74-1.42	11.46	129	1.04	129	0.76	12
1994	1.06	0.74-1.45	11.85	1.06	0.74-1.45	11.85	129	1.06	129	0.60	12
1995	0.50	0.33-0.69	14.47	0.50	0.33-0.69	14.47	151	0.54	127	0.62	12
1996	0.36	0.22-0.52	17.99	0.36	0.22-0.52	17.99	152	0.35	128	0.38	12
1997	0.46	0.31-0.63	14.63	0.46	0.31-0.63	14.63	153	0.47	129	0.23	12
1998	0.57	0.35-0.82	16.40	0.57	0.35-0.82	16.40	135	0.59	111	0.32	12
1999	0.58	0.41-0.77	12.22	0.58	0.41-0.77	12.22	146	0.60	122	0.48	12
2000	0.72	0.48-0.99	13.49	0.72	0.48-0.99	13.49	152	0.75	128	0.93	12
2001	1.29	0.85-1.84	12.89	1.29	0.85-1.84	12.89	108	1.33	84	1.31	12
2002*											

Table 16.

SCUP INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.00	0		0.00	0		5				
1955	1.44	0.72-2.46	19.55	1.44	0.72-2.46	19.55	18				
1956	2.17	1.02-3.98	19.50	2.17	1.02-3.98	19.50	15				
1957	0.07	0-0.14	49.70	0.07	0-0.14	49.70	19				
1958	0.01	0-0.03	100.00	0.01	0-0.03	100.00	19				
1959	1.21	0.23-2.98	36.97	1.21	0.23-2.98	36.97	14				
1960	2.15	0.18-7.39	42.80	2.15	0.18-7.39	42.80	7				
1961	0.75	0-4.36	100.00	0.75	0-4.36	100.00	6				
1962	38.44	15.14-95.36	12.15	38.44	15.14-95.36	12.15	6				
1963	0.70	0-3.95	100.00	0.70	0-3.95	100.00	9				
1964							0				
1965	3.54	0.67-11.34	33.06	3.54	0.67-11.34	33.06	8				
1966	0.00	0		0.00	0		8				
1967	0.52	0.11-1.1	38.14	0.52	0.11-1.1	38.14	8				
1968	0.96	0-3.56	62.53	0.96	0-3.56	62.53	8				
1969	0.25	0-0.64	59.29	0.25	0-0.64	59.29	8				
1970	0.08	0-0.2	68.09	0.08	0-0.2	68.09	8				
1971	0.00	0		0.00	0		4				
1972	0.00	0		0.00	0		58				
1973	4.67	2.8-7.45	11.51	4.67	2.8-7.45	11.51	61				
1974	0.00	0		0.00	0		53				
1975	1.78	0.79-3.32	21.52	1.78	0.79-3.32	21.52	70				
1976	0.64	0.25-1.16	27.55	0.64	0.25-1.16	27.55	52				
1977	0.00	0		0.00	0		73				
1978	1.65	0-17.52	100.00	1.65	0-17.52	100.00	2				
1979	0.74	0.11-1.72	40.43	0.74	0.11-1.72	40.43	15				
1980	5.60	4.4-7.07	5.31	5.60	4.4-7.07	5.31	6				
1981	0.75	0.21-1.52	32.96	0.75	0.21-1.52	32.96	7				
1982							0				
1983							0				
1984							0				
1985							0				
1986							0				
1987	2.07	1.24-3.21	14.10	2.07	1.24-3.21	14.10	92	2.07	92		
1988	3.06	2.05-4.41	10.20	3.06	2.05-4.41	10.20	112	3.06	112		
1989	4.92	3.14-7.45	10.03	4.92	3.14-7.45	10.03	112	4.92	112		
1990	1.90	1.11-2.99	14.99	1.90	1.11-2.99	14.99	103	1.90	103		
1991	0.65	0.41-0.93	15.67	0.65	0.41-0.93	15.67	104	0.65	104		
1992	3.36	2.16-5.01	10.90	3.36	2.16-5.01	10.90	104	3.36	104		
1993	0.90	0.53-1.35	16.67	0.90	0.53-1.35	16.67	104	0.90	104		
1994	0.39	0.21-0.59	21.36	0.39	0.21-0.59	21.36	104	0.39	104		
1995	0.54	0.29-0.83	20.37	0.54	0.29-0.83	20.37	104	0.54	104		
1996	0.21	0.09-0.35	28.00	0.21	0.09-0.35	28.00	104	0.21	104		
1997	0.50	0.27-0.75	19.83	0.50	0.27-0.75	19.83	79	0.50	79		
1998	0.27	0.06-0.52	37.91	0.27	0.06-0.52	37.91	88	0.27	88		
1999	0.13	0.02-0.25	41.14	0.13	0.02-0.25	41.14	105	0.13	105		
2000	1.33	0.88-1.90	12.77	1.33	0.88-1.90	12.77	110	1.33	110		
2001*	0.25	0.11-0.42	26.68	0.25	0.11-0.42	26.68	56	0.25	56		

Table 17.

STRIPED BASS INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954							0				
1955							0				
1956	1.47	0.03-4.95	48.65	1.55	0.06-5.14	46.94	13				
1957	2.75	1.56-4.49	14.45	2.85	1.62-4.68	14.38	15				
1958	6.06	2.02-15.53	21.76	6.53	1.84-18.95	21.14	5				
1959							0				
1960	2.79	1.74-4.25	12.16	2.79	1.74-4.25	12.16	4				
1961	1.98	0.43-5.25	33.78	2.12	0.47-5.63	33.16	9				
1962	1.21	0.27-2.84	35.04	1.21	0.27-2.84	35.04	8				
1963	6.71	4.92-9.03	6.45	7.27	5.23-9.99	6.72	20				
1964	1.25	0.51-2.36	24.62	1.26	0.52-2.38	24.50	23				
1965	3.23	1.19-7.15	22.80	3.29	1.22-7.27	22.58	31				
1966	2.13	1.41-3.07	11.50	2.14	1.41-3.08	11.51	26				
1967	3.10	1.33-6.21	19.98	4.92	2.19-9.96	17.35	26				
1968	1.78	1.16-2.58	12.40	2.92	1.78-4.53	12.54	39				
1969	1.08	0.79-1.42	10.30	1.53	1.01-2.18	12.30	36				
1970	2.04	1.02-3.59	18.48	2.75	1.42-4.8	16.56	35				
1971	0.44	0.26-0.65	18.21	0.72	0.44-1.05	16.24	54				
1972	0.28	0-1.04	96.90	0.28	0-1.04	96.90	50				
1973	0.08	0.01-0.15	42.86	0.08	0.01-0.15	42.86	49				
1974	0.02	0-0.05	100.00	0.02	0-0.05	100.00	53				
1975	0.21	0.04-0.41	40.02	0.21	0.04-0.41	40.02	53				
1976							0				
1977	0.15	0.05-0.27	32.98	0.15	0.05-0.27	32.98	42				
1978	0.34	0.13-0.58	28.54	0.34	0.14-0.58	28.36	109				
1979	0.17	0.04-0.32	36.64	0.17	0.04-0.32	36.64	43				
1980	0.42	0.18-0.71	26.35	0.42	0.18-0.71	26.35	48				
1981	1.33	0.5-2.56	25.80	1.33	0.51-2.59	25.63	51				
1982	0.79	0.11-1.9	41.36	0.79	0.11-1.9	41.36	38			0.37	7
1983	1.50	0.36-3.57	33.01	1.50	0.36-3.57	33.01	25			1.41	27
1984	0.43	0.25-0.64	19.16	0.43	0.25-0.64	19.16	33			0.75	34
1985	0.53	0.04-1.24	44.90	0.53	0.04-1.24	44.90	32			0.54	32
1986	0.08	0-0.19	59.02	0.08	0-0.19	59.02	33			0.17	33
1987	3.34	1.82-5.68	14.71	3.34	1.82-5.68	14.71	21			3.63	20
1988	1.24	0.65-2.06	19.19	1.24	0.65-2.06	19.19	35			1.93	35
1989	1.65	1.12-2.32	11.51	1.65	1.12-2.32	11.51	37			1.59	37
1990	1.06	0.49-1.84	22.33	1.06	0.49-1.84	22.33	36			1.14	36
1991	0.97	0.29-2	31.00	0.97	0.29-2	31.00	51			1.02	36
1992	1.28	0.83-1.83	13.18	1.28	0.83-1.83	13.18	51			2.15	39
1993	2.69	1.23-5.1	19.32	2.69	1.23-5.1	19.32	53			3.30	41
1994	1.33	0.88-1.88	12.58	1.33	0.88-1.88	12.58	51			1.07	39
1995	0.61	0.33-0.96	20.19	0.61	0.33-0.96	20.19	75			1.22	39
1996	0.61	0.32-0.95	20.56	0.61	0.32-0.95	20.56	90			1.19	40
1997	0.55	0.25-0.93	24.75	0.55	0.25-0.93	24.75	90			0.41	39
1998	0.89	0.44-1.47	21.30	0.89	0.44-1.47	21.30	90			1.22	39
1999	0.21	0-0.47	51.55	0.21	0-0.47	51.55	84			0.26	39
2000	1.67	0.86-2.82	18.31	1.67	0.86-2.82	18.31	90			2.58	39
2001	0.53	0.27-0.85	21.84	0.53	0.27-0.85	21.84	90			1.94	39
2002											

Table 18.

WHITE PERCH - YOY INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955							0				
1956	3.48	1.78-6.22	15.90	3.48	1.78-6.22	15.90	13				
1957	15.46	9.07-25.91	8.77	15.46	9.07-25.91	8.77	15				
1958	39.04	13.84-107.07	13.45	39.04	13.84-107.07	13.45	5				
1959							0				
1960	0.00	0		0.00	0		4				
1961	2.72	0.3-9.63	39.91	2.72	0.3-9.63	39.91	9				
1962	3.75	0.09-19.66	47.15	3.75	0.09-19.66	47.15	8				
1963	19.57	11.86-31.92	7.77	19.57	11.86-31.92	7.77	20				
1964	7.60	4.57-12.27	10.10	7.60	4.57-12.27	10.10	23				
1965	0.70	0.2-1.42	32.95	0.70	0.2-1.42	32.95	31				
1966	9.32	4.73-17.59	12.61	9.32	4.73-17.59	12.61	26				
1967	9.56	5.11-17.25	11.61	9.56	5.11-17.25	11.61	26				
1968	1.66	0.89-2.75	17.45	1.66	0.89-2.75	17.45	39				
1969	4.63	2.46-8.16	14.07	4.63	2.46-8.16	14.07	36				
1970	13.86	6.42-28.75	12.86	13.86	6.42-28.75	12.86	35				
1971	2.47	1.36-4.08	15.42	2.31	1.27-3.83	15.79	54				
1972	1.77	0.76-3.36	22.29	1.24	0.54-2.25	23.04	50				
1973	2.33	1.56-3.33	10.93	1.78	1.18-2.55	11.97	49				
1974	0.78	0.52-1.09	13.73	0.58	0.38-0.61	14.70	53				
1975	1.52	0.81-2.49	17.76	1.03	0.56-1.65	18.76	53				
1976							0				
1977	4.34	2.4-7.4	13.49	2.84	1.6-4.68	14.52	42				
1978	14.22	9.62-20.83	6.62	9.11	6.17-13.26	7.43	109				
1979	9.00	5.73-13.84	8.58	5.59	3.53-8.57	9.90	43				
1980	0.45	0.2-0.74	24.97	0.45	0.2-0.74	24.97	48				
1981	1.01	0.65-1.44	13.98	1.01	0.65-1.44	13.98	51				
1982	4.53	1.53-11.09	22.89	4.53	1.53-11.09	22.89	38			1.22	7
1983	8.61	3.95-17.67	14.66	8.61	3.95-17.67	14.66	25			9.96	27
1984	23.80	14.97-37.53	6.86	23.80	14.97-37.53	6.86	33			13.26	34
1985	2.07	1.23-3.24	14.30	2.07	1.23-3.24	14.30	32			1.86	32
1986	2.81	1.83-4.12	11.12	2.81	1.83-4.12	11.12	33			1.77	33
1987	33.58	18.74-59.57	7.91	42.47	24.73-72.42	6.95	21			42.13	20
1988	6.15	3.68-9.91	10.75	6.15	3.68-9.91	10.75	35			5.29	35
1989	12.93	6.69-24.25	11.29	12.93	6.69-24.25	11.29	37			13.33	37
1990	3.24	1.84-5.32	13.89	3.23	1.84-5.32	13.89	36			3.31	36
1991	3.40	1.17-7.94	23.89	3.40	1.17-7.94	23.89	51			2.30	36
1992	1.54	0.83-2.52	17.56	1.54	0.83-2.52	17.56	51			1.21	39
1993	17.87	5.3-55.51	18.67	17.87	5.3-55.51	18.67	53			17.91	41
1994	12.33	6.84-21.68	10.26	12.33	6.84-21.68	10.26	51			8.43	39
1995	1.92	0.98-3.29	18.01	1.92	0.98-3.29	18.01	75			4.61	39
1996	24.41	12.94-45.29	9.27	24.41	12.94-45.29	9.27	90			21.61	40
1997	9.34	6.04-14.19	8.22	9.34	6.04-14.19	8.22	90			10.00	39
1998	3.84	1.98-6.86	15.38	3.84	1.98-6.86	15.38	90			7.13	39
1999	0.74	0.39-1.19	20.54	0.74	0.39-1.19	20.54	84			2.38	39
2000	8.76	4.35-16.79	13.18	8.76	4.35-16.79	13.18	90			16.12	39
2001	1.93	0.95-3.39	18.84	1.93	0.95-3.39	18.84	90			5.99	39
2002											

Table 19.

WHITE PERCH - 1+ INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955							0				
1956	33.39	13-83.51	12.70	37.61	15.31-90.42	11.79	18				
1957	50.73	20.87-121.39	10.91	55.62	23.38-130.5	10.44	20				
1958	68.94	22.01-211.64	13.09	68.94	22.01-211.64	13.09	10				
1959	6.17	2.73-12.77	16.56	6.17	2.73-12.77	16.56	5				
1960	170.19	36.71-776.2	14.71	170.19	36.71-776.2	14.71	4				
1961	60.68	20.85-173.14	12.59	65.41	23.3-180.44	11.98	12				
1962	70.46	17.97-268.13	15.53	87.59	24.36-308.52	13.95	11				
1963	92.10	39.25-214.34	9.25	101.93	43.68-236.15	9.01	24				
1964	101.05	83.15-122.75	2.08	102.76	84.48-124.93	2.09	27				
1965	32.32	17.11-60.32	8.70	33.64	17.86-62.6	8.57	38				
1966	16.42	9-29.32	9.70	16.42	9-29.32	9.70	35				
1967	26.62	15.12-46.32	8.11	47.08	32.22-68.61	4.78	39				
1968	23.43	11.86-45.4	10.04	42.17	21.89-80.4	8.42	52				
1969	6.49	4.08-10.05	9.65	14.17	9.21-21.53	7.28	50				
1970	11.69	6.67-19.99	9.90	17.48	9.71-30.9	9.36	48				
1971	4.55	3.03-6.65	9.37	6.40	4.26-9.42	8.54	72				
1972	2.64	1.98-3.45	7.75	2.56	1.92-3.34	7.80	85				
1973	3.00	1.94-4.45	11.14	2.71	1.74-4.03	11.57	60				
1974	2.14	1.38-3.15	12.08	1.95	1.27-2.82	12.05	63				
1975	4.22	2.65-6.46	10.82	3.59	2.33-5.34	10.57	63				
1976	7.24	2.8-16.87	18.35	8.41	2.59-23.67	21.49	12				
1977	4.12	2.74-5.99	9.57	3.74	2.56-5.32	9.21	56				
1978	4.83	3.25-6.99	8.96	4.08	2.76-5.86	9.23	123				
1979	15.78	8.45-28.81	10.18	13.46	7.44-23.77	10.08	59			3.30	16
1980	5.80	3.5-9.26	10.75	5.80	3.5-9.27	10.75	64			15.79	16
1981	24.86	15.15-40.42	7.24	24.86	15.15-40.42	7.24	68			18.88	17
1982	28.78	15.09-54.09	9.06	28.78	15.09-54.09	9.06	56			15.88	25
1983	28.86	18.53-44.63	6.25	28.86	18.53-44.63	6.25	44			26.63	44
1984	25.70	12.22-52.95	10.70	25.70	12.22-52.95	10.70	54			23.84	54
1985	33.19	22.39-48.98	5.37	33.19	22.39-48.98	5.37	32			36.76	32
1986	12.06	6.72-21.1	10.23	12.06	6.72-21.1	10.23	51			9.55	51
1987	16.57	9.21-29.22	9.46	18.96	10.49-33.68	9.22	37			21.88	36
1988	39.57	26.69-58.42	5.15	39.57	26.69-58.42	5.15	46			35.10	46
1989	22.78	16-32.25	5.29	22.78	16-32.25	5.29	46			25.86	46
1990	35.39	21.9-56.83	6.44	35.39	21.9-56.83	6.44	45			31.97	45
1991	32.45	23.82-44.09	4.25	32.45	23.82-44.09	4.25	65			29.49	44
1992	11.17	7.47-16.47	7.24	11.17	7.47-16.47	7.24	64			15.77	48
1993	10.11	4.69-20.69	13.90	10.11	4.69-20.69	13.90	66			15.04	50
1994	21.29	13.52-33.2	6.90	21.29	13.52-33.2	6.90	64			18.77	48
1995	10.76	6.53-17.36	9.04	10.76	6.53-17.36	9.04	98			40.82	48
1996	9.03	5.29-15.00	10.13	9.03	5.29-15.00	10.13	116			12.78	50
1997	19.37	10.56-34.90	9.40	19.37	10.56-34.90	9.40	120			20.25	52
1998	10.89	6.70-17.36	8.78	10.89	6.70-17.36	8.78	120			27.44	52
1999	10.34	5.97-17.46	10.03	10.34	5.97-17.46	10.03	114			22.25	52
2000	8.18	4.09-15.57	13.30	8.18	4.09-15.57	13.30	120			16.44	52
2001	4.62	2.55-7.92	13.35	4.62	2.55-7.92	13.35	120			17.09	52
2002											

Table 20.

WHITE CATFISH - YOY INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.41	0-1.83	100.00	0.41	0-1.83	100.00	2				
1955	0.82	0.54-1.16	14.20	0.82	0.54-1.16	14.20	5				
1956	1.27	0.46-2.53	26.77	1.27	0.46-2.53	26.77	13				
1957	1.26	0.75-1.93	15.84	1.26	0.75-1.93	15.84	20				
1958	3.31	0.23-14.14	43.03	3.31	0.23-14.14	43.03	5				
1959							0				
1960	4.77	0.72-18.41	34.61	4.77	0.72-18.41	34.61	6				
1961	1.33	0.49-2.66	26.62	1.33	0.49-2.66	26.62	12				
1962	0.67	0-1.88	52.77	0.67	0-1.88	52.77	14				
1963	0.22	0.07-0.39	33.61	0.22	0.07-0.39	33.61	24				
1964	0.55	0.23-0.94	26.22	0.55	0.23-0.94	26.22	33				
1965	0.33	0.11-0.59	31.25	0.33	0.11-0.59	31.25	42				
1966	0.55	0.19-1.02	30.41	0.55	0.19-1.02	30.41	43				
1967	0.82	0.28-1.57	29.11	0.82	0.28-1.57	29.11	34				
1968	0.32	0.14-0.52	26.80	0.32	0.14-0.52	26.80	54				
1969	0.49	0.29-0.72	17.91	0.49	0.29-0.72	17.91	50				
1970	0.41	0.07-0.85	40.00	0.41	0.07-0.85	40.00	50				
1971	2.20	1.34-3.37	13.43	2.20	1.34-3.37	13.43	71				
1972	0.05	0-0.12	60.39	0.05	0-0.12	60.39	53				
1973	0.95	0.31-1.89	29.54	0.95	0.31-1.89	29.54	84				
1974	0.38	0.15-0.65	28.08	0.38	0.15-0.65	28.08	53				
1975	1.41	0.87-2.09	14.23	1.46	0.87-2.09	14.23	70				
1976	0.04	0-0.09	57.65	0.04	0-0.09	57.65	39				
1977	0.14	0.03-0.27	40.50	0.14	0.03-0.27	40.50	59				
1978	2.01	1.41-2.76	10.11	2.01	1.41-2.76	10.11	95				
1979	0.32	0.11-0.58	31.53	0.32	0.11-0.58	31.53	54				
1980	0.12	0.02-0.24	41.75	0.12	0.02-0.24	41.75	50				
1981	0.41	0.1-0.81	36.40	0.41	0.1-0.81	36.43	78				
1982	0.06	0.01-0.11	41.56	0.06	0.01-0.11	41.56	41				
1983	2.47	2.17-2.8	3.64	2.47	2.17-2.8	3.64	46			1.31	49
1984	1.11	0.76-1.52	11.93	1.11	0.76-1.52	11.93	54			1.39	54
1985	0.10	0.01-0.2	44.53	0.10	0.01-0.2	44.53	42			0.14	42
1986	0.95	0.64-1.32	12.96	0.95	0.64-1.32	12.96	44			0.67	44
1987	1.77	0.61-3.76	26.61	1.77	0.61-3.76	26.61	28			1.51	27
1988	0.25	0.11-0.41	26.68	0.25	0.11-0.41	26.68	52			0.61	52
1989	3.63	2.01-6.12	14.03	3.63	2.01-6.12	14.03	51			3.33	52
1990	0.76	0.57-0.97	9.89	0.76	0.57-0.97	9.89	52			0.82	52
1991	0.06	0.02-0.11	34.21	0.06	0.02-0.11	34.21	72			0.19	52
1992	0.74	0.57-0.92	9.04	0.74	0.57-0.92	9.04	68			0.50	52
1993	0.80	0.45-1.23	18.34	0.80	0.45-1.23	18.34	68			1.14	52
1994	0.12	0.06-0.19	25.82	0.12	0.06-0.19	25.82	68			0.34	52
1995	0.21	0.08-0.35	29.33	0.21	0.08-0.35	29.33	109			0.46	52
1996	0.36	0.18-0.55	22.23	0.36	0.18-0.55	22.23	120			1.18	53
1997	0.37	0.23-0.53	17.47	0.37	0.23-0.53	17.47	120			0.94	52
1998	0.07	0.04-0.10	22.96	0.07	0.04-0.10	22.96	120			0.34	52
1999	0.003	0-0.01	100.00	0.003	0-0.01	100.00	114			0.00	52
2000	0.05	0-0.12	58.53	0.05	0-0.12	58.53	120			0.09	52
2001	0.02	0-0.04	73.60	0.02	0-0.04	73.60	120			0.03	52
2002											

Table 21.

