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Project Number F104-R11
July 2000 - June 2001
by

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Submitted to
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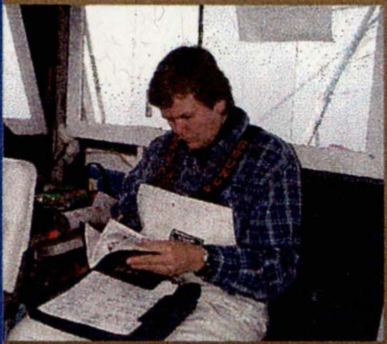

ANNUAL PROGRESS REPORT

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This project is supported by the U.S. Fish and Wildlife Service and the Virginia Marine Resources Commission through the Sportfish Restoration Program, Project F104R. Prior and supplementary field collections analyzed herein were supported by funding from the National Marine Fisheries Service through the Chesapeake Bay Stock Assessment Committee and by the Virginia Institute of Marine Science.

DISCLAIMER

Some of the results contained in this report have just 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 (1955-2000) should be used with some caution until further evaluation provides more concrete results.

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EXECUTIVE SUMMARY

Project Objectives

1 & 2: Several annual indices of juvenile abundance have been generated from trawl survey data for species of key recreational importance in the Virginia portion of Chesapeake Bay (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). No species has shown a continuous trend during the past fourteen years under the present sampling scheme. However, several species have revealed declines (spot, scup, and northern puffer) or increases (striped bass) in recent years.

Results for the 2000 sampling season indicate significant declines over previous years for Atlantic croaker (2.40 times decrease), and the age 1+ components of white and channel catfish (2.29 and 2.66 fold decline, respectively). Significant increases were observed for striped bass and y-o-y white perch (9.92 and 6.78 fold increase, respectively).

3: Vessel and gear comparisons are now complete and results published (Hata, 1997). Conversions are being applied to data to produce a time series dating to 1955.

The results of these studies have been applied to historical data to provide a longer time series (1955 to present). Two additional indices have been created. A random stratified converted index (RSCI) using converted values in a post-stratified design, and a random stratified index (RSI) which does not adjust catches by gear and vessel. Both these indices use similar spatial and temporal components as originally reported with the Bay and river mid-channel transects indices (BRI), however, values are adjusted to the present sampling scheme, and in the case of the RSCI, adjusted for gear/vessel differences.

The application of these conversion values is still being debated, with concerns of statistical significance (measured as mean catch difference) versus significant positive correlations. Also of concern are missing spatial and/or temporal data which can skew results from these earlier surveys.

4. Exploratory monitoring of some of the secondary water systems was established in July of 1998 with sampling performed on a quarterly basis. The Pocomoke Sound, Mobjack Bay, Piankatank and Great Wicomico Rivers are sampled each quarter using a random stratified design similar to the primary survey. Results have shown higher catch rates of species such as summer flounder, spot, and silver perch on some of these systems as compared to the main-stem bay, James, York, and Rappahannock Rivers. Sampling on the Piankatank and Great Wicomico were discontinued in July of 2001 due to sampling difficulties associated with commercial fishing gears and privately leased oyster grounds. All sampling was discontinued due to funding restrictions by the beginning of 2001.

*: Analysis and summary of data continues to be routinely produced and available in the form of an annual data summary report. These summaries allow for detailed comparisons and

contrasts of annual results with previous surveys. Efforts are underway to produce an Internet version of these reports.

*: Efforts are continuing to examine and evaluate older data sets for valuable and necessary information. Historical data are being analyzed and incorporated into data summary reports similar to those presented in recent years.

*: Sampling was not completed in January 2000 due to several severe storms that affected the Chesapeake region. The random stations were not completed on the James River due to these constraints. The estimates for the catfishes, striped bass, and white perch, may be effected as a result. In addition, an abbreviated survey was conducted monthly between January and April of 2001 as a result of an overhaul to the primary research platform. As an alternative to not sampling, the R/V *Langley* was used to conduct sampling in only the areas vital to the species whose temporal component of the abundance estimates includes these months (ie., white perch, striped bass, white and channel catfish).

*: Since most of the species concerned are highly migratory and utilize widespread nursery areas, a multi-state effort will be required to fully evaluate their relative annual reproductive success.

*: Nomenclature used in the discussion of the various gears used throughout this report requires some clarification. To describe, in full, a particular gear each time it is mentioned would be lengthy, repetitive, and cumbersome. To refer to each gear by its VIMS gear code designation is meaningless without some convenient key. To deal with this concern, each gear has been provided a name which corresponds to its configuration. A series of characters will be applied, separated by an underscore, "_", to describe each gear. The characters are designated as follows:

Lined or **U**nlined _ **T**ickler chain or **N**ot _ **2**0, **3**0, or **6**0 ft **B**ridle _ Door Type
Door Type: SW = **S**mall **W**ooden otter boards, 48"x22"
LW = **L**arge **W**ooden otter boards, 54"x24"
CV = Metal **C**hina - **V** doors
16 ft gears have an additional two characters at the beginning indicating them as such.

As an example, L_T_6B_CV is the lined, with a tickler chain, 60 ft bridle and china-v doors gear presently used by the project (VIMS gear code 108).

These gear descriptions, VIMS codes, names, and there period of primary use, appear on Table 9 and Figure 2.

INTRODUCTION

Measures of juvenile abundance are presently in wide use as a key element in the management of the Atlantic States' coastal fishery resources. Estimates of the relative interannual abundance of early juveniles (age-0) generated from scientific (fishery-independent) survey programs have been found to provide a reliable and early estimator of future year class strength (Goodyear 1985, Lipcius and Van Engel 1990). After a review of previously available indices of juvenile abundance for important fishery resource species in the Chesapeake Bay, the Chesapeake Bay Stock Assessment Committee (CBSAC), a federal/state committee sponsored and funded by the National Oceanic and Atmospheric Administration (NOAA), 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). In order to facilitate the implementation of such a program, CBSAC directly supported pilot studies directed at developing a comprehensive trawl survey for Chesapeake Bay. In the Virginia portion of the bay the primary focus of this support was the initiation in 1988 of a monthly trawl survey of the main stem portion of the lower bay. This survey served to compliment and greatly expand the monthly trawl surveys of the major Virginia tributaries (James, York and Rappahannock rivers) which have been conducted by the Virginia Institute of Marine Science (VIMS) as part of a long-term effort to monitor and assess the condition of fishery stocks in the lower Chesapeake Bay and its tributaries. The primary intent of the present project is to assure that this sampling effort be continued on a long-term basis as well.

The present sampling program (bay and tributaries) is a particularly vital component to insure that data will be of sufficient geographic resolution for the generation of annual relative estimates of recruitment success of recreationally important finfish species of Chesapeake Bay. An analysis of the

Virginia portion of the National Marine Fisheries Service (NMFS) Marine Recreational Fisheries Statistics Survey (MRFSS), revealed 2000 Virginia marine recreational catches to be dominated by Atlantic croaker, summer flounder, black sea bass, striped bass, weakfish, spot, and bluefish (Anon. 2001a). These species all rank in the top ten in total numbers landed with 85.17% of the estimated catch, with all but bluefish in the top ten by weight (89.26%) (Table 1). All of 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 cited 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 as to provide data sets suitable for the generation of useful indices of juvenile abundance.

The project also seeks to facilitate the further development of a comprehensive trawl survey program through gear evaluations and comparison studies which will serve to unify current trawling efforts while maximizing continuity with historical data sets (1955 to present). Although the primary focus of the project is the generation of annual indices of juvenile (young-of-year) abundance of recreationally and ecologically important marine and estuarine finfish, survey results can also be used to address other aspects of the population biology of these species, such as habitat utilization, early growth and survival, climate and pollutant interactions, or prevalence of disease.

The development of juvenile indices requires considerable continuous time series of data in order to determine the proper area-time sequences best used in index calculations. In view of this fact, Colvocoresses and Geer (1991) developed provisional annual juvenile abundance indices for spot, weakfish, Atlantic croaker, summer flounder, and black sea bass. 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 five additional species (white and channel catfish, silver perch, northern puffer, and tautog), were briefly introduced in the 1994 project report (Geer and Austin, 1994). However these results for tautog were extremely conditional due to the sporadic catch rates. Recent project reports, (Geer et al., 1995; Geer and Austin, 1996a), provided more concrete results for the species of interest, with the 1997 report (Geer and Austin, 1997) providing a time series back to 1955 with the use of gear conversions and post stratification methods.

Many of the above species are captured in significant numbers across several year classes. As a result, both y-o-y and age 1+ indices have been created for white perch, and white and channel catfish, with a recruit, or spring index (returning young-of-the-year) for Atlantic croaker. Preliminary estimates of abundance have been prepared for additional species of interest (Bonzek et al., 1995, Anon. 2001b). However, presentation of these indices and those of other species will not be included in these reports without further literature reviews and additional analyses. The provisional nature of the reported values is emphasized by the fact that all of the abundance estimates for the initial five species reported during previous segments have undergone some minor modifications since their first publication.

The present report continues an attempt to relate the juvenile indices developed herein with a longer time series based on the traditional mid-channel transect tributary sampling. In some cases this appears to provide a historical context in which to place recent project results, while in others it only emphasizes the need for the present comprehensive sampling program. Overall data summaries for samples collected in the main stem bay sampling in 1988 (Chittenden, 1989) and for both the bay and river sampling in 1988 (Land et al., 1994), 1989 (Geer et al., 1990), 1990 to 1992

(Bonzek et al., 1991, 1992, 1993) , 1993 (Geer et al., 1994), 1994 (Land et al., 1995), 1995 (Geer and Austin, 1996b) , 1996 (Geer et al., 1997) , 1997 to 1998 (Geer, 1998; Geer, 1999), and 1999 (Lowery et al., 2000) have been previously prepared and distributed.

METHODS

Field Sampling

Sampling protocol continues as described in previous segment reports and the above mentioned data summary reports. 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 a period of five minutes during daylight hours. One note should be made concerning the sampling gear. Marinovich Net Company of Biloxi MS, was the sole source for this program's trawl gear for over thirty years. Unfortunately, the company recently went out of business creating a need for a new and reliable vendor. Thankfully, Glavan Trawl Manufacturing Company, (also of Biloxi, MS) purchased the remainder of Marinovich's stock, and has agreed to build trawl nets to our original specifications. Other details of sampling protocols, gear specifications and specific collection information have been summarized in the reports for previous segments and the data report series cited above. In addition to the previous protocol, a new type of data were collected, beginning in May 1998, to describe the habitat or substrate type. Various substrates such as shell, sponge, hydroid, and sea squirts, may influence fish distribution and abundance. Many of these substrates extend up from the bottom into the water column creating a three dimensional structure which may be used for spawning, shelter, or feeding grounds. These substrates are measured discretely at each trawling site, based upon the quantity observed in the net (and attached to the tickler chain) in relationship to a standard container device. The goal is to map each substrate type and compare catch rates of various fish species in relationship to substrate distribution. Table 2 indicates the various substrates described to date and the discrete values used in estimating quantity.

Sampling of the near-shore shallow waters (4-12ft) of the eastern and western Bay (June 1995), and introduction of random stratified sampling of both the Rappahannock and James Rivers (September 1995, and March 1996, respectively) continued, and is now fully incorporated into the sampling scheme. This work was established in addition to, not at the expense of, the previous sampling design. Sampling remains on a monthly basis, (with the exception of the bay during January to March when few target species are available and only a single cruise has been conducted since 1991). The tributaries continue to be sampled with both the random stratified stations as well as the historical fixed mid-channel station transects. 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 shore shallow (4-12ft), western shoal (12-30ft), central plain (30-42ft), deep channel ($\geq$ 42ft), eastern shoal, and eastern shore shallow (Table 3). Each tributary is divided into four regions of approximately ten longitudinal miles, with four depth strata in each - (4-12ft, 12-30ft, 30-42ft, and $\geq$ 42ft) (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.

A proposal was put forth in 1998 to provide exploratory monitoring of secondary water systems. Beginning in July of 1998, quarterly sampling of the Pocomoke Sound, Mobjack Bay, Piankatank and Great Wicomico Rivers was initiated. Each system was sampled once per quarter, usually with one system sampled per month (Piankatank and Great Wicomico Rivers are sampled the same month). The sampling order was randomly selected the first quarter, then altered by one month each proceeding quarter. This provided sampling every other month for each system, (excepted during one quarter where there is a four month separation). This method insures that over a three year period, each system will be sampled during each month. Information from this sampling will further enhance knowledge of distribution, abundance, and essential fish habitat for Chesapeake Bay fishes.

Sampling methodology is identical to the primary survey with a random stratified survey design based on depth. Three of the four systems (Pocomoke, Mobjack, and Piankatank River) have been sampled by the program in the past. By reviewing the available information on these systems, several fixed sites were established to aid in comparison with past results. These fixed sites were assigned a stratum based on location and depth. Table 7 provides the sampling scheme for these systems.

Results from these surveys through June 2000, were present in the last report segment. Catches of some species such as summer flounder were typically higher in the secondary systems than those of the primary survey (Geer and Austin 2000). The Mobjack Bay seemed a particularly interesting system, having higher catch rates for flounder, croaker, spot, weakfish, and silver perch. However, regular sampling in these systems was all but eliminated by the last quarter of 2000 (October to December), as funding sources for this sampling were eliminated. Since that time, only the Mobjack Bay has been sampled, and only on a very limited basis from other funding sources.

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 data base 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. There are one to two stations selected monthly for each river strata. The number of potential sites for the RSD of the bay and tributaries with the approximate areas of each strata, are given 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 that of the James, Rappahannock, and main stem bay. In earlier segment reports (Geer et al., 1994), the proposed depth strata for the tributaries included all depths ≥ 30 ft as one strata. This was modified beginning January 1996, to create depth strata similar to the bay, (30-42ft and ≥ 42ft) (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 have showed results dating back to only 1979. This was due mainly to gear and sampling changes which made earlier data difficult to use in the present sampling format. However, with gear and vessel conversions now available for most target species, these conversions can be used to provide a standard measure of relative abundance. In addition, station data have been post-stratified to the present sampling scheme, allowing for full use of the historical data. Although the stratification of the main-stem bay has not changed, that of the initial random stratified surveys of the rivers has. Furthermore, until now, these recent random surveys of the rivers have not been used in estimates of abundance. Previously only the historical fixed station transects have been used in estimating abundance, by post-stratifying rivers into two equal regions (Table 8). The bay latitudinal strata were slightly different, and overall coverage greater during the first year's (1988) sampling, but for the purpose of juvenile index calculations 1988 data were post-stratified into, and restricted to, those strata which have been continually sampled (1-12).

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. These stations have been sampled on a monthly basis almost continuously since 1980 (Table 9, Fig.2). They were previously sampled with monthly surveys using an unlined 30' trawl (Gear U_N_3B_SW, gear code 010) beginning in the mid-1950's (York R.) or early-1960's (James and Rappahannock) through 1972. During 1973-79, semi-annual random stratified sampling was performed by the Ichthyology Department while the Crustaceology Department continued 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. With all three tributaries now being sampled with a random stratified design, these fixed locations have been assigned to a stratum based on location and depth. The new combined tributary survey (fixed and random stations) will provide for a statistically sound survey, large spatial coverage, and a long term historical reference.

Gear Calibration Studies

Gear calibration analyses were completed in 1997 (Hata, 1997). Emphasis has been placed on applying these conversion values to the historical datasets and providing a converted catch for each observation. The methods and statistical analyses used for these calibration studies were fully explained in Hata (1997). This project segment's efforts involved applying these conversions to the historical data and creating permanent datasets.

Juvenile Index Computations

Measuring the abundance of migratory species (as are many of the key target species in this project) presents special difficulties, particularly if the timing and duration of migratory behavior 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 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 the multi-specific monitoring objectives precludes temporally intense surveys in the face of finite resources. Given the multi-species nature of this program, it would be difficult to adjust survey timing in order to maximize the usefulness of the data collected for all species. Given this, the survey will continue to be conducted on a regular periodicity and juvenile indices constructed as best possible from these data.

The following approach is used for juvenile index calculation. Trawl catches of target species were first separated into young-of-year and older components by applying a standard monthly cutoff value to the length frequency information collected with each catch. Cutoff values vary among months for each species and were 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 values which 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 so as 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 overlap occurring. 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, there is little likelihood that any significant error will be introduced, as only a very small fraction of the total number of young-of-the-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 at all is present.

After partitioning out non-young-of-the-year individuals, monthly catch rates of the 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, as this transformation has repeatedly been shown to best normalize collection data for contagiously 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 the area-time combinations which appear to 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 which indicated distribution patterns suggesting migratory behavior was occurring. Although identification of areas most suitable for index calculations (primary nursery zones) is generally clear, selection of appropriate time windows has proven a more complex issue. Surveys are timed on regular period intervals which might or might not coincide with periods of maximal recruitment to the nursery areas. Using a very limited portion of the overall data set would decrease sample sizes, increasing both confidence intervals, and the risk of sampling artifacts influencing results. As a result, the use of a single (maximal) month's survey results was deemed inappropriate. Conversely, a conscious effort is made not to incorporate any longer temporal series of data into index calculations than is necessary in order to capture the period of maximal juvenile utilization of the nursery area. It is believed indices calculated over longer time periods run the risk of confounding temporal persistence on the nursery area with maximal utilization levels. Using this approach it has been possible to identify three or four month periods which consistently capture the months of highest abundance for the species thus far examined (Table 10).

After area-time combinations are selected, annual juvenile indices are calculated as the weighted geometric mean catch per tow. Strata-specific means and variances are calculated and then combined, weighing by stratum areas according to the formulae supplied by Cochran (1977). Since stratum areas are quite variable, use of a weighted mean will provide an index that more closely mirrors actual population sizes than will a simple mean.

For consistency purposes, several indices have been produced for each species: the original index which is based on the present bay strata and the fixed mid-channel tributary stations (Bay & River Index - BRI, 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 since results from the longer time series must be considered provisional, with concerns of missing data and conversion factors still being addressed.

RESULTS

The most noteworthy events this past project segment involved logistics and funding. The research vessel, *Fish Hawk*, went into dry dock in January to replace its diesel engine with a quieter gasoline equivalent. As a result, the vessel was unavailable until May 2001. To insure the continuation of the time-series for target species, only those areas of specific interest were sampled during this period. Species estimates affected during this temporal period include white perch, striped bass, and the catfish species. Their distribution (spatial component of abundance estimates) is limited to the upper two regions of the tributaries. The 13.4 m launch, R/V *Langley*, was used to conduct the sampling during this period. Its maximum cruising speed (9 knots) greatly limited the ability to conduct a complete survey of the bay and tributaries, and as such, only the areas of vital importance to the time series were sampled. The event concerning funding occurred in November 2000, when it was announced that the eleven year relationship between the program and Wallop

Breaux funding would be terminated as a result of declining resources. This prompted the investigators and VIMS administration to take and austere approach to the program to insure monitoring could continue as long as possible until other funding sources could be identified.

Objectives 1 to 3: *To develop and produce timely annual estimates of recruitment success of important finfish species for the major Virginia nursery areas of Chesapeake Bay and to apply gear comparison results to historical data to provide a standard catch-per-unit-effort for the entire time series.*

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 remains wide and consistent throughout the sampling area (Appendix Fig. 1). Juveniles first recruit to the gear in April with their abundance remains consistently high until December, peaking between July and October.

The weighted geometric mean catch per tow for juvenile spot has declined sharply since the late eighties. The tributary based index has averaged 20.9 since 1979, however, since 1991 values (mean = 8.3) have been far below that value, with 2000 results remaining very low at 4.94 fish per trawl. (Table 11, Fig. 3). Since 1988, the BRI and the Rivers only index have been quite similar, indicating comparable use of the main-stem bay and tributaries as nursery grounds.

The longer time series shows great fluctuations in CPUE (Figure 3) , with the mean index value from 1955-78, nearly twice as high (39.5) as that of the River only index since (1979). Contributing factors may be the large conversion factors for both the R/V *Pathfinder* and gear U_N_3B_SW (gear code 010), and the varying sample sizes from year to year (Figure 3, Table 11). A large amount of noise appears in the time series, with large fluctuations occurring every three to four years (Figure 3). Regardless, considering the extensive sampling the past ten years, the extremely low recruitment years since 1992 appear real and of concern (Figure 3, Table 11).

Atlantic Croaker (*Micropogonias undulatus*). Croaker, like the spot, display high levels of abundance in the trawl catches but present a much more complex pattern of recruitment and distribution (Appendix Fig. 2). Spawning takes place over a more protracted period than the other species considered here, and small early juveniles (<30mm) have been found to be present in the 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 100mm, but in other years the peak occurs the following spring from animals either overwintering or recruiting from offshore waters. To separate these size cohorts, two estimates are generated: a juvenile fall (Oct. - Dec.) based just on the tributaries; and a spring recruit (May - Aug.) with data from the Bay and tributaries.

Successful spawning events are evident from the very successful year classes in the fall of 1984, 1985, and 1989 (Table 12, Figure 4). However, these successful spawning events often did not result in comparably successful recruitment the following spring (Table 13 and Figure 5). There appears to be no significant correlation between the fall and spring indices. Estimates for the 2000 fall index have declined to very low values (5.96 fish per trawl) (Table 12) ,with the spring index showing a similar trend the last several years, with preliminary 2001 results continuing to decline (0.32) (Table 13) .

The adjusted catches have only a minor effect on both the fall and spring croaker indices. Conversions have been made for nearly all gears and vessels with exception of the *Capt. John Smith* and gear U_T_3b_LW (gear code 043) (Tables 12 and 13). Some of the largest year classes for the fall index have come in recent years (1985, 89, and 96) (Figure 4, Table 12). Its evident from the very low catch rates prior to the addition of a cod-end liner (1972) that the earlier gears rarely capture animals in the smaller size ranges (less than 50mm). The spring index however, has shown large catch rates periodically (Table 13, Figure 5), with the most recent resurgence occurring between 1991 and 1994. This spring index may eventually prove to be a better estimate of recruitment success since it is based on larger sized animals, which have already survived a full winter, and were fully available to all previous gear types.

Weakfish (*Cynoscion regalis*) - Weakfish, while considerably less abundant than the spot and croaker, are still one of the dominant species of the trawl collections. Juveniles occasionally have first occurred in the 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 has taken place in July, August and September. July young-of-the-year weakfish were found primarily in the tributaries, and by August and into the fall months had dispersed into the main stem Bay as well (Appendix Fig. 3). The three months of highest juvenile abundances were typically observed during the same three month period, August-October.

The river only index has fluctuated with no trend since 1994, while the BRI has shown a continuous upward trend since 1994 (Table 14, Figure 6). The 2000 river only index declined nearly 32% from 1999, while the BRI rose 27%. The spatial distribution of juvenile weakfish has often shown large variations between years, providing a strong argument for the Bay-River index due to its greater coverage.

The most striking observation of the weakfish time series is the very poor recruitment between 1972 and 1977. This broad band of recruitment failure is buffered by successful year classes in 1971 and 1978 (Figure 6,Table 14). Environment factors may have been a cause. However, more likely is the fact that during this period sampling was performed primarily as a semi-annual survey in January/February, then again in July, missing the peak period of abundance which occurs from August to October. Adjustments have been made for all gears except gear 043, and gear 010 with 7.5 minute trawls (Table 14).

Summer Flounder (*Paralichthys dentatus*) - Small juvenile flounder can first appear in the catches as early as late March, which for the current purposes 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-the-year summer flounder abundance continued to increase steadily throughout the summer and early fall towards a late fall peak, and then show clear evidence of emigration during December. September to November encompasses the three months of greatest abundance for most years. During this time period juvenile flounder are broadly distributed across the main stem bay and are commonly taken in the lower rivers, but only rarely appear in catches in the upper tributaries. (Appendix Figure 4). Index calculations therefore include all bay strata and the lower river strata.

Both the River only and the Bay-River indices remain very low in 2000 (0.52 and 0.62 fish per trawl respectively)(Table 15, Figure 7). The addition of the tributary random surveys supports these low numbers seen most of the late 1990's.

The addition of the tickler chain to the gear in the early 1970's made a significant affect on flounder catches. Significant conversions were applied to all gears without a tickler chain; gears 16L_N_2B_SW (gear code 035), L_N_3B_SW (gear code 033), and U_N_3B_SW (gear code 010 at 15 minutes) (Hata, 1997). The adjusted catches indicate large year classes (> 2 fish per trawl) in 1956, 1963, and 1971. A very successful period occurred between 1979 and 1983 with annual catch rates ranging from 2.27 to 10.69 during the period. More recently, the early nineties (1990-91, and 1994) were the last period of very successful recruitment.

Black Sea Bass (*Centropristis striata*) - Like summer flounder, black sea bass are seldom taken in large numbers but regularly occur in the catches. Juveniles first appear in low numbers in August. When present, young-of-the-year sea bass occur throughout the bay strata but do not appear to penetrate into most of the tributaries on a regular basis except the lower James River (Appendix Figure 5). Index calculations have thus 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 out with the onset of winter, a much larger number of young-of-the-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 have been based on the months of May through July. This period usually encompasses 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 1988 index is for the 1987 year class.

The annual juvenile indices for black sea bass have shown no consistent pattern (Figure 8). Occasionally, the river only index is higher than the BRI, indicating higher utilization of the lower James River. However, the small annual sample size for the river index (N=12) provides little confidence in the precision of this estimate. Annual estimates have been increasing since a low in

1997, returning near the 13 year average of the Bay-River index (mean=0.82) (Table 16).

Historic catch rates appear similar to those seen in the late eighties (Figure 8). A significant gear difference occurred between the present gear and gear L_N_3B_SW, (VIMS gear code 033) (Hata, 1997), raising values between 1970 and 1977 slightly (Table 16, Figure 8). During years with little or no main stem bay sampling this can be of concern since there are only limited samples for the lower James with typically smaller catches.

Scup (*Stenotomus chrysops*) - The scup is a primarily marine and summer spawning species and appears to use the Chesapeake Bay in much the same way as black sea bass; i.e. there is minimal usage of the estuary as a nursery area by early juveniles but a very significant use by older juveniles during their second summer. Early juvenile scup (25-40mm FL) occasionally appear in the catches in June, but rapidly disappear after that if they do indeed appear at all. Older scup first appear in the catches in May, and by June range in size from 50 to 215 mm. The original length cutoff criteria were based on ageing studies reported by Morse (1978), with the collective trawl data indicating three size classes which were assigned as the age-0, age-1 and age-2+ year classes. Since the age-0 component is annually variable and not persistent, and the largest size class is only taken in very small numbers, index calculations are performed on age-1 individuals. This component clearly remains present in the bay and available to the gear for the remainder of the summer and early fall. Thus, while the data collected are obviously not amenable to the construction of a true young-of-the-year juvenile index, it is suitable for assessing juvenile scup abundance just as they enter their second year. The term, "age 1" scup was often applied in earlier reports, when in actuality data were lagged one year (year - 1), referring to y-o-y measured in their second year. Although there has been some discussion whether the animals captured in Chesapeake Bay are young-of-the year or early age one, based on studies along the Virginia coast, trawl catches in these size ranges are comprised of mainly age one specimens (Campbell et al., unpublished manuscript).

Distributional data for 2000 and early 2001 (Appendix Figure 6) supports previous findings that the early age-1 nursery area is largely restricted to the two lower main stem bay segments, although some large catches were associated with the upper bay in 1994 (Geer et al., 1995). Catch rates for scup usually peak in July, and essentially show a July-August dome. With the exception of 1988, when age-1 scup were not taken until July, there were also sizable numbers of late juveniles taken during the months of June and September. These months were therefore chosen as the temporal basis for index calculation. Scup appear have been on the decline in Chesapeake Bay with values recorded for the 1999 year class at a 13 year low (Table 17, Fig.9). However, early results from the 2001 sampling indicate a better than average recruitment for the 2000 yearclass (Table 17).

Scup were never caught in large enough numbers during the calibration studies to evaluate catches by size classes. Therefore the grand mean difference, $\bar{\bar{D}}$, was used for conversions. A very large peak in 1962 can be accounted for by several large catches and small sample size (n=6) (Table 17, Figure 9). Annual sample size for the Bay-River index have averaged about 104 trawls since 1988. Collection sizes for earlier years were often too small to provide reliable estimates. The exception would be the period from 1972 to 1977 when random surveys of the Bay were conducted (Table 17).

Striped Bass -(*Morone saxatilis*) - Striped bass utilize 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-the-year striped bass often appear in catches in May to July in size classes less than 50 mm, 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).

After several years of decline catch (since 1994) a very successful year class was observed in 2000 (2.58 fish per trawl) (Table 18, Figure 10), making it the third highest yearclass since 1979 (Figure 10).

Estimates seen in 2000, 1993, and 1987, are comparable to those seen in the early sixties prior to the major decline in the stock (Figure 10). An early gear, (U_N_3B_SW towed for 7.5 minutes (VIMS gear code 010) appeared to catch more when compared against the present gear configuration. Therefore, these estimates for the striped bass y-o-y data are adjusted slightly downward.

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, 1991; Seaver et al., 1996), and those separations are not clear at this point, for purposes of this analysis all specimens were categorized as either age-0 or age-1+. Examination of distributional data (Appendix Figures 8 & 9), reveals neither cohort of white perch are found in the main stem bay, with the highest abundances found in upper portions of each tributary. As a result, index calculations are confined to the upper strata of each tributary. The temporal component of November to February for age 1+, and December to February for y-o-y, is disturbed only by periodic abundance shown in March for age 1+ individuals, and November and March for y-o-y specimens.

The annual juvenile indices for white perch increased from 2.38 in 1999 to 16.12 in 2000 (Table 19, Figure 11). Successful yearclasses appear to be occurring every three to four years

(Figure 11). The age 1+ estimates revealed a second year of decline (mean = 16.44 fish per trawl), remaining slightly below the 22 average of 22.02 fish per trawl (Table 20, Figure 12).

As with striped bass, gear U_N_3B_SW with a tow duration of 7.5 minutes caught slightly more fish than the present gear and as such, estimated are adjusted downward (Table 19 and 20). Conversely, a length regression was applied for gear L_N_3B_SW (VIMS gear code 033), with an upward adjustment (Hata, 1997) (Table 19 and 20). Y-O-Y white perch show a similar three to four year pattern throughout the time series, while age 1+ individuals appear have declined since the sixties (Figures 11 and 12). The random stratified indices may be artificially skewed prior to 1965 since only the York River was sampled. Additionally, the random survey indices use data from all depth strata while that of the river only index only use channel stations in the estimates. Depth distribution of the species may vary greatly from year to year based on bottom water temperature.

White catfish *(Ictalurus catus)* and **Channel catfish** *(I. punctatus)* - The 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 has its specific characteristics, spawning typically occurs in late May through early July in Virginia waters, (Fewlass, 1980; Menzel, 1945), and as such, June has been selected as the start of the biological year. The survey typically catches both species up to 600 mm with juveniles in the size range of 50 mm 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 up river strata only. The index values for the age-1+ component often indicates a higher, more stable trend than the juvenile counterparts. This is due to the fact sampling is over several year classes which aid in stabilizing the population (Figures 13 to 16 and Tables 21-24). Juvenile channel catfish are often at very low level ranging from 0.0 in 1992 and 1999, to 1.27 geometric mean catch in 1989.