WHITE CATFISH - 1+ INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.41	0-1.83	100.00	0.41	0-1.83	100.00	2				
1955	2.12	1.51-2.87	9.54	2.12	1.51-2.87	9.54	5				
1956	1.72	0.81-3.09	20.34	1.72	0.81-3.09	20.34	13				
1957	2.65	1.55-4.21	13.78	2.65	1.55-4.21	13.78	20				
1958	8.43	0.38-63.2	42.75	8.43	0.38-63.2	42.75	5				
1959							0				
1960	9.81	2.31-34.25	24.84	9.81	2.31-34.25	24.84	6				
1961	2.47	1.6-3.63	11.57	2.47	1.6-3.63	11.57	12				
1962	14.14	5.56-33.94	15.40	14.14	5.56-33.94	15.40	14				
1963	1.30	0.67-2.17	19.15	1.30	0.67-2.17	19.15	24				
1964	1.35	0.85-1.98	13.95	1.35	0.85-1.98	13.95	33				
1965	0.69	0.41-1.02	17.00	0.69	0.41-1.02	17.00	42				
1966	1.68	1.1-2.43	12.48	1.68	1.1-2.43	12.48	43				
1967	1.49	0.81-2.41	17.33	1.49	0.81-2.41	17.33	34				
1968	0.64	0.29-1.08	24.04	0.64	0.29-1.08	24.04	54				
1969	0.97	0.57-1.46	16.60	0.97	0.57-1.46	16.60	50				
1970	1.38	0.52-2.72	25.82	1.38	0.52-2.72	25.82	50				
1971	2.12	1.46-2.95	10.47	2.12	1.46-2.95	10.47	71				
1972	1.11	0.49-2.01	23.57	1.11	0.49-2.01	23.57	53				
1973	1.19	0.79-1.67	12.83	1.19	0.79-1.67	12.83	84				
1974	0.71	0.38-1.12	20.24	0.71	0.38-1.12	20.24	53				
1975	0.95	0.64-1.33	13.02	0.94	0.64-1.31	12.96	70				
1976	0.41	0.16-0.71	28.08	0.41	0.16-0.71	28.08	39				
1977	0.50	0.27-0.76	20.28	0.50	0.27-0.76	20.28	59				
1978	0.29	0.14-0.46	24.02	0.29	0.14-0.46	24.02	95				
1979	1.46	0.68-2.59	21.08	1.46	0.68-2.59	21.08	54				
1980	0.54	0.28-0.87	21.91	0.55	0.28-0.88	22.05	50				
1981	1.16	0.7-1.74	15.60	1.16	0.7-1.74	15.59	78				
1982	1.91	0.82-3.65	21.93	1.91	0.82-3.65	21.93	41				
1983	1.62	0.7-3.02	22.30	1.62	0.7-3.02	22.31	46			1.46	49
1984	2.31	1.35-3.67	14.33	2.31	1.35-3.67	14.33	54			3.53	54
1985	2.47	1.02-4.95	21.67	2.47	1.02-4.95	21.67	42			2.14	42
1986	1.77	1.31-2.33	8.99	1.77	1.31-2.33	8.99	44			2.13	44
1987	1.71	0.98-2.71	15.74	1.71	0.98-2.71	15.74	28			2.18	27
1988	1.88	1.29-2.62	10.81	1.88	1.29-2.62	10.81	52			3.16	52
1989	3.23	1.68-5.67	15.78	3.23	1.68-5.67	15.78	51			4.35	52
1990	3.46	2.13-5.34	11.82	3.46	2.13-5.34	11.82	52			6.75	52
1991	2.04	0.9-3.87	21.14	2.04	0.9-3.87	21.14	72			2.31	52
1992	3.77	3.03-4.63	5.34	3.77	3.03-4.63	5.34	68			3.97	52
1993	2.25	1.19-3.82	16.69	2.25	1.19-3.82	16.69	68			1.66	52
1994	1.59	1.09-2.22	11.37	1.59	1.09-2.22	11.37	68			2.72	52
1995	0.94	0.45-1.61	22.21	0.94	0.45-1.61	22.21	109			1.77	52
1996	1.05	0.76-1.40	10.78	1.05	0.76-1.40	10.78	120			3.11	53
1997	1.85	1.32-2.49	9.82	1.85	1.32-2.49	9.82	120			3.45	52
1998	1.21	0.76-1.77	14.40	1.21	0.76-1.77	14.40	120			2.45	52
1999	0.50	0.36-0.79	15.31	0.50	0.36-0.79	15.31	114			1.51	52
2000	0.29	0.15-0.45	22.91	0.29	0.15-0.45	22.91	120			0.66	52
2001	0.29	0.14-0.47	24.65	0.29	0.14-0.47	24.65	120			0.54	52
2002											

Table 22.

CHANNEL CATFISH - YOY INDICES

	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.00	0		0.00	0		2				
1955	0.08	0-0.25	100.00	0.08	0-0.25	100.00	5				
1956	0.03	0-0.1	100.00	0.03	0-0.1	100.00	13				
1957	0.09	0.01-0.17	44.17	0.09	0.01-0.17	44.17	20				
1958	0.00	0		0.00	0		5				
1959							0				
1960	0.00	0		0.00	0		6				
1961	0.46	0.06-1	42.06	0.46	0.06-1	42.06	12				
1962	0.19	0-0.48	63.03	0.19	0-0.48	63.03	14				
1963	0.87	0-4.83	90.76	0.87	0-4.83	90.76	24				
1964	0.34	0.08-0.66	36.52	0.34	0.08-0.66	36.52	33				
1965	0.29	0.06-0.58	38.23	0.29	0.06-0.58	38.23	42				
1966	1.48	0.71-2.6	20.44	1.48	0.71-2.6	20.44	43				
1967	0.12	0-0.33	74.16	0.12	0-0.33	74.16	34				
1968	0.29	0-0.66	49.49	0.29	0-0.66	49.49	54				
1969	0.50	0.21-0.84	25.85	0.50	0.21-0.84	25.85	50				
1970	0.31	0-0.75	54.17	0.31	0-0.75	54.17	50				
1971	1.88	1.15-2.86	13.83	1.88	1.15-2.86	13.83	71				
1972	0.00	0		0.00	0		53				
1973	1.18	0.79-1.65	12.65	1.18	0.79-1.65	12.65	84				
1974	0.13	0.01-0.28	46.73	0.13	0.01-0.28	46.73	53				
1975	0.65	0.28-1.12	25.17	0.79	0.4-1.29	21.34	70				
1976	0.00	0		0.00	0		39				
1977	0.06	0-0.11	47.28	0.06	0-0.11	47.28	59				
1978	0.63	0.41-0.89	15.15	0.63	0.41-0.89	15.15	95				
1979	0.71	0.21-1.41	31.96	0.71	0.21-1.41	31.96	54				
1980	0.14	0.02-0.28	42.99	0.14	0.02-0.28	42.99	50				
1981	0.16	0.08-0.24	24.59	0.16	0.08-0.24	24.59	78				
1982	0.10	0.01-0.19	43.47	0.10	0.01-0.19	43.47	41				
1983	0.33	0.17-0.51	22.71	0.33	0.17-0.51	22.71	46			0.16	49
1984	0.33	0.1-0.6	32.67	0.33	0.1-0.6	32.67	54			0.43	54
1985	0.04	0-0.13	100.00	0.04	0-0.13	100.00	42			0.04	42
1986	0.08	0.04-0.12	26.20	0.08	0.04-0.12	26.20	44			0.08	44
1987	0.09	0-0.25	79.59	0.09	0-0.25	79.59	28			0.15	27
1988	0.02	0-0.06	85.43	0.02	0-0.06	85.43	52			0.03	52
1989	1.92	1.03-3.22	17.10	1.92	1.03-3.22	17.10	51			1.27	52
1990	0.04	0-0.01	72.68	0.04	0-0.01	72.68	52			0.09	52
1991	0.03	0-0.08	100.00	0.03	0-0.08	100.00	72			0.02	52
1992	0.00	0		0.00	0		68			0.00	52
1993	0.04	0-0.12	77.30	0.04	0-0.12	77.30	68			0.08	52
1994	0.05	0-0.11	58.60	0.05	0-0.11	58.60	68			0.09	52
1995	0.22	0.07-0.40	33.76	0.22	0.07-0.40	33.76	109			0.40	52
1996	0.13	0.02-0.26	43.48	0.13	0.02-0.26	43.48	120			0.24	53
1997	0.05	0-0.12	63.47	0.05	0-0.12	63.47	120			0.03	52
1998	0.06	0-0.12	49.85	0.06	0-0.12	49.85	120			0.04	52
1999	0.00	0		0.00	0		114			0.00	52
2000	0.01	0-0.02	42.25	0.01	0-0.02	42.25	120			0.04	52
2001	0.00	0-0.01	100.00	0.00	0-0.01	100.00	120			0.00	52
2002											

Table 23.

CHANNEL CATFISH - 1+ INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1954	0.00	0		0.00	0		2				
1955	0.00	0		0.00	0		5				
1956	0.00	0		0.00	0		13				
1957	0.11	0.01-0.22	45.47	0.11	0.01-0.22	45.47	20				
1958	0.00	0		0.00	0		5				
1959							0				
1960	0.00	0		0.00	0		6				
1961	0.86	0.16-1.97	37.79	0.86	0.16-1.97	37.79	12				
1962	0.26	0-0.66	61.69	0.26	0-0.66	61.69	14				
1963	0.07	0-0.18	67.11	0.07	0-0.18	67.11	24				
1964	0.67	0.34-1.08	21.40	0.67	0.34-1.08	21.40	33				
1965	0.29	0.15-0.45	22.93	0.29	0.15-0.45	22.93	42				
1966	0.60	0.13-1.26	36.87	0.60	0.13-1.26	36.87	43				
1967	0.40	0.08-0.81	38.24	0.40	0.08-0.81	38.24	34				
1968	0.27	0.05-0.54	39.70	0.27	0.05-0.54	39.70	54				
1969	0.50	0.26-0.79	21.78	0.50	0.26-0.79	21.78	50				
1970	1.27	0.76-1.92	15.57	1.27	0.76-1.92	15.57	50				
1971	0.48	0.19-0.85	27.91	0.48	0.19-0.85	27.91	71				
1972	0.00	0		0.00	0		53				
1973	1.54	1.09-2.1	10.56	1.54	1.09-2.1	10.56	84				
1974	0.33	0.14-0.55	26.87	0.33	0.14-0.55	26.87	53				
1975	1.03	0.56-1.64	18.45	0.98	0.53-1.57	18.87	70				
1976	0.00	0		0.00	0		39				
1977	0.38	0.18-0.62	24.65	0.38	0.18-0.62	24.65	59				
1978	0.94	0.65-1.28	12.05	0.94	0.65-1.28	12.05	95				
1979	1.96	0.82-3.81	22.42	1.96	0.82-3.82	22.39	54				
1980	1.89	1.33-2.59	10.21	1.89	1.33-2.59	10.21	50				
1981	0.54	0.26-0.88	23.22	0.54	0.26-0.88	23.22	78				
1982	0.40	0-1.08	59.47	0.40	0-1.08	59.47	41				
1983	1.97	1.36-2.75	10.70	1.97	1.36-2.75	10.70	46			0.91	49
1984	2.37	1.32-3.88	15.30	2.37	1.32-3.88	15.30	54			1.69	54
1985	2.92	1.82-4.45	12.03	2.92	1.82-4.45	12.03	42			1.81	42
1986	1.53	1.29-1.79	5.30	1.53	1.29-1.79	5.30	44			0.84	44
1987	0.94	0.36-1.77	26.61	0.94	0.36-1.77	26.61	28			0.85	27
1988	1.41	1.05-1.82	9.09	1.41	1.05-1.82	9.09	52			0.91	52
1989	1.10	0.52-1.91	21.82	1.10	0.52-1.91	21.82	51			1.20	52
1990	2.67	1.79-3.83	10.56	2.67	1.79-3.83	10.56	52			1.52	52
1991	3.37	2.27-4.82	9.78	3.37	2.27-4.82	9.78	72			1.73	52
1992	1.87	1.30-2.58	10.47	1.87	1.30-2.58	10.47	68			1.48	52
1993	0.83	0.20-1.80	35.01	0.83	0.20-1.80	35.01	68			1.15	52
1994	0.81	0.48-1.22	17.04	0.81	0.48-1.22	17.04	68			1.49	52
1995	0.69	0.39-1.05	18.45	0.69	0.39-1.05	18.45	109			0.58	52
1996	1.08	0.60-1.71	17.84	1.08	0.60-1.71	17.84	120			1.17	53
1997	0.84	0.47-1.30	18.21	0.84	0.47-1.30	18.21	120			1.06	52
1998	0.79	0.46-1.19	17.60	0.79	0.46-1.19	17.60	120			0.68	52
1999	0.33	0.13-0.56	28.23	0.33	0.13-0.56	28.23	114			0.77	52
2000	0.27	0.13-0.42	24.35	0.27	0.13-0.42	24.35	120			0.29	52
2001	0.17	0.04-0.33	38.79	0.17	0.04-0.33	38.79	120			0.16	52
2002											

Table 24.

NORTHERN PUFFER INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	0.00	0		0.00	0		4				
1956	0.05	0-0.11	53.96	0.05	0-0.11	53.96	23				
1957	0.08	0-0.18	59.03	0.08	0-0.18	59.03	20				
1958	0.00	0		0.00	0		19				
1959	0.00	0		0.00	0		19				
1960	0.02	0-0.07	100.00	0.02	0-0.07	100.00	10				
1961	0.22	0-0.8	100.00	0.22	0-0.8	100.00	7				
1962	0.18	0-0.63	100.00	0.18	0-0.63	100.00	4				
1963	0.21	0-0.53	61.24	0.21	0-0.53	61.24	8				
1964	0.44	0-1.44	72.14	0.44	0-1.44	72.14	8				
1965							0				
1966	0.23	0-0.71	82.25	0.23	0-0.71	82.25	8				
1967	0.18	0-0.44	58.66	0.18	0-0.44	58.66	8				
1968	1.35	0.75-2.14	17.08	1.35	0.75-2.14	17.08	8				
1969	0.42	0-1.04	51.09	0.42	0-1.04	51.09	8				
1970	0.16	0-0.41	69.83	0.16	0-0.41	69.83	8				
1971	0.57	0.12-1.19	37.57	0.57	0.12-1.19	37.57	8				
1972	0.28	0		0.28	0		2				
1973							0				
1974	0.00	0		0.00	0		76				
1975	0.02	0-0.06	71.82	0.02	0-0.06	71.82	74				
1976	0.00	0		0.00	0		90				
1977	0.00	0		0.00	0		68				
1978	0.00	0	100.00	0.00	0	100.00	95				
1979	0.00	0		0.00	0		4				
1980	0.36	0-1.02	65.81	0.36	0-1.02	65.81	15				
1981	0.00	0		0.00	0		9				
1982	0.00	0		0.00	0		5				
1983							0				
1984							0				
1985							0				
1986							0				
1987							0				
1988	0.84	0.58-1.15	12.43	0.84	0.58-1.15	12.43	147	0.84	147		
1989	0.79	0.61-0.99	9.00	0.79	0.61-0.99	9.00	168	0.79	168		
1990	0.68	0.49-0.90	11.83	0.68	0.49-0.90	11.83	167	0.68	167		
1991	0.45	0.32-0.59	12.78	0.45	0.32-0.59	12.78	155	0.45	155		
1992	0.11	0.06-0.17	22.68	0.11	0.06-0.17	22.68	156	0.11	156		
1993	0.17	0.10-0.24	18.28	0.17	0.10-0.24	18.28	156	0.17	156		
1994	0.10	0.05-0.16	26.01	0.10	0.05-0.16	26.01	156	0.1	156		
1995	0.08	0.04-0.12	24.11	0.08	0.04-0.12	24.11	156	0.08	156		
1996	0.14	0.08-0.22	22.94	0.14	0.08-0.22	22.94	156	0.14	156		
1997	0.20	0.12-0.28	18.18	0.20	0.12-0.28	18.18	156	0.2	156		
1998	0.09	0.04-0.14	27.44	0.09	0.04-0.14	27.44	118	0.09	118		
1999	0.25	0.15-0.34	17.59	0.25	0.15-0.34	17.59	138	0.24	138		
2000	0.13	0.08-0.19	18.81	0.13	0.08-0.19	18.81	156	0.13	156		
2001	0.32	0.21-0.44	16.06	0.32	0.21-0.44	16.06	163	0.32	163		
2002*	0.11	0.04-0.19	33.16	0.11	0.04-0.19	33.16	64	0.11	64		

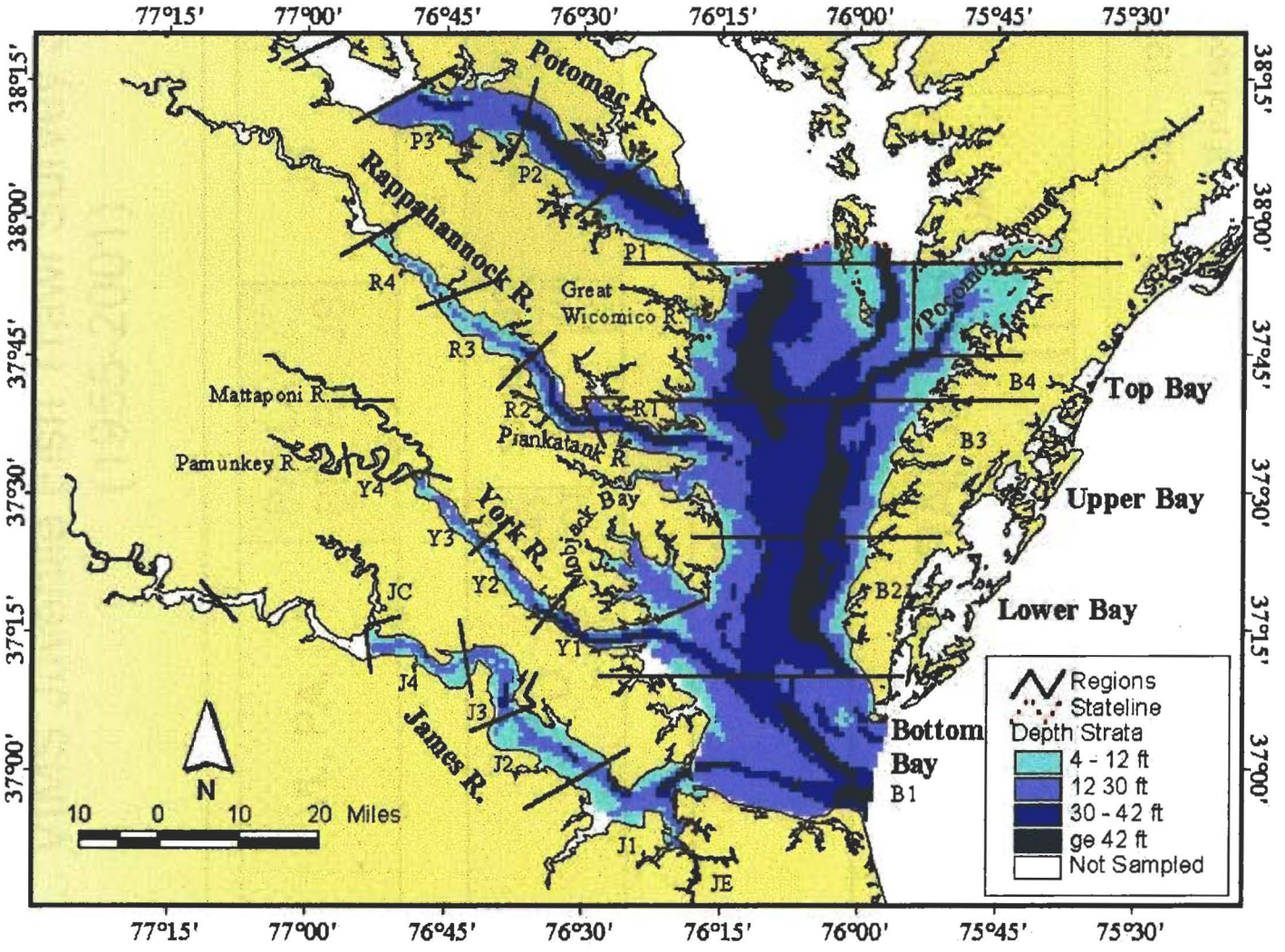
Table 25.