Catch rates for the older fish have usually been five to ten times higher. Exceptions include the 1989 and 1995 year classes which had similar values for both age components (Tables 23 and 24). Juvenile white catfish appear to be at very low levels the past three years, with the age 1+ cohort beginning to show a similar trend (Figures 13 and 14).

The only gear conversion applied to these catfish species involved gear U_T_3B_LW (VIMS code 043) which was used exclusively by the VIMS Crustaceology Department. Since this gear was used typically only between May and November, there were no impact on the catfish indices which are calculated from January to April. Catches of both y-o-y and age 1+ white cats appear highest in the years before 1965 (Figures 13 and 14, Tables 21 and 22), with 1989 the only cohort in recent years to appear as high. During these earlier years, only the York River was sampled with regularity, possibly biasing catches upward due to its small area. Indices based on individual river systems may prove more useful and deserve further investigation.

The y-o-y channel cat index shows no similar trend. Catches of juveniles is sporadic between years with a slight indication that there may be a decline (Figure 15). However, the overall trend since the 1970's was upward for the age 1+ cohort, with a downward cycle beginning 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 y-o-y have shown dramatic decline since the mid 1980's (with the exception of the 1989 year class) (Table 23 and Figure 16), 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 24 and Figure 16).

Northern Puffer *(Sphoeroides maculatus)* - The puffer is captured in small numbers primarily in the main stem 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 considered the start of the biological year with animals captured less than 50 mm. The spatial component is clearly all segments of the bay with catches first appearing in May and peaking during the late summer, July to October.

As with other species primarily captured in the main stem bay only, estimates prior to the start of the random survey of the Bay in 1988 are often suspect (due to the small sample size). Since the onset of that survey, the species has experienced a rapid, near continuous decline, dropping from a high of 0.85 in 1988, to 0.08 in 1995 (Table 25, Figure 18). However, catch rates have remained low, but relatively stable since 1993 with a range of values from 0.08 to 0.25.

Since the puffer's index is estimated from only the main-stem bay, sample sizes (trawls) were often very small if present at all (Table 25). The largest gap occurs between 1983-87, which is of concern, since the first year of the present Bay survey (1988) was the second highest estimate of abundance (Table 25 and Figure 17).

Silver Perch *(Bairdiella chrysoura)* - The drum, silver perch, uses all strata for its spatial component but interestingly, 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) begin recruiting to the fishing gear by July (Chao and Musick, 1977; Rhodes ,1971). The months September to November have the highest catch rates for all years of the expanded survey except 1991, when August had slightly higher values.

Values have been relatively stable for the expanded survey, but a large influx to the York River in 1990 made the tributary index 5 times greater than the combined index (Table 26, Figure 18).

Since the Chesapeake Bay is near the northern limits of the silver perch's typical range, abundance is probably higher during seasons with above average water temperatures. This may explain the upward trend seen in the early 90's when record temperatures were observed.

Conversions have been made for nearly every major period of the program. Catches in the years prior to 1971 were on a scale nearly 50 times greater than those seen in recent years (Figure 18 and Table 26). Observations in recent years have indicated relatively even distribution between the rivers and main stem bay, however, catches in the York system are often much higher. Since the York was the only system routinely sampled prior to 1965, it would provide justification for these much higher values.

Objective 3: *To complete analyses on gear evaluation and comparison studies which will facilitate the development of a standardized trawl survey and maximize continuity with historical data sets.*

All gear and vessel comparisons studies performed to date have been analyzed and results tabulated (Hata, 1997). Recent efforts have been placed on applying these conversions to historical data and interpreting the results. In circumstances where length samples were large for a given species, a weighted regression of mean size differences, $\overline{D}_L$, was created and applied if significant. Otherwise, an overall weighted grand mean conversion, $\overline{\overline{D}}$, was calculated and applied if the 95% confidence intervals were significantly different from zero (Hata, 1997). A summary of the results were provided in previous project segments (Geer and Austin, 1997; Geer and Austin, 1998) and in the detailed report by Hata, 1997.

The procedure to produce a relative estimate of abundance time series from 1955 to the present was similar to that described earlier with two additional steps. First, all station information were post-stratified to the present sampling scheme. This was conducted by applying the appropriate algorithm to the data to designate strata by location and depth. In addition to the regions presently sampled, other regions such as the Chickahominy, Elizabeth, Mattaponi, Piankatank, and Potomac Rivers, as well as Pocomoke Sound, Mobjack Bay, and the Atlantic Ocean, were classified since past surveys were conducted in these regions (Figure 1, Table 9). The second step was to apply the necessary gear and/or vessel conversions to the data to standardize to the present gear and research platform. This was performed by subtracting the appropriate conversion value ($\bar{\bar{D}}$ or $\bar{D}_L$)(Hata, 1997) to the log transformed catch ,ln(catch+1), of an individual sample prior to index calculations. Only the conversion factors significantly different from zero were used.

<u>Objective 4</u>: *Examine the pilot random stratified and fixed transect surveys of the York River and develop similar random stratified designs for both the Rappahannock and James Rivers.*

In the examination of these two survey types for the tributaries, it became evident that both provided significant advantages, while also providing some concerns. The fixed mid-channel transects have been sampled nearly every month for over forty five years - providing a long term basis for comparison. In addition, using the same locations consistently provided assurance against untrawlable bottom types, submerged hazards, and other problems which can destroy fishing gear. The disadvantages lie in both the range of sampling and the statistical problems created by non-random selection of trawling sites. By sampling only in the channel areas (waters greater than 12ft , $\geq$ 30ft in the lower Rappahannock River), many sampling areas are excluded. Additionally, many of the deep water locations (particularly on the Rappahannock and lower York Rivers), are characteristically anoxic during warm water months, and thus, catches may be minimal. To state these samples represent the population of a fish species on a particular river may be misleading if hypoxia events are common. Statistically, this design violates many of the assumptions associated with population estimate calculations. A random stratified sample design meets these statistical requirements but presents logistic concerns such as additional sampling effort and concerns with untrawlable and unfamiliar sampling locations. The fixed channel stations have been assigned to the appropriate strata and are sampled in addition to the monthly random stations within that strata.

With all this taken into consideration, the RSD was developed and applied to the Rappahannock River beginning in September 1995, and the James starting in March 1996. When a simple geometric mean is calculated on a monthly basis for the fixed transect survey, and compared to a weighted geometric mean from the random surveys, there often appears to be a significant correlation between the surveys for several key species (Geer and Austin, 1996a; Geer and Austin 1999). There seems to be no consistent pattern between, and within systems to which survey has the higher catch rates. However, with the surveys often showing significant correlation between catch rates, and t-test statistics only occasionally finding significant differences in their means (Geer and Austin 1999), there is confidence to continue applying these surveys to future data collections.

Objective 5: *Establish life history and age structure studies of important species, particularly those where research is limited.*

Data collected from these surveys have been used in several life history studies of target species, including Atlantic croaker (Barbieri et al., 1994), weakfish (Lowery-Barbieri et al., 1995), blackcheek tonguefish (Terwilliger and Munroe, 1999), white perch (Seaver et al., 1996), and

American eel (Owens and Geer, *in review*). Present efforts continue to be placed on lesser studied species, including scup, silver perch, and butterfish. Preliminary findings on spawning periodicity and weight specific relationships were reported in previous project segments for scup, silver perch, and American eel. Data collection is completed for these species, with ageing techniques slowly being developed.

<u>Objective 6:</u> *Conduct monitoring surveys of secondary water systems in the Virginia portion of Chesapeake Bay.*

Initial sampling was very successful on each of the four secondary water systems selected (Mobjack Bay, Pocomoke Sound, Piankatank and Great Wicomico Rivers). Through June 2000, each system was sampled once each of the last eight seasons. Unfortunately, sampling was much more sporadic this past year. The Great Wicomico and Piankatank Rivers sampling was discontinued in July 2001 due to the large number of untrawlable areas associated with commercial fishing gear and privately owned oyster beds. Vessel and weather problems limited Fall 2000 and Winter 2001 sampling to a single abbreviated sampling event on the Mobjack Bay. As a result of funding cuts, sampling on all systems was completed and/or terminated by the Spring 2001. Fortunately, funding from other sources has allowed sampling to continue on a limited basis on several systems, as well as expanding to other areas. The Environmental Protection Agency's National Coastal Assessment Program provided a limited number of samples on the Piankatank River and Mobjack Bay each of the last two years in September. CBSAC has funded a limited monitoring program of the lower Potomac and the Top portion of Virginia's Chesapeake Bay. Both programs use the same gear and similar protocol as the VIMS Trawl Survey.

Results from these secondary water systems often showed higher catch rates when compared to those for the Bay, James, York, and Rappahannock River water systems (Table 27). Summer flounder catch rates were almost always higher(particularly in the fall) in the Mobjack Bay as compared to the primary systems (Table 27, Figure 19). Weakfish showed similar results, with Mobjack Bay catch rates significantly higher than all the primary systems but the Rappahannock (Table 27, Figure 19). Nearly all the secondary water systems revealed higher catch rates for spot. In particular, The Mobjack Bay nearly always had higher (with significance) cpue's than the other systems (Table 27, Figure 20). Catch rates for Atlantic croaker were often lower than on the primary water systems. However, on several sampling events, observed catch rates were extremely high (Summer 1988 on Pocomoke Sound, and Fall 1998 on Mobjack Bay and Piankatank River) (Table 27, Figure 20). Black sea bass catches are typically concentrated in the Bay and lower James River. However, the few sampling events in the Top Bay indicate high catch rates occur in that region as well (Figure 21). Mobjack Bay appears to have significantly higher summer season catches of silver perch that the primary water systems (Table 27, Figure 21). Catches of other target species were negligible and do not warrant further examination.

The results of these surveys are worth noting. In some circumstances they appear to support results from the primary water systems. In others, it supports the notion that distribution and abundance varies significantly from one water body to the next. The Great Wicomico and Piankatank Rivers are small euryhaline systems that are dominated by mud and shell bottoms. Catch rates are sometimes higher but inconsistent, with confidence limits often very large when compared to the Mobjack Bay, Pocomoke Sound, and primary systems (Table 27). The Pocomoke Sound and Mobjack Bay are extensions of the main stem Bay. However, the fringes of these systems are bordered by submerged aquatic vegetation (SAV's) which provide better nursery grounds for many of the target species.

These comparisons were examined on each water system as a whole, and do not take into consideration the change in salinity regime that occurs on the primary water systems. These changes most definitely affect distribution and abundance of some of the species examined, and may make the differences between systems appear larger. For example, although summer flounder are sometimes captured in the upper reaches of the tributaries (salinity < 10 ppt), their abundance is low. When a tributary estimate of abundance is created, these areas would reduce the overall estimate. In contrast, a smaller system such as the Mobjack Bay, has fairly homogeneous salinities which are in the flounder's "preferred" habitat range (Geer 2001). It may be necessary to examine these data on a finer scale based on regional distribution (bottom, lower, upper, and top regions of each primary water system), to gain a full appreciate of the importance of these secondary water bodies.

DISCUSSION

Four estimates of relative abundance have been presented. The values reported as the Bay and River indices (BRI) were only for the historic fixed stations transects of the tributaries and the Bay survey as established in 1988. Two indices were presented, one from the tributaries only (1979 to present) and the other for both the Bay and rivers (1988 to present). These estimates have been the standard for this program. With the gear calibration studies now completed, older data can now be post-stratified to provide a standardized measure of relative abundance based on the present sampling scheme. These long time-series have produced converted indices (random stratified converted index - RSCI) and unconverted indices (random stratified index - RSI), for the 12 target species discussed. However, these newly developed indices should be considered preliminary and are still being tested. The actual process of creating conversion values from over 600 comparison trawls was tedious, but most often straight forward. Applying these conversions to over six million observations in the 46 year database was also time consuming. Only those conversions which proved to have mean differences statistically different from zero were used (Hata, 1997).

It is unlikely that post-stratifying past data into the present sampling scheme will cause any major difficulties. All previous random surveys performed by the program were based on some type of depth stratification system. The fixed mid-channel transect stations most often represent the 12 to 30 ft (3.66-9.14 m) strata. A more pressing issue concerns periods of missing data and/or lack of samples in a particular area. With all data standardized to the present sampling gear and design, missing data can tend to skew results. For example, the silver perch RSI and RSCI indicate very large catch rates prior to 1964, and near zero since (Figure 18). In fact, unconverted catch rates appear 50 times as much as those since the Bay - River index (BRI) was established for data after 1979 . Interpreting these data can cause much speculation and concern. These results are more than likely due to the absence of data from particular systems. The silver perch index is calculated from the months of September to November in all regions presently sampled (James regions J1-J4; York regions Y1-Y4, Rappahannock regions R1-R4, Bay regions B1-B3). It is unlikely missing data from the temporal components would have a large impact. Indices are calculated over a three to four month period of peak abundance, and rarely is peak abundance observed outside that window. The spatial component however, may cause drastic changes if distribution and abundance are not similar between the regions. In the case of silver perch, the York often has the highest catch rates and is the smallest (in area and strata weighing) system sampled. If all systems are sampled, large catches on the York are reduced when multiplied by its small percentage to the total sampling area. Unfortunately, prior to 1964 the York was the only system routinely sampled. Since no other system was sampled, the ratio of each York River strata to the total area for those years was higher, and thus the index was artificially inflated upward.

A method to combat this concern will need to be developed. Applying a simple ratio of catch by system has been suggested, but that assumes a near steady state between systems which may or may not occur. Fortunately for many of these target species, this problem can be resolved by creating an estimate of abundance for each system as well as a comprehensive value. This can be done for species which are confined to a system by some type of barrier (salinity). White perch, white and channel catfish, and possibly y-o-y striped bass will be further examined in this fashion. The other target species are all highly migratory (even as juveniles), and as such, a single system index would merely reveal nursery utilization for the small temporal period sampled. Other methods will need to be devised to address missing spatial data for these species.

Even though there are still concerns with use of older data in the present sampling scheme, great steps have been made to incorporate these data into a meaningful time-series. Efforts continue on validating older data, and comparing these historical values against data presently being collected. The calibration studies have produced a wealth of information, and have continued to spark interest into other gear and vessel topics. 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). With expansion to other regions of interest beginning in July 1998 (particularly Piankatank, Great Wicomico, Mobjack Bay, and Pocomoke Sound), annual effort was the highest in the program's history. Unfortunately, with secure funding once again becoming a major issue, objectives and goals may need to be altered.

The juvenile indices presented here must be kept in a geographic context. This is evident by their absence during the winter months, as the first six species, northern puffer, and silver perch, are highly migratory and only use the Bay nursery grounds during the summer months. Chesapeake Bay constitutes a major nursery area for all of them (with the possible exception of black sea bass and scup) but is certainly only one of several along the Atlantic seaboard for these stocks. With the exception of weakfish and the anadromous species, all of the juveniles recruited to the Chesapeake Bay nursery areas are the result of 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, but this will only be verified through comparisons with recruitment in other nursery areas. Assessment of annual recruitment success for coastal Atlantic finfish populations as a whole will require multi-state monitoring efforts, and may complete validation of area-specific juvenile indices.

A random stratified sampling approach, if coupled with knowledge of gear efficiencies and physical sampling frames, can be used to provide population estimates as well as relative indices of abundance. However, 47 years of sampling the same locations, (as it has been performed on the tributary survey) can not be ignore and provides an excellent reference to historical fish stocks. If these fixed locations can be incorporated into a random stratified design, and still meet the assumptions of that design, then there will be a reference point to the past, with a sampling design to meet future research and management goals. It is hoped the initiation of random stratified surveys on the tributaries will provide the basis for incorporating the fixed tributary stations into a random sampling design. With this design now fully in place, resources should be secured so the present design can remain intact without alteration, to provide a consistent and scientifically sound program for future fisheries needs.

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TABLES

Table 1. 2000 National Marine Fisheries Service's Marine Recreational Fisheries Statistic Survey (NMFS MRFSS) for Virginia Waters. Key: A=Fish caught, landed, and identified; B=Fish caught but not kept; B1=Fish caught, fileted or released dead; B2=Fish caught and released live.

Total Catch = Type A+B1+B2

Total Weight = Type A + B1

Species Name	Catch in Numbers				Catch by Weight (kg)			
	Total	Percent	Cumulative Percent	Rank	Weight	Percent	Cumulative Percent	Rank
ATLANTIC CROAKER	12,903,612	50.10	50.10	1	2,152,501	37.25	37.25	1
SUMMER FLOUNDER	3,118,591	12.11	62.21	2	539,954	9.34	71.86	4
BLACK SEA BASS	1,960,840	7.61	69.82	3	233,197	4.04	82.29	6
STRIPED BASS	1,312,981	5.10	74.92	4	880,800	15.24	52.50	2
WEAKFISH	1,187,320	4.61	79.53	5	219,312	3.80	86.08	7
SPOT	998,169	3.88	83.40	6	111,163	1.92	88.01	8
HERRINGS	712,557	2.77	86.17	7	1,761	0.03	99.93	30
BLUEFISH	456,710	1.77	87.94	8	72,254	1.25	93.89	12
KINGFISHES	397,971	1.55	89.49	9	16,372	0.28	98.79	20
TOADFISHES	346,447	1.35	90.83	10	0	0.00	100.00	36
SPOTTED SEATROUT	345,160	1.34	92.17	11	86,369	1.49	91.19	10
FRESHWATER CATFISHES	267,468	1.04	93.21	12	97,608	1.69	89.70	9
OTHER FISHES	257,197	1.00	94.21	13	369,312	6.39	78.25	5
RED DRUM	214,196	0.83	95.04	14	42,232	0.73	96.46	15
WHITE PERCH	173,709	0.67	95.72	15	2,256	0.04	99.90	29
SPANISH MACKEREL	149,413	0.58	96.30	16	36,875	0.64	97.10	16
SKATES/RAYS	139,843	0.54	96.84	17	0	0.00	100.00	37
MULLETS	127,417	0.49	97.33	18	1,050	0.02	99.97	32
SILVER PERCH	112,789	0.44	97.77	19	10,734	0.19	99.48	23
PIGFISH	109,211	0.42	98.20	20	5,672	0.10	99.58	24
OTHER SHARKS	71,962	0.28	98.47	21	31,695	0.55	98.21	18
PUFFERS	69,232	0.27	98.74	22	3,158	0.05	99.86	28
TAUTOG	46,983	0.18	98.93	23	83,657	1.45	92.64	11
OTHER FLOUNDERS	40,021	0.16	99.08	24	0	0.00	100.00	38
ATLANTIC MACKEREL	38,619	0.15	99.23	25	14,757	0.26	99.04	21
PINFISHES	29,347	0.11	99.35	26	1,064	0.02	99.95	31
DOLPHINS	28,948	0.11	99.46	27	43,448	0.75	95.73	14
OTHER TUNAS/MACKERELS	24,519	0.10	99.55	28	578,820	10.02	62.52	3
SCUP	21,845	0.08	99.64	29	785	0.01	99.98	33
DOGFISH SHARKS	19,531	0.08	99.71	30	14,390	0.25	99.29	22
KING MACKEREL	17,338	0.07	99.78	31	32,260	0.56	97.66	17
SEAROBINS	13,926	0.05	99.83	32	627	0.01	99.99	34
LITTLE TUNNY/ATLANTIC BONITO	13,628	0.05	99.89	33	17,152	0.30	98.51	19
EELS	10,176	0.04	99.93	34	449	0.01	100.00	35
GREATER AMBERJACK	6,748	0.03	99.95	35	63,061	1.09	94.98	13
TRIGGERFISHES/FILEFISHES	4,537	0.02	99.97	36	4,656	0.08	99.75	26
BLACK DRUM	3,495	0.01	99.98	37	5,332	0.09	99.67	25
SHEEPSHEAD	2,449	0.01	99.99	38	3,273	0.06	99.81	27
OTHER CODS/HAKES	1,408	0.01	100.00	39	0	0.00	100.00	39
OTHER PORGIES	91	0.00	100.00	40	0	0.00	100.00	40
OTHER WRASSES	29	0.00	100.00	41	0	0.00	100.00	41
Total	25,756,433				5,778,006			

Table 2. Substrate, or habitat types described to date (May 1998 to July 2001), with various statistical information.

Substrate Description	Code	Percent of Stations[1]	Mean Quantity[2]	Min	Max
Artificial	ART	2.46	0.58	0.1	3.0
Dead man's fingers	DMF	6.99	0.41	0.1	5.0
Detritus	DET	28.13	0.30	0.1	10.0
Hydroid	HYD	37.86	0.33	0.1	5.0
Mud (soft) bottom	MUD	6.52	1.00	1.0	1.0
Sand (hard) bottom	SND	4.06	1.00	1.0	1.0
Sea Squirts *(Mogula spp.)*	SQT	20.15	0.79	0.1	14.0
Seaweeds (red, green, or brown)	SWD	17.90	0.36	0.1	10.0
Shell (oyster, clam, etc)	SHL	18.83	0.47	0.1	5.0
Sponges (yellow, orange, etc)	SPG	7.54	0.70	0.1	6.0
Submerged Aquatic Vegetation	SAV	6.59	0.32	0.1	3.0
Tube Worms	TUB	7.13	0.22	0.1	1.0
Undetermined	UNK	7.43	1.00	1.0	1.0

Sand and Mud are only used when no other substrate type is present, and verification can be confirmed by direct observation or sediment grab. Values for these and Unknown are always given as 1.0.

1. Based on the number of occurrences of a habitat type divided by the total number of trawls, 4,308.
2. Mean Quantity refers only to stations where that habitat type was observed.

Abundance is estimated relative to the capacity of a commercial nest tote (internal dimensions 25.7"x16.7"x10", approximately 72 liters). Categories include: 0.1 = trace, 0.5 = < ¼ bin, 1 = ¼ bin, 2 = ½ bin, 3 = ¾ 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. Number of potential trawl sites and approximate square miles of exploratory sampling strata for the Pocomoke River, Mobjack Bay, and Great Wicomico and Piankatank Rivers.

Region	Stratum	Description	No .of Points	Percent of System	Square Miles (NM)	Number of Samples per Quarter
Pocomoke Sound						
Region CP	110	CP 4-12'	734	63.17	47.39	4
	111	CP 12-30'	344	29.60	22.21	4[A]
	112	CP 30-42'	30	2.58	1.94	3[A]
	113	CP ≥42'	54	4.65	3.49	3[A]
			1162		75.02	14
Mobjack Bay	090	MB 4-12'	114	17.17	7.36	4[A]
Region MB	091	MB ≥ 12'	310	46.69	20.01	5[B]
Severn, Ware, East, &	092	MB Tribs. 4-12'	154	23.19	9.94	2
North Rivers	093	MB Tribs. ≥ 12'	86	12.95	5.55	6[C]
			664		42.87	17
Great Wicomico River	121	GW 4-12'	154	78.57	9.94	3
Region GW	122	GW ≥ 12'	42	21.43	2.71	3
			196		12.65	6
Piankatank River	105	PK 4-12'	133	50.57	8.59	2
Region PK	106	PK ≥ 12'	130	49.43	8.39	5[D]
			263		16.98	7

Number of Fixed Stations: A=1, B=2, C=4, D=3

Table 8. 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	687	44.35	071
	J13	30.2	JA01			076
	J17	22.0	JA01			075
	J24	35.0	JA02			079
	J27	28.0	JA02	364	23.50	078
	J35	29.0	JA02			081
	J40	12.0	JA02			081
York R.	Y02	35.0	YK01			032
	Y05	40.0	YK01	372	24.02	032
	Y10	29.9	YK01			035
	Y15	25.0	YK01			035
	Y20	20.0	YK02			038
	Y25	25.0	YK02			038
	Y30	20.0	YK02	184	11.88	040
	Y35	20.0	YK02			040
	Y40	13.0	YK02			040
Rappahannock R.	R02	60.0	RA01			053
	R10	60.0	RA01	283	18.27	053
	R15	50.0	RA01			057
	R20	50.0	RA01			057
	R25	29.9	RA02			059
	R30	20.0	RA02	190	12.26	062
	R35	20.0	RA02			062
	R40	12.1	RA02			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 9. Summary of samples collected, 1955 - August 2001. 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
	OT	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 9. Sample collection history of the VIMS trawl survey, 1955 - September 2001 (partially completed). RSD surveys (1991- present) of the tributaries included. Codes are on attached key.

YR	TOT	SAMPLE TYPE			MONTH												WATER SYSTEM					
		ALL	CRAB	FISH	J	F	M	A	M	J	J	A	S	O	N	D	CL	JA	PO	RA	YK	ZZ
1955	31	0	0	31	0	3	1	3	1	5	14	1	3	0	0	0	6	0	0	0	25	0
1956	135	103	0	32	0	0	0	16	17	0	17	20	17	16	16	16	43	0	0	0	92	0
1957	141	113	0	28	12	16	16	0	12	0	4	16	17	16	16	16	46	0	0	0	95	0
1958	192	167	0	25	16	16	13	16	19	16	15	17	16	16	16	16	56	0	0	0	136	0
1959	117	86	2	29	0	0	0	14	3	16	19	16	16	16	17	0	32	0	0	0	85	0
1960	57	42	0	15	0	0	0	0	16	14	14	13	0	0	0	0	19	0	0	0	38	0
1961	89	19	16	54	6	0	0	4	10	12	8	8	11	12	10	8	15	0	0	0	74	0
1962	116	6	35	75	8	8	8	5	12	19	8	8	11	11	11	7	18	0	0	17	81	0
1963	142	25	45	72	6	8	9	13	16	18	14	9	19	13	9	8	19	0	0	22	101	0
1964	190	104	36	50	23	9	9	12	20	22	18	15	14	19	14	15	24	62	0	0	104	0
1965	189	106	5	78	22	13	17	14	14	14	14	19	14	15	12	21	1	71	0	23	94	0
1966	214	138	3	73	14	21	25	16	17	17	17	23	13	18	16	17	21	70	0	9	114	0
1967	259	195	2	62	15	17	31	17	17	24	23	23	23	23	23	23	23	67	0	61	108	0
1968	262	215	2	45	14	16	16	23	23	23	21	31	23	23	23	26	23	70	0	65	104	0
1969	286	281	1	4	23	23	24	24	24	24	24	24	24	24	24	24	23	72	0	83	108	0
1970	359	276	1	82	17	24	24	24	24	24	51	24	51	23	51	22	23	70	0	80	105	81
1971	804	346	57	401	51	18	51	55	61	63	103	82	74	82	82	82	24	80	0	96	449	155
1972	851	168	97	586	73	73	73	56	56	75	71	85	43	98	94	54	14	86	0	95	545	111
1973	871	179	0	692	54	53	11	56	80	202	91	91	105	105	23	0	88	67	0	80	591	45
1974	748	175	0	573	156	137	75	0	27	26	166	62	55	26	18	0	138	147	73	174	216	0
1975	795	435	7	353	194	128	16	0	18	18	349	18	18	18	18	0	162	148	60	194	231	0
1976	1141	308	0	833	184	141	23	40	40	40	525	40	40	36	32	0	174	340	60	318	249	0
1977	876	182	0	694	0	0	182	0	26	26	493	71	26	26	26	0	113	243	8	284	228	0
1978	1130	208	0	922	94	214	79	0	26	90	396	66	26	26	26	87	171	366	78	220	285	10
1979	810	321	0	489	282	70	124	0	36	41	47	46	37	44	44	39	60	267	63	159	260	1
1980	559	248	0	311	28	48	46	18	49	51	50	50	58	52	52	57	129	145	0	115	170	0
1981	486	243	1	242	41	34	52	17	52	46	52	24	39	42	38	49	52	146	18	97	173	0
1982	580	261	0	319	11	67	80	54	53	40	40	45	50	46	46	48	43	180	37	140	180	0
1983	482	295	0	187	32	54	14	15	40	39	39	38	38	65	50	58	0	162	19	118	183	0
1984	475	261	1	213	19	13	38	45	50	49	47	46	37	49	49	33	0	212	21	95	147	0
1985	335	191	0	144	36	26	26	26	35	12	38	39	27	45	0	25	0	120	17	75	123	0
1986	374	374	0	0	22	24	25	24	37	35	37	37	37	37	36	23	0	135	0	117	122	0
1987	334	334	0	0	23	24	23	24	36	37	33	34	32	34	34	0	0	108	0	108	118	0
1988	889	802	87	0	69	69	62	48	82	82	82	82	82	82	80	69	576	97	0	105	111	0
1989	840	749	91	0	61	61	61	66	76	76	76	76	76	76	76	59	479	108	0	124	129	0
1990	827	739	88	0	61	61	61	61	76	76	77	75	76	69	76	58	473	108	0	119	127	0
1991	930	840	90	0	61	25	61	61	73	94	95	95	97	97	97	74	411	108	0	120	291	0
1992	982	891	91	0	79	47	79	79	97	88	88	88	89	88	88	72	404	110	0	124	344	0
1993	915	824	91	0	40	73	40	71	88	89	88	88	88	88	87	75	370	110	0	126	309	0
1994	911	820	91	0	40	73	40	73	88	88	88	88	88	88	88	69	368	110	0	124	309	0
1995	993	980	13	0	40	73	40	73	92	88	88	88	105	105	99	102	411	96	0	201	285	0
1996	1176	1176	0	0	52	91	71	106	106	107	108	108	107	108	107	105	435	228	0	258	255	0
1997	1220	1220	0	0	68	105	66	98	110	111	111	112	111	112	111	105	425	265	0	264	266	0
1998	1262	1262	0	0	66	105	66	105	111	111	128	59	138	124	130	119	388	265	0	256	264	89
1999	1382	1382	0	0	79	122	80	122	120	118	119	118	122	124	131	127	402	264	0	264	265	187
2000	1367	1367	0	0	52	129	85	101	158	111	128	125	121	141	111	105	433	250	17	266	265	136
2001	681	681	0	0	30	30	30	75	110	142	111	111	42	0	0	0	210	140	17	139	164	11
TOT	28805	20138	953	7714	2274	2362	1973	1770	2354	2519	4245	2454	2356	2378	2207	1913	7345	5693	488	5335	9118	826

YR	RESEARCH VESSEL							GEAR CODE							STAT. TYPE		TOW DURATION/DISTANCE				
	BR	FH	JS	LA	PA	RE	ZZ	10	33	43	68	70	108	OT	F	R	5	7.5	15	OT	DIS
1955	0	0	0	0	0	0	31	31	0	0	0	0	0	0	31	0	0	12	17	2	0
1956	0	0	0	0	0	0	135	135	0	0	0	0	0	0	135	0	0	6	127	2	0
1957	0	0	0	0	85	0	56	141	0	0	0	0	0	0	141	0	0	44	97	0	0
1958	0	0	0	0	192	0	0	192	0	0	0	0	0	0	192	0	0	58	134	0	0
1959	0	0	0	0	117	0	0	117	0	0	0	0	0	0	117	0	0	34	83	0	0
1960	0	0	0	0	57	0	0	57	0	0	0	0	0	0	57	0	0	10	44	3	0
1961	0	0	0	0	89	0	0	89	0	0	0	0	0	0	89	0	0	26	63	0	0
1962	0	0	0	22	94	0	0	116	0	0	0	0	0	0	116	0	0	31	84	1	0
1963	0	0	0	63	79	0	0	142	0	0	0	0	0	0	142	0	0	37	102	3	0
1964	0	0	0	75	115	0	0	190	0	0	0	0	0	0	190	0	1	36	149	4	0
1965	0	0	0	44	145	0	0	189	0	0	0	0	0	0	189	0	0	38	145	6	0
1966	0	0	0	184	30	0	0	214	0	0	0	0	0	0	214	0	0	51	163	0	0
1967	0	0	0	16	243	0	0	259	0	0	0	0	0	0	259	0	0	58	192	9	0
1968	0	0	0	4	258	0	0	259	3	0	0	0	0	0	262	0	10	66	180	6	0
1969	0	0	0	0	286	0	0	286	0	0	0	0	0	0	286	0	1	86	189	10	0
1970	14	0	0	0	314	0	31	305	0	0	0	0	0	54	359	0	3	173	177	6	0
1971	154	0	0	50	358	234	8	372	0	32	0	0	0	400	572	232	440	172	189	3	0
1972	73	0	0	154	193	431	0	246	0	101	0	0	0	504	506	345	657	104	89	1	0
1973	126	0	0	64	237	444	0	0	122	179	0	0	0	570	304	567	751	0	0	120	0
1974	0	0	0	568	105	75	0	0	498	175	0	0	0	75	478	270	257	0	0	38	453
1975	117	0	0	429	176	73	0	0	535	126	0	0	0	134	126	669	471	0	0	2	322
1976	230	0	6	466	262	177	0	0	426	308	0	0	0	407	308	833	816	0	0	0	325
1977	172	0	23	269	130	282	0	0	240	182	0	0	0	454	182	694	771	0	0	0	105
1978	22	0	73	544	153	179	159	0	583	181	0	0	0	366	181	949	551	0	16	2	561
1979	0	0	43	371	333	63	0	2	461	0	284	0	0	63	285	525	485	0	0	2	323
1980	0	0	367	0	192	0	0	0	140	0	0	419	0	0	362	197	558	0	0	1	0
1981	0	0	424	0	16	0	46	0	0	0	0	486	0	0	295	191	478	0	0	8	0
1982	0	0	580	0	0	0	0	0	0	0	0	538	0	42	364	216	577	0	0	3	0
1983	0	0	482	0	0	0	0	0	0	0	0	465	0	17	367	115	478	0	0	4	0
1984	0	0	461	0	0	0	14	0	3	0	0	472	0	0	475	0	471	0	0	4	0
1985	0	0	285	0	0	0	50	0	0	0	0	335	0	0	335	0	333	0	0	2	0
1986	0	0	374	0	0	0	0	0	0	0	0	374	0	0	374	0	374	0	0	0	0
1987	0	0	334	0	0	0	0	0	0	0	0	334	0	0	334	0	333	0	0	0	1
1988	0	0	889	0	0	0	0	0	0	0	0	889	0	0	313	576	885	0	0	0	4
1989	0	0	840	0	0	0	0	0	0	0	0	840	0	0	361	479	840	0	0	0	0
1990	0	279	548	0	0	0	0	0	0	0	0	827	0	0	354	473	826	0	0	0	1
1991	0	930	0	0	0	0	0	0	0	0	0	0	930	0	357	573	928	0	0	1	1
1992	0	982	0	0	0	0	0	0	0	0	0	0	982	0	361	621	975	0	0	7	0
1993	0	915	0	0	0	0	0	0	0	0	0	0	915	0	365	550	914	0	0	1	0
1994	0	911	0	0	0	0	0	0	0	0	0	0	911	0	363	548	906	0	0	5	0
1995	0	993	0	0	0	0	0	0	0	0	0	0	993	0	314	679	984	0	0	9	0
1996	0	1176	0	0	0	0	0	0	0	0	0	0	1176	0	279	897	1168	0	0	6	2
1997	0	1220	0	0	0	0	0	0	0	0	0	0	1220	0	302	918	1217	0	0	3	0
1998	0	1262	0	0	0	0	0	0	0	0	0	0	1262	0	322	940	1261	0	0	1	0
1999	0	1382	0	0	0	0	0	0	0	0	0	0	1382	0	363	1019	1380	0	0	2	0
2000	0	1367	0	0	0	0	0	0	0	0	0	0	1367	0	363	1004	1367	0	0	0	0
2001	0	576	0	0	0	0	105	0	0	0	0	0	681	0	180	501	679	0	0	0	2
TOT	908	11993	5729	3323	4259	1958	635	3342	3011	1284	284	5979	11819	3086	13224	15581	23146	1042	2240	277	2100

Table 10. Spatial, temporal and length criteria used to calculate indices.

VIMS Trawl Survey - Area/Time/Size Values by Species

Species-Age	VIMS SP. CODE	Bay Bottom	Bay Lower	Bay Upper	James Lower	James Upper	York Lower	York Upper	Rapp Lower	Rapp 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**

Month: Size Cutoff Values - Darkened Areas Represent Index Months

Table 11. Converted (RSCI) and unconverted (RSI) indices for spot, with reference to originally reported bay and river index (BRI) values since1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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			

Continued

Table 11. Spot indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	50.20	231,84
1989	22.46	17.7-28.45	3.60	31.41	24.51-40.18	3.44	252	32.27	54.19	252,84
1990	33.88	24.63-46.46	4.34	44.78	32.34-61.85	4.14	248	45.28	53.06	248,81
1991	16.83	12.78-22.08	4.48	16.83	12.78-22.08	4.48	334	16.56	21.44	238,83
1992	2.02	1.54-2.58	7.78	2.02	1.54-2.58	7.78	301	1.96	4.39	238,82
1993	9.99	7.45-13.3	5.48	9.99	7.45-13.3	5.48	300	9.74	11.85	240,84
1994	9.68	7.28-12.79	5.38	9.68	7.28-12.79	5.38	300	9.07	8.88	240,84
1995	1.81	1.39-2.3	7.87	1.81	1.39-2.3	7.87	352	1.52	2.37	240,84
1996	5.26	4.15-6.6	5.30	5.26	4.15-6.6	5.30	407	4.52	4.84	244,88
1997	11.50	9.11-14.45	4.20	11.50	9.11-14.45	4.20	421	8.63	19.68	256,100
1998	2.51	1.92-3.23	7.36	2.51	1.92-3.23	7.36	374	1.88	3.04	214,96
1999	4.72	3.63-6.07	6.07	4.72	3.63-6.07	6.07	402	3.98	6.61	238,100
2000	3.32	2.57-4.23	6.51	3.32	2.57-4.23	6.51	421	2.70	4.94	253,97
2001*	2.89	2.08-3.92	8.61	2.89	2.08-3.92	8.61	248	2.48	3.34	151,59

Table 12. Converted (RSCI) and unconverted (RSI) indices for fall Atlantic croaker (1955-2000), with reference to originally reported bay and river index (BRI) values (1979-2000).

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1955	.	0.00	.	.	0.00	.	.			
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	1.60	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	.	0.00	.	.	0.00	.	.			
1961	1.20	1.02-1.39	5.40	0.77	0.67-0.88	4.94	15			
1962	0.30	0-1.02	83.36	0.30	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	2.00	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	2.10	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	3.40	1.74-6.05	15.97	1.96	1.03-3.32	17.38	61			
1971	4.70	2.85-7.44	11.29	2.45	1.55-3.68	12.31	177			
1972	6.10	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	5.80	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			

Continued

Table 12. Fall Atlantic croaker indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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		14.59	/ 67
1993	4.54	2.84-7	10.72	4.54	2.84-7	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		14.33	/75
2000	7.68	5.50-10.60	6.70	7.68	5.50-10.60	6.70	197		5.96	/74
2001										

Table 13. Converted (RSCI) and unconverted (RSI) indices for spring Atlantic croaker, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0-0.08	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			

Continued

Table 13. Spring Atlantic croaker indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	2.22	234 / 84
1989	0.60	0.38-0.85	15.51	0.65	0.41-0.93	15.63	252	0.78	4.63	252 / 84
1990	0.43	0.23-0.67	21.19	0.48	0.26-0.74	20.56	252	0.52	2.98	252 / 85
1991	4.41	3.08-6.18	8.36	4.41	3.08-6.18	8.36	307	4.35	12.87	238 / 83
1992	1.28	0.87-1.78	12.10	1.28	0.87-1.78	12.10	309	1.34	10.26	240 / 84
1993	2.17	1.5-3.02	10.34	2.17	1.5-3.02	10.34	301	2.21	19.40	240 / 84
1994	0.90	0.6-1.26	13.54	0.90	0.6-1.26	13.54	300	0.95	2.98	240 / 84
1995	1.06	0.77-1.39	10.40	1.06	0.77-1.39	10.40	306	0.93	5.55	246 / 90
1996	0.19	0.11-0.28	19.63	0.19	0.11-0.28	19.63	405	0.16	0.36	242 / 88
1997	1.47	1.15-1.85	7.78	1.47	1.15-1.85	7.78	419	0.87	7.78	255 2100
1998	1.19	0.95-1.47	7.51	1.19	0.95-1.47	7.51	374	0.48	6.21	214 / 96
1999	1.50	1.05-2.05	10.83	1.50	1.05-2.05	10.83	397	1.28	4.08	232 / 100
2000	0.60	0.42-0.80	12.68	0.60	0.42-0.80	12.68	413	0.44	1.39	245 / 97
2001	0.36	0.24-0.49	14.65	0.36	0.24-0.49	14.65	419	0.32	1.18	253 / 98

Table 14. Converted (RSCI) and unconverted (RSI) indices for weakfish, with reference to originally reported bay and river index (BRI) values since1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1955	2.35	0.00	.	3.07	0.00	.	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	61.56	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	31.41	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			

Continued

Table 15. Converted (RSCI) and unconverted (RSI) indices for summer flounder, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	1.22-3.42	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	.	.			
1961	0.19	0-0.61	85.91	0.01	0-0.03	100.00	11			
1962	0.00	0.00	.	0.00	0.00	.	7			
1963	2.07	0.78-4.29	24.24	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	0-1.46	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	0.03-0.37	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			

Continued

Table 14. Weakfish indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	21.72	173 / 63
1989	11.91	8.33-16.86	6.34	11.74	8.18-16.68	6.44	189	12.22	21.27	189 / 63
1990	4.29	2.99-6.03	8.52	4.46	3.1-6.26	8.44	184	4.87	30.01	184 / 59
1991	3.21	2.38-4.25	7.64	3.21	2.38-4.25	7.64	252	3.56	15.32	179 / 62
1992	6.78	4.79-9.47	7.21	6.78	4.79-9.47	7.21	226	6.93	15.91	178 / 61
1993	5.84	4.12-8.15	7.55	5.84	4.12-8.15	7.55	225	6.12	15.42	180 / 63
1994	2.60	1.84-3.55	9.21	2.60	1.84-3.55	9.21	225	2.67	7.04	180 / 63
1995	6.62	4.89-8.86	6.34	6.62	4.89-8.86	6.34	275	6.07	11.00	186 / 69
1996	7.26	5.33-9.78	6.31	7.26	5.33-9.78	6.31	305	7.85	7.42	183 / 66
1997	6.81	5.26-8.74	5.38	6.81	5.26-8.74	5.38	316	7.15	14.82	1912927/5
1998	7.60	5.46-10.45	6.65	7.60	5.46-10.45	6.65	269	8.18	9.95	150 / 71
1999	6.78	5.01-9.06	6.28	6.78	5.01-9.06	6.28	303	7.38	16.25	180 / 75
2000	8.35	6.34-10.92	5.42	8.35	6.34-10.92	5.42	316	9.39	11.09	191 / 74
2001*	11.75	7.92-17.23	7.03	11.75	7.92-17.23	7.03	143	10.19	19.33	88 / 34

Table 15. Summer flounder indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.54	143 / 36
1989	1.24	0.94-1.58	8.77	1.24	0.94-1.58	8.77	162	1.23	0.96	162 / 36
1990	2.54	2.06-3.09	5.73	2.54	2.06-3.09	5.73	162	2.54	2.61	162 / 36
1991	2.81	2.28-3.41	5.51	2.81	2.28-3.41	5.51	207	2.78	1.42	153 / 36
1992	0.92	0.7-1.16	9.09	0.92	0.7-1.16	9.09	187	0.91	0.49	153 / 36
1993	0.52	0.37-0.67	11.77	0.52	0.37-0.67	11.77	185	0.53	0.49	153 / 36
1994	2.50	1.99-3.1	6.30	2.50	1.99-3.1	6.30	186	2.50	1.08	153 / 36
1995	0.71	0.53-0.91	10.21	0.71	0.53-0.91	10.21	218	0.72	0.74	149 / 36
1996	0.81	0.62-1.02	9.32	0.81	0.62-1.02	9.32	224	0.86	0.62	153 / 36
1997	0.89	0.69-1.12	8.77	0.89	0.69-1.12	8.77	226	0.97	0.70	153 / 36
1998	0.73	0.55-0.93	9.92	0.73	0.55-0.93	9.92	226	0.78	0.17	153 / 36
1999	0.53	0.41-0.67	9.94	0.53	0.41-0.67	9.94	219	0.58	0.36	147 / 36
2000	0.57	0.43-0.73	10.81	0.57	0.43-0.73	10.81	227	0.62	0.52	154 / 36
2001*	0.54	0.28-0.84	20.92	0.54	0.28-0.84	20.92	28	0.51	0.00	19 / 4

Table 16. Converted (RSCI) and unconverted (RSI) indices for black sea bass, with reference to originally reported bay and river index (BRI) values since 1979

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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			

Continued

Table 16. Black sea bass indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1978	2.75	0.35-9.41	38.61	2.75	0.35-9.41	38.61	16		0.86	
1979	0.11	0-0.24	56.90	0.11	0-0.24	56.90	34		0.15	/ 16
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	/ 23
1982	0.46	0.16-0.83	30.13	0.46	0.16-0.83	30.13	25		0.40	/ 22
1983	0.67	0.12-1.49	38.63	0.67	0.12-1.49	38.63	16		0.44	/ 25
1984	1.29	0.63-2.21	20.63	1.29	0.63-2.21	20.63	12		0.73	/ 16
1985	2.04	0.95-3.75	20.01	2.04	0.95-3.75	20.01	18		1.19	/ 12
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		0.95	124 / 12
1988	0.84	0.59-1.13	11.89	0.84	0.59-1.13	11.89	138	1.58	1.04	138 / 12
1989	2.36	1.7-3.17	8.93	2.36	1.7-3.17	8.93	138	0.83	1.52	138 / 12
1990	1.12	0.78-1.53	11.63	1.12	0.78-1.53	11.63	128	2.36	0.50	128 / 12
1991	1.28	0.91-1.72	10.76	1.28	0.91-1.72	10.76	129	1.12	2.35	129 / 12
1992	0.22	0.13-0.32	18.86	0.22	0.13-0.32	18.86	129	1.29	0.19	129 / 12
1993	1.05	0.74-1.42	11.46	1.05	0.74-1.42	11.46	129	0.22	0.76	129 / 12
1994	1.06	0.74-1.45	11.85	1.06	0.74-1.45	11.85	129	1.04	0.60	129 / 12
1995	0.50	0.33-0.69	14.47	0.50	0.33-0.69	14.47	151	1.06	0.62	127 / 12
1996	0.36	0.22-0.52	17.99	0.36	0.22-0.52	17.99	152	0.54	0.38	128 / 12
1997	0.46	0.31-0.63	14.63	0.46	0.31-0.63	14.63	153	0.35	0.23	129 / 12
1998	0.57	0.35-0.82	16.40	0.57	0.35-0.82	16.40	135	0.59	0.32	111/12
1999	0.58	0.41-0.77	12.22	0.58	0.41-0.77	12.22	146	0.60	0.48	122 / 12
2000	0.72	0.48-0.99	13.49	0.72	0.48-0.99	13.49	152	0.75	0.93	128 / 12
2001										

Table 17. Converted (RSCI) and unconverted (RSI) indices for scup, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1954	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	4			
1972	0.00	0.00	.	0.00	0.00	.	58			
1973	4.67	2.8-7.45	11.51	4.67	2.8-7.45	11.51	61			
1974	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	73			

Continued

Table 17. Scup indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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*	1.52	0.98-2.21	13.03	1.52	0.98-2.21	13.03	92	1.52		92 /

Table 18. Converted (RSCI) and unconverted (RSI) indices for striped bass, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1954							0			
1955							0			
1956	1.47	0.03-4.95	48.63	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	24.14	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			

Continued

Table 18. Striped bass indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	1.31	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	0.00-0.46	51.55	0.21	0.00-0.46	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										

Table 19. Converted (RSCI) and unconverted (RSI) indices for y-o-y white perch, with reference to originally reported bay and river index (BRI) values since 1979

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.00	.	0.00	0.00	.	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	0.38-0.81	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			

Continued

Table 19. YOY white perch indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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										

Table 20. Converted (RSCI) and unconverted (RSI) indices for age 1+ white perch, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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			

Continued

Table 20. Age 1+ white perch indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	21.9-56.84	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	10.13	9.03	5.29-15	10.13	116		12.78	/ 50
1997	19.37	10.56-34.9	9.40	19.37	10.56-34.9	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										

Table 21. Converted (RSCI) and unconverted (RSI) indices for y-o-y white catfish, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.91-2.17	13.99	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			

Continued

Table 21. YOY white catfish indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.00-0.01	100.00	0.003	0.00-0.01	100.00	114		0.00	/ 52
2000	0.05	0.00-0.12	58.53	0.05	0.00-0.12	58.53	120		0.09	/ 52
2001										

Table 22. Converted (RSCI) and unconverted (RSI) indices for age 1+ white catfish, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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			

Continued

Table 22. Age 1+ white catfish indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.76-1.4	10.78	1.05	0.76-1.4	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	0.56	0.36-0.79	15.31	0..5	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										

Table 23. Converted (RSCI) and unconverted (RSI) indices for y-o-y channel catfish, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1954	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	5			
1959							0			
1960	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	39			
1977	0.06	0-0.11	47.28	0.06	0-0.11	47.28	59			

Continued

Table 23. YOY channel catfish indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0-0.1	72.68	0.04	0-0.1	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	0.00	.	0.00	0.00	.	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	0.07-0.4	33.76	0.22	0.07-0.4	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	0.00-0.00	.	0.00	0.00-0.00	.	114		0.00	/ 52
2000	0.01	0.00-0.02	42.25	0.01	0.00-0.02	42.25	120		0.04	/ 52
2001										

Table 24. Converted (RSCI) and unconverted (RSI) indices for age 1+ channel catfish, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1954	0.00	0.00	.	0.00	0.00	.	2			
1955	0.00	0.00	.	0.00	0.00	.	5			
1956	0.00	0.00	.	0.00	0.00	.	13			
1957	0.11	0.01-0.22	45.47	0.11	0.01-0.22	45.47	20			
1958	0.00	0.00	.	0.00	0.00	.	5			
1959							0			
1960	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	39			
1977	0.38	0.18-0.62	24.65	0.38	0.18-0.62	24.65	59			

Continued

Table 24. Age 1+ channel catfish indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	1.3-2.58	10.47	1.87	1.3-2.58	10.47	68		1.48	/ 52
1993	0.83	0.2-1.8	35.01	0.83	0.2-1.8	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	0.6-1.71	17.84	1.08	0.6-1.71	17.84	120		1.17	/ 53
1997	0.84	0.47-1.3	18.21	0.84	0.47-1.3	18.21	120		1.06	/ 52
1998	0.79	0.46-1.19	17.60	0.79	0.46-1.19	17.60	120		0.62	/ 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										

Table 25. Converted (RSCI) and unconverted (RSI) indices for northern puffer, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1955	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.00	0.00	.	19			
1959	0.00	0.00	.	0.00	0.00	.	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	0.00	.	0.28	0.00	.	2			
1973							0			
1974	0.00	0.00	.	0.00	0.00	.	76			
1975	0.02	0-0.06	71.82	0.02	0-0.06	71.82	74			
1976	0.00	0.00	.	0.00	0.00	.	90			
1977	0.00	0.00	.	0.00	0.00	.	68			
1978	0.00	0.00	100.00	0.00	0.00	100.00	95			

Continued

Table 25. Northern puffer indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1979	0.00	0.00	.	0.00	0.00	.	4			
1980	0.36	0-1.02	65.81	0.36	0-1.02	65.81	15			
1981	0.00	0.00	.	0.00	0.00	.	9			
1982	0.00	0.00	.	0.00	0.00	.	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	0.49-0.9	11.83	0.68	0.49-0.9	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	0.1-0.24	18.28	0.17	0.1-0.24	18.28	156	0.17		156 /
1994	0.10	0.05-0.16	26.01	0.10	0.05-0.16	26.01	156	0.10		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	0.20		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	0.25		138 /
2000	0.13	0.08-0.19	18.81	0.13	0.08-0.19	18.81	156	0.13		156 /
2001*	0.21	0.09-0.35	27.21	0.21	0.09-0.35	27.21	92	0.21		92 /

Table 26. Converted (RSCI) and unconverted (RSI) indices for silver perch, with reference to originally reported bay and river index (BRI) values since 1979.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
1955	13.34	0.00	.	33.71	0.00	.	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	0.06-0.33	32.01	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			

Continued

Table 26. Silver perch indices continued.

	Converted Index			Unconverted Index				Original Index		
Year	Geo. Mean	95% C.I.'s	C.V.	Geo. Mean	95% C.I.s	C.V.	N	Bay & River	River Only	N's
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	0.00	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	0.00	.	0.06	0.01-0.1	37.52	113		0.06	/ 113
1984	0.00	0.00	.	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	1.02	172 / 65
1989	0.28	0.16-0.41	19.62	0.53	0.33-0.76	16.32	189	0.56	1.63	189 / 63
1990	0.40	0.28-0.54	13.36	0.69	0.49-0.92	11.94	185	0.75	4.08	185 / 59
1991	0.36	0.22-0.51	17.33	0.36	0.22-0.51	17.33	251	0.40	1.47	179 / 62
1992	0.80	0.49-1.16	15.80	0.80	0.49-1.16	15.80	226	0.86	1.95	178 / 61
1993	0.43	0.28-0.61	16.01	0.43	0.28-0.61	16.01	224	0.45	0.60	180 / 63
1994	0.25	0.12-0.4	25.42	0.25	0.12-0.4	25.42	225	0.26	0.37	180 / 63
1995	0.62	0.39-0.89	15.65	0.62	0.39-0.89	15.65	291	0.65	1.81	180 / 67
1996	0.59	0.38-0.84	15.63	0.59	0.38-0.84	15.63	304	0.58	1.18	183 / 66
1997	0.71	0.5-0.94	12.07	0.71	0.5-0.94	12.07	316	0.79	1.43	192 / 75
1998	0.24	0.15-0.33	16.77	0.24	0.15-0.33	16.77	316	0.24	0.53	192 / 75
1999								0.74	2.51	186 / 75
2000								0.76	2.12	192 / 74
2001*								0.96	25.43	24 / 9

Table 27. Weighted geometric mean per trawl for total catch, 95% confidence intervals, and sample size by water system and season, Summer 1998-Summer 2001. '*' Sampling ongoing.

			Chesapeake Bay			James River			Rappahannock R.			York River			Pocomoke Sound			Great Wicomico R.			Mobjack Bay			Piankatank River		
Species	Year	Season	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N
Spot	1998	Summer	2.53	0.41	79	6.72	0.70	66	7.64	0.64	58	4.91	0.52	66	15.57	0.84	14	26.67	4.03	6	41.49	0.54	17	18.94	10.43	7
	1998	Fall	0.89	0.24	111	3.88	0.77	67	2.11	0.92	66	4.98	0.57	66	0.05	0.05	14	11.85	6.65	6	10.31	0.50	18	25.65	8.66	7
	1999	Winter	0.00	0.00	33	0.06	0.07	66	0.00	0.00	66	0.01	0.02	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.32	0.14	99	2.14	0.56	66	2.49	0.69	66	2.78	0.64	67	1.44	0.70	14	7.99	7.55	6	0.02	0.03	17	28.19	1.52	7
	1999	Summer	5.48	0.40	99	15.97	0.79	66	11.11	0.62	66	5.01	0.54	66	17.79	0.88	14	9.31	3.15	6	50.06	0.91	17	14.14	6.38	7
	1999	Fall	1.11	0.30	111	2.44	0.54	66	2.16	0.83	66	5.04	0.58	66	0.00	0.00	14	10.57	3.85	6	6.58	0.56	17	30.73	2.46	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.03	0.06	66	0.03	0.03	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	1.10	0.24	101	4.00	0.67	66	3.21	0.40	66	2.09	0.57	66	3.85	1.18	14	4.54	1.37	6	8.08	0.96	17	7.09	1.58	7
	2000	Summer	3.34	0.34	117	8.58	1.08	66	12.39	0.52	67	5.98	0.36	67	11.23	1.51	14				26.43	1.95	19			1
	2000	Fall	0.88	0.27	105	1.17	0.65	66	1.32	0.70	66	1.56	0.45	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	1.18	0.34	78	1.53	0.52	66	1.17	0.51	65	1.81	0.45	66							2.04	1.37	9			
	2001*	Summer	3.10	0.34	93	8.12	0.79	44	4.48	0.39	44	4.91	0.42	67							33.39		2			
Atlantic Croaker	1998	Summer	3.80	0.52	79	14.08	0.99	66	17.72	0.88	58	24.40	0.64	66	126.79	1.16	14	5.24	2.01	6	10.74	0.84	17	9.05	1.13	7
	1998	Fall	5.26	0.31	111	23.83	0.72	67	43.12	0.96	66	31.03	0.59	66	2.72	0.74	14	22.06	4.99	6	162.32	0.56	18	110.84	5.08	7
	1999	Winter	0.79	0.22	33	2.48	0.24	66	0.50	0.18	66	7.15	0.65	66	0.02	0.02	14	0.05	0.10	6	0.00	0.00	17	0.15	0.18	7
	1999	Spring	1.44	0.34	99	11.69	0.76	66	4.27	0.73	66	23.63	0.77	67	1.55	0.84	14	1.10	0.75	6	1.41	0.88	17	5.14	0.80	7
	1999	Summer	7.24	0.46	99	10.48	0.53	66	5.02	0.58	66	10.35	0.80	66	4.39	0.77	14	0.10	0.10	6	7.40	0.97	17	1.87	0.67	7
	1999	Fall	4.40	0.30	111	15.49	1.16	66	9.60	0.56	66	13.66	0.73	66	0.54	0.45	14	13.67	7.84	6	16.67	1.53	17	6.84	0.29	7
	2000	Winter	0.78	0.33	33	0.67	0.65	52	1.46	0.99	66	2.31	0.61	66				0.00	0.00	3	0.07	0.14	17	0.00	0.00	7
	2000	Spring	2.65	0.38	101	8.28	0.45	66	2.79	0.34	66	10.18	0.49	66	0.82	0.59	14	0.57	0.11	6	4.50	1.85	17	3.83	0.23	7
	2000	Summer	2.71	0.30	117	4.67	0.96	66	3.73	0.60	67	4.69	0.38	67	0.49	0.41	14				3.90	0.58	19			1
	2000	Fall	9.78	0.39	105	6.01	0.61	66	12.20	0.55	66	7.50	0.49	65							0.41	0.05	7			
	2001	Winter				0.26	0.37	30	0.00	0.00	30	1.36	0.54	30												
	2001	Spring	1.82	0.42	78	1.43	0.44	66	2.29	0.48	65	7.03	0.36	66							0.68	0.78	9			
	2001*	Summer	2.54	0.33	93	2.64	0.44	44	1.01	0.35	44	9.83	0.44	67							3.47		2			
Weakfish	1998	Summer	3.84	0.64	79	5.51	0.78	66	5.00	1.26	58	8.11	0.47	66	5.42	1.98	14	3.09	1.46	6	1.39	0.29	17	7.30	6.04	7
	1998	Fall	1.23	0.28	111	1.24	0.47	67	2.03	0.91	66	2.73	0.36	66	0.06	0.06	14	2.65	3.11	6	4.16	0.38	18	4.52	2.07	7
	1999	Winter	0.00	0.00	33	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.50	0.16	99	0.56	0.33	66	0.51	0.31	66	0.44	0.18	67	0.25	0.20	14	0.00	0.00	6	0.00	0.00	17	2.34	1.09	7
	1999	Summer	7.28	0.41	99	11.77	1.17	66	14.99	1.02	66	10.99	0.56	66	12.76	1.48	14	7.52	2.73	6	11.00	0.73	17	4.82	1.56	7
	1999	Fall	0.84	0.27	111	0.87	0.26	66	1.49	0.42	66	4.23	0.53	66	0.00	0.00	14	1.38	0.46	6	2.97	0.59	17	2.51	0.22	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.00	0.00	66	0.01	0.02	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	1.20	0.21	101	0.73	0.35	66	0.90	0.24	66	1.07	0.22	66	1.94	1.92	14	1.03	0.89	6	2.28	0.76	17	0.67	0.58	7
	2000	Summer	6.68	0.42	117	6.36	1.43	66	13.71	0.76	67	19.67	0.53	67	2.36	0.95	14				10.37	1.29	19			1
	2000	Fall	1.69	0.36	105	0.79	0.42	66	0.98	0.37	66	2.18	0.44	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.76	0.25	78	2.15	1.08	66	0.42	0.27	65	1.42	0.48	66							0.05	0.10	9			
	2001*	Summer	10.23	0.41	93	22.75	0.44	44	48.68	0.70	44	32.79	1.02	67							137.43		2			

Table 27. Weighted geometric mean per trawl for total catch, 95% confidence intervals, and sample size by water system and season, Summer 1998-Summer 2001. '*' Sampling ongoing.