SILVER PERCH INDICES											
	Converted Index (RSCI)			Unconverted Index (RSI)				Original Index			
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.'s	C.V.	N	Bay & River (BRI)	N	River Only	N
1955	13.34	0		33.71	0		3				
1956	7.30	2.69-17.67	19.14	18.43	7.62-42.81	13.70	43				
1957	15.59	6.92-33.74	13.16	30.16	15.46-57.99	9.28	43				
1958	2.75	0.54-8.11	33.61	6.60	2-18.22	22.88	42				
1959	5.02	0.42-24.49	40.20	11.74	1.98-53.44	28.53	42				
1960							0				
1961	3.70	0.84-11.01	30.29	12.22	4.48-30.9	17.06	20				
1962	1.29	0.77-1.98	15.67	1.82	1.27-2.5	10.51	13				
1963	29.70	11.61-73.79	13.00	51.20	18.17-141.17	12.67	24				
1964	1.04	0-3.4	54.15	2.02	0.59-4.72	28.91	34				
1965	0.49	0.28-0.73	18.81	1.35	0.87-1.94	13.19	38				
1966	0.47	0-1.28	57.83	1.04	0-3.69	58.13	42				
1967	0.40	0.11-0.75	33.92	0.55	0.2-1.01	29.62	66				
1968	1.45	0-7.86	71.84	2.07	0-13.14	67.96	66				
1969	3.10	0-16.68	51.88	3.80	0-25.02	53.89	69				
1970	11.12	2.62-39.64	24.24	23.53	8.08-65.26	15.53	68				
1971	4.16	3.54-4.86	3.88	8.61	7.26-10.19	3.36	183				
1972	0.69	0.51-0.91	11.14	0.69	0.51-0.91	11.14	161				
1973	0.34	0.23-0.47	15.30	0.34	0.23-0.47	15.30	209				
1974	0.06	0.01-0.11	41.36	0.06	0.01-0.11	41.36	73				
1975	0.05	0-0.11	52.59	0.05	0-0.11	52.59	54				
1976	0.26	0.07-0.48	34.39	0.19	0.07-0.48	34.39	108				
1977	0.03	0-0.06	48.53	0.03	0-0.06	48.53	78				
1978	0.07	0-0.19	76.37	0.07	0-0.19	76.37	78				
1979	0.05	0.02-0.08	27.64	0.05	0.02-0.08	27.64	97			0.17	95
1980	0.06	0-0.17	72.55	0.12	0-0.26	56.21	121			0.07	112
1981	0.00	0	66.82	0.15	0-0.48	88.03	118			0.06	112
1982	0.02	0-0.03	40.87	0.05	0.02-0.09	29.57	118			0.16	114
1983	0.00	0		0.06	0.01-0.1	37.52	113			0.06	113
1984	0.00	0		0.02	0-0.05	73.77	95			0.02	99
1985	0.16	0.06-0.27	31.13	0.34	0.17-0.54	23.50	58			0.68	59
1986	0.10	0.03-0.17	33.23	0.26	0.13-0.4	23.44	107			0.34	107
1987	0.24	0.11-0.37	24.38	0.42	0.25-0.62	18.37	100			0.53	100
1988	0.39	0.22-0.59	20.46	0.61	0.35-0.92	18.30	172	0.65	172	1.02	65
1989	0.28	0.16-0.41	19.62	0.53	0.33-0.76	16.32	189	0.56	189	1.63	63
1990	0.40	0.28-0.54	13.36	0.69	0.49-0.92	11.94	185	0.75	185	4.08	59
1991	0.36	0.22-0.51	17.33	0.36	0.22-0.51	17.33	251	0.40	179	1.47	62
1992	0.80	0.49-1.16	15.80	0.80	0.49-1.16	15.80	226	0.86	178	1.95	61
1993	0.43	0.28-0.61	16.01	0.43	0.28-0.61	16.01	224	0.45	180	0.60	63
1994	0.25	0.12-0.4	25.42	0.25	0.12-0.4	25.42	225	0.26	180	0.37	63
1995	0.62	0.39-0.89	15.65	0.62	0.39-0.89	15.65	291	0.65	180	1.81	67
1996	0.59	0.38-0.84	15.63	0.59	0.38-0.84	15.63	304	0.58	183	1.18	66
1997	0.71	0.50-0.94	12.07	0.71	0.50-0.94	12.07	316	0.79	192	1.43	75
1998	0.24	0.15-0.33	16.77	0.24	0.15-0.33	16.77	316	0.24	192	0.53	75
1999	0.70	0.49-0.94	12.42	0.70	0.49-0.94	12.42	309	0.74	186	2.51	75
2000	0.68	0.46-0.93	13.56	0.68	0.46-0.93	13.56	317	0.76	192	2.12	74
2001	0.71	0.47-0.98	13.75	0.71	0.47-0.98	13.75	327	0.85	200	3.17	75
2002*	0.29	0-0.80	64.21	0.29	0-0.80	64.21	15	0.29	15		

FIGURES

Figure 1. The VIMS Trawl Survey random stratified design of the Chesapeake Bay. Transect lines indicate geographic regions as designated below. '*' indicates areas not presently sampled.

Chesapeake Bay	B1	Bottom Bay
	B2	Lower Bay
	B3	Upper Bay
	B4	Top Bay
James River	J1	Bottom James
	J2	Lower James
	J3	Upper James
	J4	Top James
	J5*	Freshwater James 1
	J6*	Freshwater James 2
	JE	Elizabeth River (sampled for EFH 11/99-5/00)
	JC*	Chickahominy River
York River	Y1	Bottom York
	Y2	Lower York
	Y3	Upper York
	Y4	Top York (lower Pamunkey River)
	PM*	Pamunkey River
	MP1*	Lower Mattaponi
	MP2*	Upper Mattaponi
Rappahannock River	R1	Bottom Rappahannock
	R2	Lower Rappahannock
	R3	Upper Rappahannock
	R4	Top Rappahannock
	R5*	Freshwater Rappahannock
	RC*	Corrotoman River
Potomac River	P1	Potomac (River Mile 0-10)
	P2	Potomac (River Mile 10-20)
	P3	Potomac (River Mile 20-30)
Mobjack Bay	MB	(re-established as of July 1998)
Atlantic Ocean	AT*	
Piankatank River	PK	(re-established as of July 1998)
Pocomoke Sound	CP	(re-established as of July 1998)
Great Wicomico River	GW	(as of July 1998)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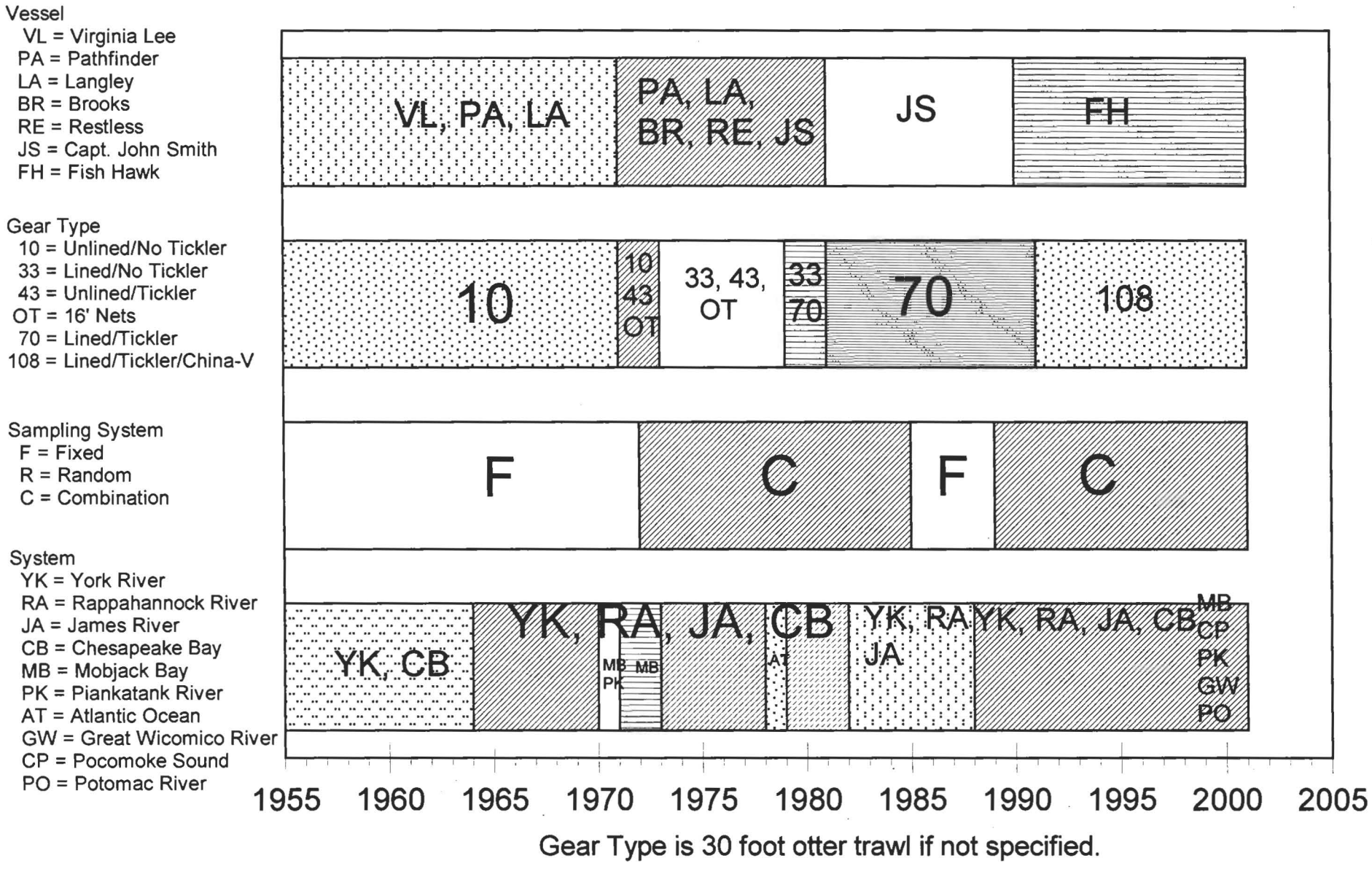
76°30'
76°15'
76°00'
75°45'
75°30'
38°15'
38°00'
37°45'
37°30'
37°15'
37°00'
Potomac R.
Rappahannock R.
Great Wicomico R.
Mattaponi R.
Pamunkey R.
Piankatank R.
York R.
Mobjack Bay
James R.
Potomac Sound
P3
P2
P1
R4
R3
R2
R1
Y4
Y3
Y2
Y1
JC
J4
J3
J2
J1
JE
B4
B3
B2
B1
Top Bay
Upper Bay
Lower Bay
Bottom Bay
N
10 0 10 20 Miles
Regions
Stateline
Depth Strata
4 - 12 ft
12 30 ft
30 - 42 ft
ge 42 ft
Not Sampled

Figure 2. VIMS Juvenile Fish Trawl Survey Sampling Changes (1955-2001)



Gear Type is 30 foot otter trawl if not specified.

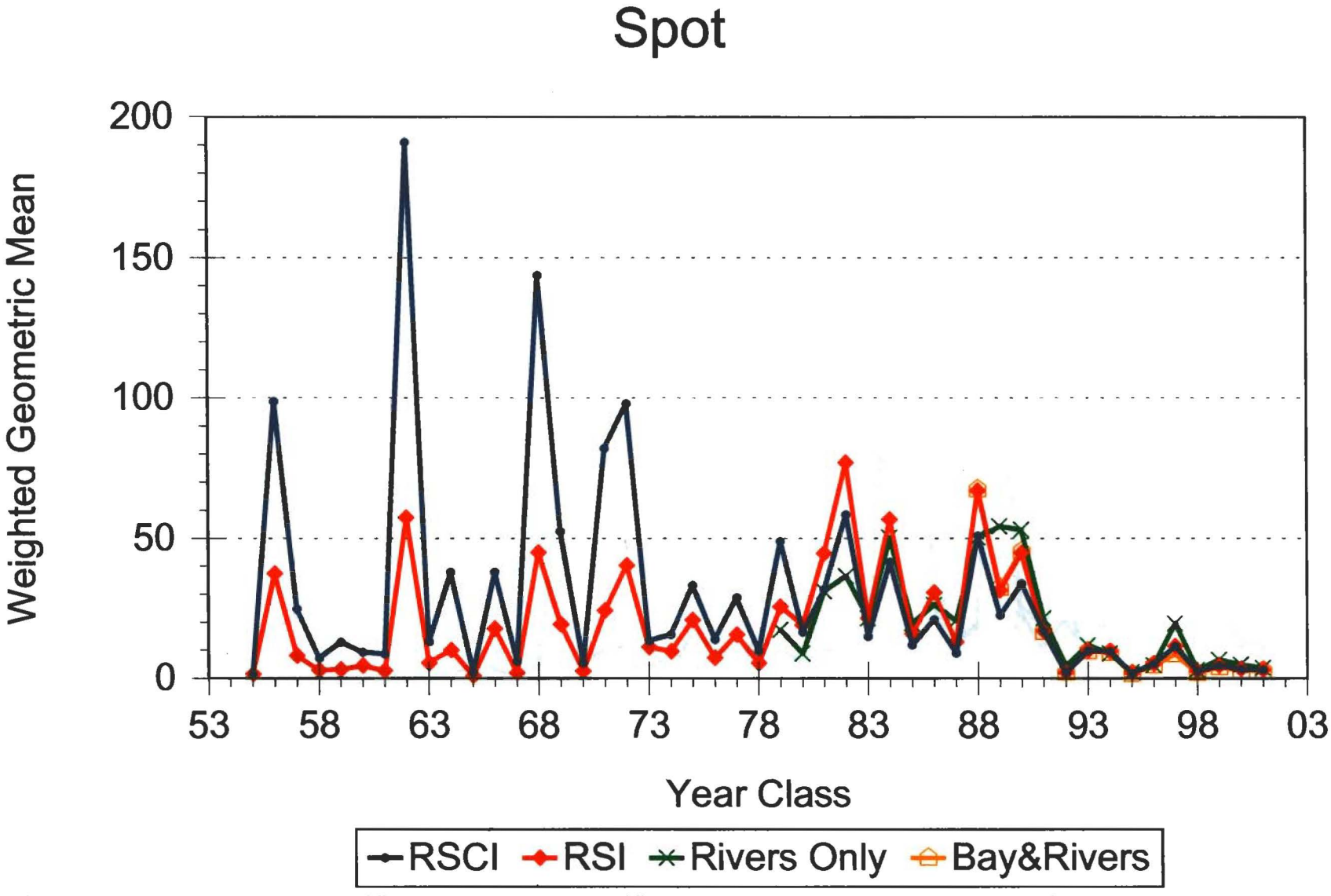


Figure 3. YOY spot random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

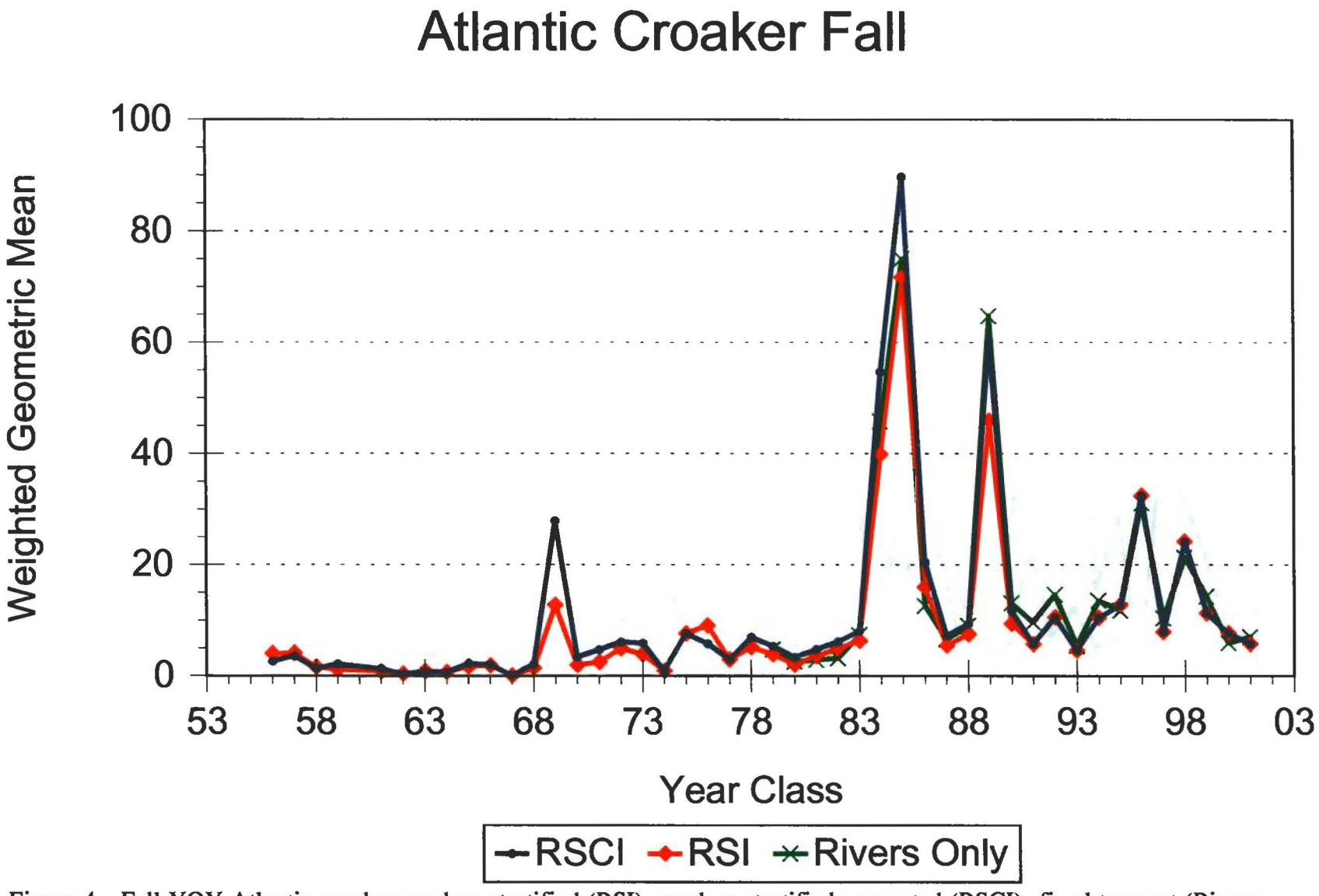


Figure 4. Fall YOY Atlantic croaker random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

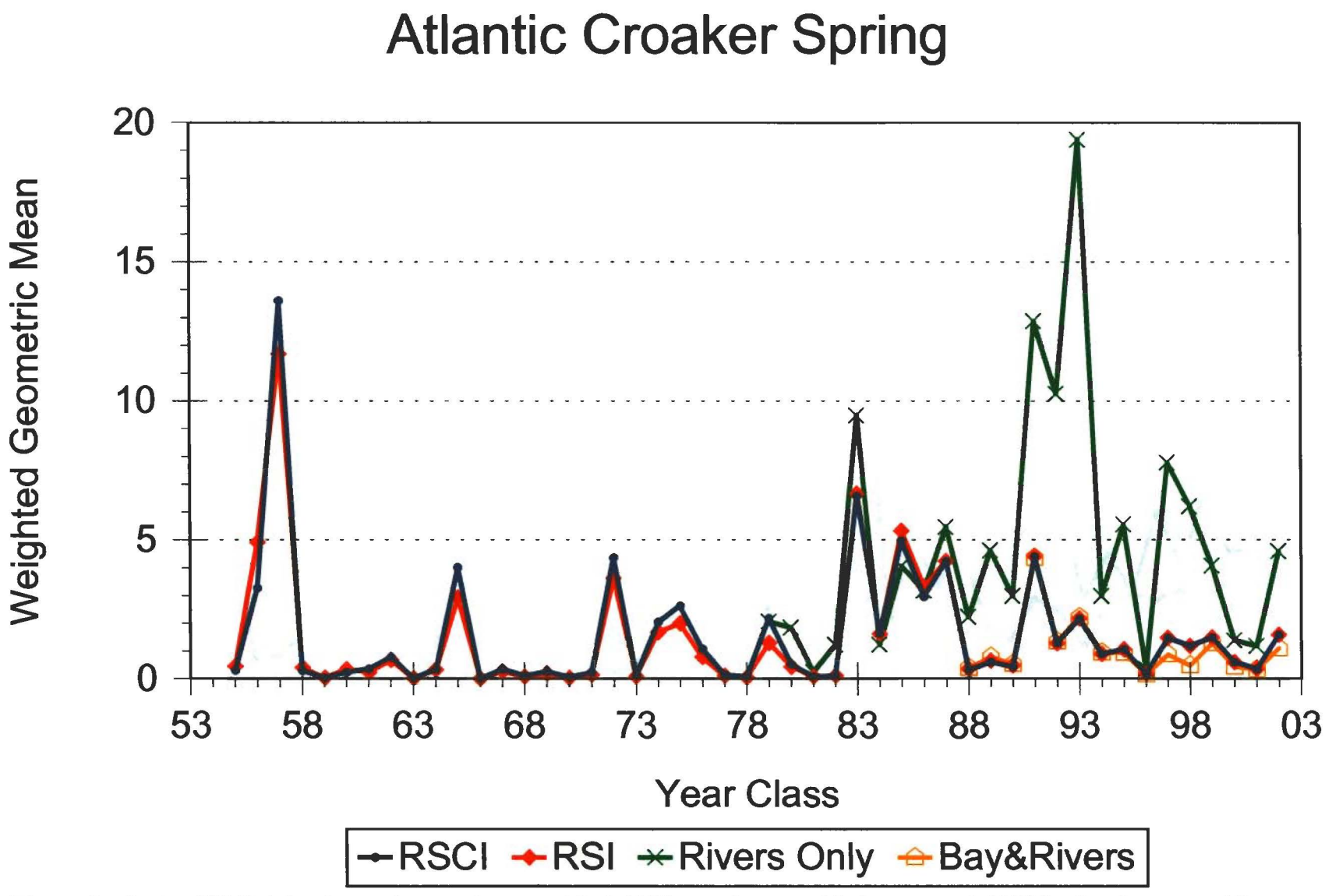


Figure 5. Spring YOY Atlantic croaker random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