			Chesapeake Bay			James River			Rappahannock R.			York River			Pocomoke Sound			Great Wicomico R.			Mobjack Bay			Piankatank River		
Species	Year	Season	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N
Summer Flounder	1998	Summer	1.10	0.16	79	0.40	0.21	66	0.63	0.17	58	0.70	0.25	66	0.30	0.44	14	1.06	0.82	6	2.01	0.19	17	3.05	3.12	7
	1998	Fall	1.08	0.16	111	0.12	0.10	67	0.27	0.14	66	0.40	0.21	66	0.01	0.03	14	1.54	0.45	6	1.07	0.31	18	2.71	0.27	7
	1999	Winter	0.02	0.04	33	0.01	0.02	66	0.00	0.00	66	0.01	0.02	66	0.01	0.02	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.37	0.09	99	0.41	0.16	66	0.47	0.17	66	0.28	0.19	67	0.73	0.54	14	0.72	0.88	6	0.35	0.32	17	0.42	0.52	7
	1999	Summer	0.90	0.15	99	0.35	0.18	66	0.65	0.19	66	0.55	0.25	66	0.58	0.39	14	0.68	0.67	6	0.95	0.21	17	1.24	0.33	7
	1999	Fall	0.77	0.12	111	0.18	0.08	66	0.30	0.19	66	0.34	0.15	66	0.00	0.00	14	1.12	1.00	6	0.88	0.27	17	0.41	0.36	7
	2000	Winter	0.01	0.03	33	0.04	0.04	52	0.00	0.00	66	0.05	0.05	66				0.00	0.00	3	0.03	0.06	17	0.00	0.00	7
	2000	Spring	0.15	0.07	101	0.41	0.32	66	0.14	0.12	66	0.49	0.30	66	0.92	0.23	14	0.40	0.79	6	1.46	0.36	17	0.19	0.42	7
	2000	Summer	0.79	0.14	117	0.43	0.30	66	0.43	0.22	67	0.89	0.24	67	1.83	0.77	14				2.12	0.28	19			1
	2000	Fall	0.80	0.14	105	0.11	0.07	66	0.26	0.20	66	0.32	0.19	65							0.00	0.00	7			
	2001	Winter				0.03	0.05	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.45	0.13	78	0.65	0.27	66	0.35	0.14	65	0.39	0.27	66							0.16	0.06	9			
	2001*	Summer	1.05	0.15	93	0.70	0.49	44	0.48	0.33	44	1.30	0.24	67							1.36		2			
Black Sea Bass	1998	Summer	0.30	0.14	79	0.23	0.15	66	0.00	0.00	58	0.03	0.06	66	0.12	0.24	14	0.00	0.00	6	0.03	0.06	17	0.00	0.00	7
	1998	Fall	0.06	0.04	111	0.15	0.15	67	0.01	0.02	66	0.07	0.12	66	0.00	0.00	14	0.00	0.00	6	0.03	0.06	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.50	0.17	99	0.15	0.23	66	0.02	0.02	66	0.01	0.01	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.34	0.11	99	0.30	0.17	66	0.04	0.06	66	0.15	0.15	66	0.06	0.11	14	0.00	0.00	6	0.03	0.06	17	0.00	0.00	7
	1999	Fall	0.07	0.08	111	0.08	0.05	66	0.12	0.16	66	0.01	0.02	66	0.00	0.00	14	0.05	0.10	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.00	0.00	66	0.00	0.00	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.62	0.14	101	0.26	0.07	66	0.09	0.10	66	0.04	0.07	66	0.07	0.11	14	0.00	0.00	6	0.13	0.19	17	0.11	0.24	7
	2000	Summer	0.33	0.10	117	0.10	0.08	66	0.13	0.12	67	0.11	0.10	67	0.01	0.01	14				0.06	0.11	19			1
	2000	Fall	0.12	0.09	105	0.11	0.10	66	0.00	0.00	66	0.01	0.02	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.74	0.17	78	0.09	0.07	66	0.03	0.07	65	0.03	0.05	66							0.00	0.00	9			
	2001*	Summer	0.81	0.20	93	0.45	0.23	44	0.02	0.05	44	0.07	0.08	67							0.00		2			
Scup	1998	Summer	0.46	0.16	79	0.10	0.21	66	0.00	0.00	58	0.03	0.05	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1998	Fall	0.00	0.00	111	0.00	0.00	67	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.13	0.14	99	0.00	0.00	66	0.00	0.00	66	0.00	0.00	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.09	0.07	99	0.10	0.14	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Fall	0.00	0.01	111	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.00	0.00	66	0.00	0.00	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.03	0.04	101	0.08	0.08	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Summer	0.11	0.09	117	0.00	0.00	66	0.00	0.00	67	0.00	0.00	67	0.00	0.00	14				0.00	0.00	19			1
	2000	Fall	0.00	0.00	105	0.01	0.02	66	0.00	0.00	66	0.00	0.00	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.11	0.08	78	0.01	0.03	66	0.00	0.00	65	0.00	0.00	66							0.00	0.00	9			
	2001*	Summer	1.16	0.22	93	0.01	0.03	44	0.00	0.00	44	0.00	0.00	67							0.00		2			

Table 27. Weighted geometric mean per trawl for total catch, 95% confidence intervals, and sample size by water system and season, Summer 1998-Summer 2001. '*' Sampling ongoing.

			Chesapeake Bay			James River			Rappahannock R.			York River			Pocomoke Sound			Great Wicomico R.			Mobjack Bay			Piankatank River		
Species	Year	Season	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N
Striped Bass	1998	Summer	0.00	0.00	79	0.47	0.34	66	0.01	0.01	58	0.13	0.11	66	0.00	0.00	14	0.00	0.00	6	0.02	0.03	17	0.19	0.42	7
	1998	Fall	0.01	0.02	111	0.11	0.09	67	0.05	0.05	66	0.07	0.08	66	0.07	0.11	14	0.00	0.00	6	0.00	0.00	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.49	0.24	66	0.18	0.10	66	0.68	0.33	66	0.12	0.24	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.00	0.00	99	0.35	0.15	66	0.10	0.13	66	0.06	0.05	67	0.00	0.00	14	0.00	0.00	6	0.12	0.19	17	0.19	0.42	7
	1999	Summer	0.00	0.00	99	0.13	0.15	66	0.02	0.05	66	0.03	0.05	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Fall	0.00	0.00	111	0.16	0.13	66	0.02	0.02	66	0.02	0.02	66	0.05	0.11	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.09	0.12	33	0.14	0.09	52	0.09	0.05	66	0.23	0.06	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.00	0.00	101	0.52	0.48	66	0.28	0.33	66	0.14	0.12	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Summer	0.00	0.00	117	0.28	0.23	66	0.02	0.03	67	0.04	0.04	67	0.00	0.00	14				0.00	0.00	19			1
	2000	Fall	0.00	0.00	105	0.37	0.25	66	0.25	0.20	66	0.23	0.15	65							0.00	0.00	7			
	2001	Winter				2.37	0.87	30	0.34	0.38	30	2.04	0.49	30												
	2001	Spring	0.00	0.00	78	0.79	0.40	66	0.14	0.10	65	0.42	0.18	66							0.00	0.00	9			
	2001*	Summer	0.00	0.00	93	0.49	0.31	44	0.00	0.00	44	0.12	0.09	67							0.00		2			
White Perch	1998	Summer	0.00	0.00	79	2.98	0.49	66	0.54	0.34	58	0.10	0.07	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.42	1.02	7
	1998	Fall	0.00	0.00	111	1.73	0.30	67	2.11	0.87	66	0.40	0.16	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	18	0.19	0.42	7
	1999	Winter	0.00	0.00	33	4.34	0.45	66	1.75	0.35	66	3.50	0.50	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.00	0.00	99	1.73	0.48	66	2.16	0.42	66	0.44	0.12	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.00	0.00	99	1.29	0.47	66	1.41	0.70	66	0.13	0.18	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Fall	0.00	0.00	111	2.44	0.36	66	2.51	0.34	66	0.57	0.20	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	1.85	0.66	52	1.67	0.54	66	1.50	0.29	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.00	0.00	101	2.09	0.45	66	1.40	0.30	66	0.22	0.11	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.32	0.74	7
	2000	Summer	0.00	0.00	117	2.03	0.23	66	1.09	0.38	67	0.13	0.09	67	0.00	0.00	14				0.00	0.00	19			1
	2000	Fall	0.00	0.00	105	1.30	0.24	66	2.58	0.55	66	0.73	0.19	65							0.00	0.00	7			
	2001	Winter				33.55	2.06	30	2.97	0.56	30	18.01	0.87	30												
	2001	Spring	0.00	0.00	78	2.61	0.40	66	0.50	0.34	65	0.25	0.11	66							0.00	0.00	9			
	2001*	Summer	0.00	0.00	93	1.66	0.77	44	0.57	0.63	44	0.11	0.07	67							0.00		2			
White Catfish	1998	Summer	0.00	0.00	79	0.12	0.10	66	0.24	0.17	58	0.19	0.09	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1998	Fall	0.00	0.00	111	0.19	0.11	67	0.15	0.08	66	0.13	0.06	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.48	0.15	66	0.22	0.09	66	0.24	0.06	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.00	0.00	99	0.21	0.10	66	0.31	0.18	66	0.57	0.15	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.00	0.00	99	0.36	0.19	66	0.05	0.03	66	0.08	0.04	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Fall	0.00	0.00	111	0.22	0.11	66	0.09	0.05	66	0.30	0.10	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	0.23	0.17	52	0.09	0.07	66	0.30	0.11	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.00	0.00	101	0.09	0.07	66	0.30	0.16	66	0.29	0.09	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Summer	0.00	0.00	117	0.13	0.11	66	0.16	0.11	67	0.09	0.05	67	0.00	0.00	14				0.00	0.00	19			1
	2000	Fall	0.00	0.00	105	0.07	0.06	66	0.05	0.04	66	0.18	0.08	65							0.00	0.00	7			
	2001	Winter				0.30	0.22	30	0.00	0.00	30	0.82	0.33	30												
	2001	Spring	0.00	0.00	78	0.12	0.08	66	0.09	0.12	65	0.14	0.06	66							0.00	0.00	9			
	2001*	Summer	0.00	0.00	93	0.09	0.10	44	0.11	0.10	44	0.12	0.07	67							0.00		2			

Table 27. Weighted geometric mean per trawl for total catch, 95% confidence intervals, and sample size by water system and season, Summer 1998-Summer 2001. '*' Sampling ongoing.

Species	Year	Season	Chesapeake Bay			James River			Rappahannock R.			York River			Pocomoke Sound			Great Wicomico R.			Mobjack Bay			Piankatank River		
			Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N	Geo. Mean	95% C.I.'s	N
Channel Catfish	1998	Summer	0.00	0.00	79	0.08	0.10	66	0.10	0.13	58	0.03	0.04	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1998	Fall	0.00	0.00	111	0.20	0.14	67	0.04	0.05	66	0.01	0.01	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.37	0.20	66	0.15	0.11	66	0.02	0.03	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.00	0.00	99	0.30	0.16	66	0.18	0.10	66	0.03	0.04	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.00	0.00	99	0.21	0.13	66	0.01	0.01	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Fall	0.00	0.00	111	0.28	0.14	66	0.03	0.05	66	0.02	0.03	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	0.23	0.15	52	0.04	0.05	66	0.06	0.05	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.00	0.00	101	0.14	0.11	66	0.05	0.10	66	0.02	0.02	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Summer	0.00	0.00	117	0.04	0.05	66	0.02	0.01	67	0.00	0.00	67	0.00	0.00	14				0.00	0.00	19			1
	2000	Fall	0.00	0.00	105	0.07	0.07	66	0.02	0.03	66	0.02	0.03	65							0.00	0.00	7			
	2001	Winter				0.32	0.19	30	0.11	0.14	30	0.07	0.07	30												
	2001	Spring	0.00	0.00	78	0.13	0.03	66	0.08	0.16	65	0.01	0.02	66							0.00	0.00	9			
	2001*	Summer	0.00	0.00	93	0.09	0.13	44	0.09	0.12	44	0.00	0.00	67							0.00		2			
Northern Puffer	1998	Summer	0.07	0.06	79	0.00	0.00	66	0.00	0.00	58	0.00	0.00	66	0.01	0.01	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1998	Fall	0.09	0.05	111	0.00	0.00	67	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	18	0.00	0.00	7
	1999	Winter	0.00	0.00	33	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.04	0.06	99	0.00	0.00	66	0.00	0.00	66	0.00	0.00	67	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.26	0.10	99	0.01	0.03	66	0.11	0.10	66	0.12	0.12	66	0.24	0.29	14	0.72	0.88	6	0.03	0.06	17	0.28	0.46	7
	1999	Fall	0.14	0.07	111	0.00	0.00	66	0.00	0.00	66	0.03	0.06	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.00	0.00	66	0.00	0.00	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.02	0.02	101	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	2000	Summer	0.14	0.06	117	0.01	0.02	66	0.08	0.10	67	0.08	0.08	67	0.17	0.27	14				0.08	0.10	19			1
	2000	Fall	0.11	0.06	105	0.00	0.00	66	0.00	0.00	66	0.00	0.00	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.07	0.06	78	0.00	0.00	66	0.00	0.00	65	0.00	0.00	66							0.13	0.00	9			
	2001*	Summer	0.22	0.12	93	0.01	0.03	44	0.04	0.06	44	0.05	0.09	67							0.00		2			
Silver Perch	1998	Summer	0.16	0.11	79	0.27	0.29	66	0.02	0.02	58	0.66	0.47	66	0.18	0.12	14	0.00	0.00	6	0.22	0.29	17	0.46	0.47	7
	1998	Fall	0.12	0.08	111	0.24	0.18	67	0.13	0.13	66	1.39	0.54	66	0.06	0.08	14	0.68	1.57	6	1.51	0.58	18	0.62	0.75	7
	1999	Winter	0.00	0.00	33	0.00	0.00	66	0.00	0.00	66	0.00	0.00	66	0.00	0.00	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Spring	0.01	0.01	99	0.03	0.03	66	0.03	0.07	66	0.11	0.15	67	0.11	0.23	14	0.00	0.00	6	0.00	0.00	17	0.00	0.00	7
	1999	Summer	0.38	0.16	99	0.38	0.16	66	0.24	0.14	66	1.52	0.33	66	0.58	0.32	14	3.18	11.67	6	8.43	0.62	17	0.11	0.24	7
	1999	Fall	0.27	0.14	111	0.55	0.18	66	0.49	0.24	66	2.75	0.51	66	0.00	0.00	14	1.06	1.08	6	1.62	0.56	17	1.81	0.46	7
	2000	Winter	0.00	0.00	33	0.00	0.00	52	0.00	0.00	66	0.00	0.00	66				0.00	0.00	3	0.00	0.00	17	0.00	0.00	7
	2000	Spring	0.12	0.07	101	0.01	0.01	66	0.00	0.00	66	0.06	0.07	66	0.54	0.38	14	0.00	0.00	6	0.53	0.45	17	0.00	0.00	7
	2000	Summer	0.41	0.20	117	0.51	0.38	66	0.75	0.31	67	3.05	0.42	67	0.37	0.35	14				3.98	3.10	19			1
	2000	Fall	0.24	0.13	105	0.29	0.20	66	0.32	0.20	66	1.42	0.33	65							0.00	0.00	7			
	2001	Winter				0.00	0.00	30	0.00	0.00	30	0.00	0.00	30												
	2001	Spring	0.07	0.05	78	0.03	0.03	66	0.03	0.07	65	0.13	0.28	66							0.59	1.18	9			
	2001*	Summer	0.14	0.17	93	0.93	0.14	44	0.03	0.05	44	2.81	0.37	67							23.37		2			

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	Corotoman 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)

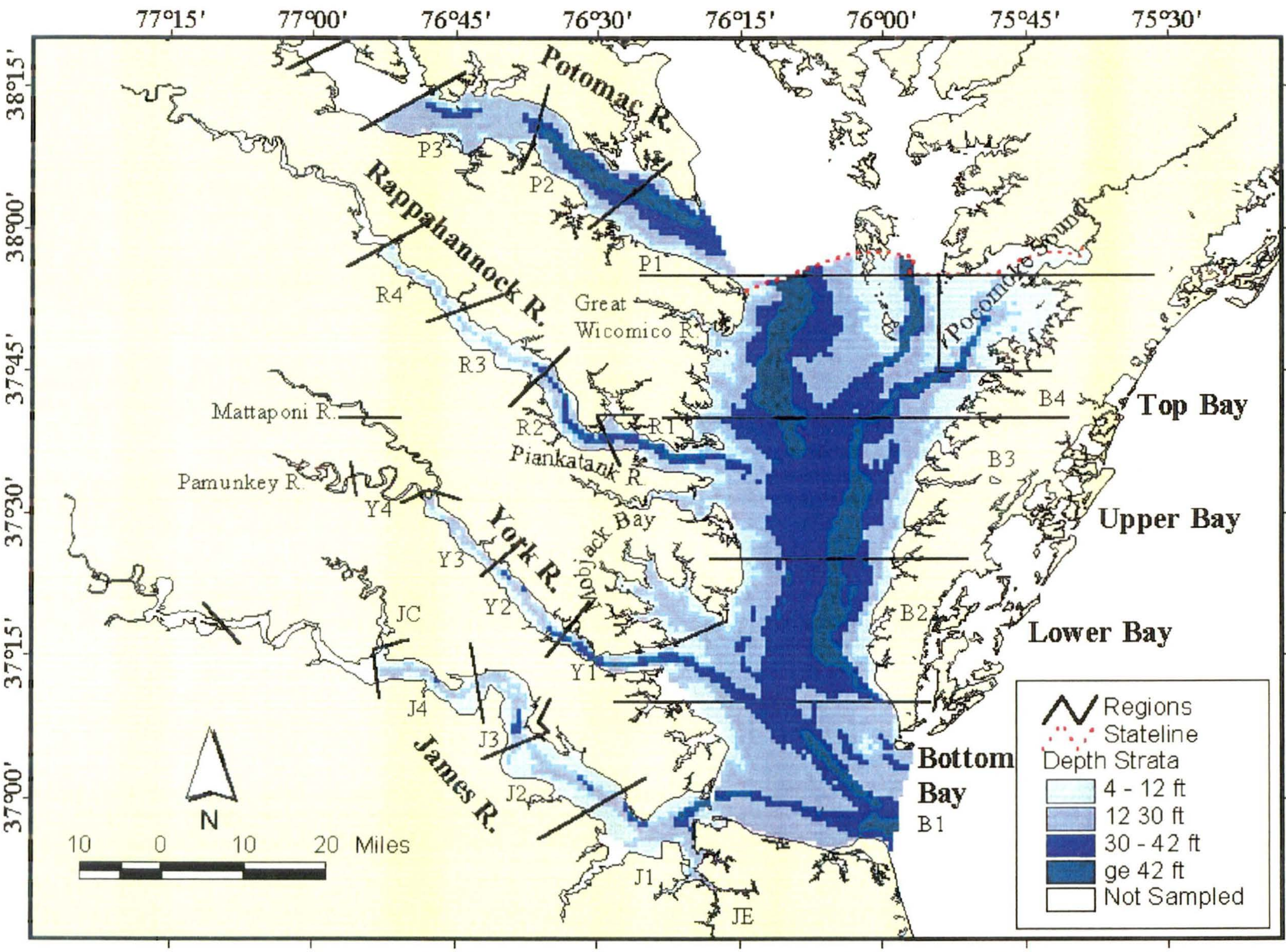


Figure 1. The VIMS Trawl Survey random stratified design of the Chesapeake Bay and associated geographic regions.

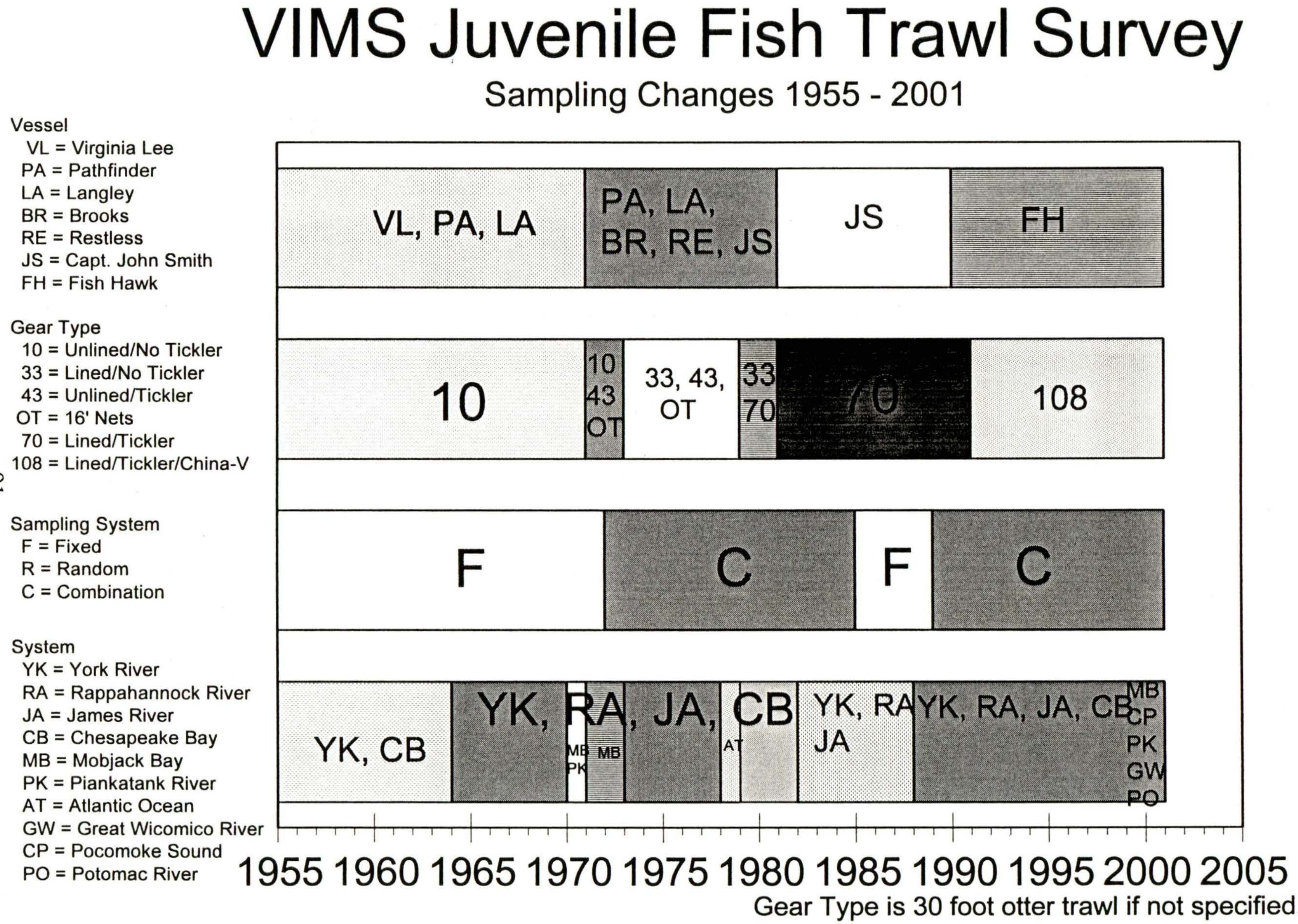


Figure 2. Sampling system, design, and gear changes for the VIMS trawl survey, 1955-2001. See Table 9 for code descriptions.

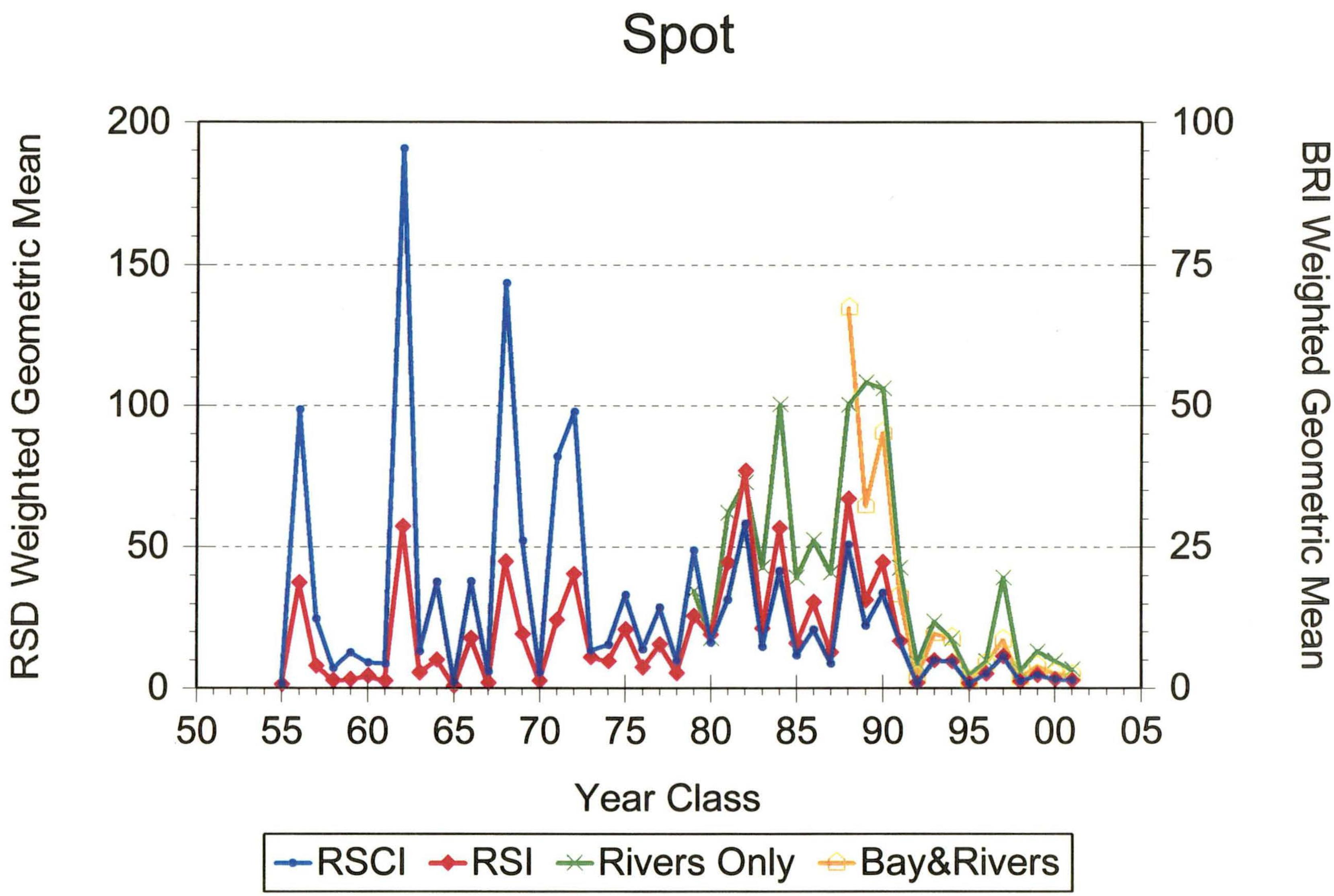


Figure 3. Y-O-Y spot random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

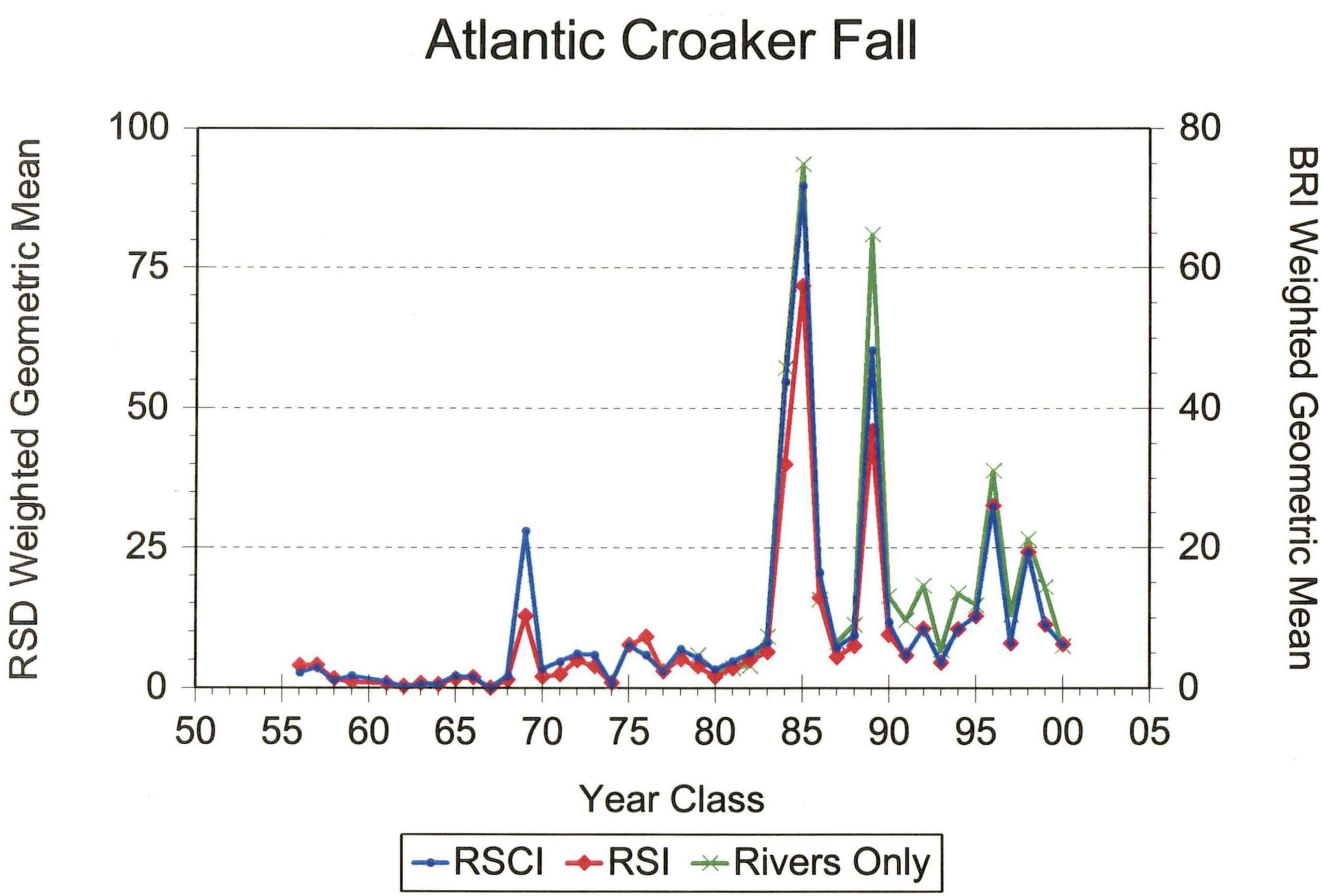


Figure 4. Fall Y-O-Y Atlantic croaker random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

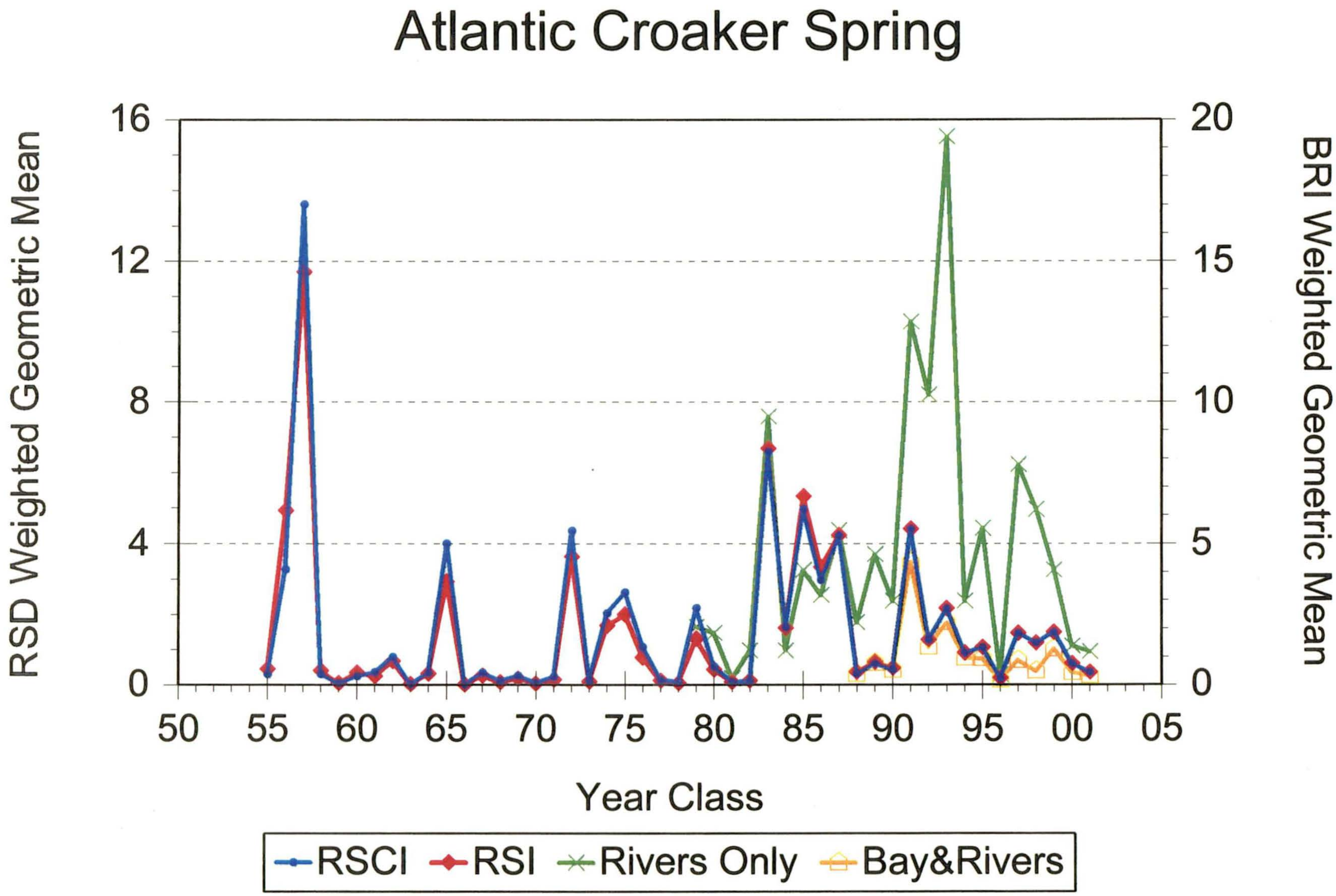


Figure 5. Spring Y-O-Y Atlantic croaker random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

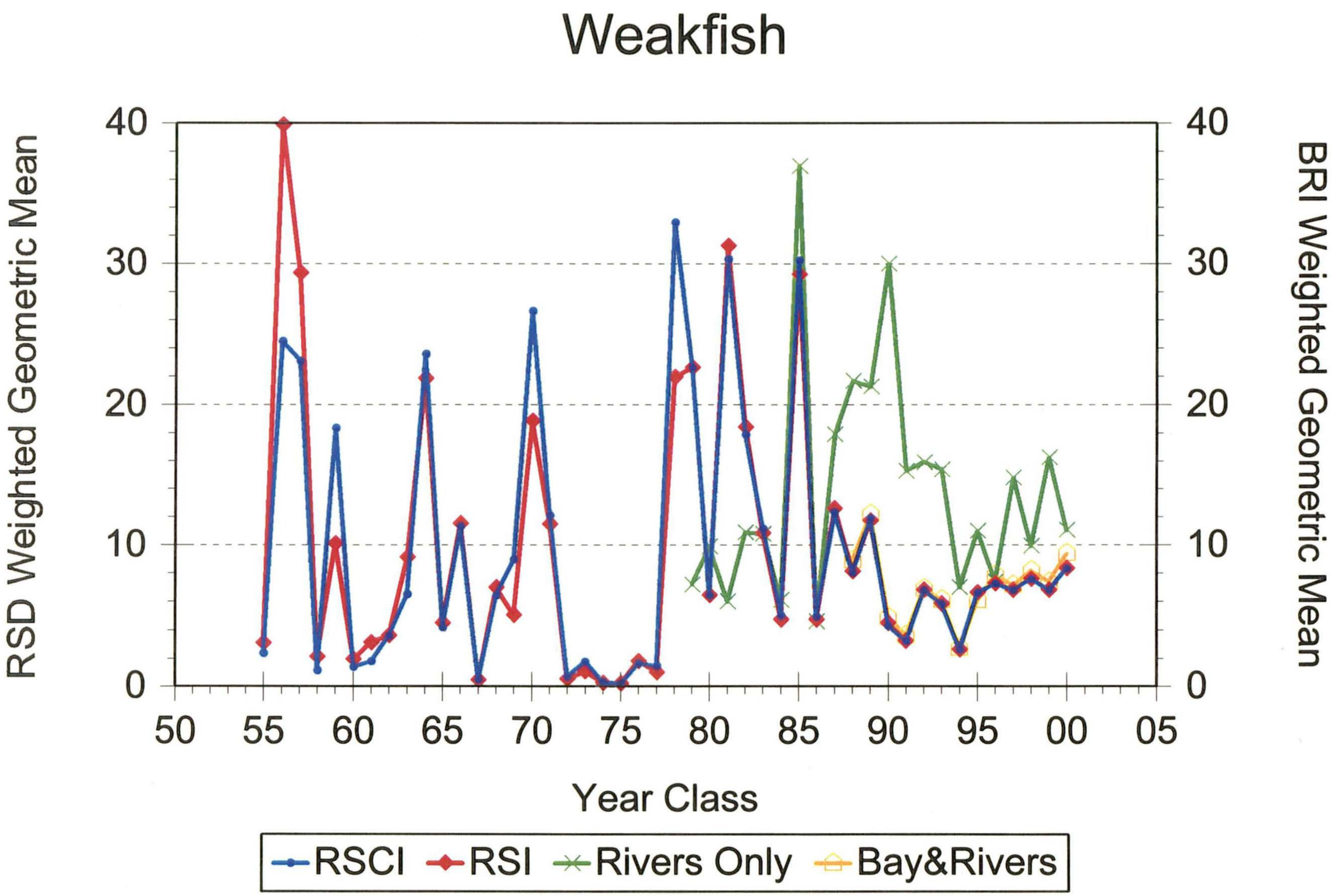


Figure 6. Y-O-Y weakfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

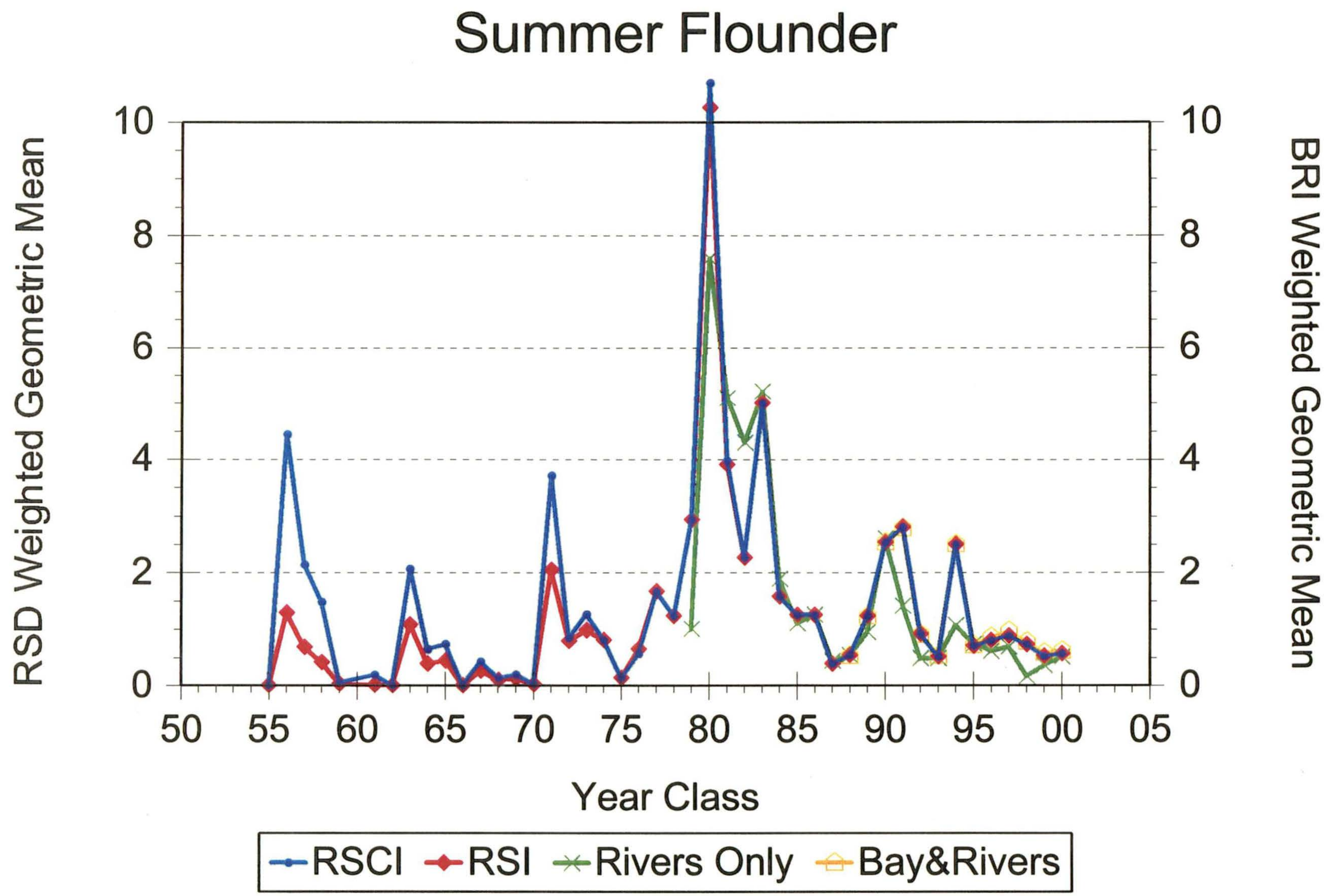


Figure 7. Y-O-Y summer flounder random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

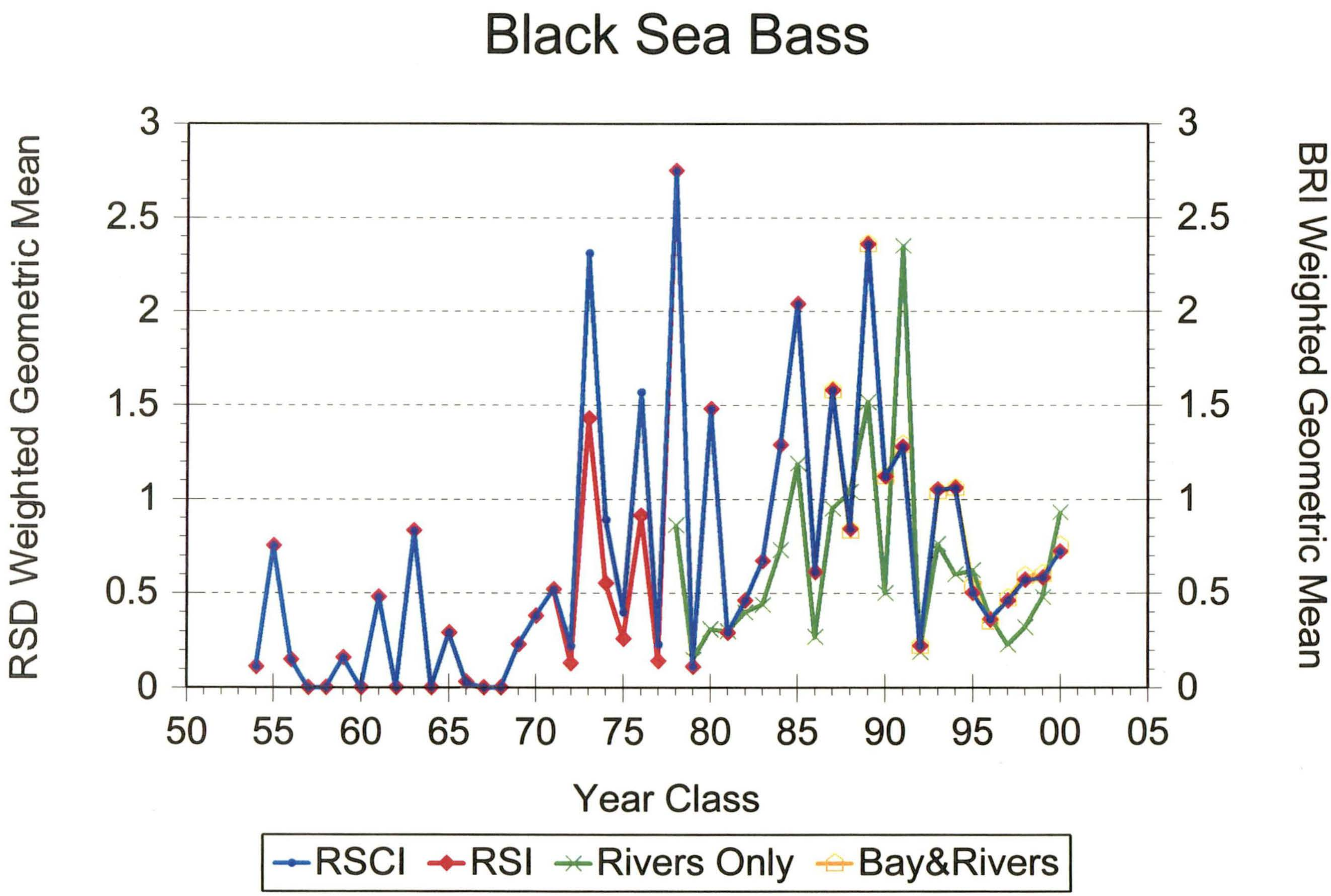


Figure 8. Y-O-Y black sea bass random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

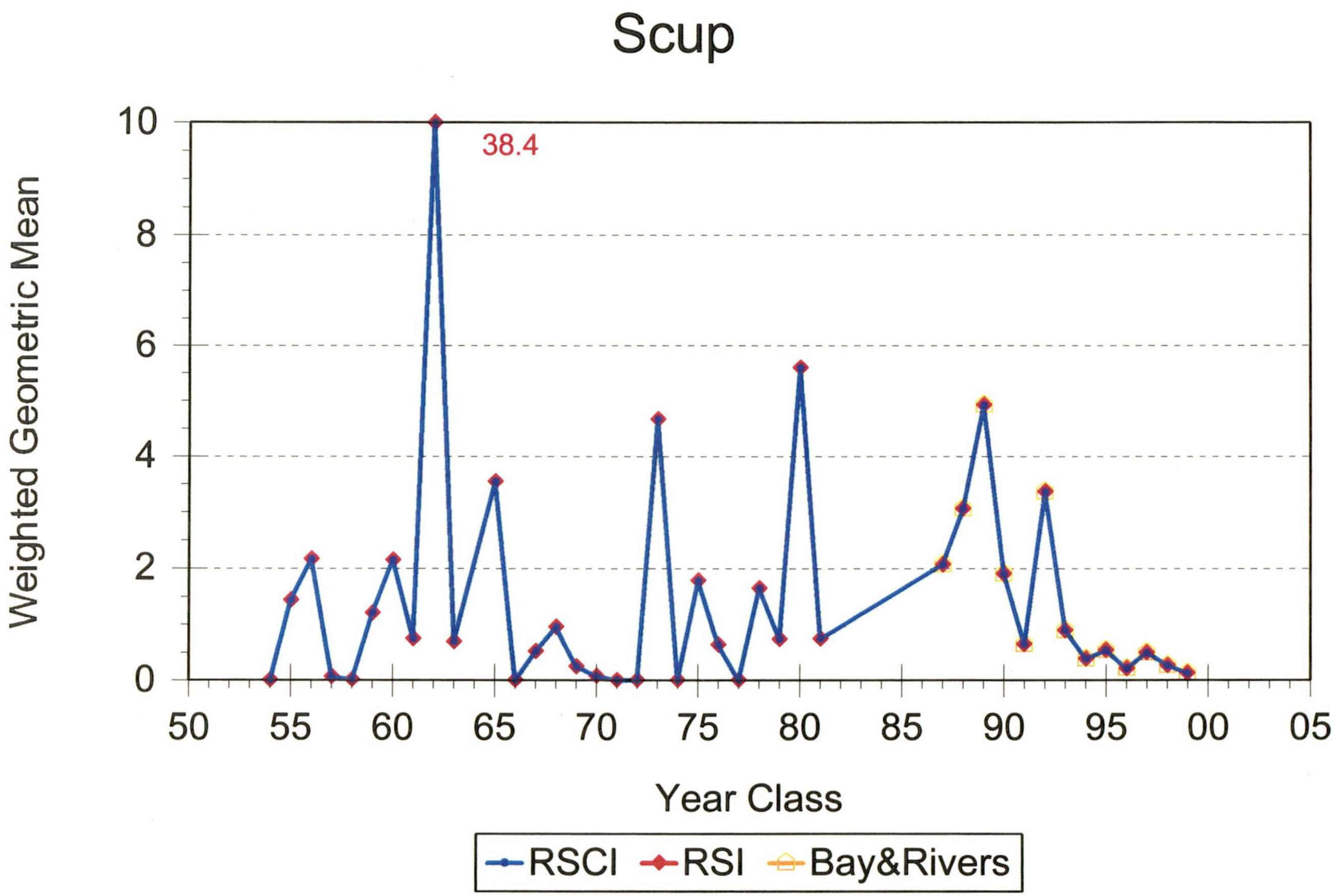


Figure 9. Y-O-Y scup random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

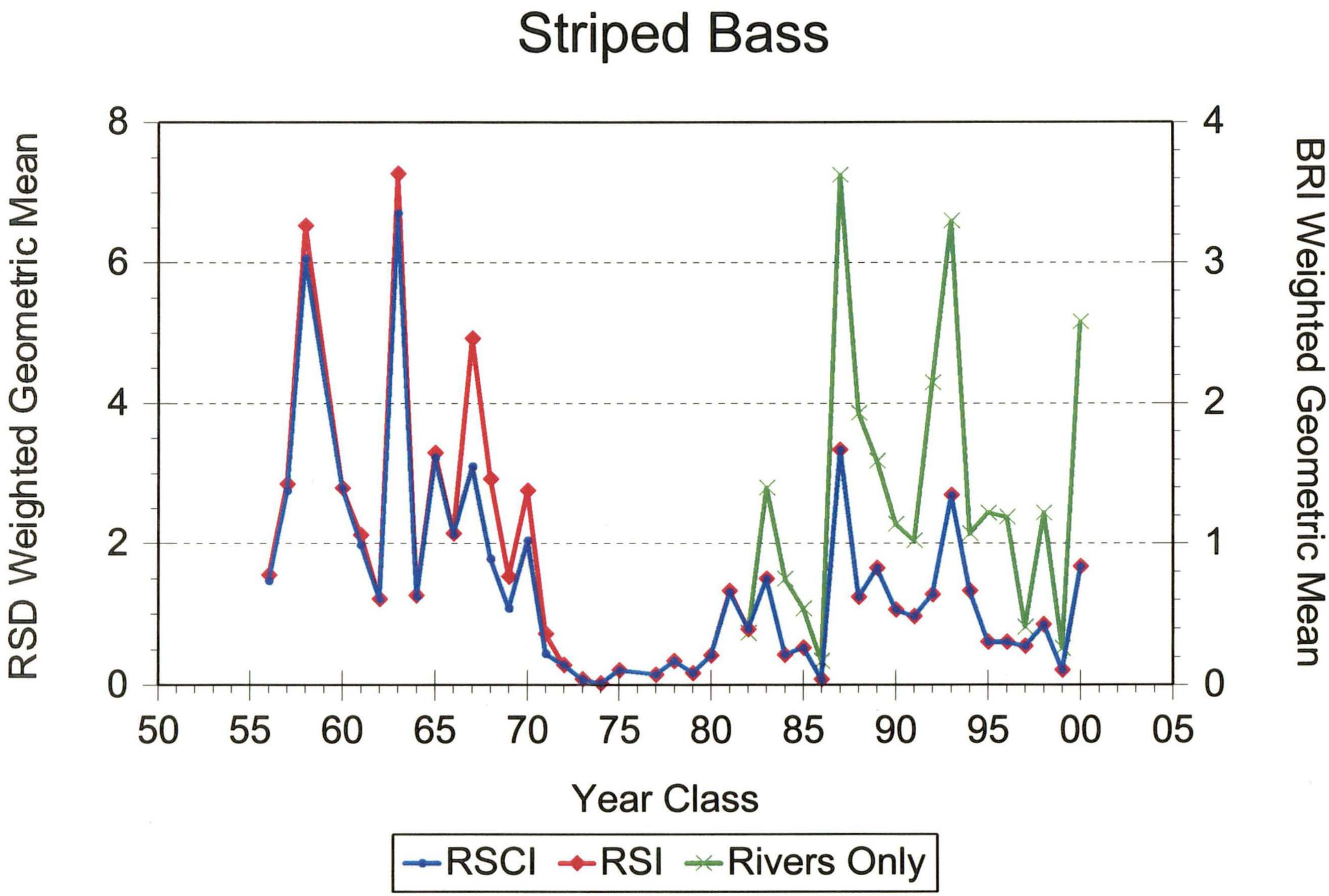


Figure 10. Y-O-Y striped bass random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