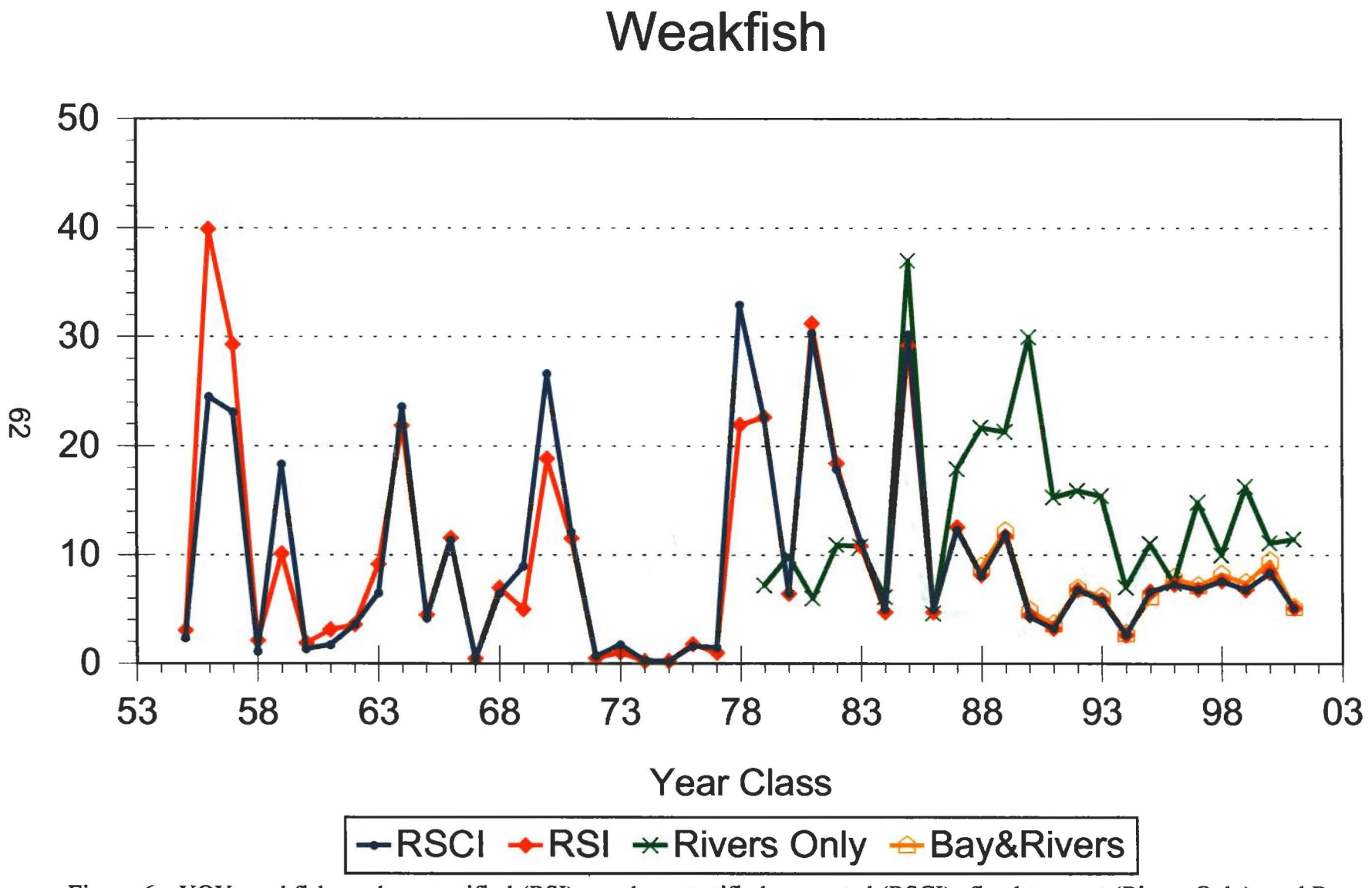


Figure 6. YOY weakfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

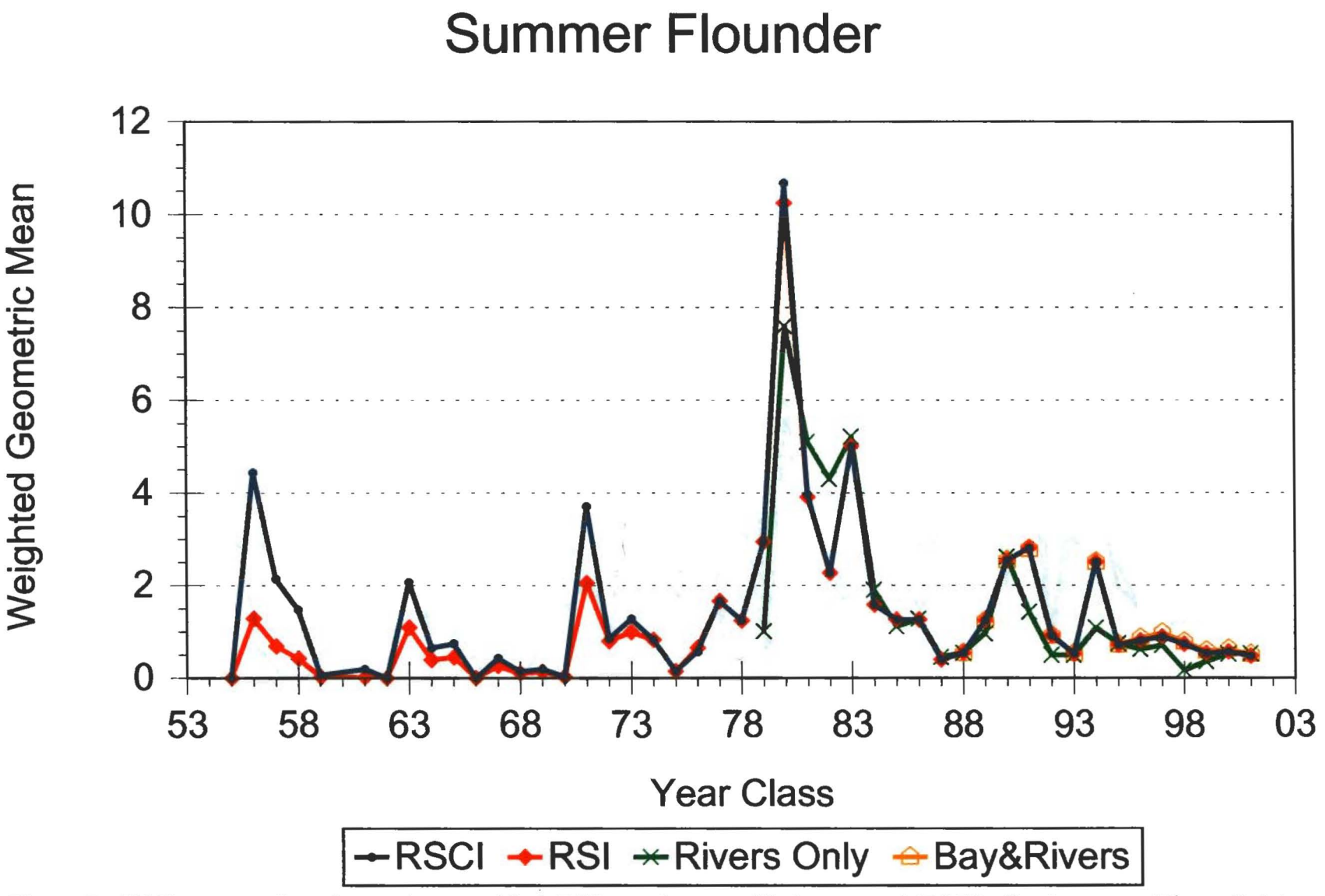


Figure 7. YOY summer flounder random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

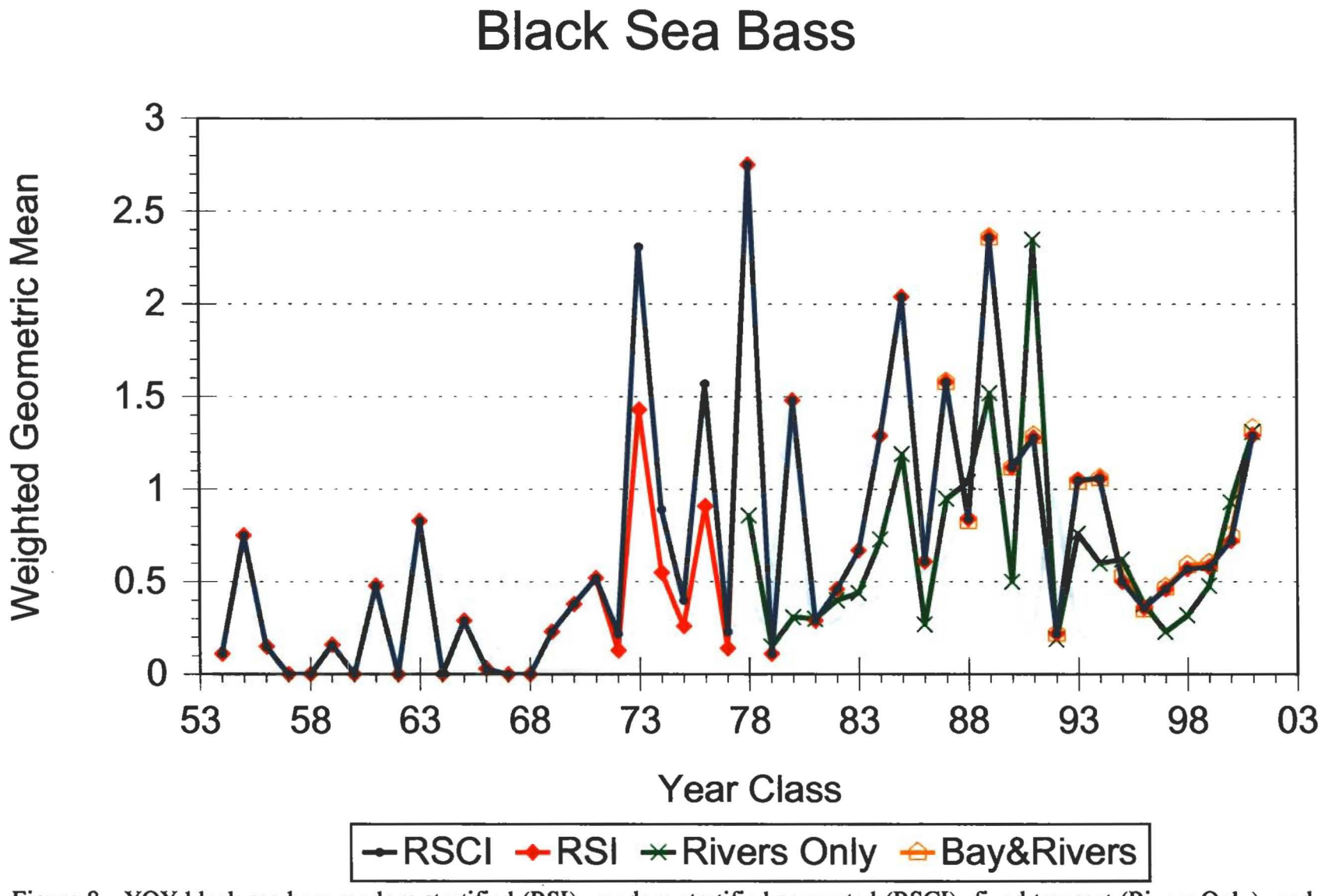


Figure 8. YOY black sea bass random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

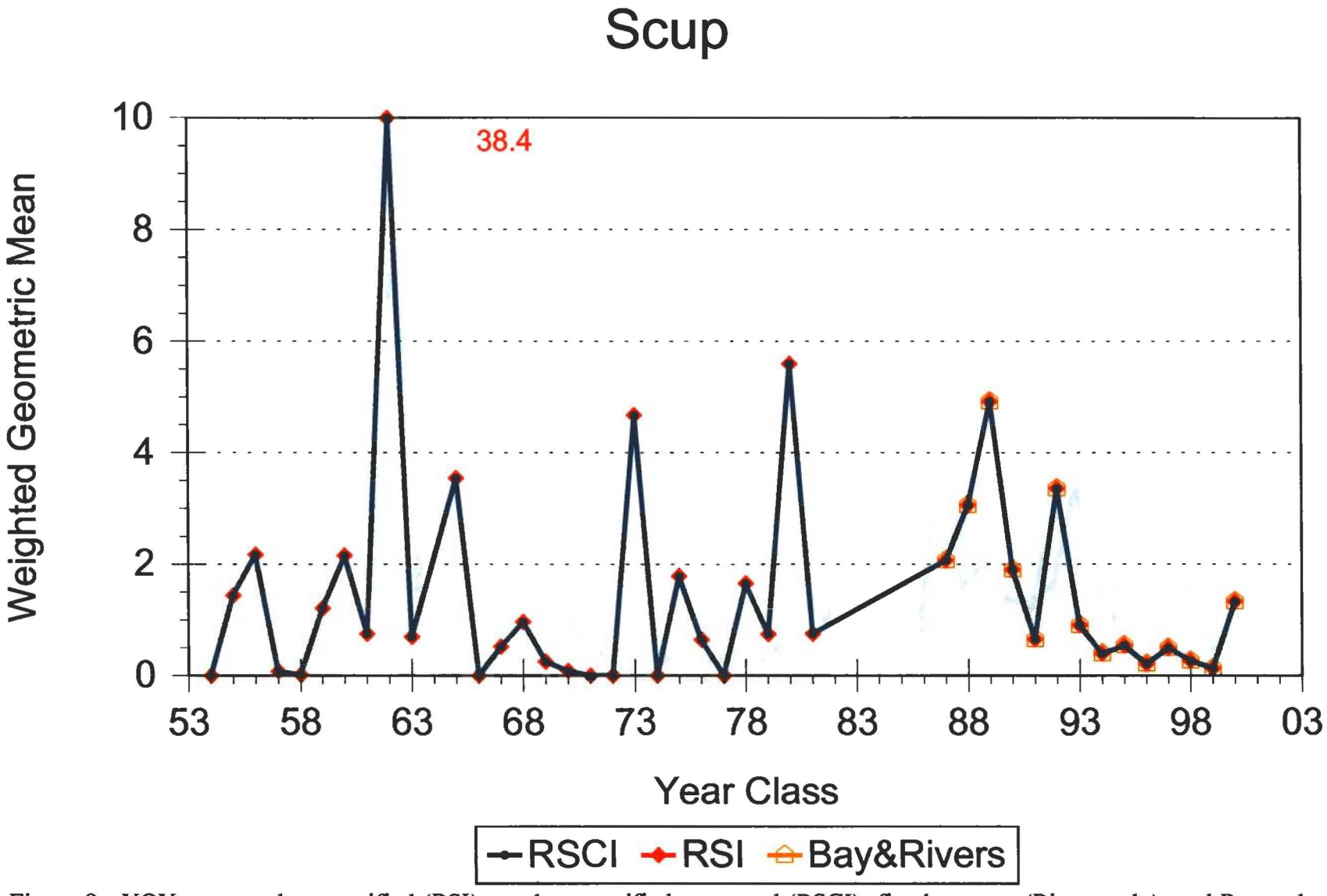


Figure 9. YOY scup random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station indices.

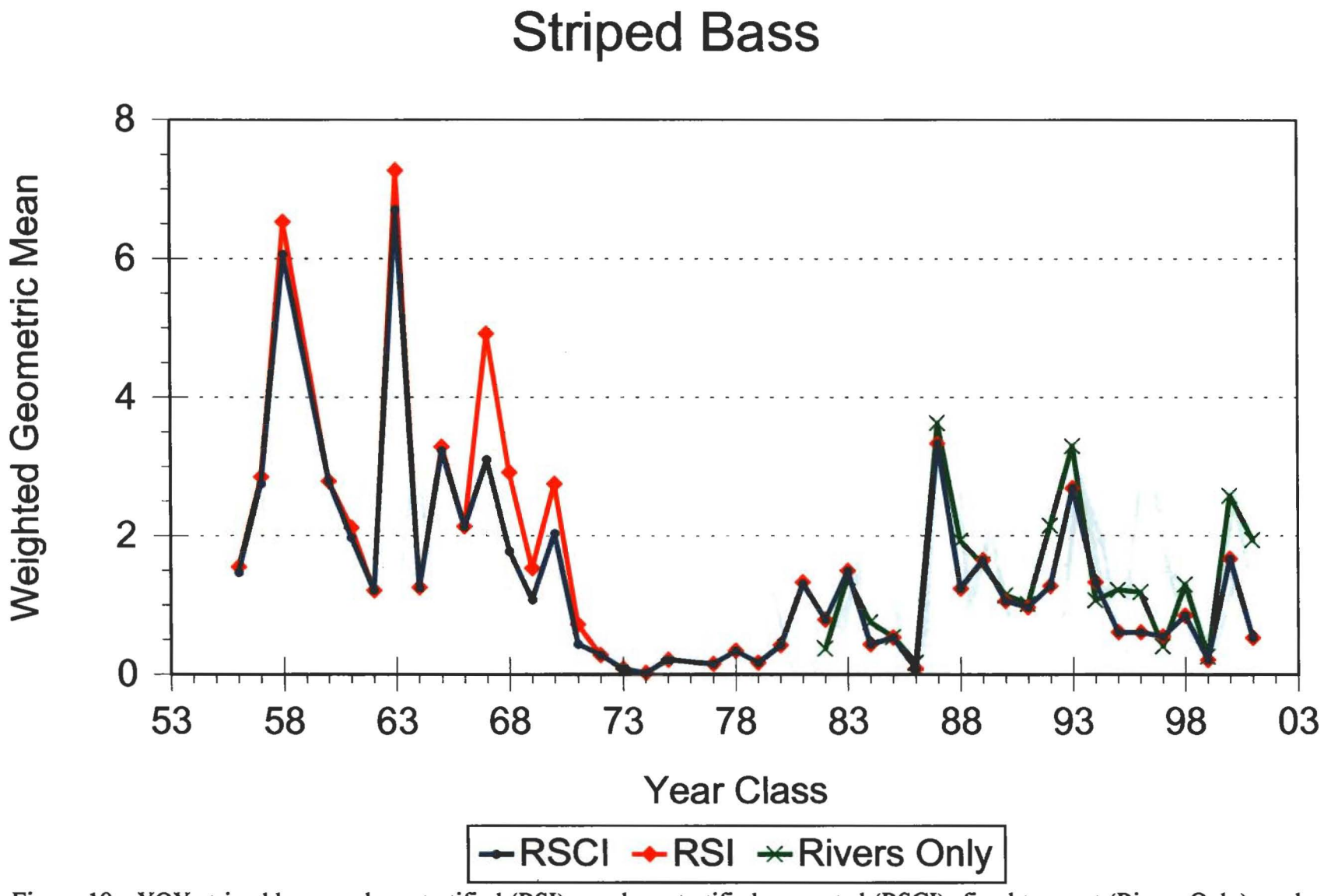


Figure 10. YOY striped bass random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