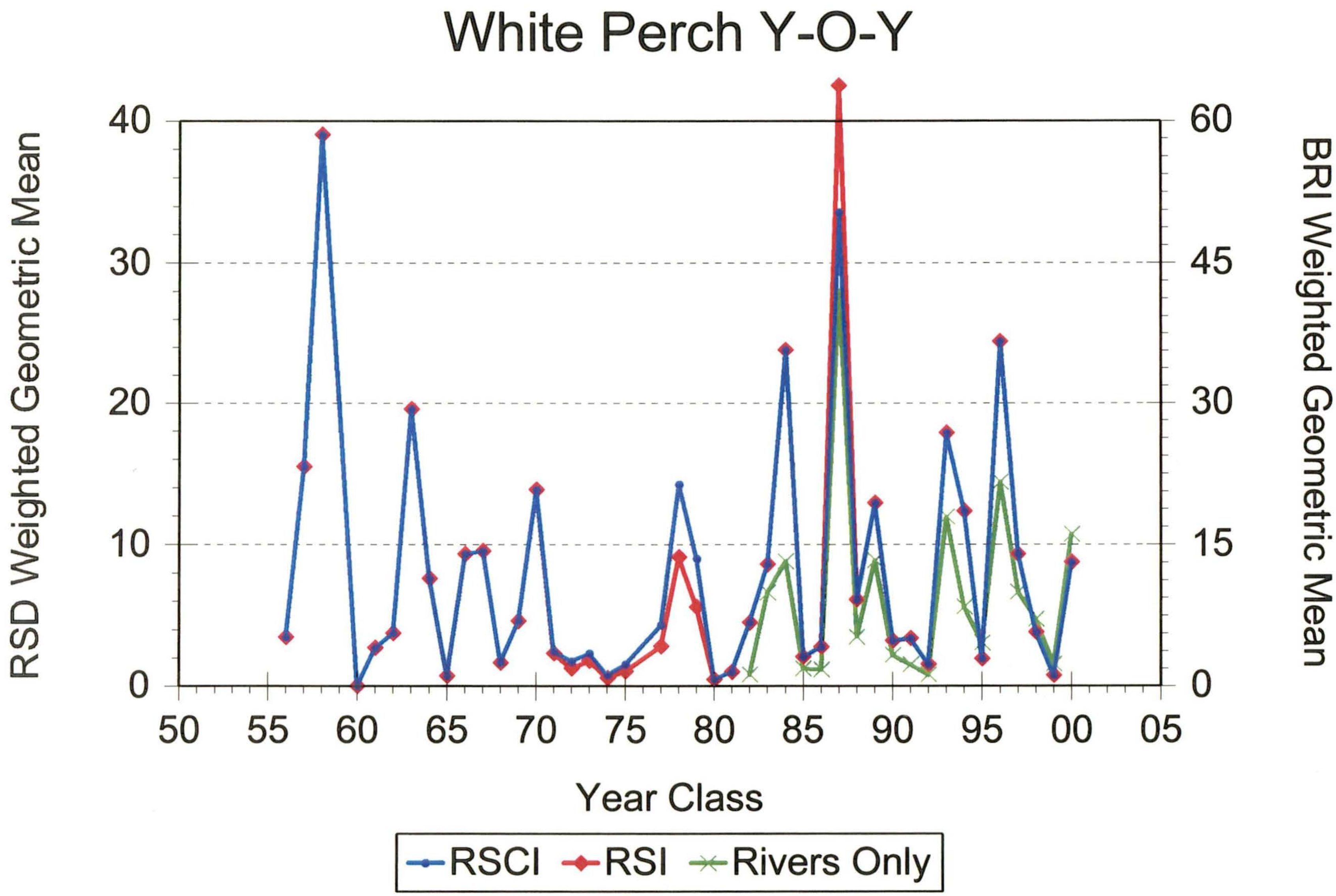


Figure 11. Y-O-Y white perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

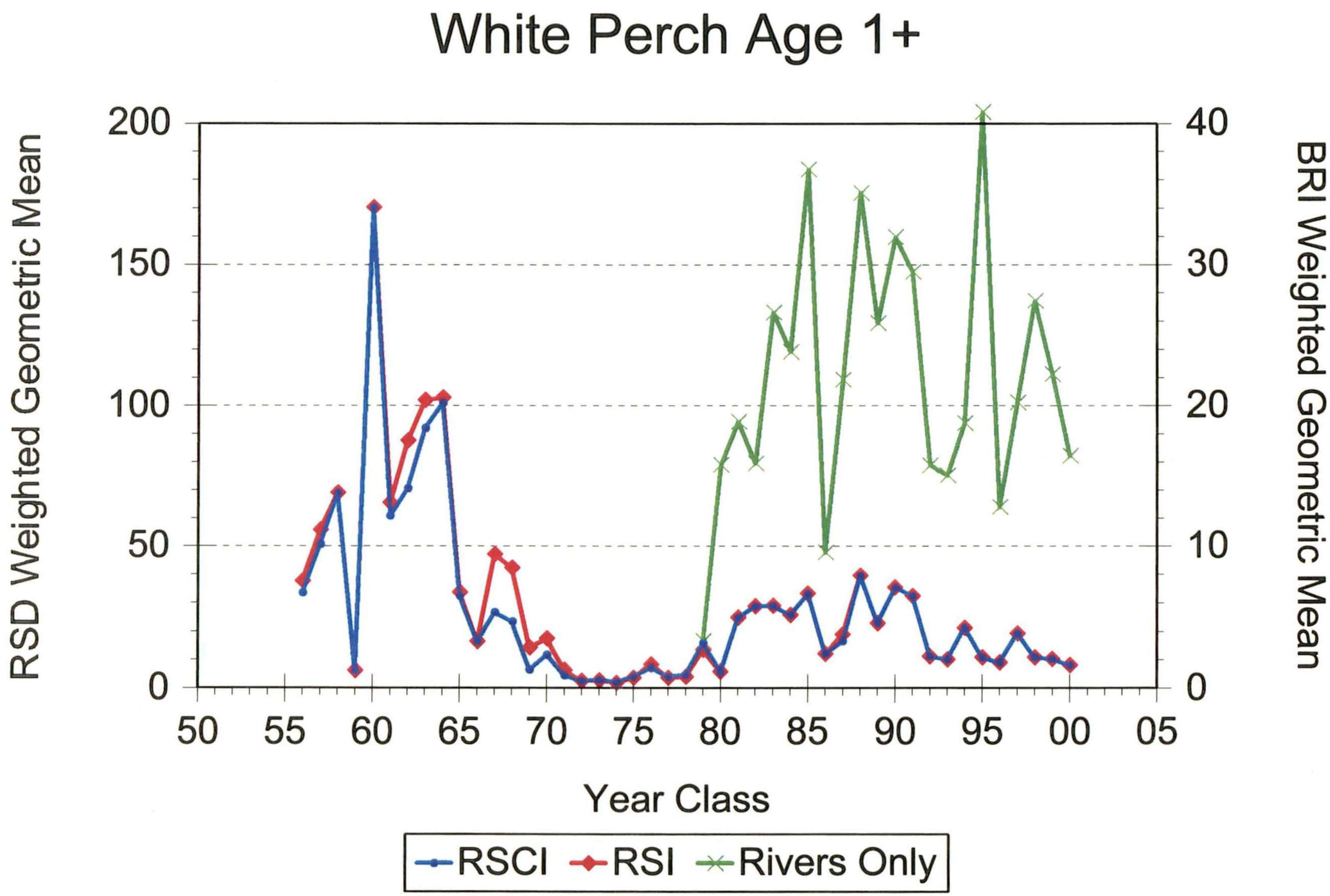


Figure 12. Age 1+ white perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

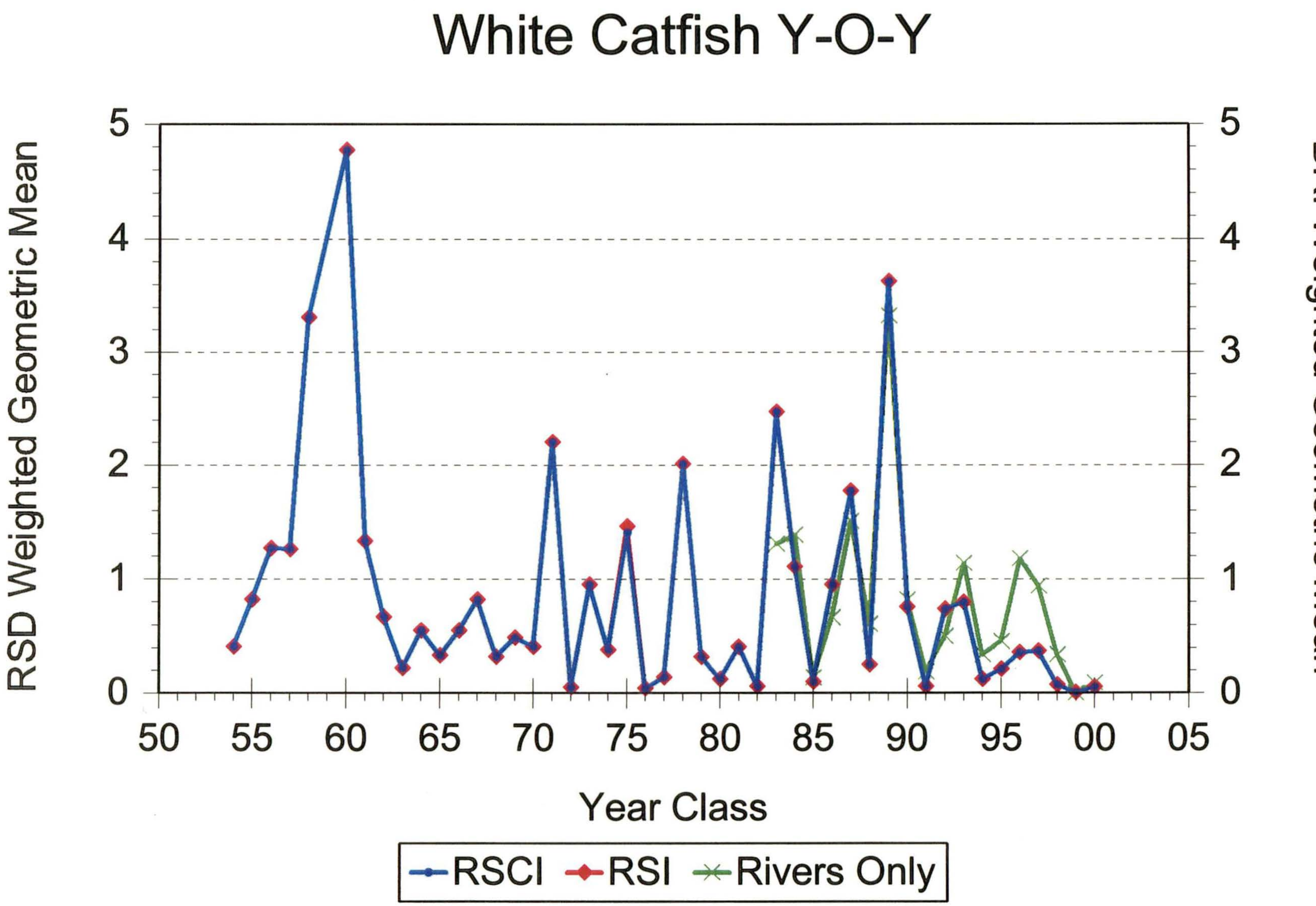


Figure 13. Y-O-Y white catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

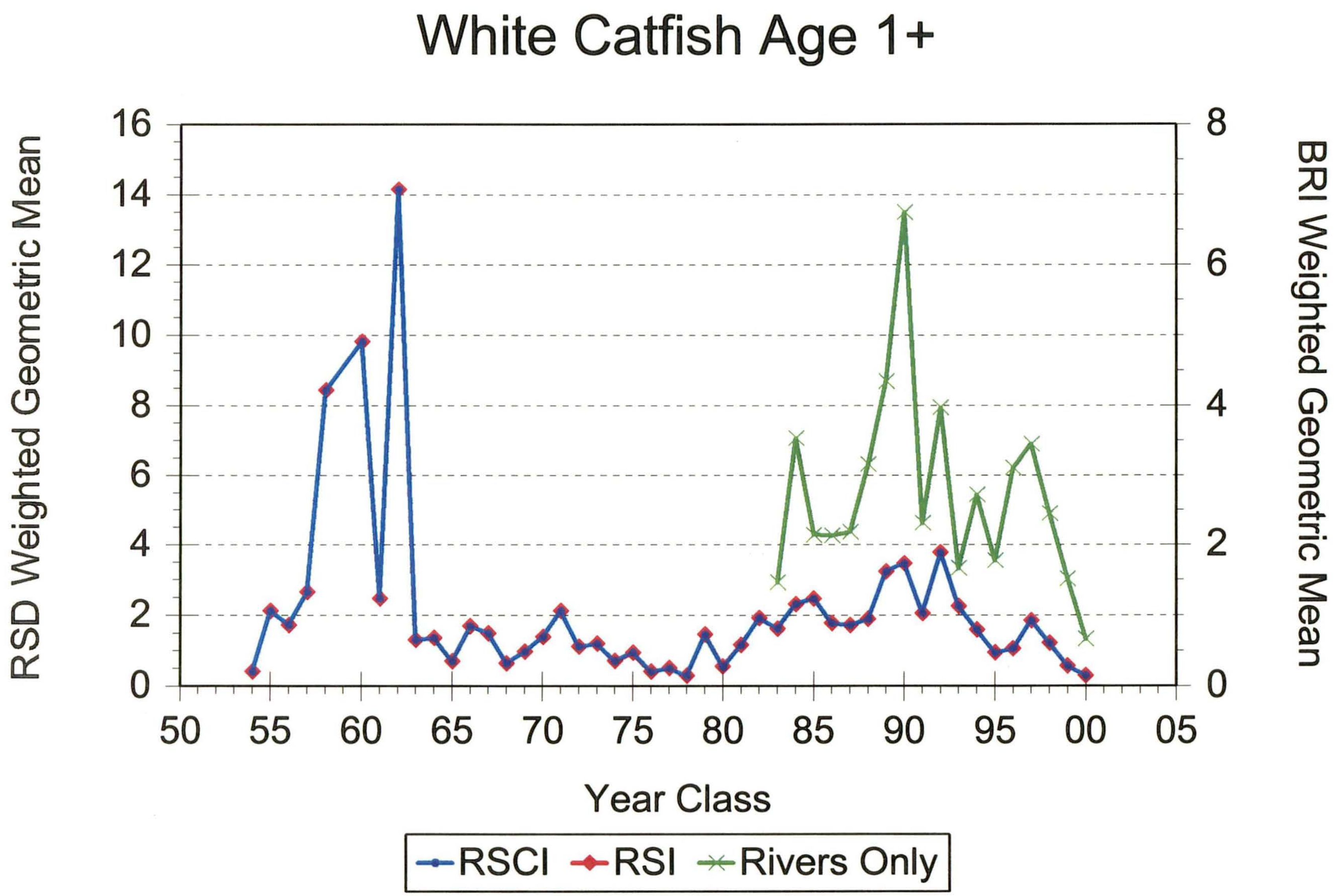


Figure 14. Age 1+ white catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

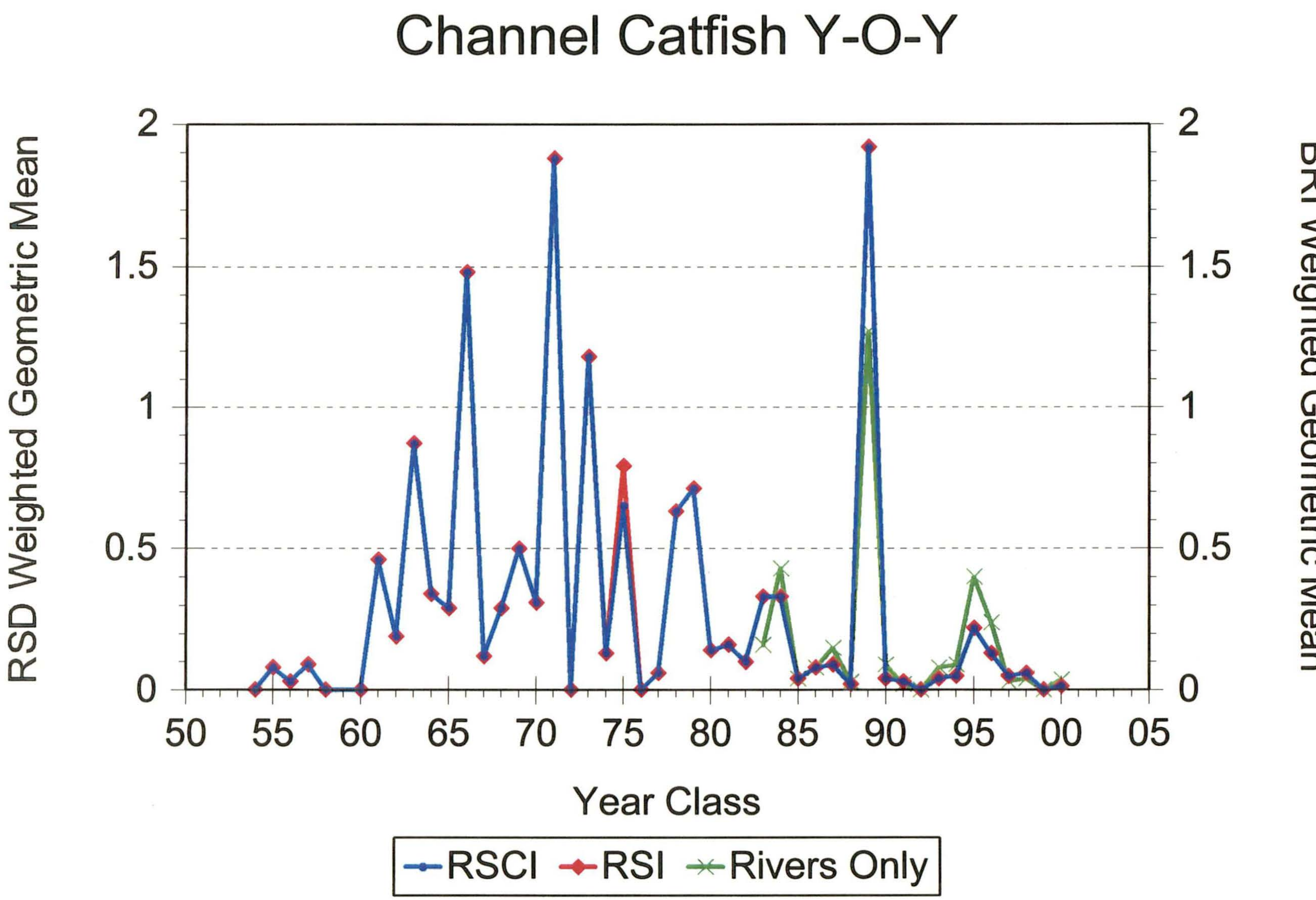


Figure 15. Y-O-Y channel catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

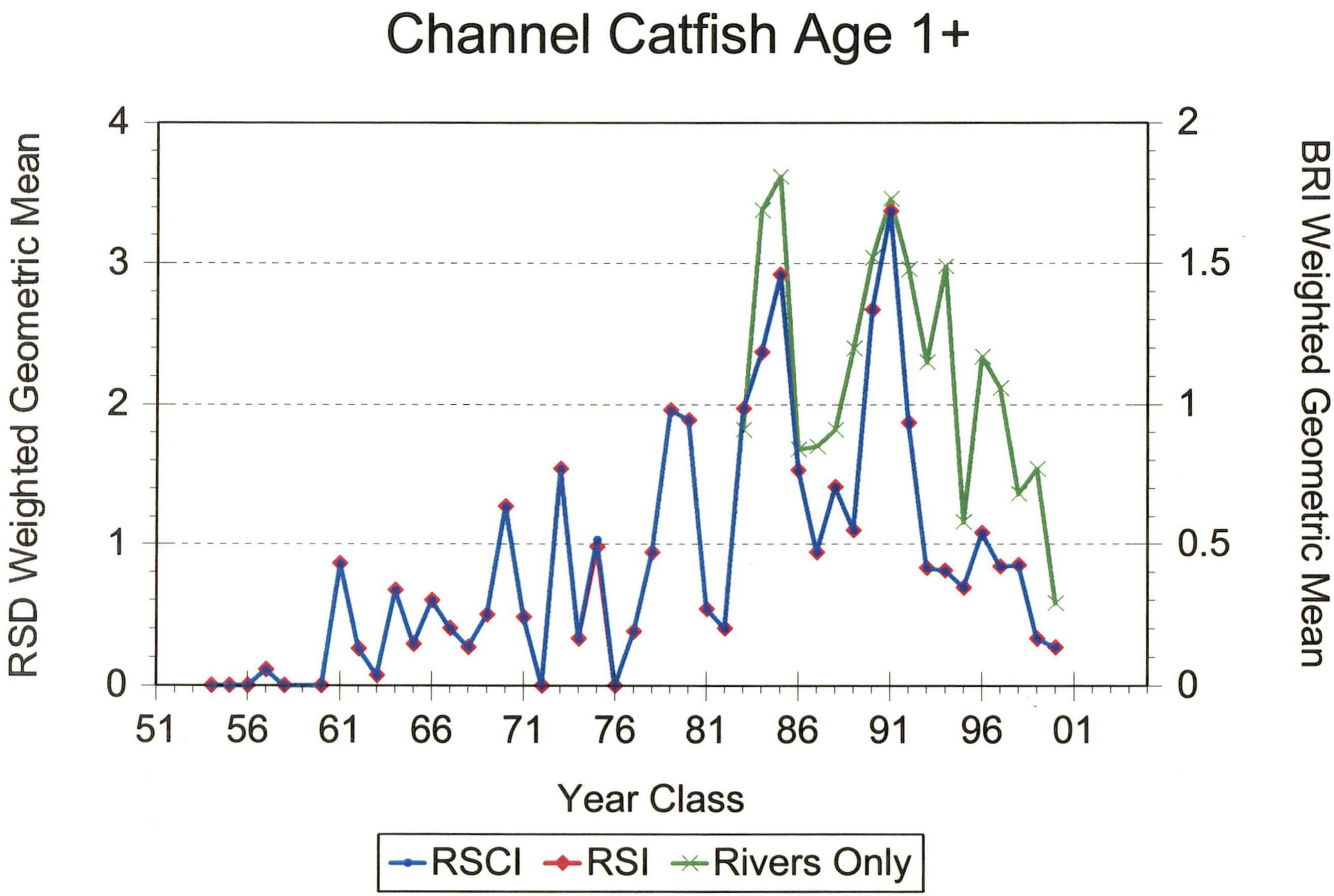


Figure 16. Age 1+ channel catfish random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

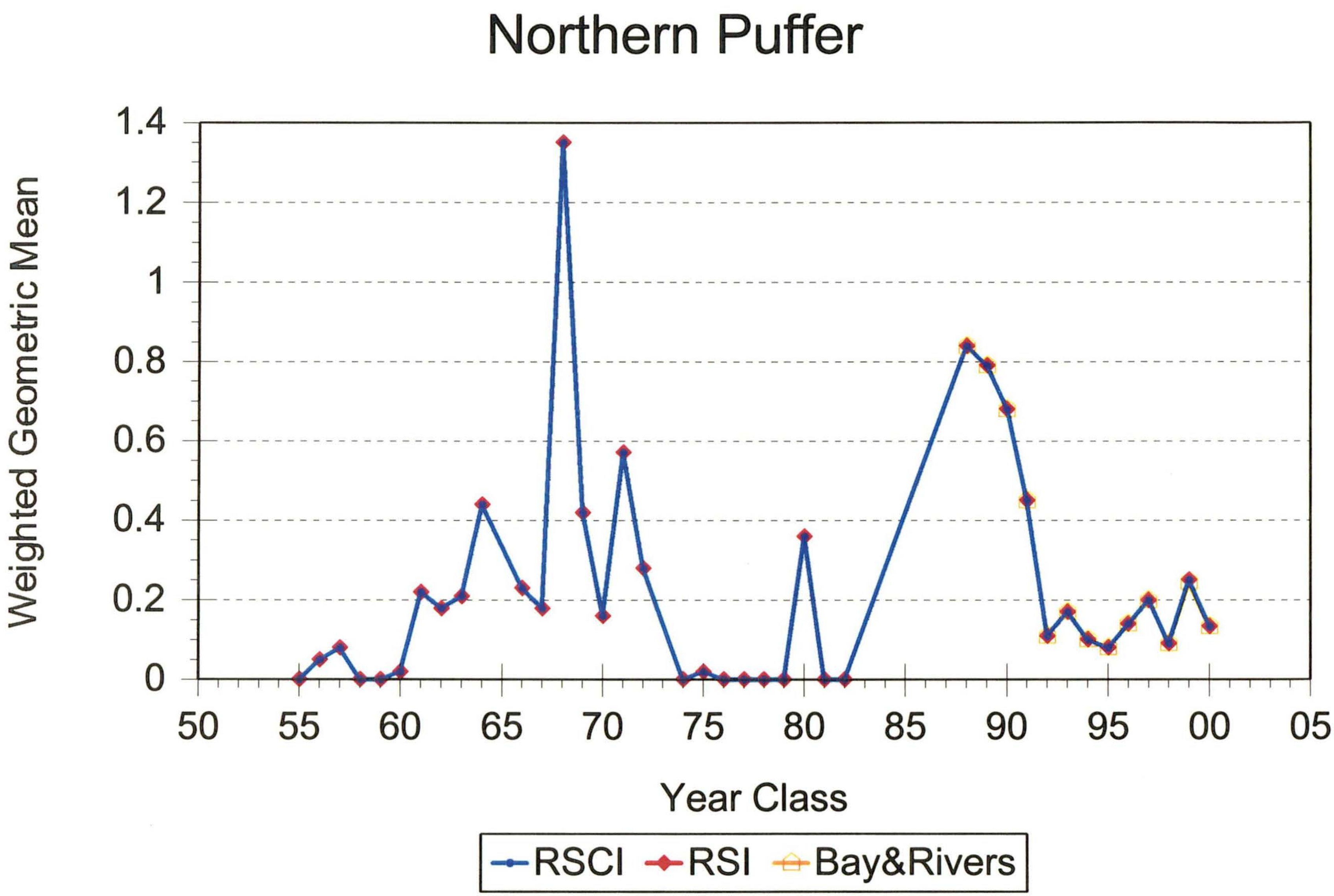


Figure 17. Y-O-Y northern puffer random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.

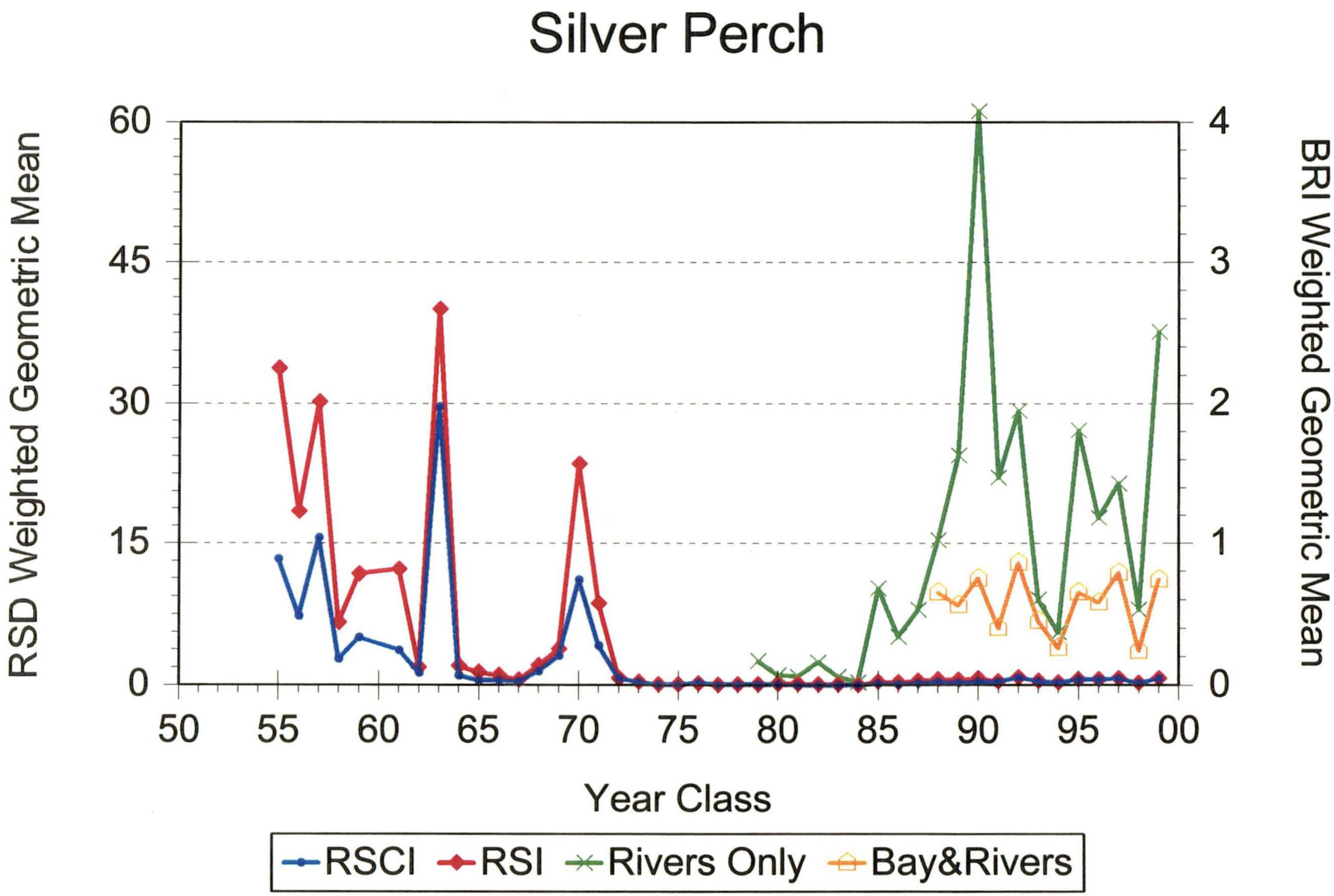
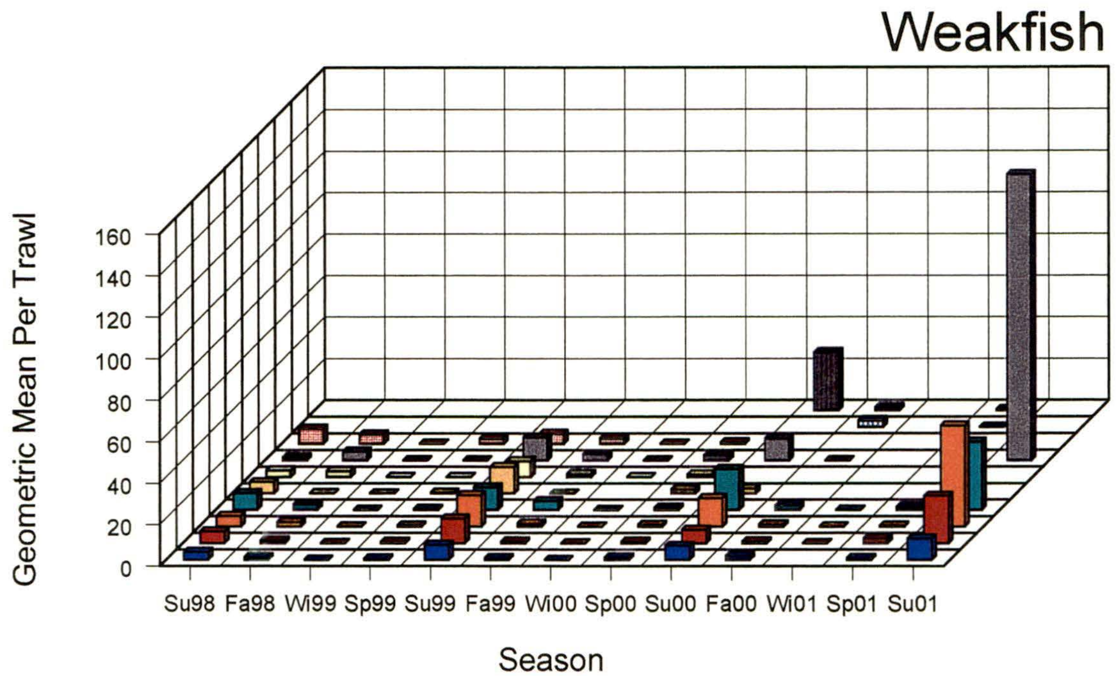


Figure 18. Y-O-Y silver perch random stratified (RSI), random stratified converted (RSCI), fixed transect (Rivers only), and Bay and fixed river station (BRI) indices.



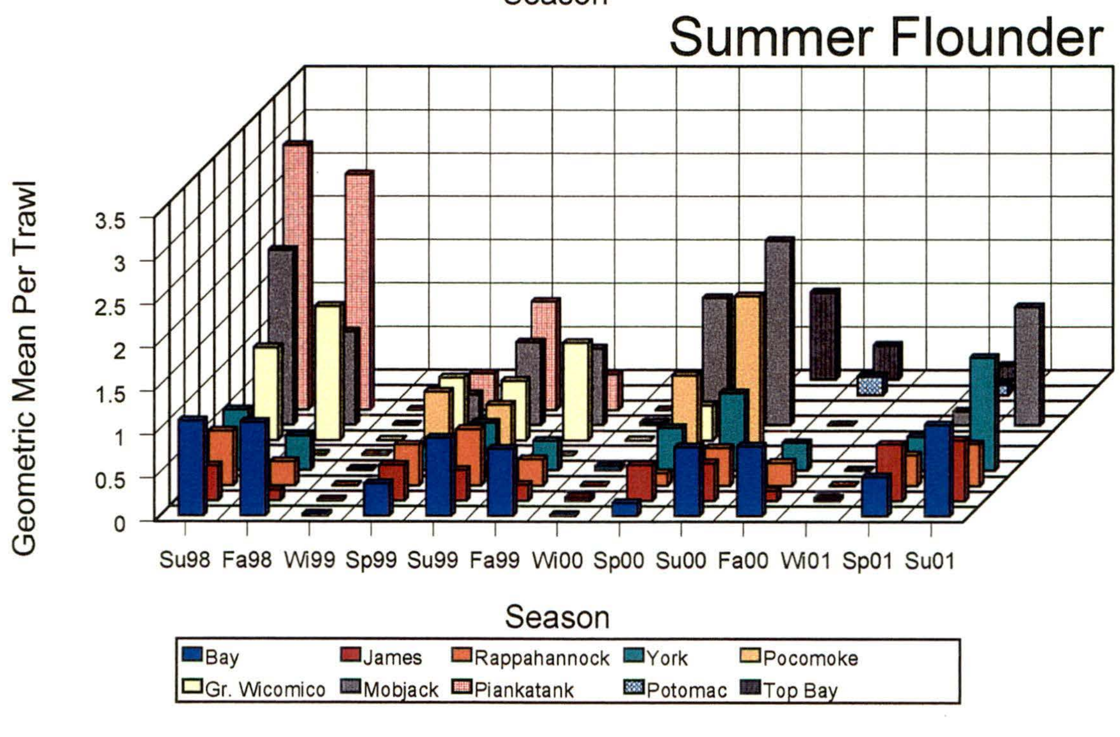


Figure 19. Weakfish and summer flounder seasonal estimates of relative abundance from July 1998 to September 2001 on the Pocomoke Sound , Mobjack Bay , Top Bay, Great Wicomico, Piankatank, and Potomac Rivers, as they related to the primary water systems (Bay, James, York, and Rappahannock Rivers).

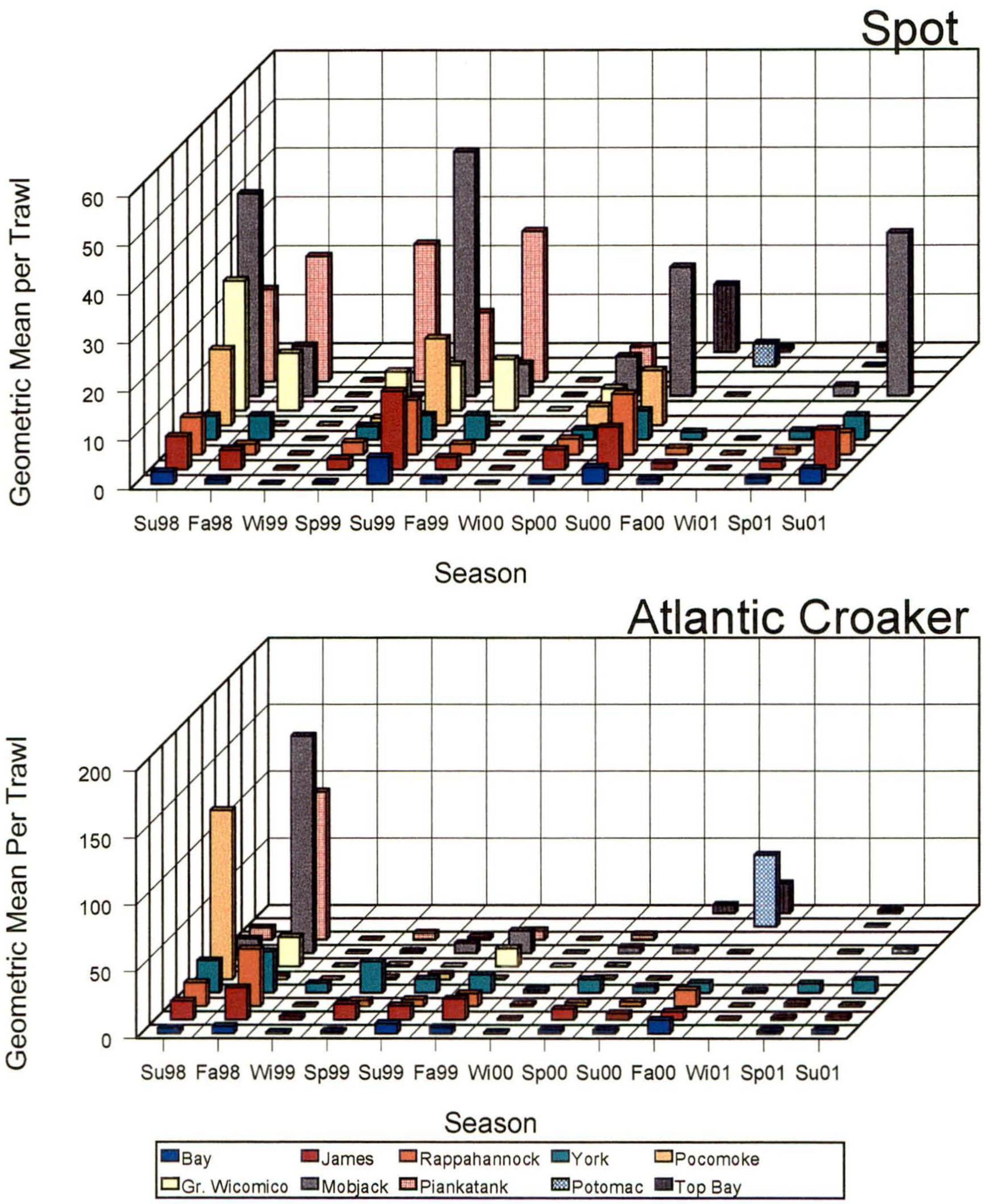


Figure 20. Spot and Atlantic croaker seasonal estimates of relative abundance from July 1998 to September 2001 on the Pocomoke Sound , Mobjack Bay , Top Bay, Great Wicomico, Piankatank, and Potomac Rivers, as they related to the primary water systems (Bay, James, York, and Rappahannock Rivers).

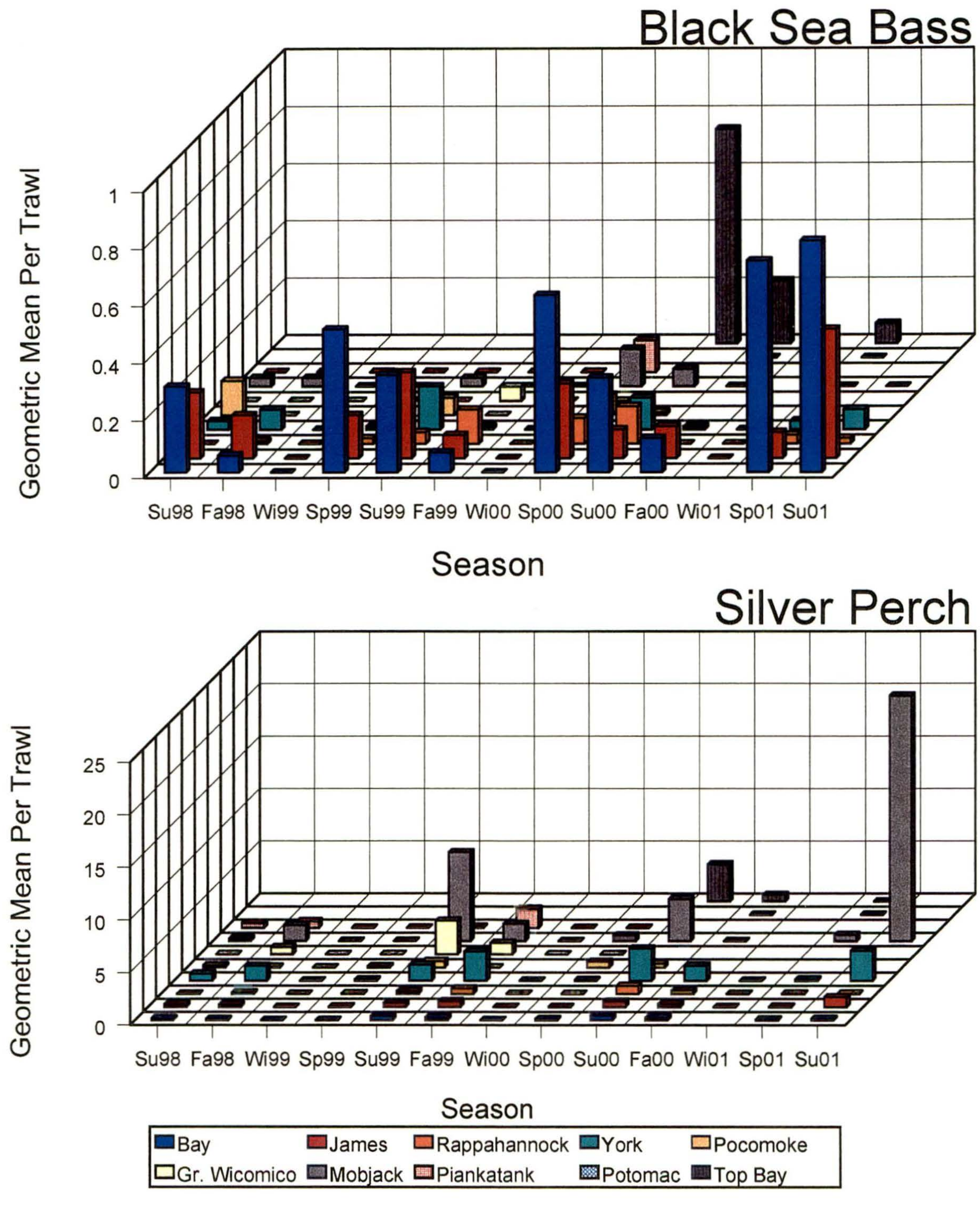
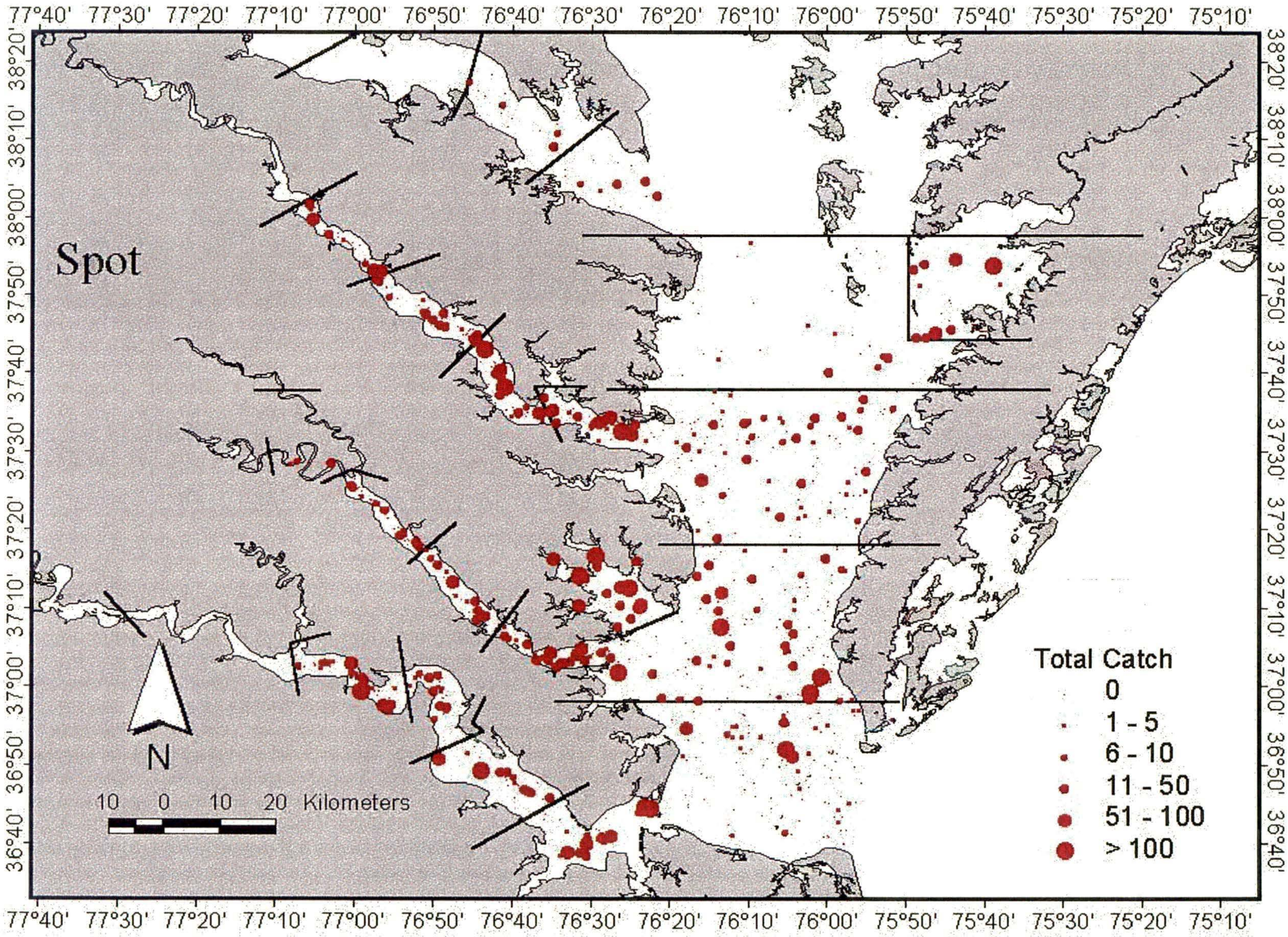


Figure 21. Black sea bass and silver perch seasonal estimates of relative abundance from July 1998 to September 2001 on the Pocomoke Sound , Mobjack Bay , Top Bay, Great Wicomico, Piankatank, and Potomac Rivers, as they related to the primary water systems (Bay, James, York, and Rappahannock Rivers).

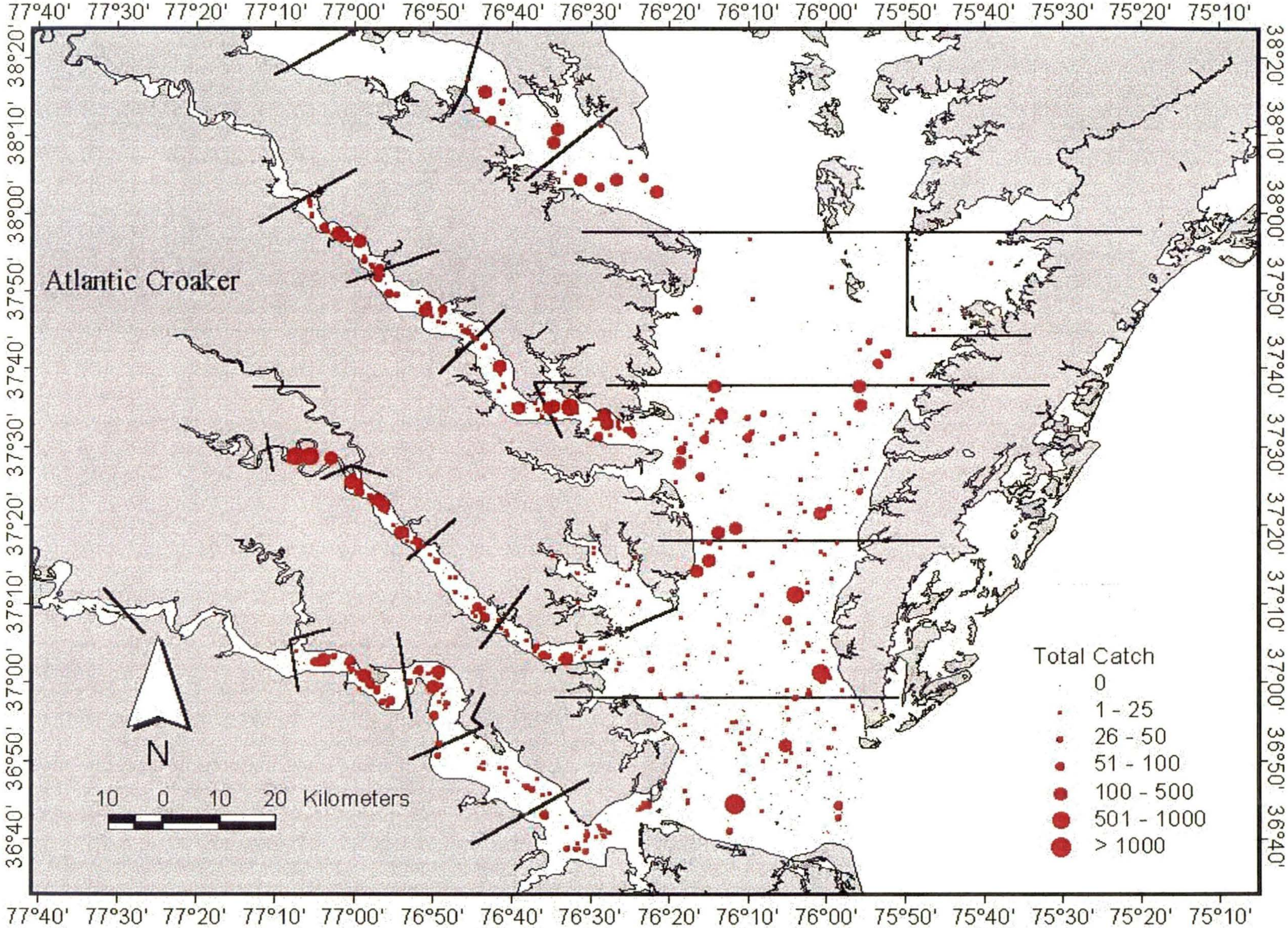
Appendix Figures 1-15.	Trawl catches (numbers of index-aged individuals) plotted by month and station location for July 2000 to June 2001 for the following species:

Appendix Figure:

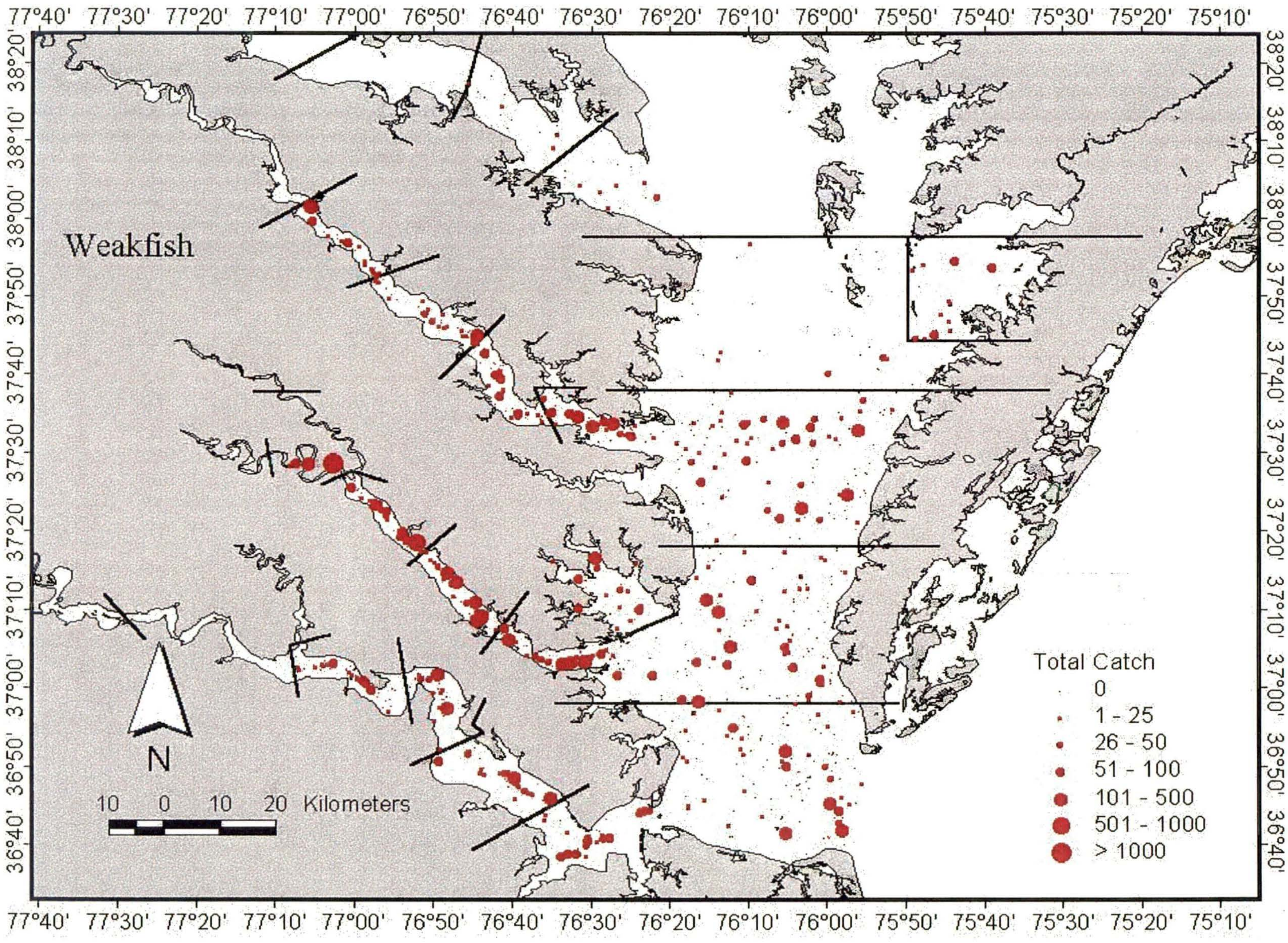
(I)	spot
(II)	Atlantic croaker
(III)	weakfish
(IV)	summer flounder
(V)	black sea bass
(VI)	early age-1 scup
(VII)	striped bass
(VIII)	y-o-y white perch
(IX)	age 1+ white perch
(X)	y-o-y white catfish
(XI)	age 1+ white catfish
(XII)	y-o-y channel catfish
(XIII)	age 1+ channel catfish
(XIV)	)northern puffer
(XV)	)silver perch



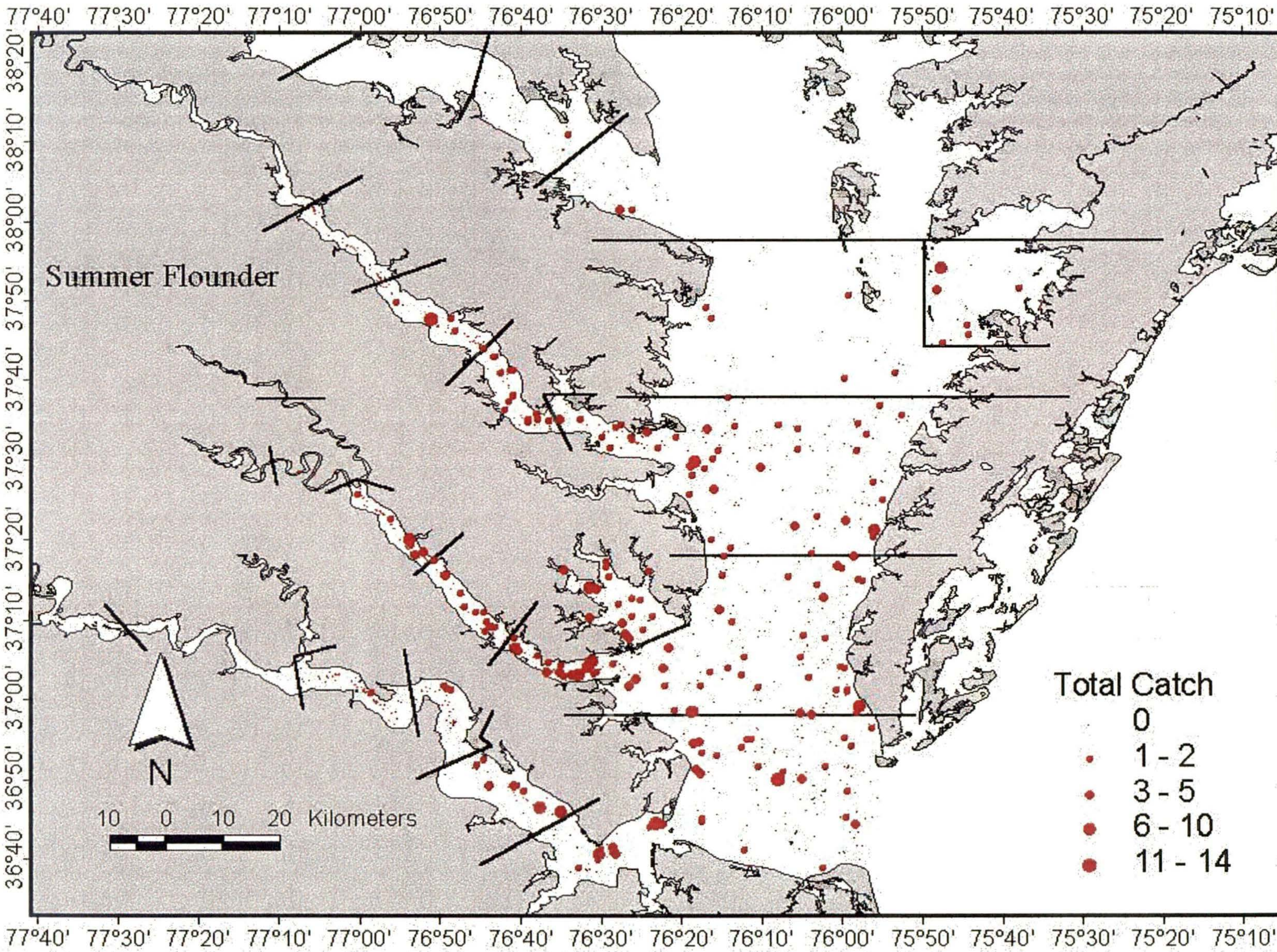
Appendix Figure I. Y-O-Y spot from VIMS Trawl Survey, July 2000 to June 2001.



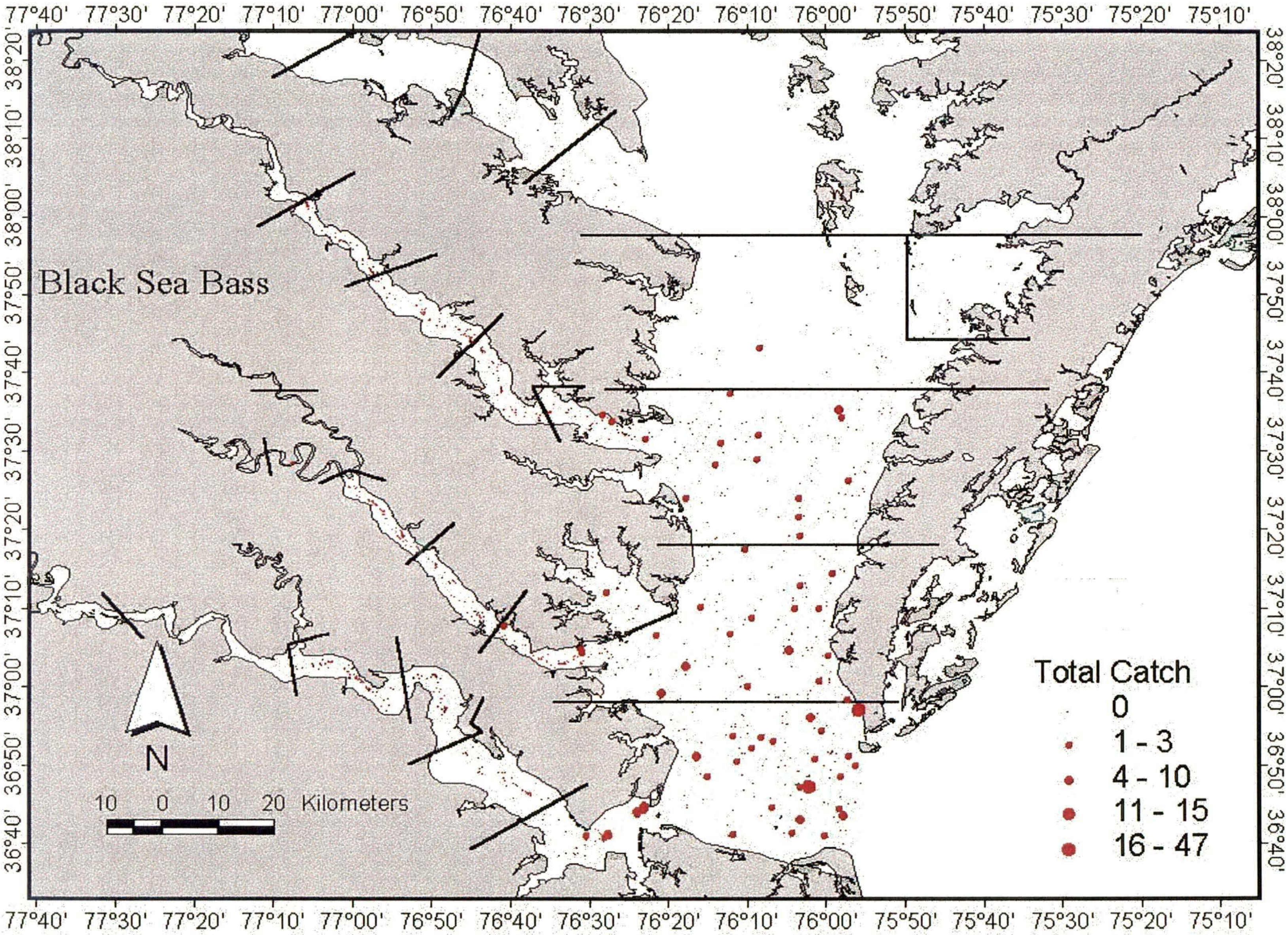
Appendix Figure II. Y-O-Y Atlantic croaker from VIMS Trawl Survey, July 2000 to June 2001.



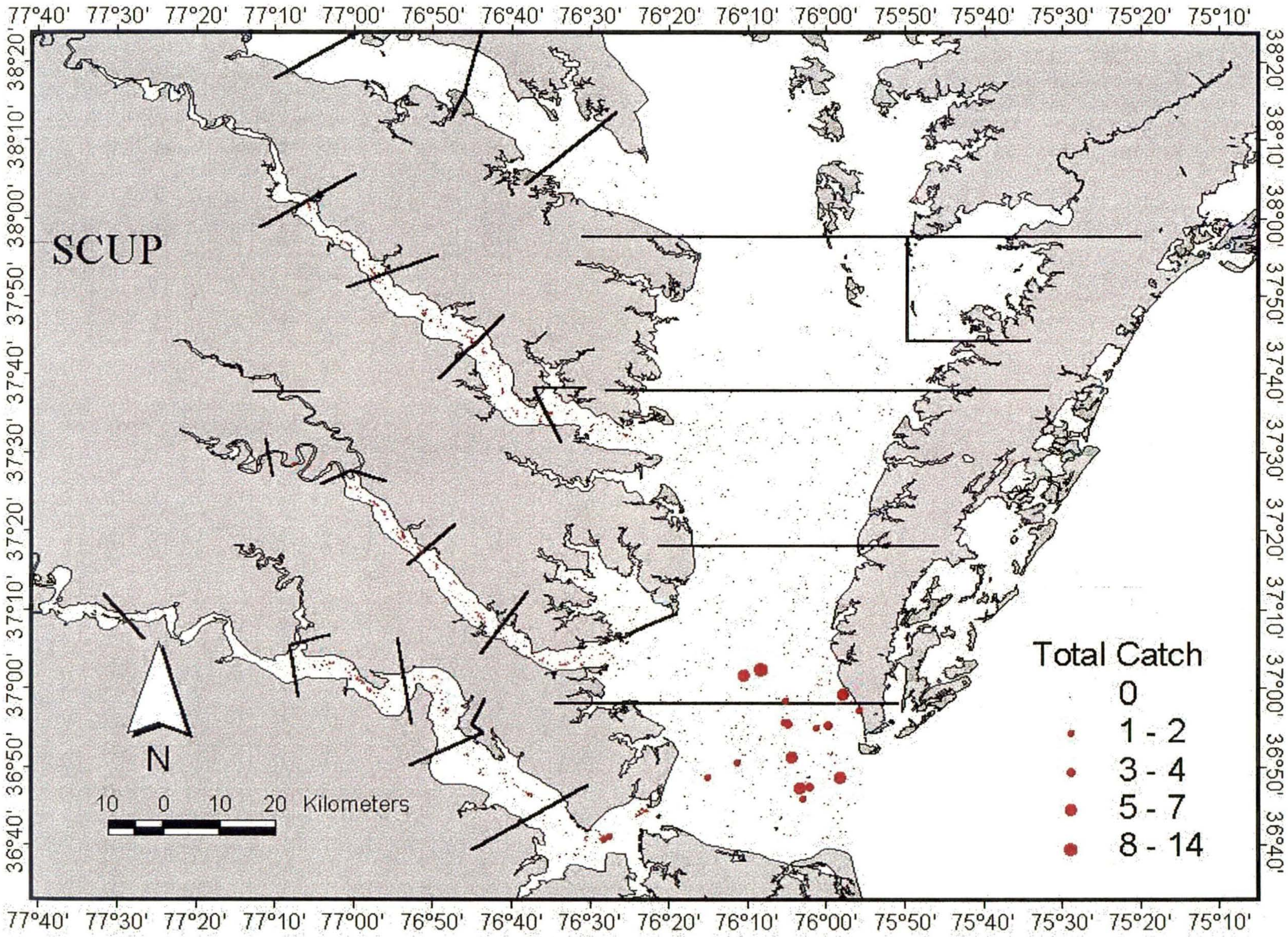
Appendix Figure III. Y-O-Y weakfish from VIMS Trawl Survey, July 2000 to June 2001.



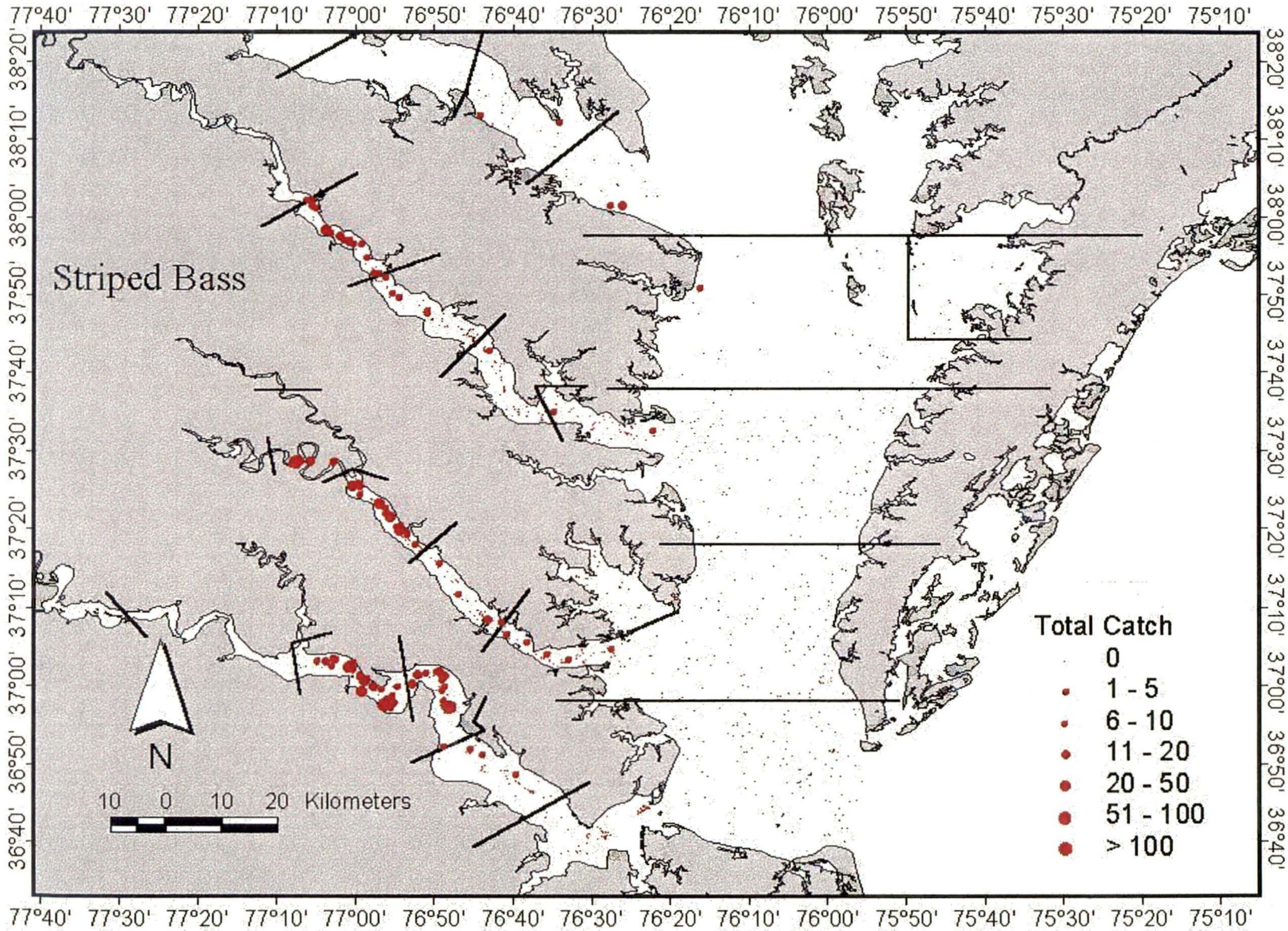
Appendix Figure IV. Y-O-Y summer flounder from VIMS Trawl Survey, July 2000 to June 2001.