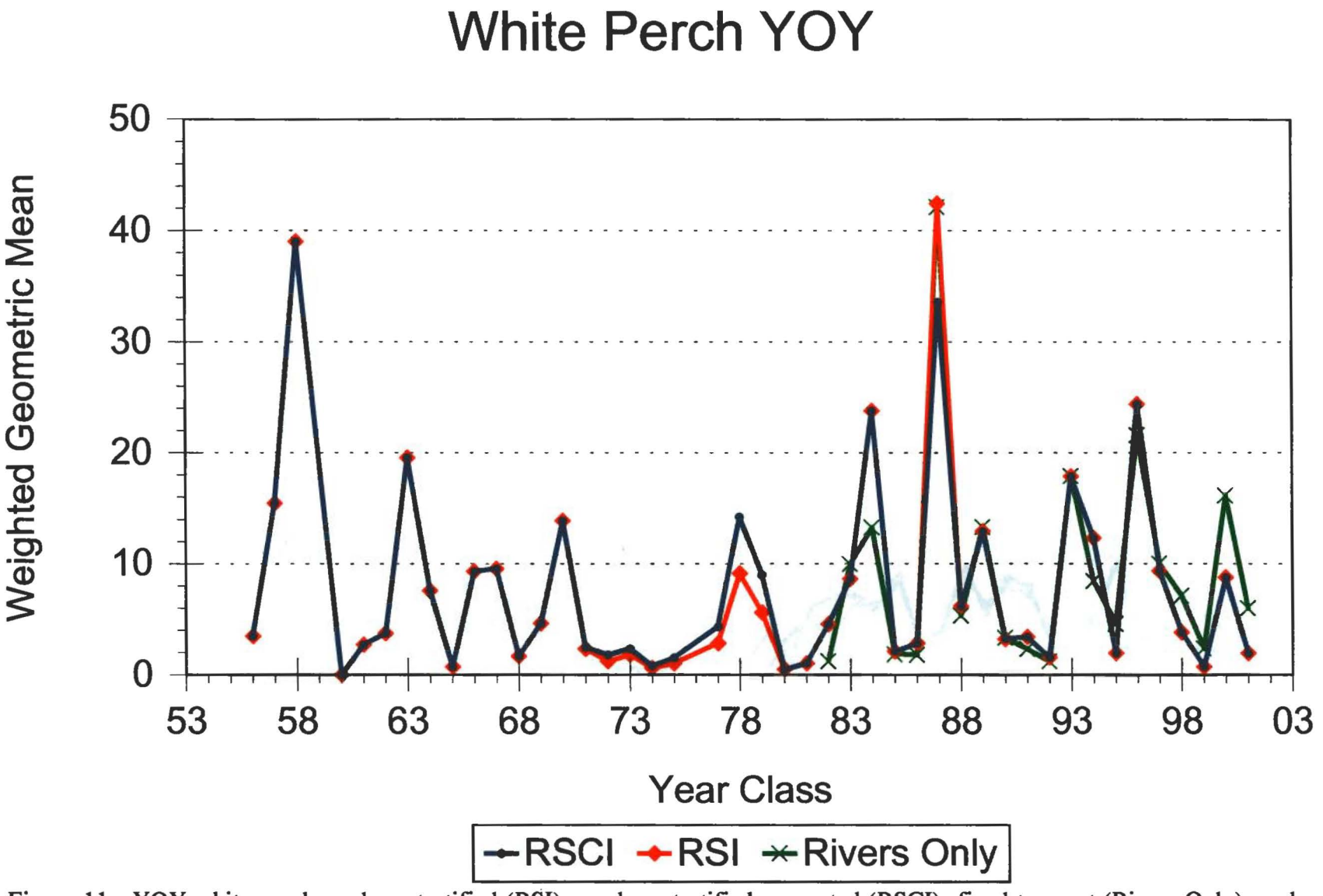


Figure 11. YOY white perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

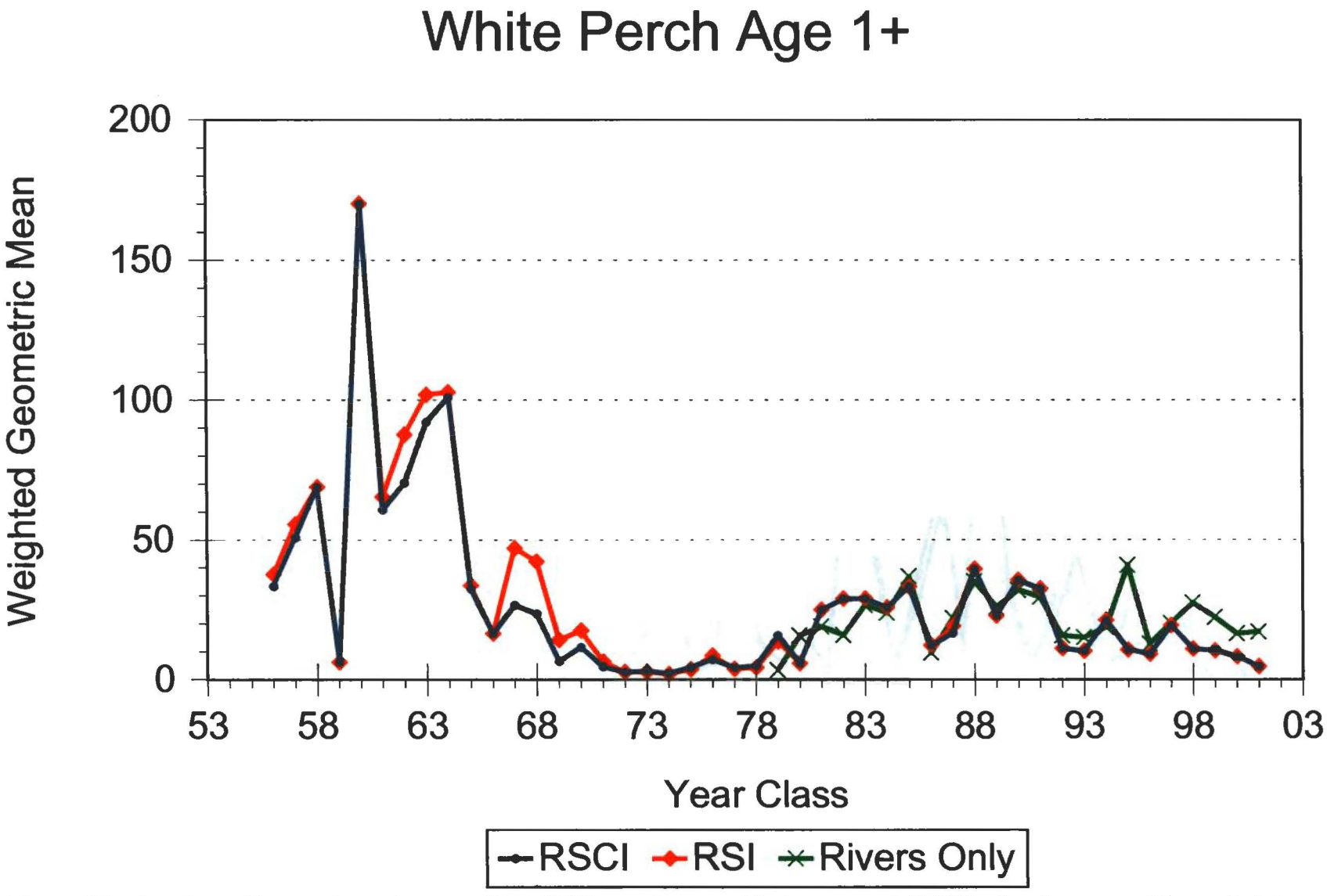


Figure 12. Age 1+ white perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

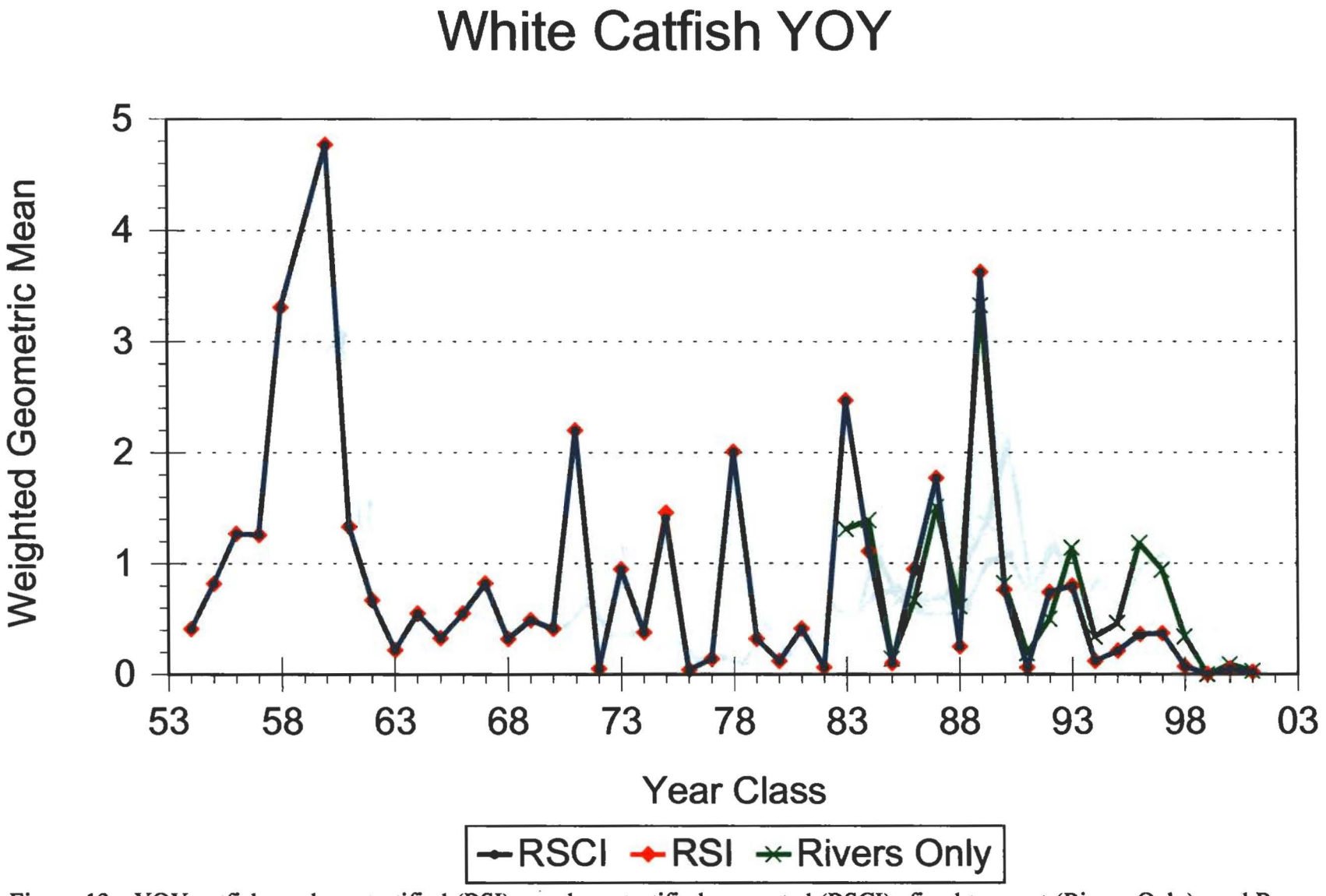


Figure 13. YOY catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

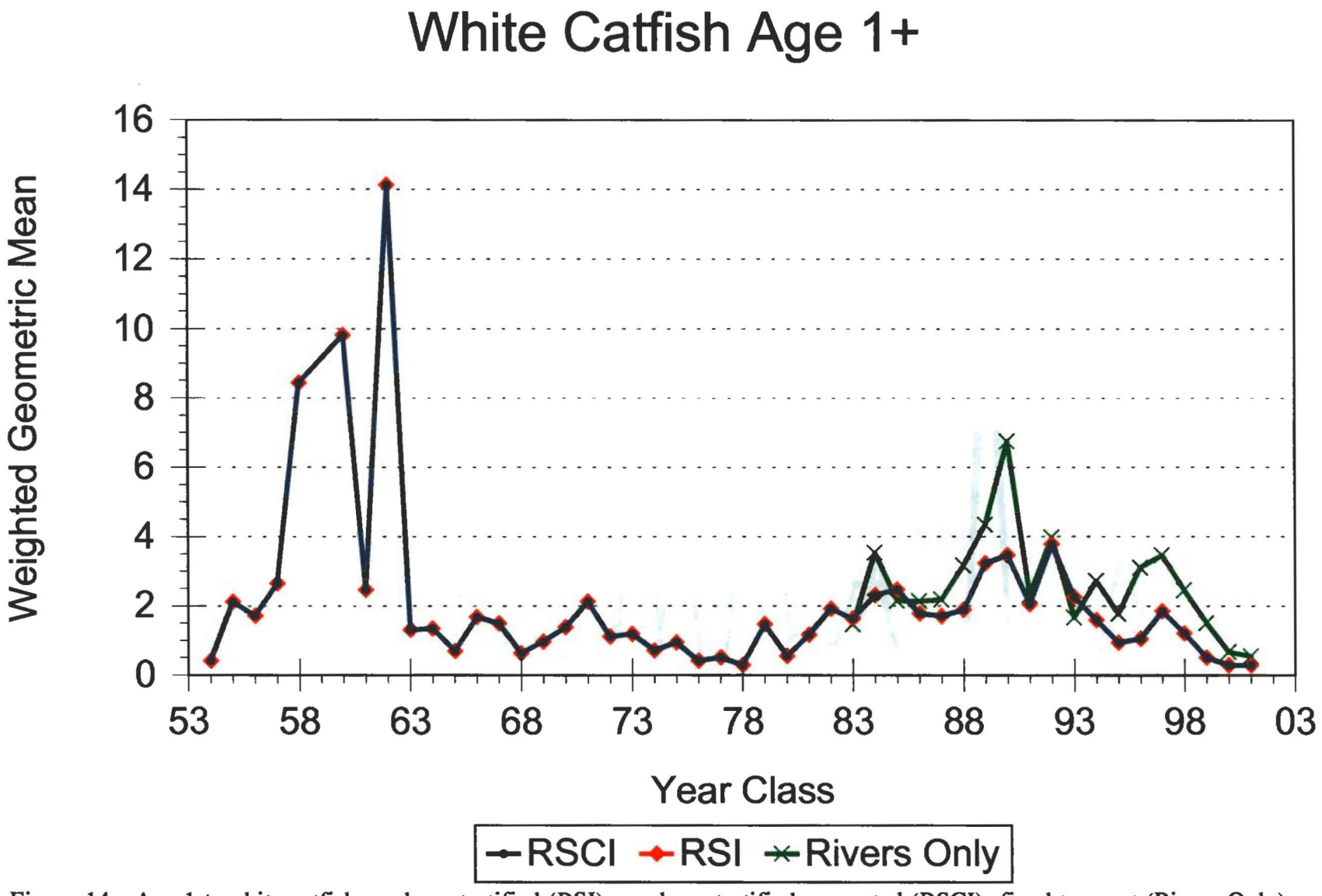


Figure 14. Age 1+ white catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

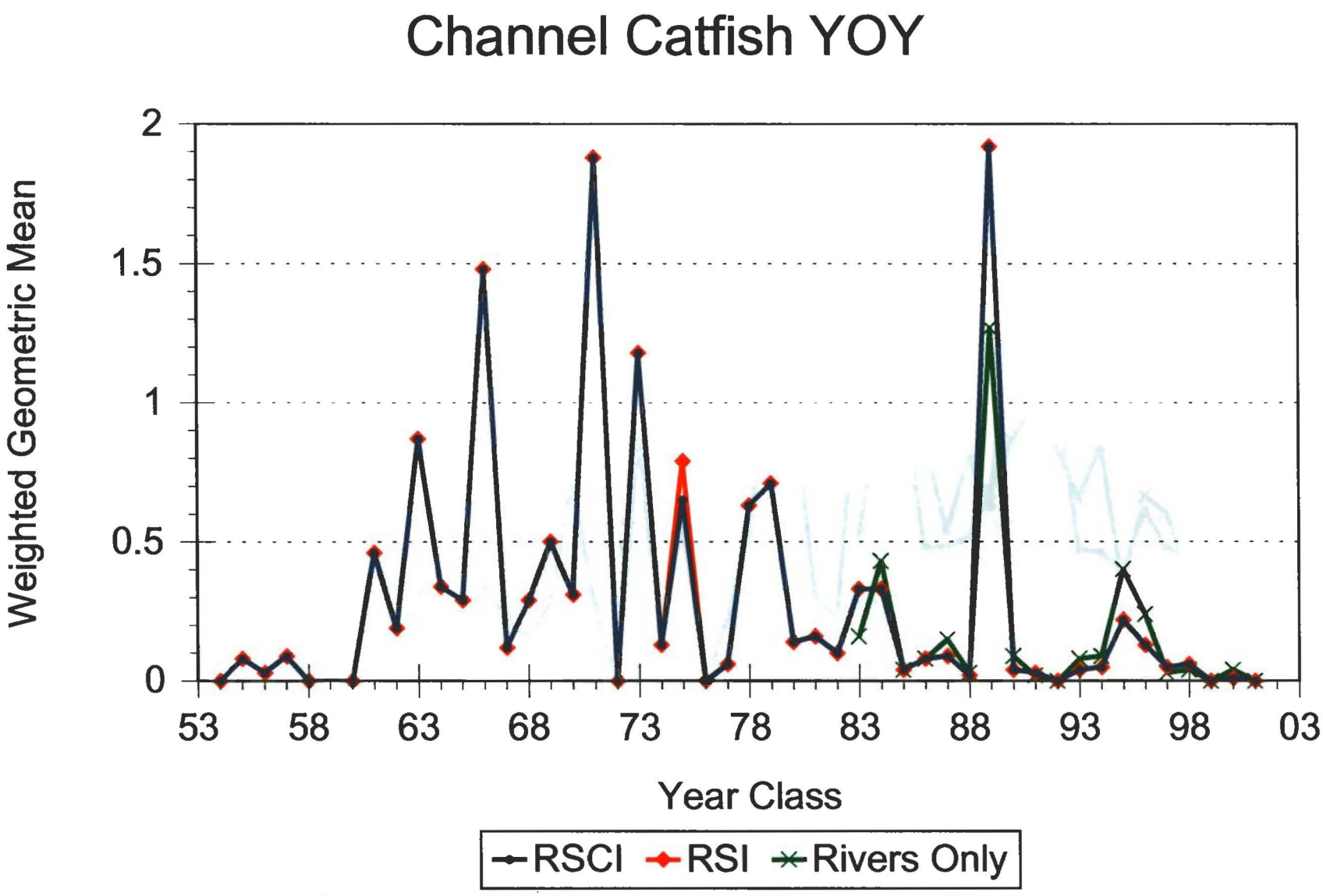


Figure 15. YOY channel catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

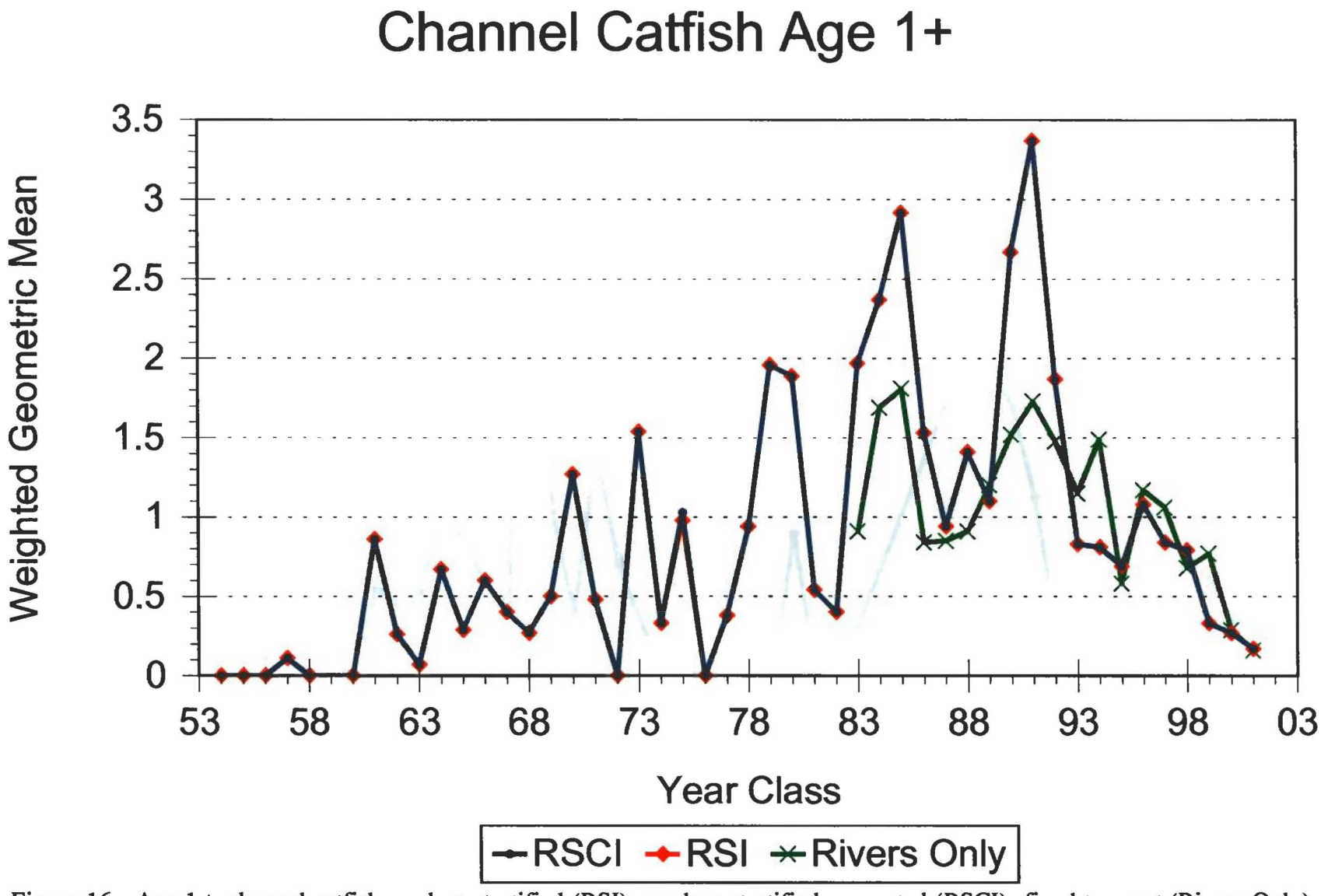


Figure 16. Age 1+ channel catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