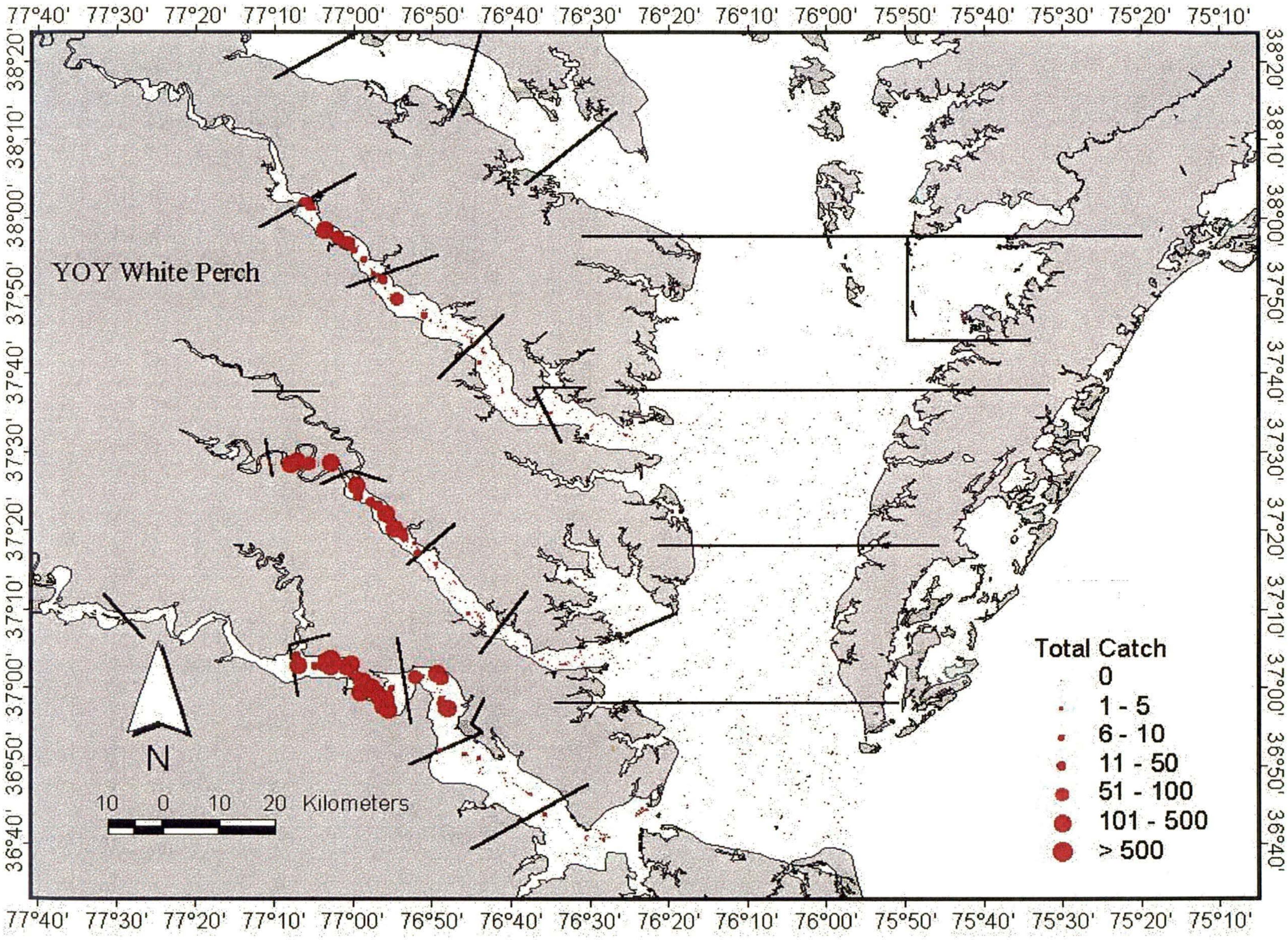
Appendix Figure V. Y-O-Y black sea bass from VIMS Trawl Survey, July 2000 to June 2001.



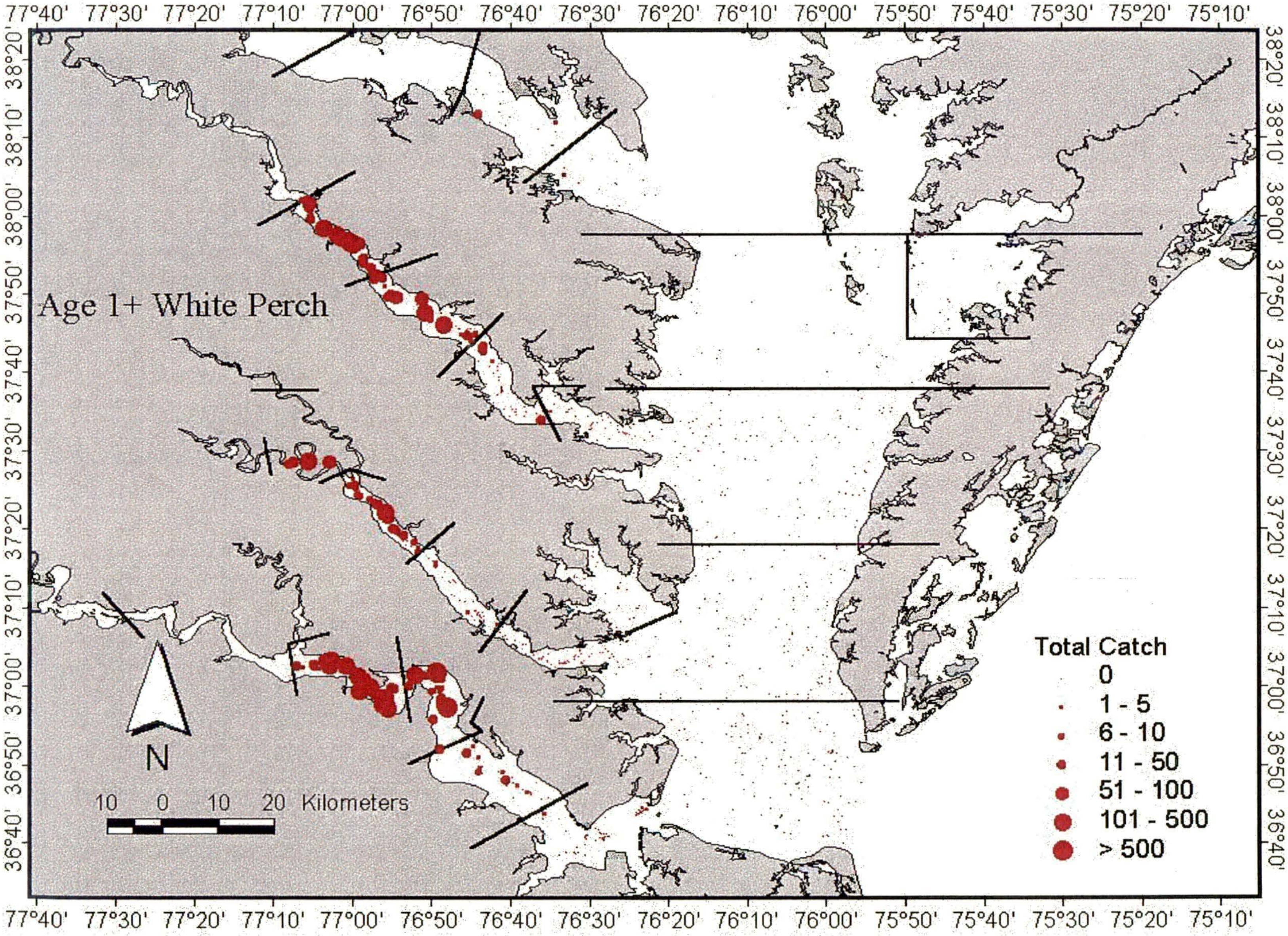
Appendix Figure VI. Early Age 1 scup from VIMS Trawl Survey, July 2000 to June 2001.



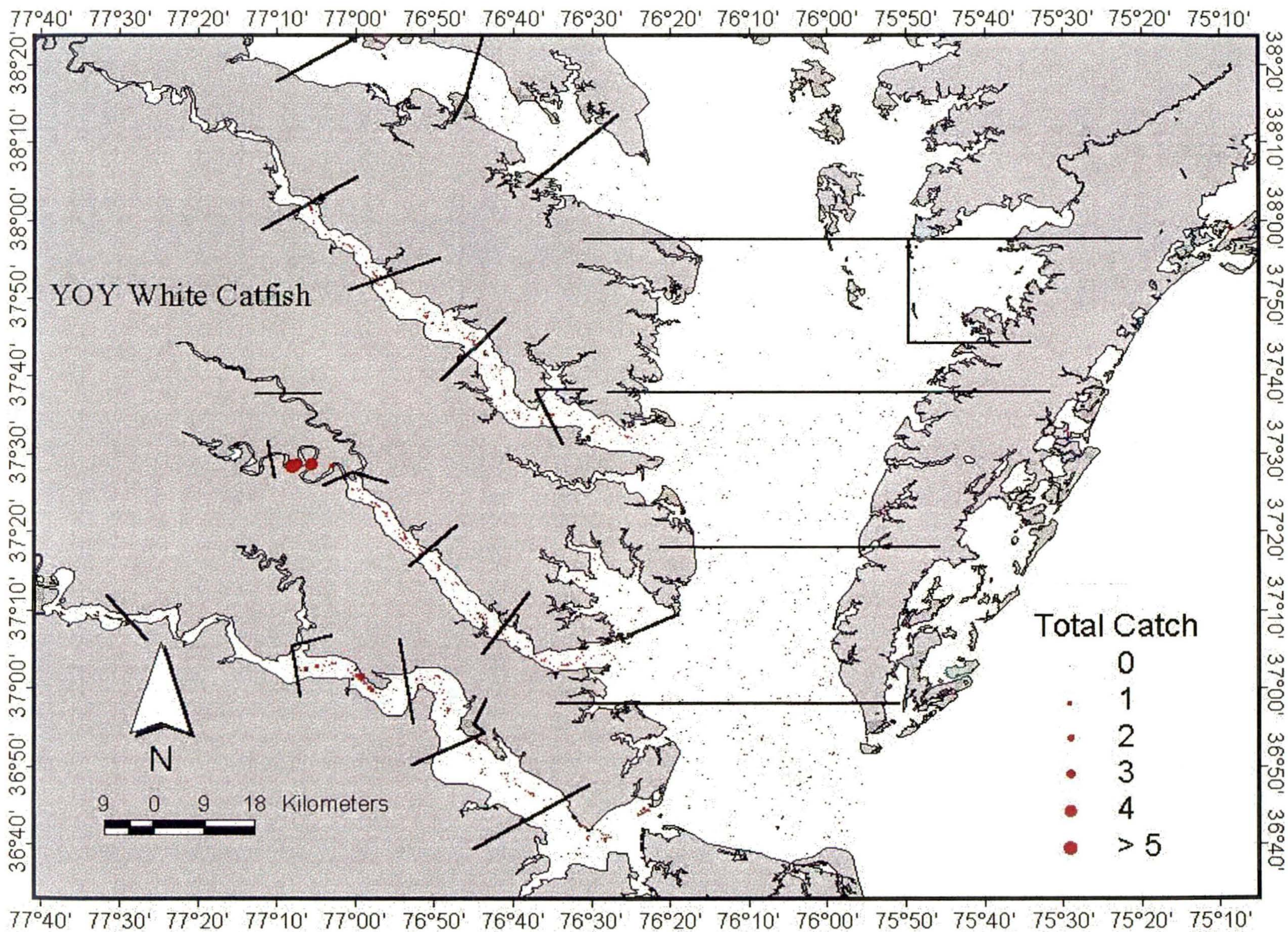
Appendix Figure VII. Y-O-Y striped bass from VIMS Trawl Survey, July 2000 to June 2001.



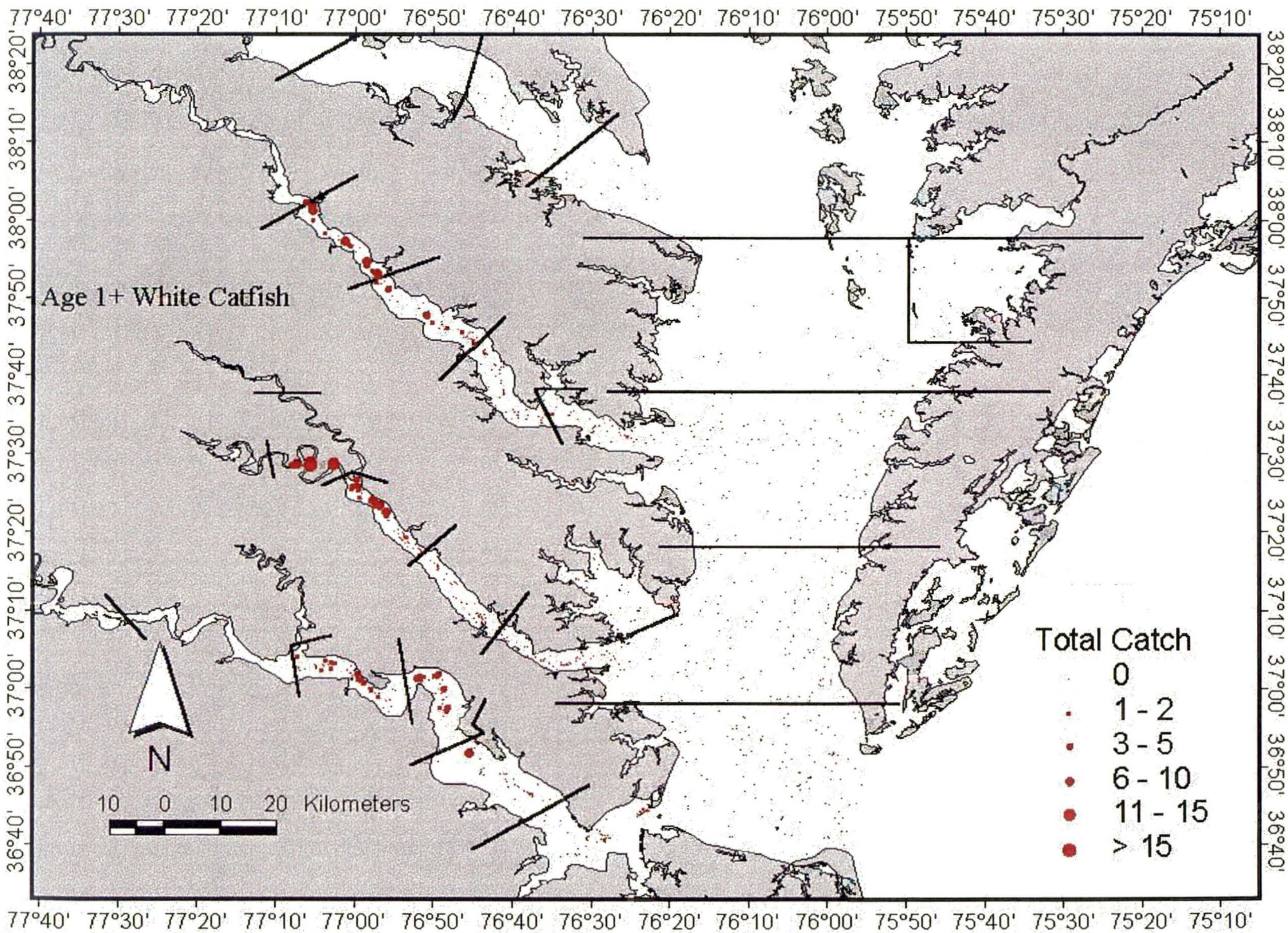
Appendix Figure VII. Y-O-Y white perch from VIMS Trawl Survey, July 2000 to June 2001.



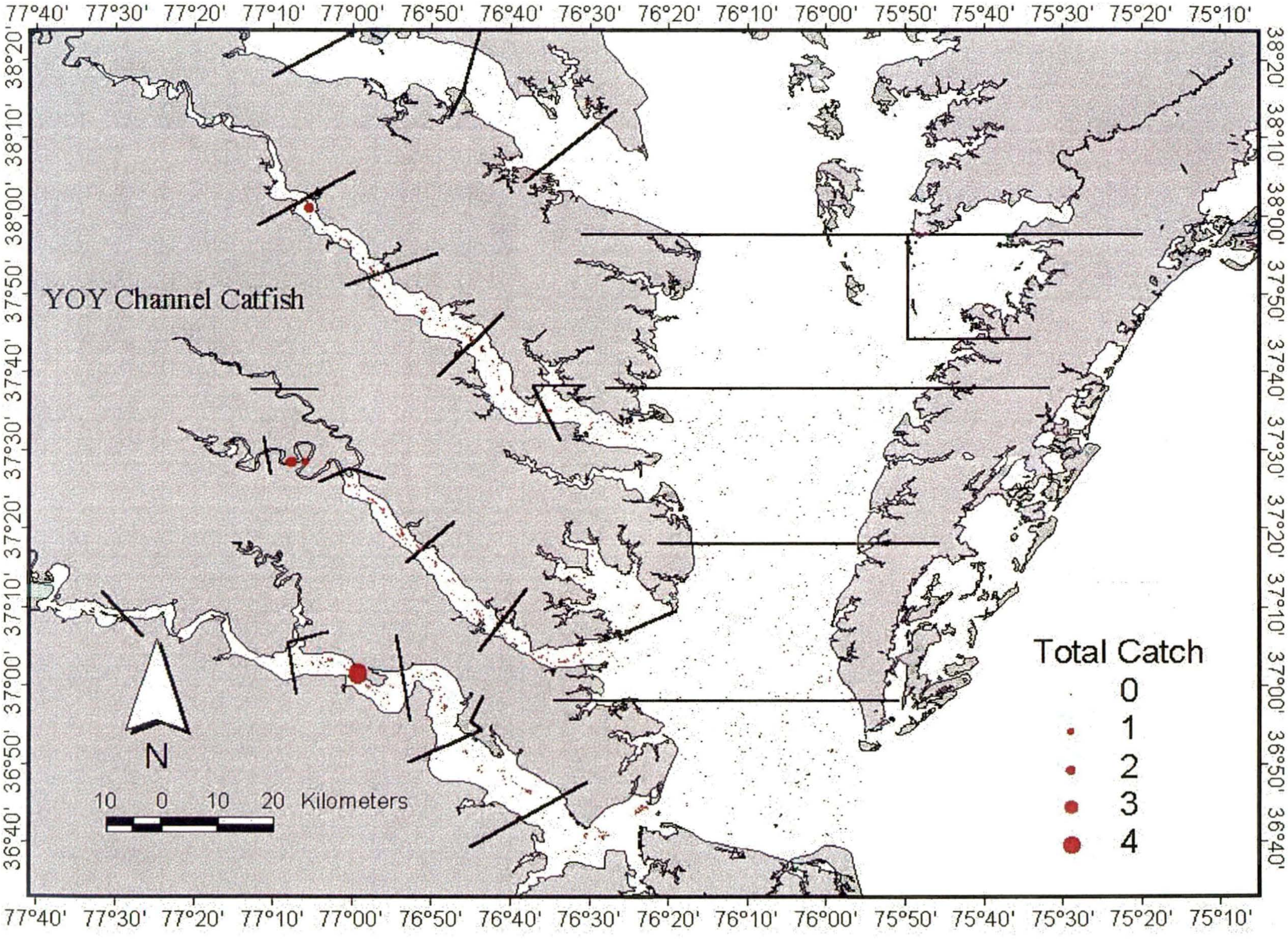
Appendix Figure IX. Age 1+ white perch from VIMS Trawl Survey, July 2000 to June 2001.



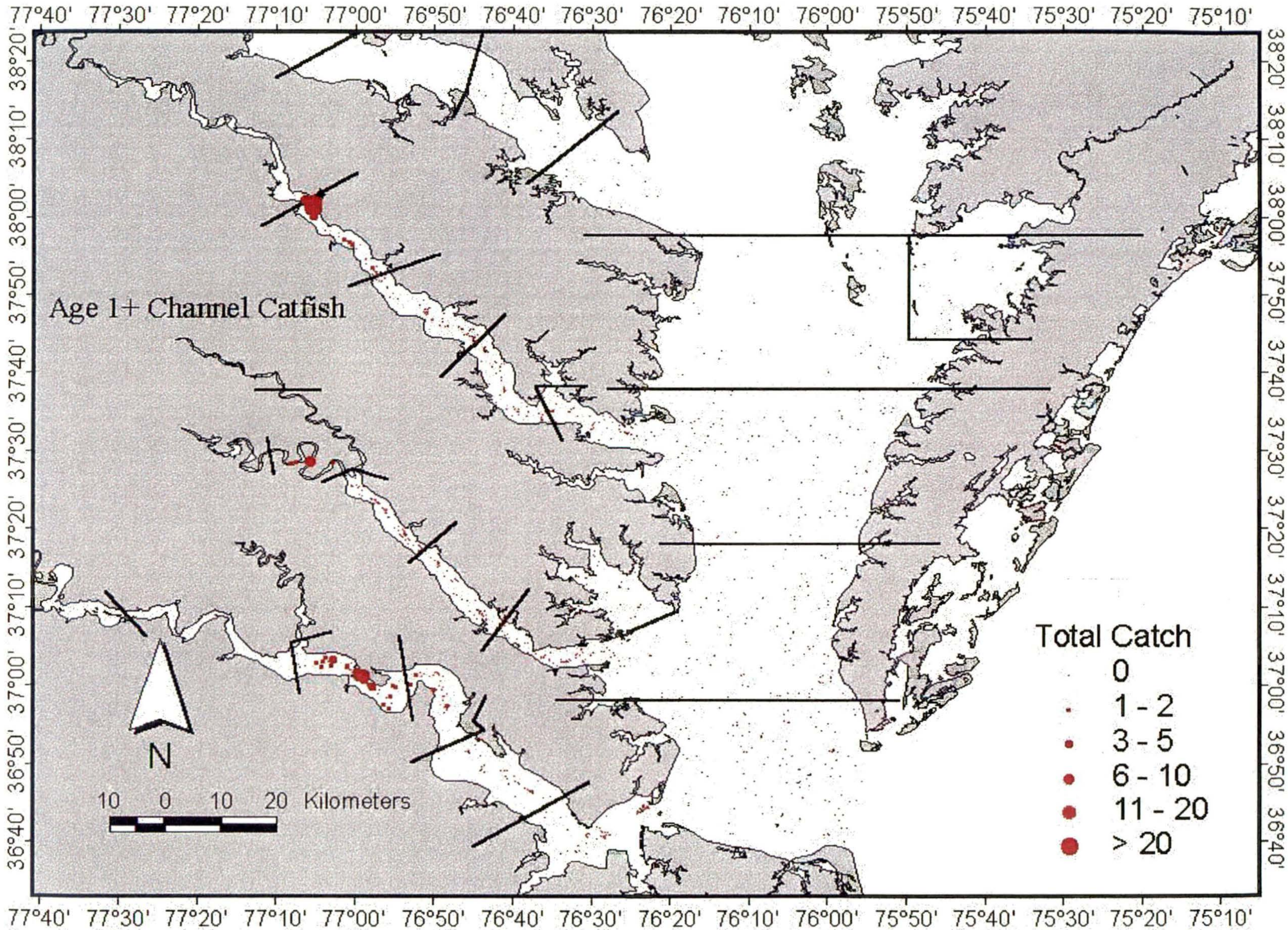
Appendix Figure X. Y-O-Y white catfish from VIMS Trawl Survey, July 2000 to June 2001.



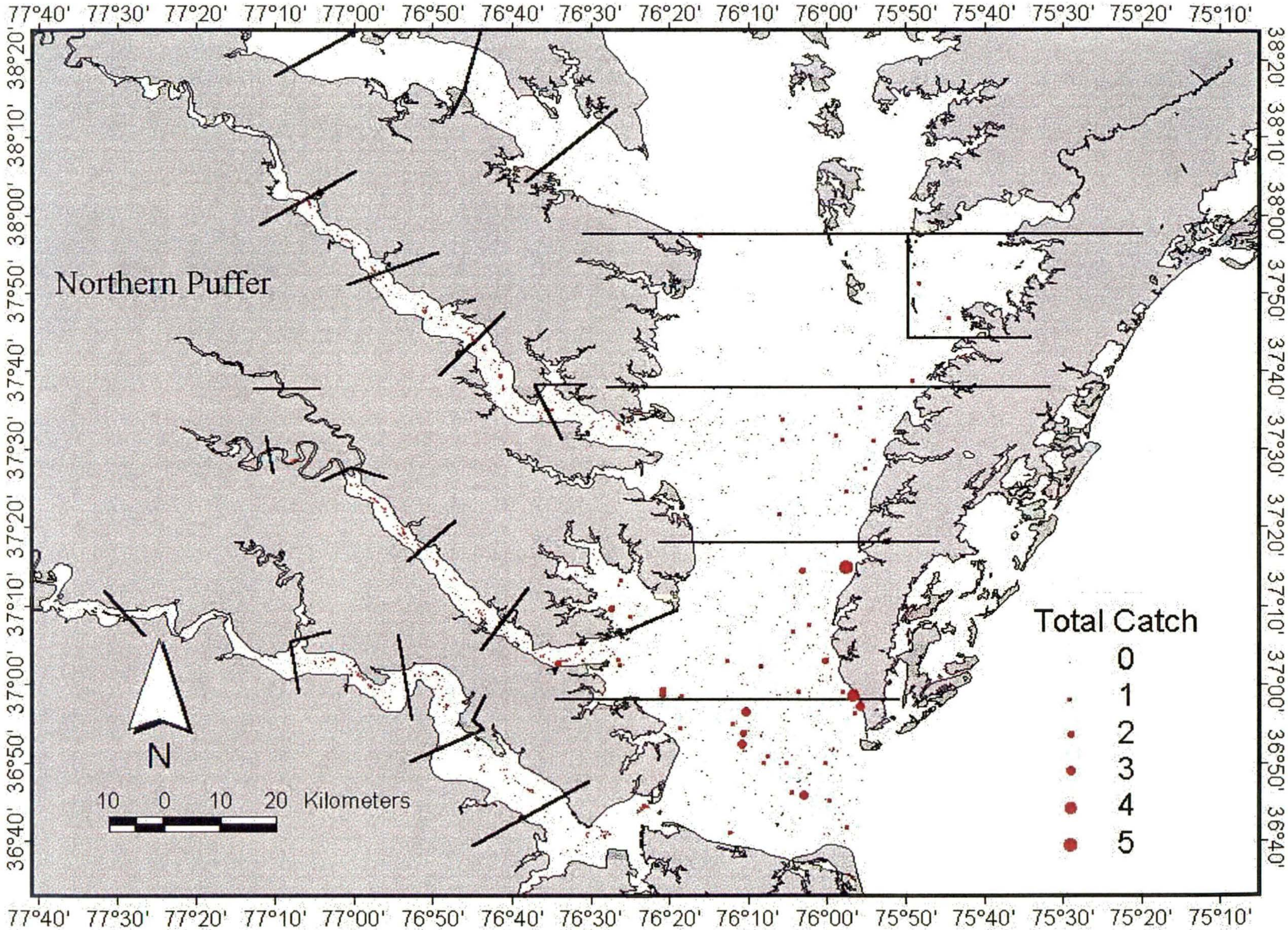
Appendix Figure XI. Age 1+ white catfish from VIMS Trawl Survey, July 2000 to June 2001.



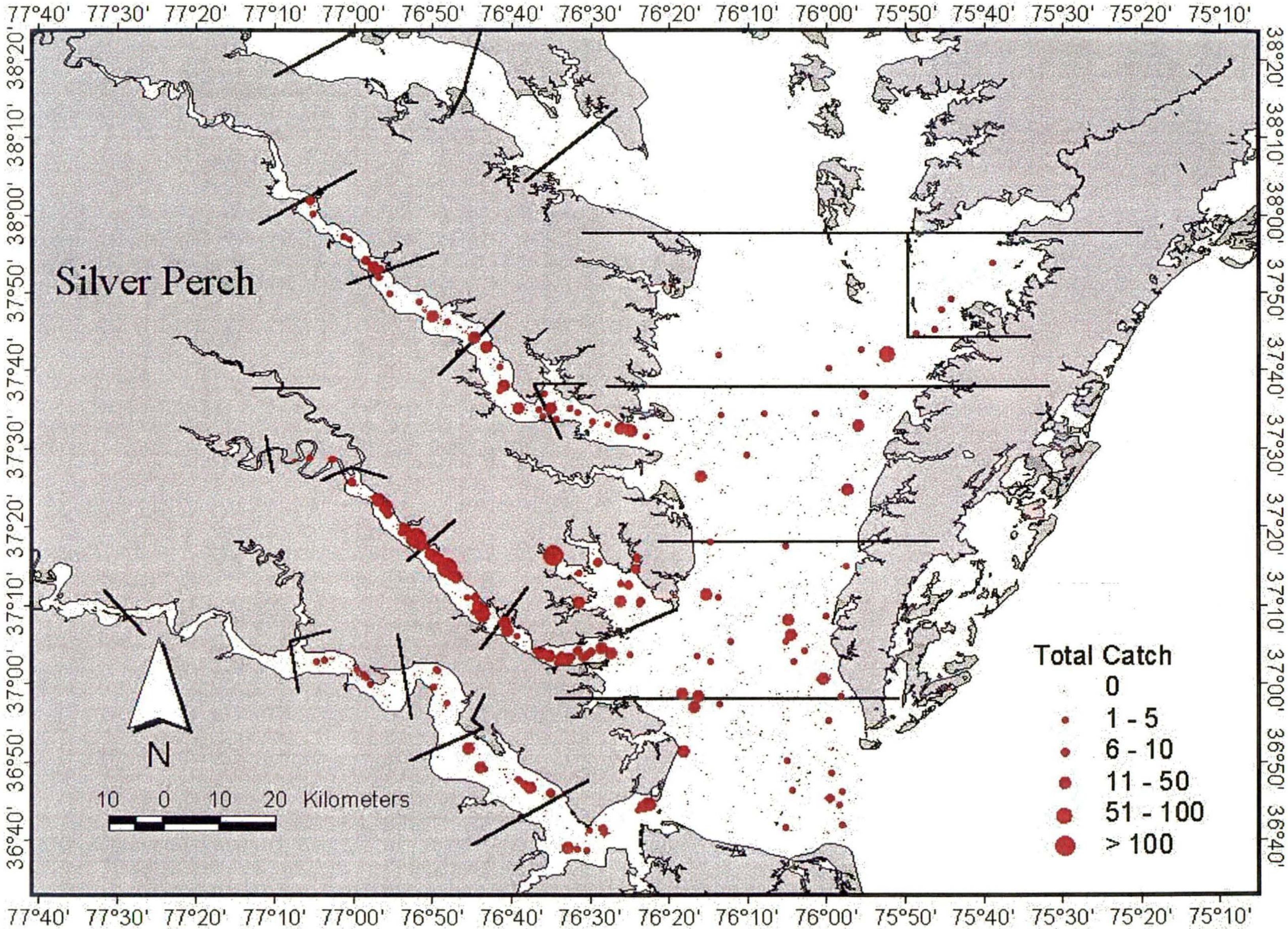
Appendix Figure XII. Y-O-Y channel catfish from VIMS Trawl Survey, July 2000 to June 2001.



Appendix Figure XIV. Age 1+ channel catfish from VIMS Trawl Survey, July 2000 to June 2001.



Appendix Figure XV. Y-O-Y northern puffer from VIMS Trawl Survey, July 2000 to June 2001.



Appendix Figure XVI. Y-O-Y silver perch from VIMS Trawl Survey, July 2000 to June 2001.