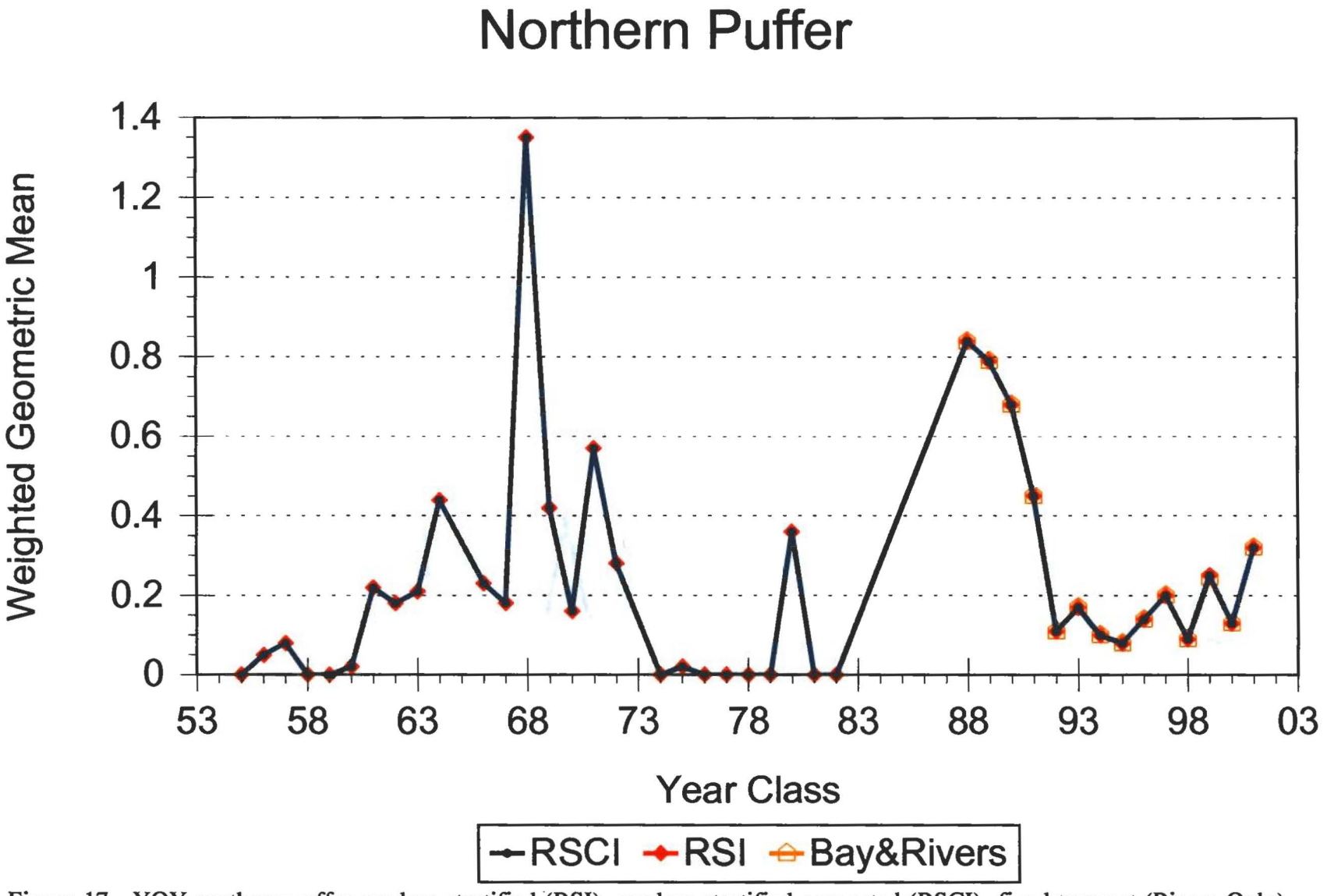


Figure 17. YOY northern puffer random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

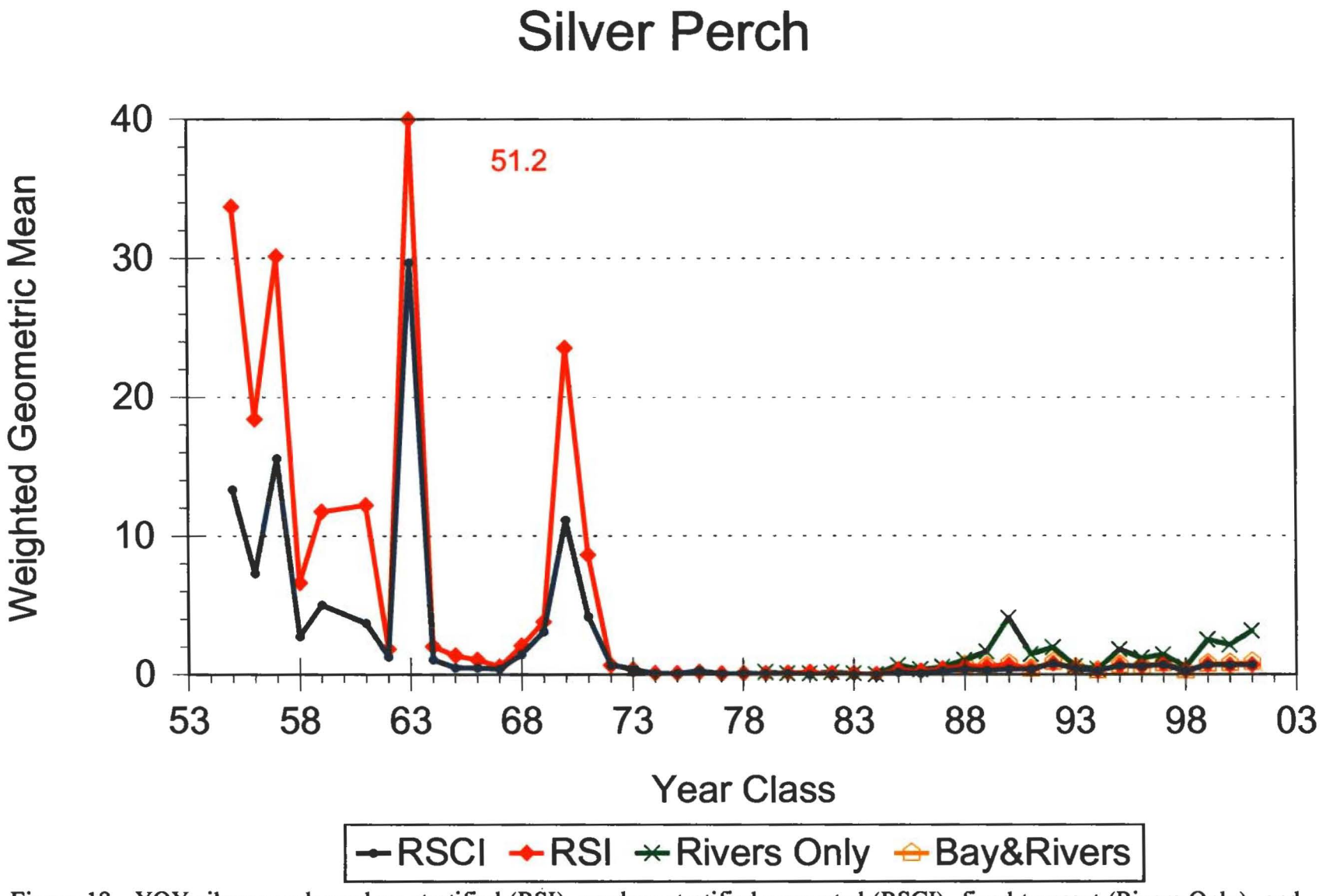


Figure 18. YOY silver perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers Only), and Bay and fixed river station indices.

Appendix Figures 1-15. Species (and age class, as appropriate) distribution from July 2001 to June 2002.

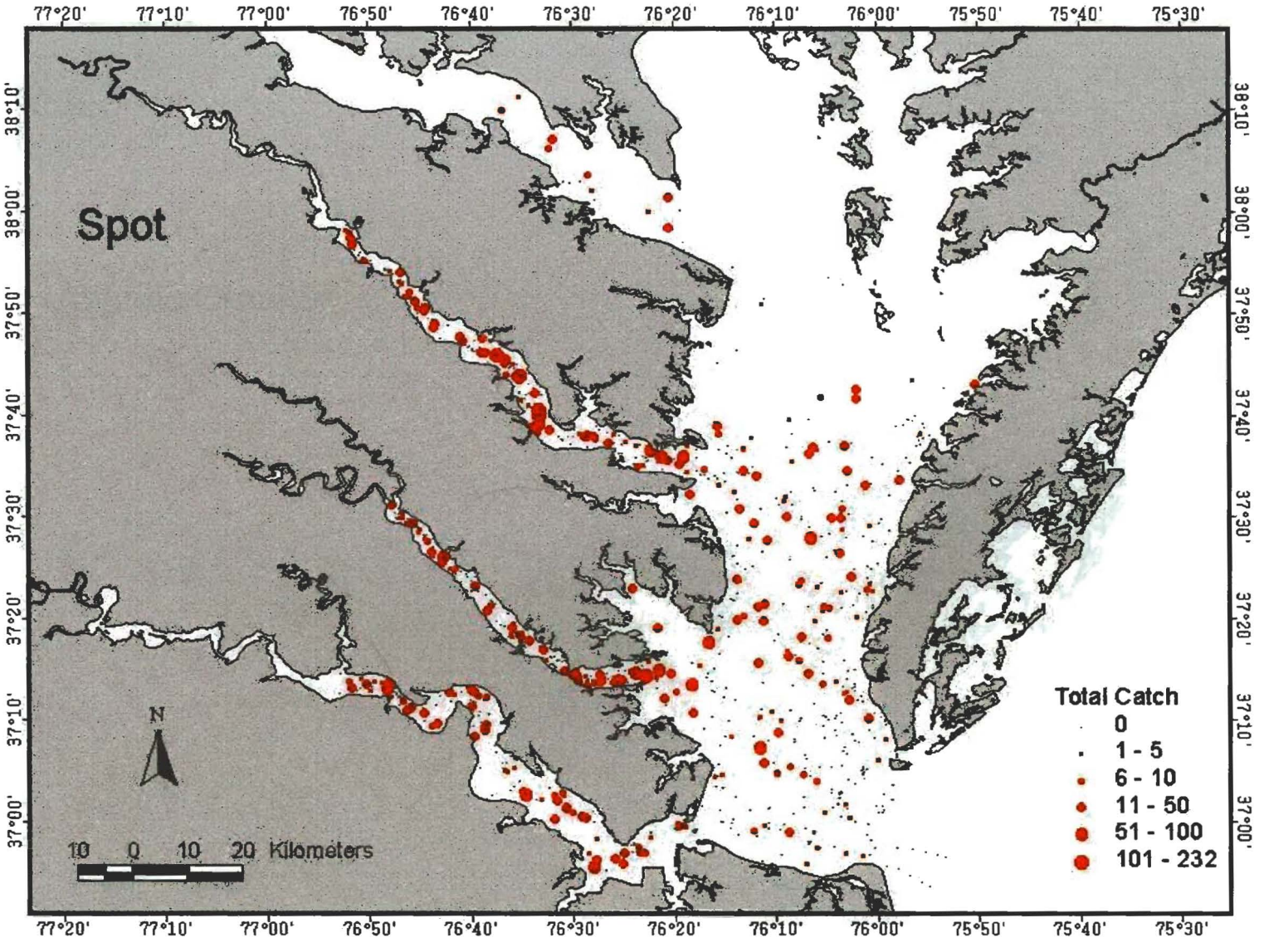


Figure 1. Distribution of YOY spot from VIMS Trawl Survey, July 2001 to June 2002.

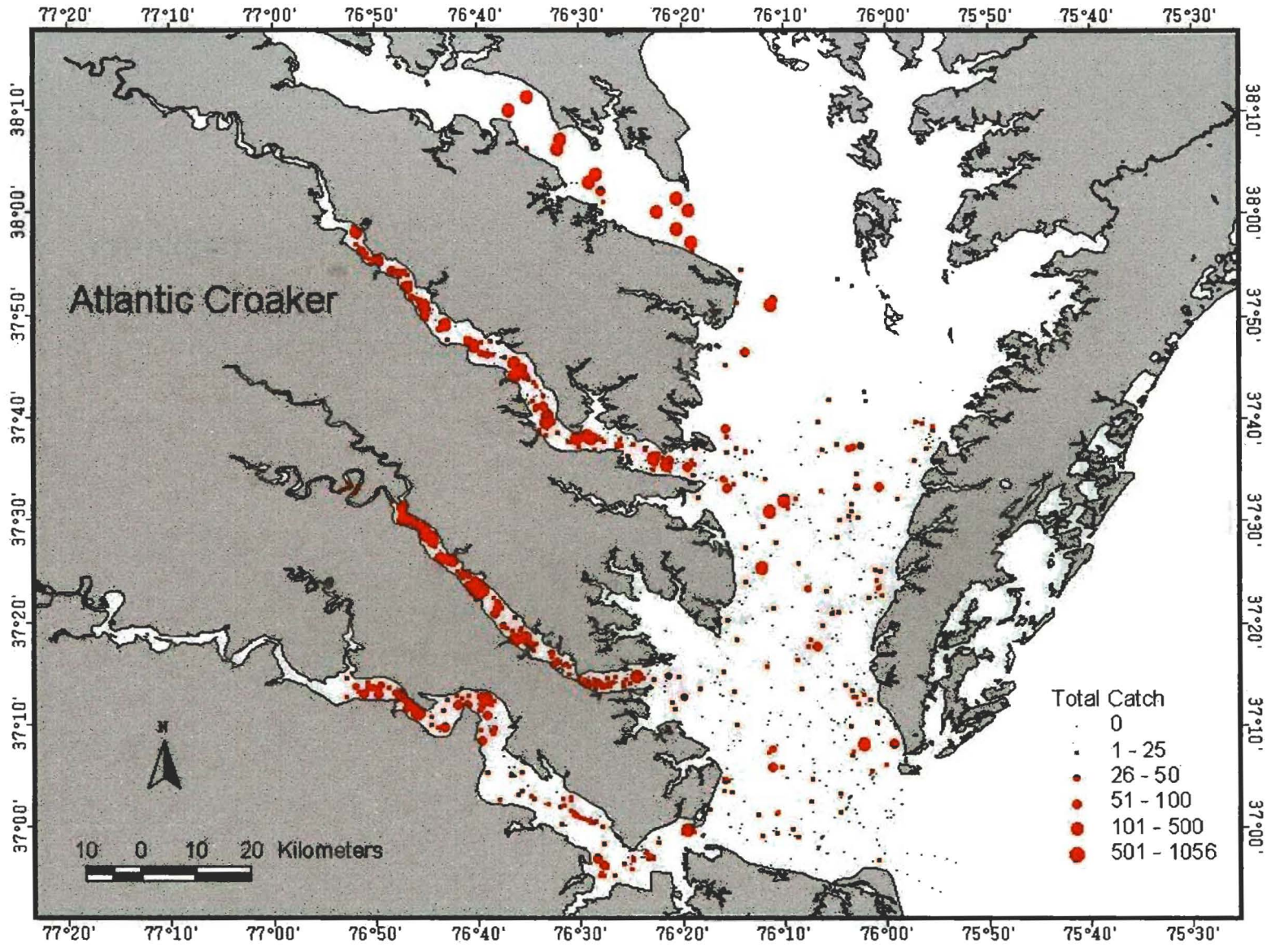


Figure 2. Distribution of YOY Atlantic croaker from VIMS Trawl Survey, July 2001 to June 2002.

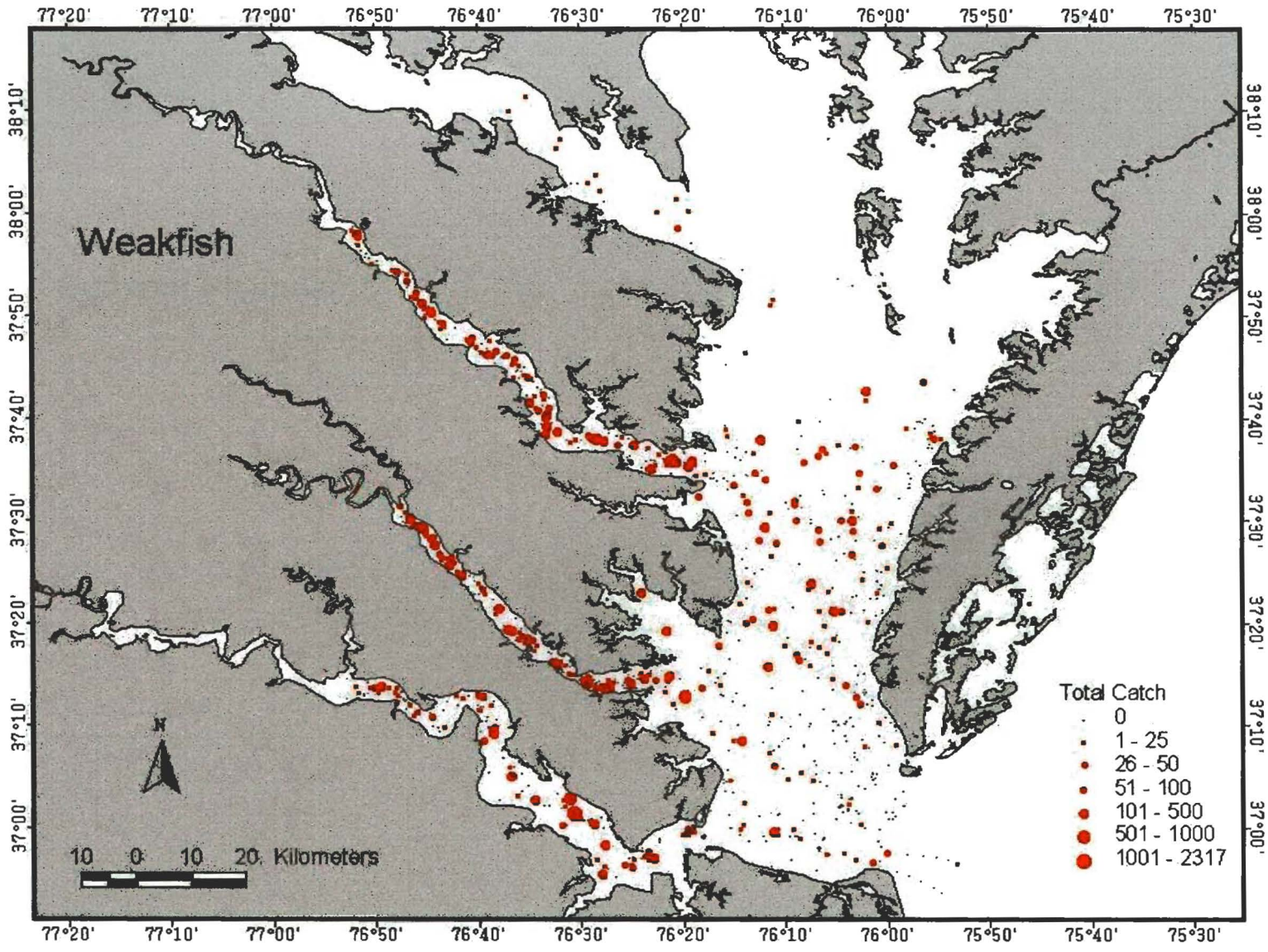


Figure 3. Distribution of YOY weakfish from VIMS Trawl Survey, July 2001 to June 2002.

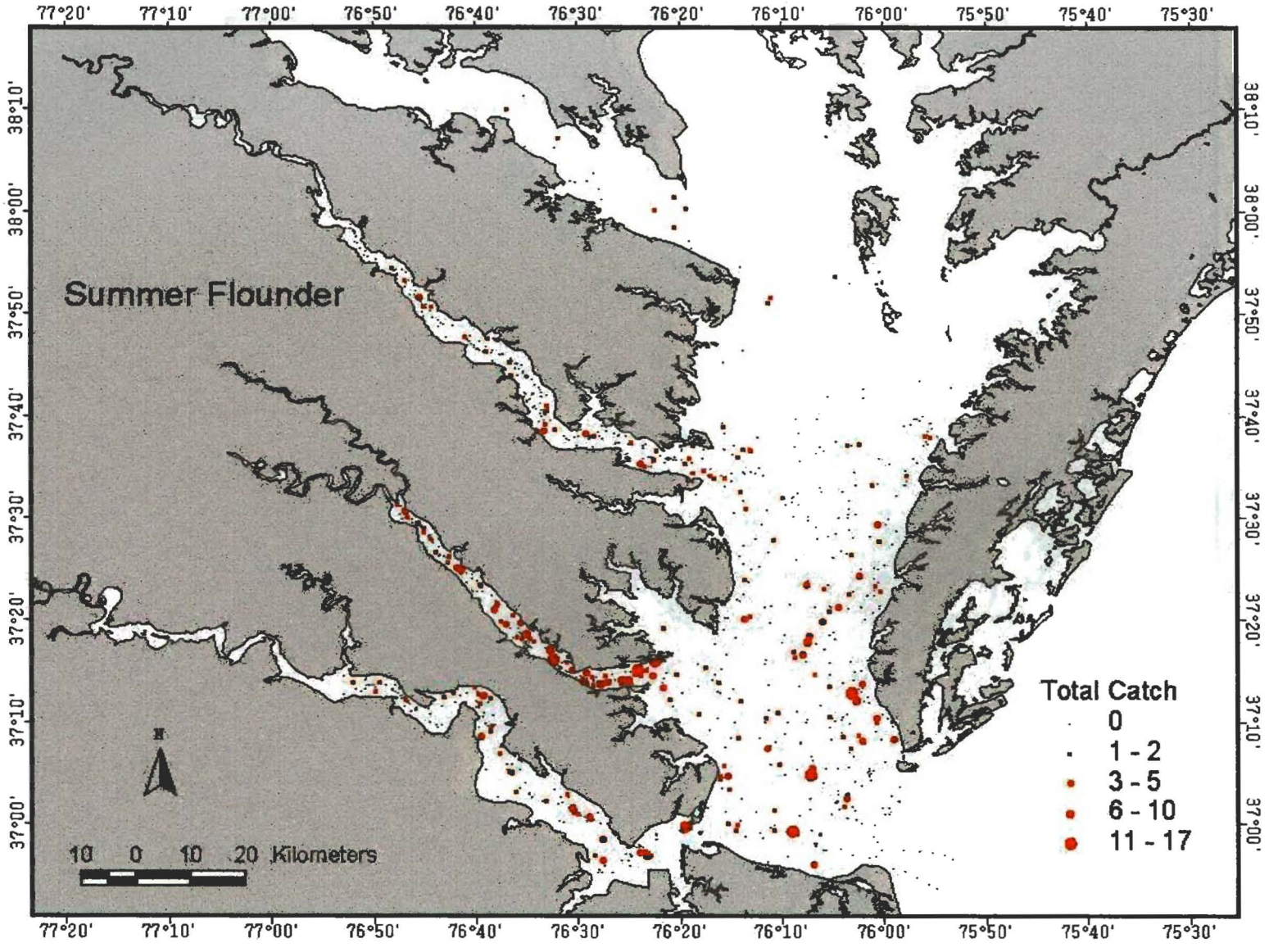


Figure 4. Distribution of YOY summer flounder from VIMS Trawl Survey, July 2001 to June 2002.

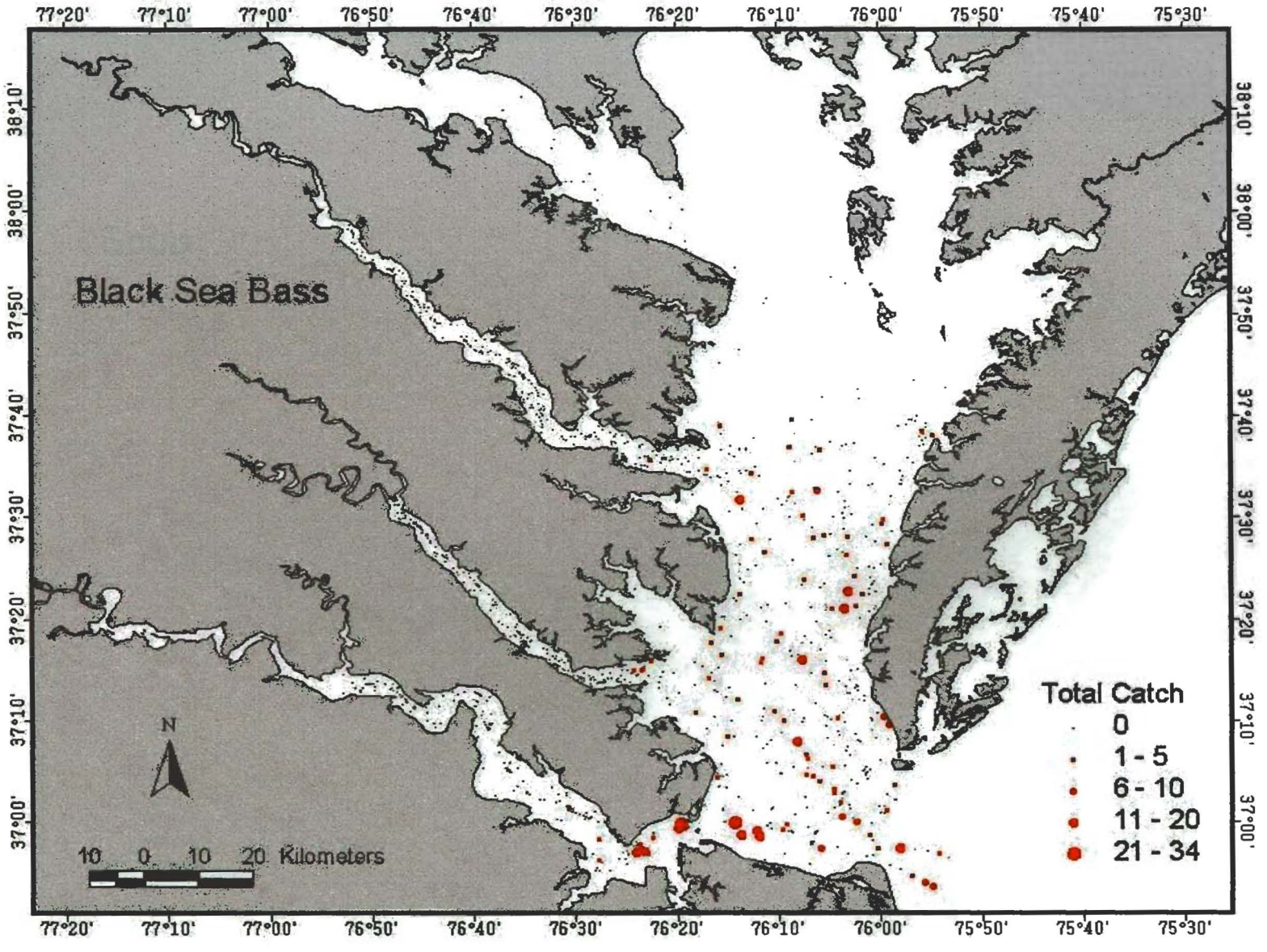


Figure 5. Distribution of YOY black sea bass from VIMS Trawl Survey, July 2001 to June 2002.

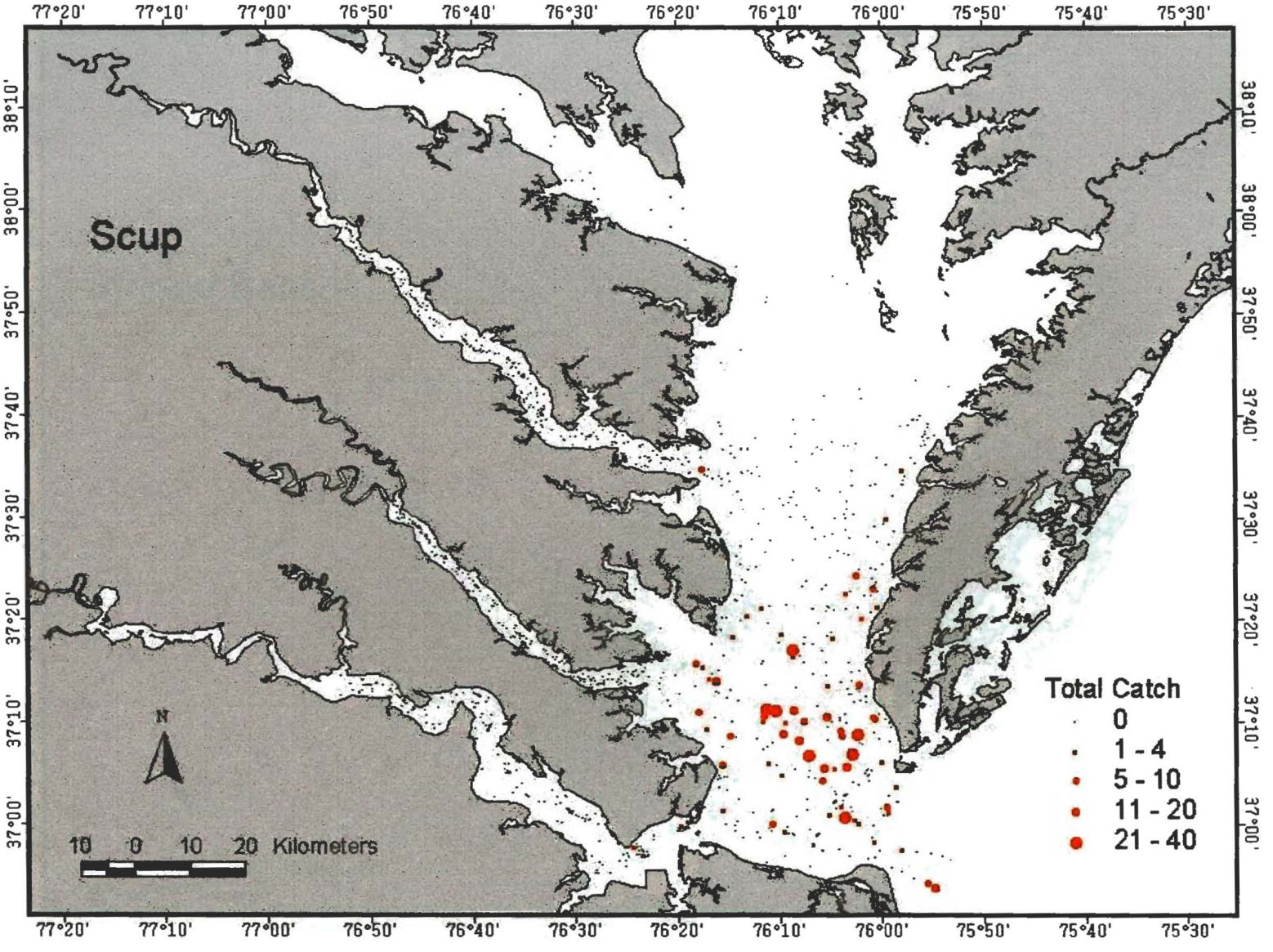


Figure 6. Distribution of early age 1 scup from VIMS Trawl Survey, July 2001 to June 2002.

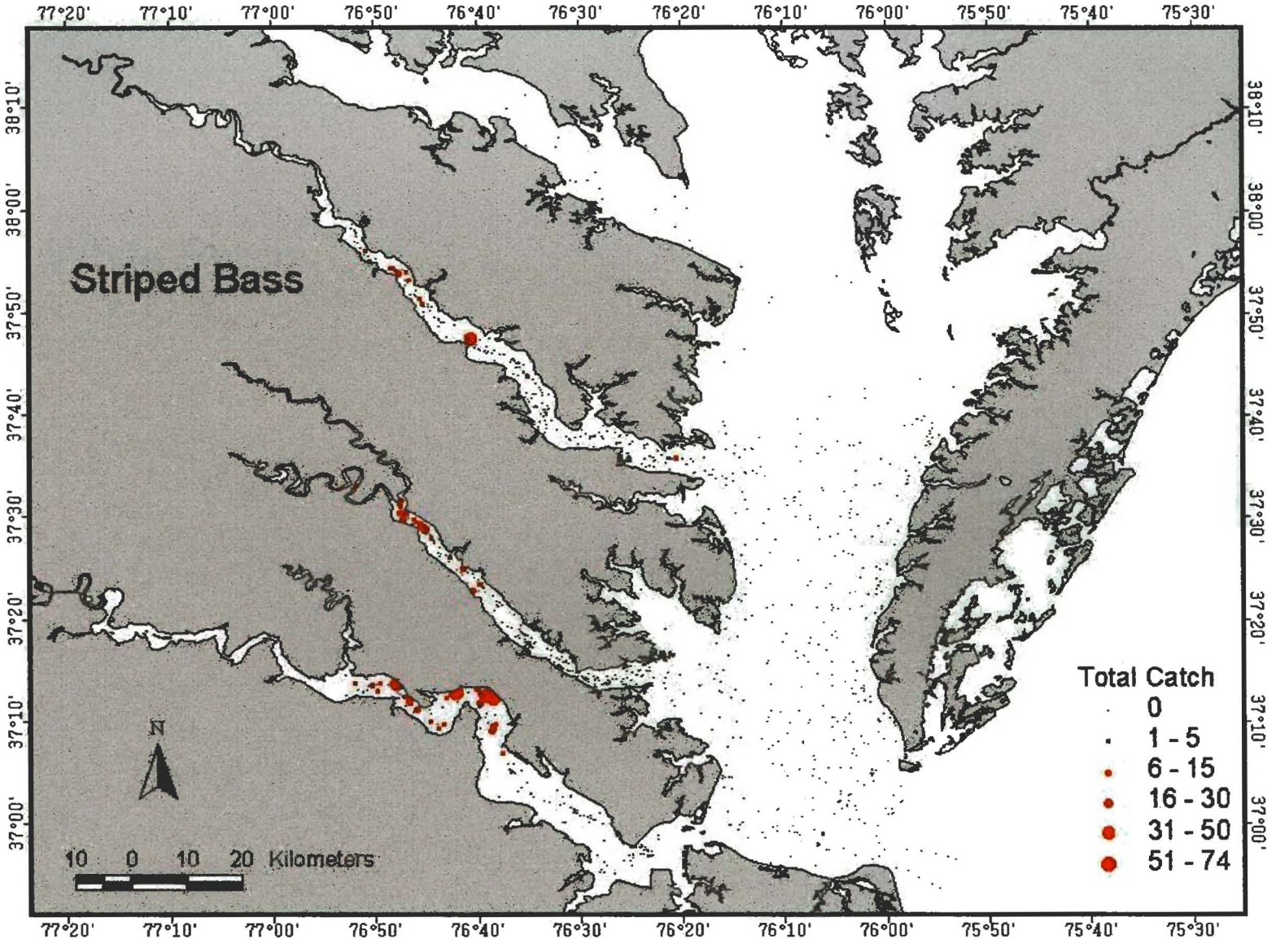


Figure 7. Distribution of YOY striped bass from VIMS Trawl Survey, July 2001 to June 2002.

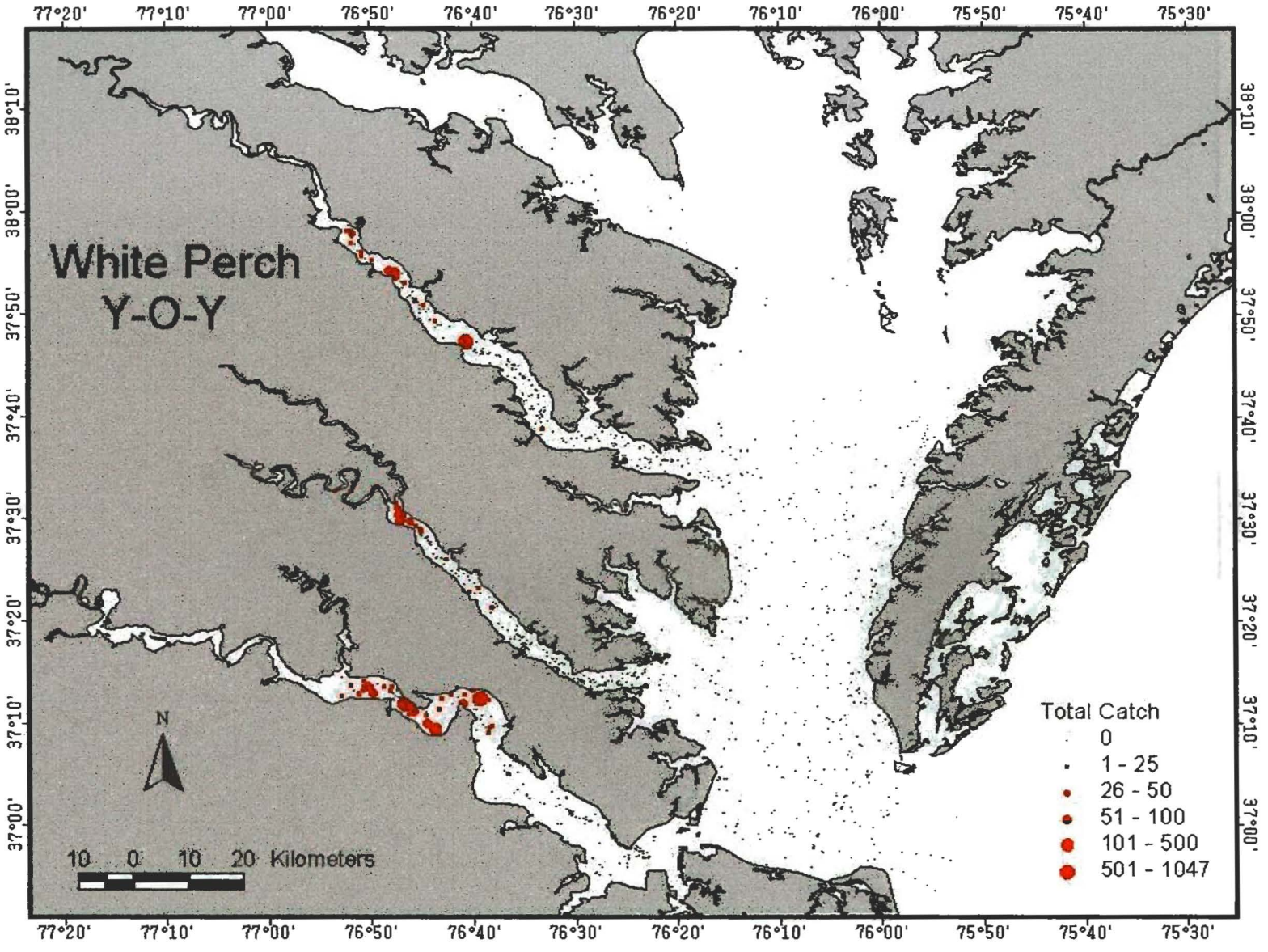


Figure 8. Distribution of YOY white perch from VIMS Trawl Survey, July 2001 to June 2002.

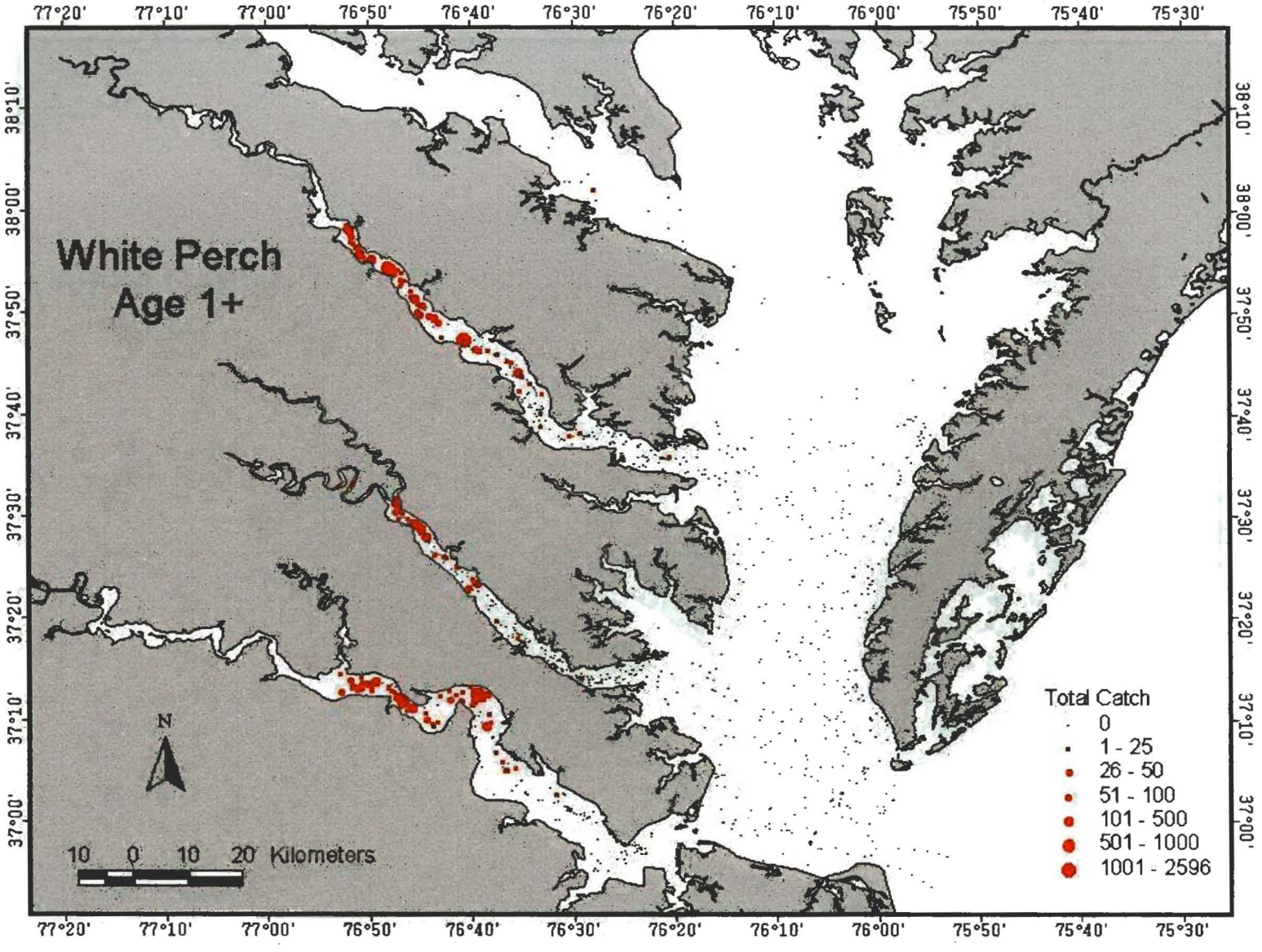


Figure 9. Distribution of age 1+ white perch from VIMS Trawl Survey, July 2001 to June 2002.

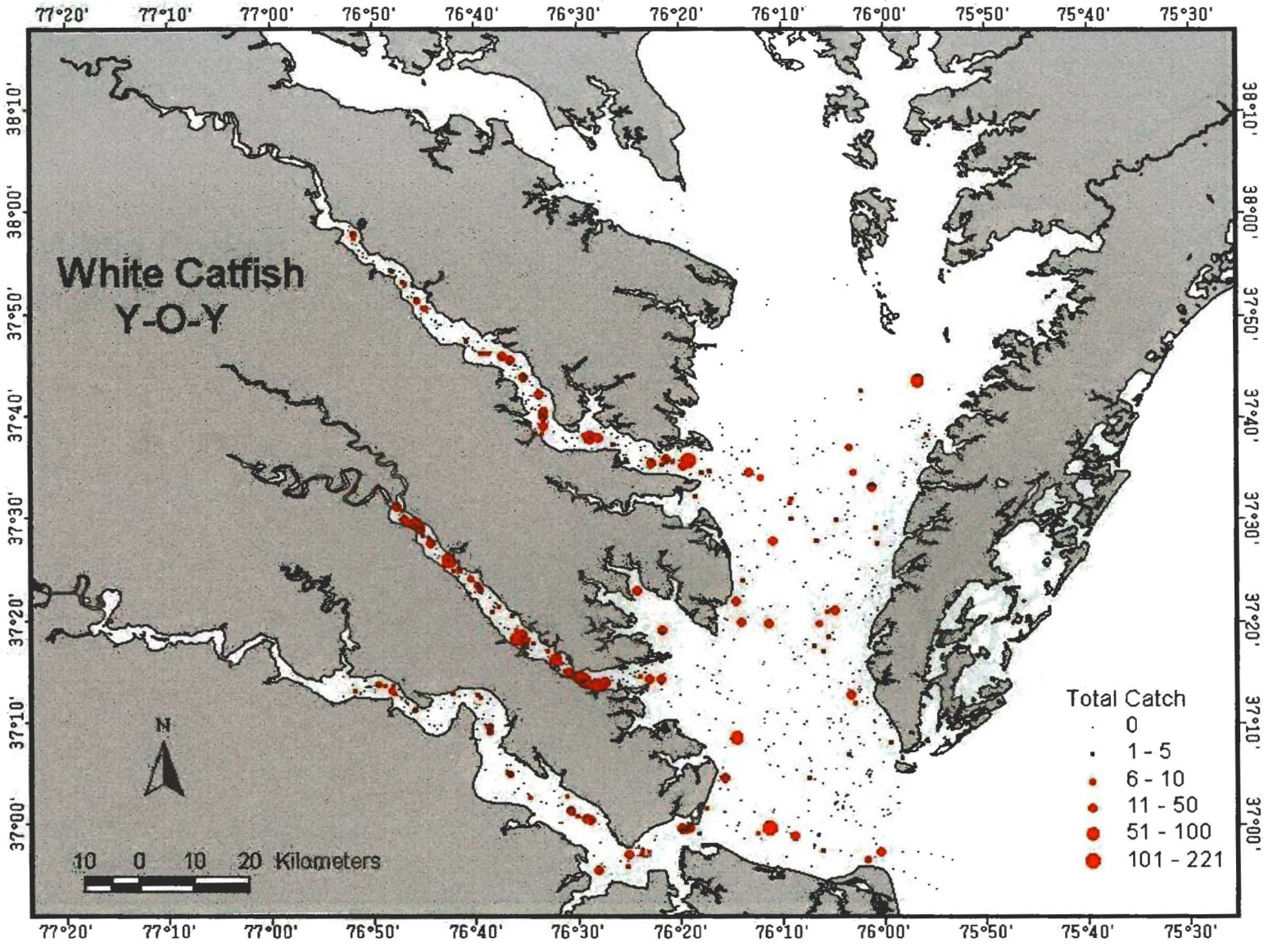


Figure 10. Distribution of YOY white catfish from VIMS Trawl Survey, July 2001 to June 2002.

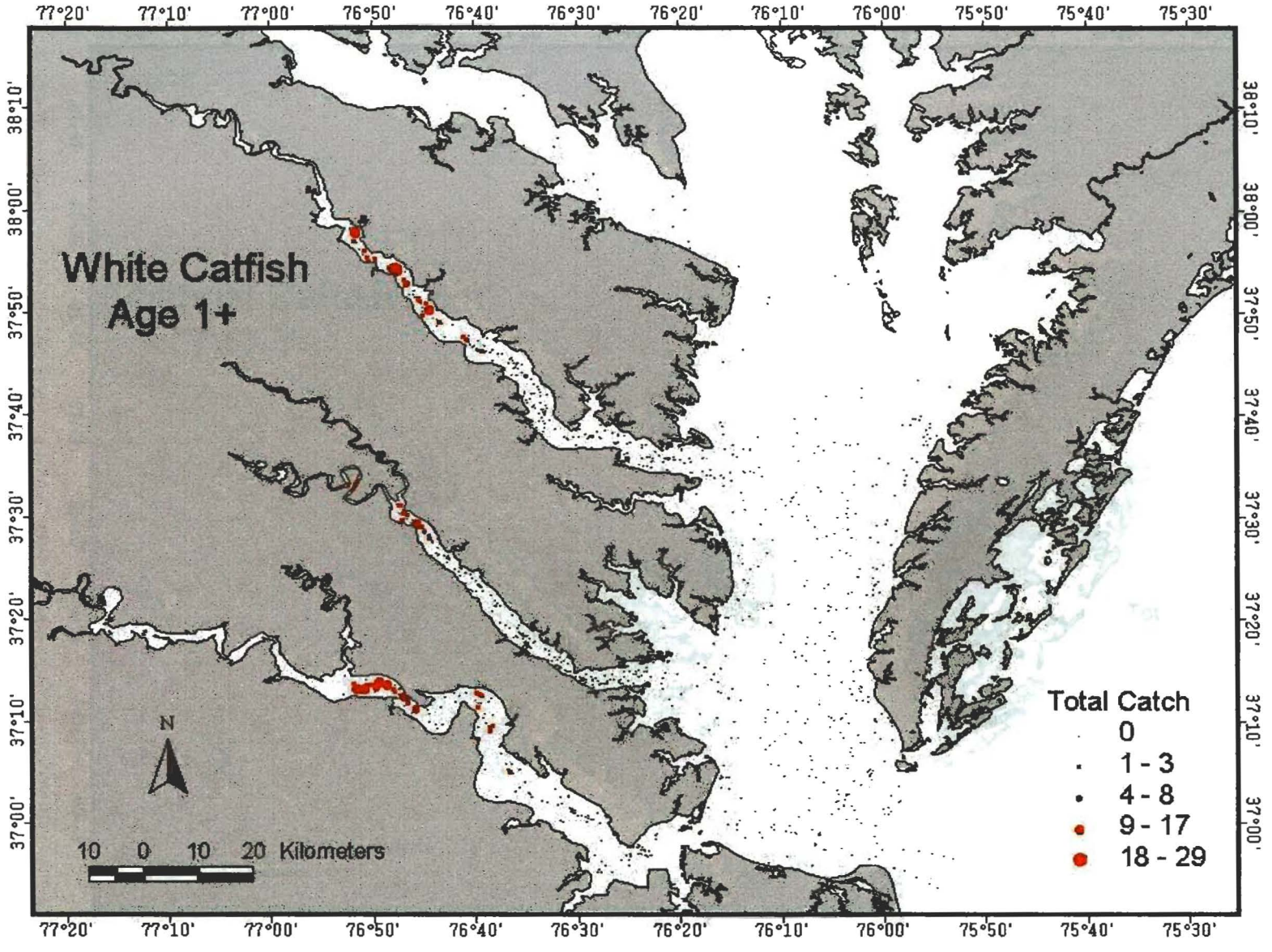


Figure 11. Distribution of age 1+ white catfish from VIMS Trawl Survey, July 2001 to June 2002.

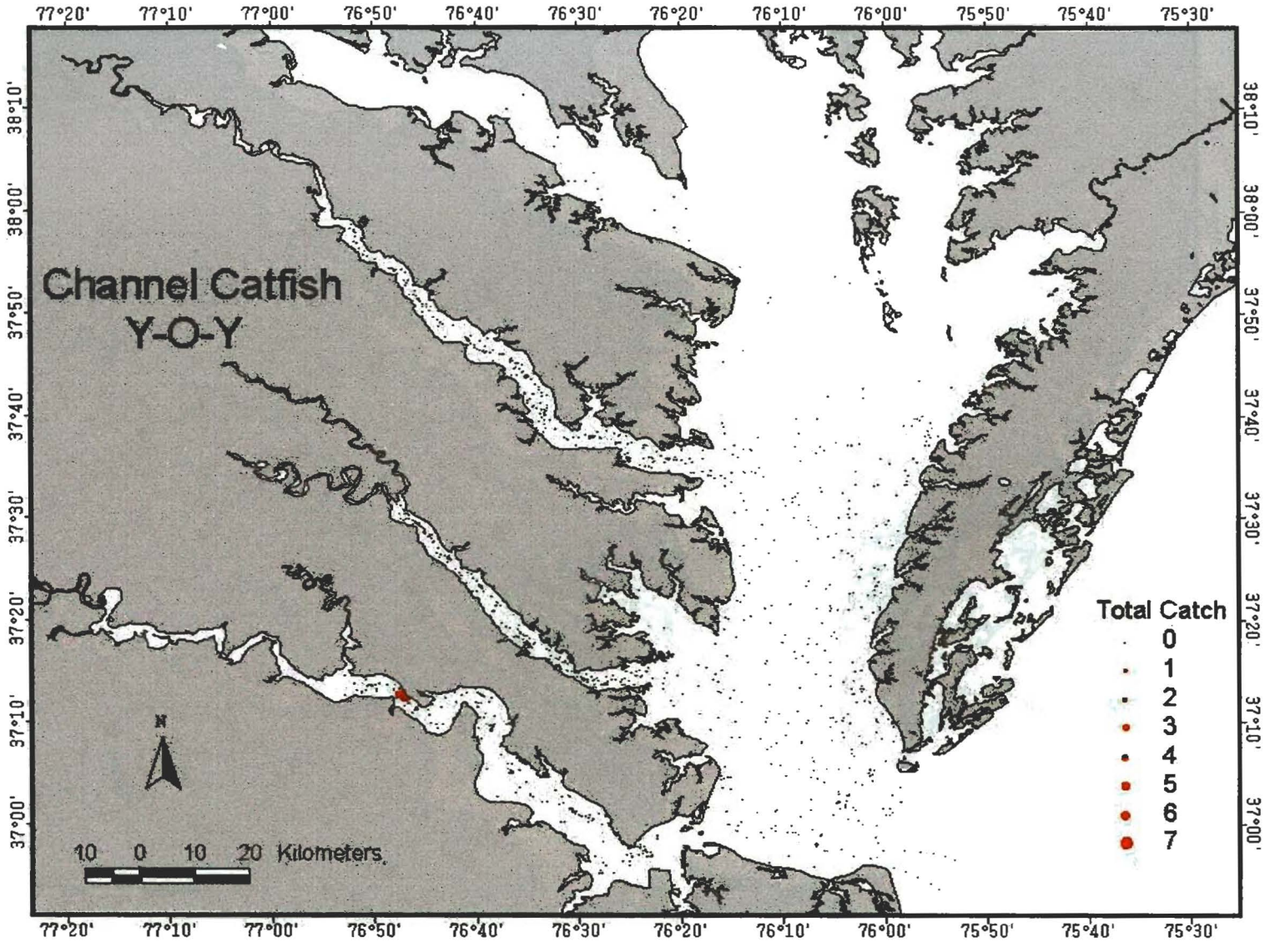


Figure 12. Distribution of YOY channel catfish from VIMS Trawl Survey, July 2001 to June 2002.

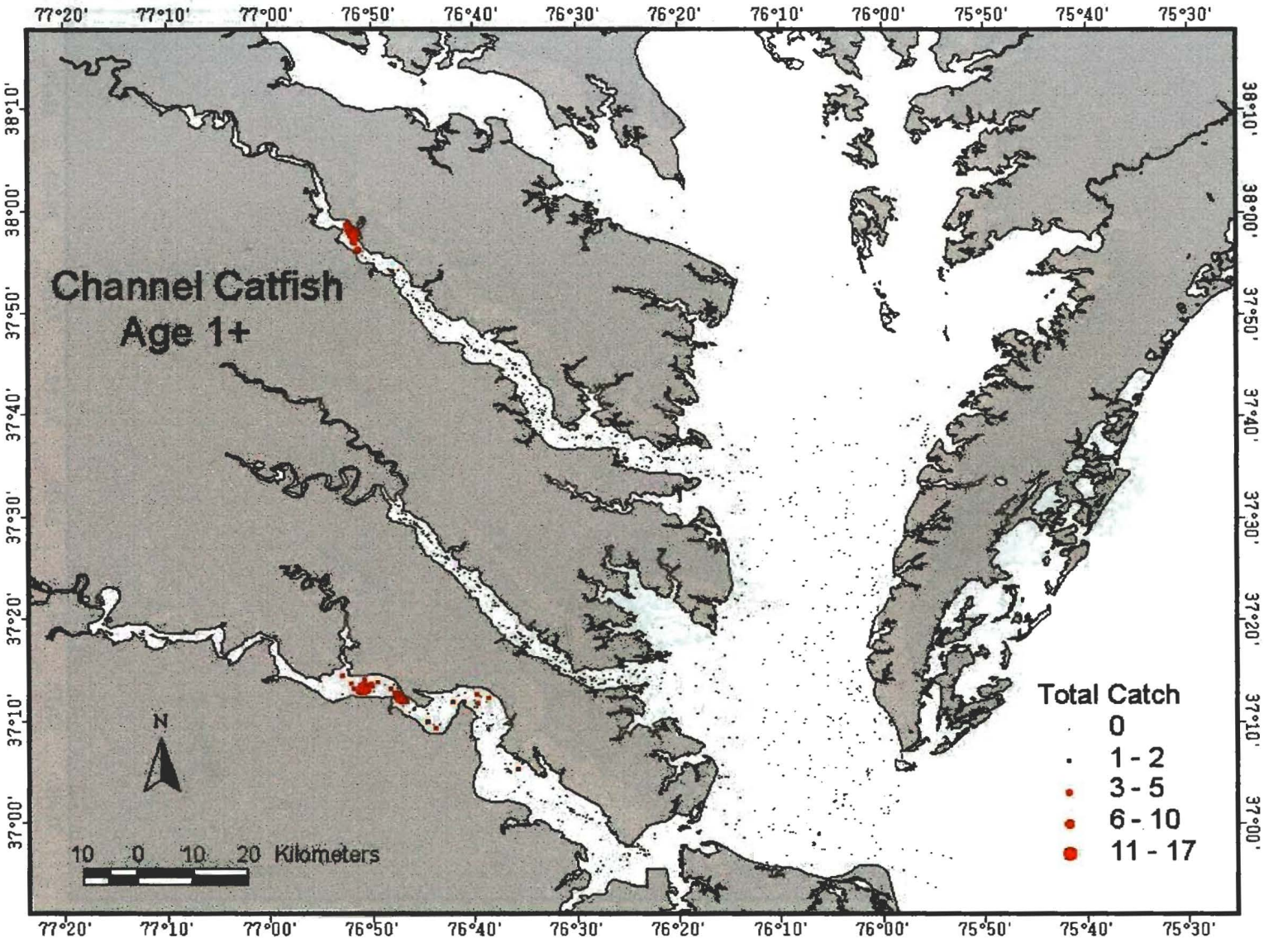


Figure 13. Distribution of age 1+ channel catfish from VIMS Trawl Survey, July 2001 to June 2002.

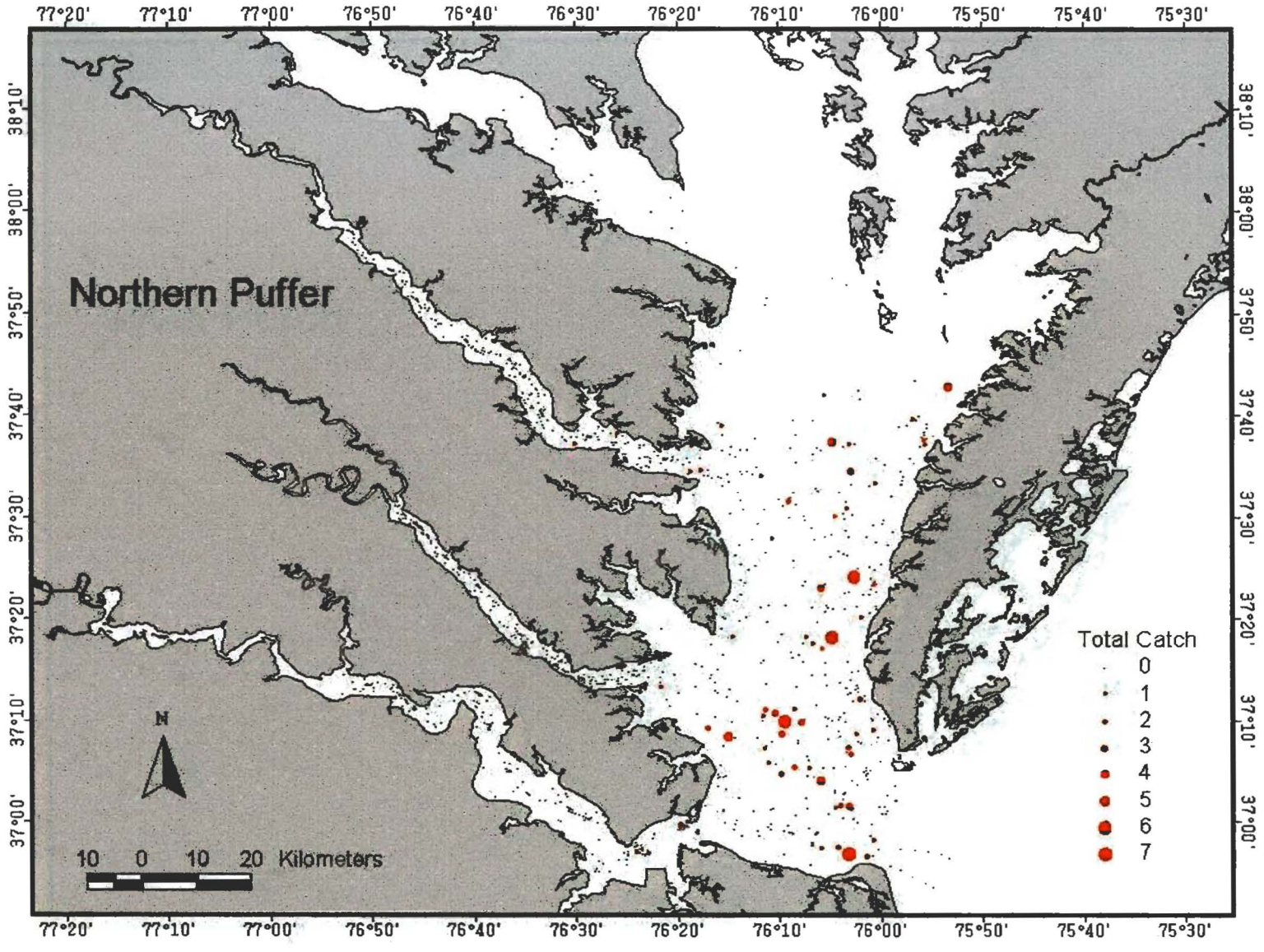


Figure 14. Distribution of YOY northern puffer from VIMS Trawl Survey, July 2001 to June 2002.

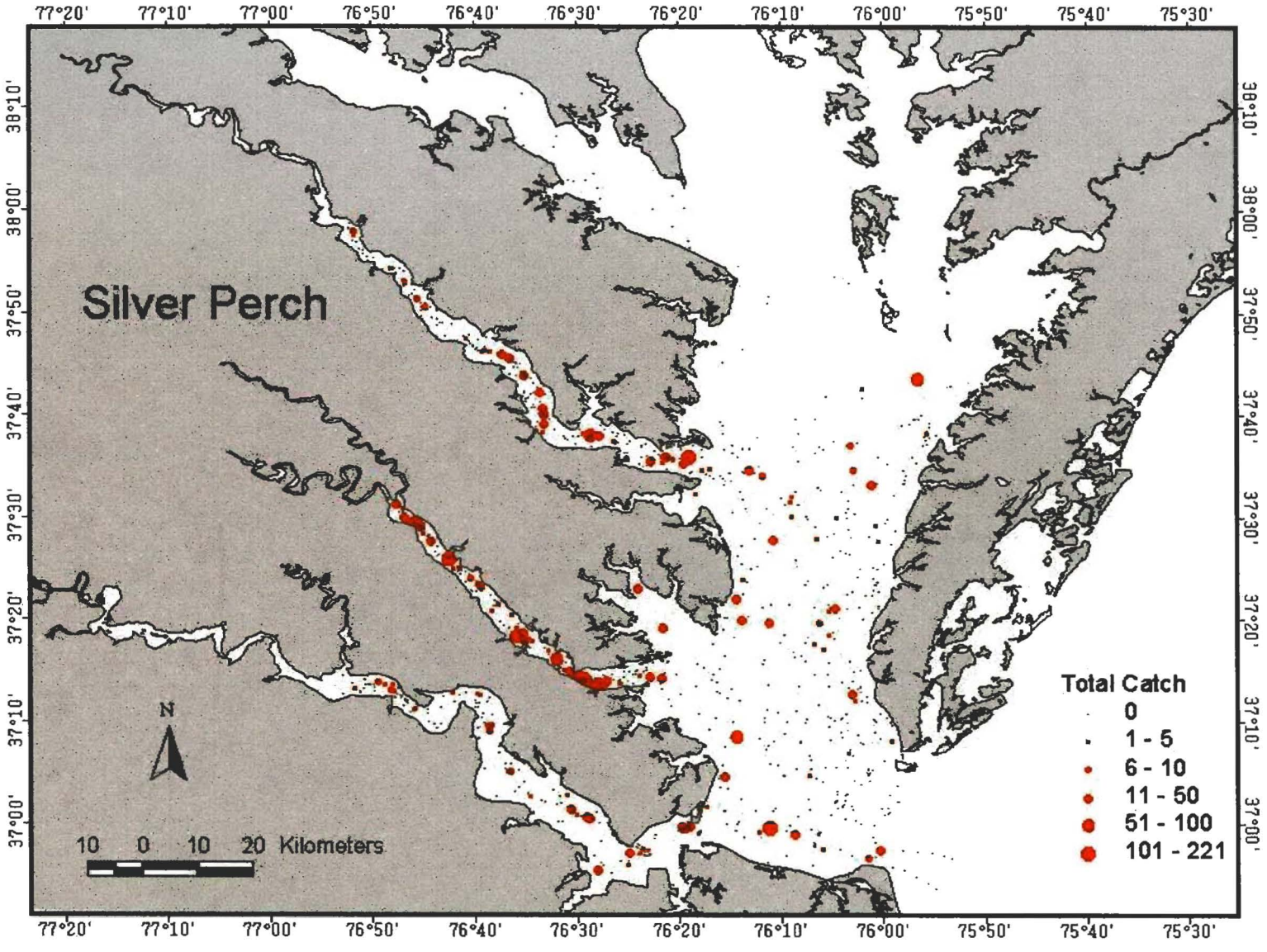


Figure 15. Distribution of YOY silver perch from VIMS Trawl Survey, July 2001 to June 2002.