

Summary of 1976-2003 Warm Water Assessment

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This report summarizes gill net sampling carried out by the New York State Department of Environmental Conservation (NYSDEC) to assess fish stocks in New York waters of Lake Ontario's eastern basin. Warm water assessment is a long-term trend-through-time sampling program designed to provide an annual overview of the warm water fish community. The sampling provides information on a wide variety of species and variables, but is targeted at establishing abundance indices from catch per unit effort (CPUE) data, with emphasis on smallmouth bass, walleye, yellow perch, and white perch.

Sampling Procedures

The 1976-2003 warm water assessment utilized standardized gangs of sinking gill net, set overnight on bottom, parallel to the depth contours. Each net gang consisted of nine equal length net panels, 8 feet deep, and ranging in size from 2-6 inch stretch mesh by ½ inch size increments. Sampling was usually scheduled for the first two weeks of August, but has been started as early as July 29 and ended as late as August 25. Depth contours and depth strata boundaries all refer to the maximum water depth, although the nets actually sampled a band of water extending from bottom to approximately 8 feet above bottom.

From 1976-79, the sampling utilized 900 foot multifilament net gangs (each net panel 100 ft long), half set at the 17-foot depth contour (5 meters), and half set in deeper water between the 17-foot contour and the top of the thermocline. The 1976-79 sampling also excluded Chaumont, Black River, and Henderson Bays. In 1980, a number of significant modifications were made in the sampling. Net panel length was reduced from 100 to 50 feet (all other specifications remained the same); the number of net gangs set was increased; Chaumont, Black River, and Henderson Bays were

included among the locations sampled; and a stratified random sample design was used to select netting sites. This new design used three depth strata (stratum 1, 12-30 ft; stratum 2, 31-50 ft; stratum 3, 51-100 ft), plus five area strata (Figure 1). Species diversity and mean catch were highest in depth strata 1 and 2, and sampling effort was concentrated there. Both were sampled in proportion to their surface areas, with 10 and 9 net gangs, respectively, scheduled each year. The area strata were used primarily to ensure that all major geographic areas within depth strata 1 and 2 were sampled each year in proportion to their respective surface areas. Sampling effort within depth stratum 3 has varied, with 4 net gangs scheduled in 1980-83, 8 net gangs in 1984-88, and 10 net gangs from 1989-2003.

In 1993, sampling was again modified by switching from multifilament gill nets to monofilament gill nets. This latest change was implemented in part to take advantage of the greater efficiency associated with handling monofilament gill nets, and in part due to cost and availability of multifilament netting of the proper specifications.

Corrections for changes in sample and net design that occurred between 1979 and 1993 have been described previously (Eckert 1986, 1998). Adjustments for differences in areas sampled in 1976-79 versus later years were made using the 1980-85 data. Assuming that the relative species distribution between areas of the eastern basin remained the same from 1976-85, the 1980-85 data were used to calculate indices of relative species catch within the five geographic areas. These species specific area abundance indices were then used to adjust the 1976-79 data for those areas of the eastern basin which were not sampled. Adjustments for the change from multifilament to monofilament mesh gill nets were calculated from 34 paired mono/multifilament net gangs set in 1990-93. Significant differences in CPUE data were found among eight species.

Multifilament nets caught significantly higher numbers of brown bullhead and pumpkinseed, while monofilament nets caught significantly higher numbers of white perch, rock bass, smallmouth bass, yellow perch, walleye and freshwater drum. No significant differences were detected in the ages or sizes of fish collected in the two net types. Correction factors were applied to the multifilament gill net catch data from 1976-92 to calculate "monofilament equivalent" catch values. Mean catch per standard 450 ft monofilament net gang, and 95% confidence limits, were calculated from raw (non-transformed) monofilament or "monofilament equivalent" catch data, using standard formulas for stratified random samples (Cochran 1977). Weighting factors for strata 1-3 were equal to their respective surface areas within New York waters of the eastern basin (stratum 1: 0.20828; stratum 2: 0.18845; stratum 3: 0.60327).

Numbers of warm and cold water fish captured in deeper areas during the August assessment are largely dependent on water temperatures. Although a mix of warm and cold water species can be found in net gangs subjected to fluctuating water temperatures, experience had shown that catches of warm water fish were consistently zero in areas inundated by cold hypolimnetic waters. To avoid the unnecessary killing of cold water species such as lake trout, net gangs scheduled for locations in stratum 3 which had stable bottom temperatures less than 50°F were often deleted prior to 1996. Whenever a scheduled net gang was deleted due to cold water temperatures, catches of all warm water fish were simply assumed to equal zero. Beginning in the mid 1990s, shifts in the distributions of alewives, rainbow smelt, and lake trout to greater depths were documented in Lake Ontario coincidental with the establishment of dreissenid mussels (O'Gorman et al. 2000). Due to concerns that factors such as increasing water clarity might also increase depth distributions of some warm water fish species, all scheduled net locations have been utilized since 1996 regardless of bottom water temperatures. These and other ecological changes might also affect fish distribution among the geographic areas of the eastern basin. Of particular concern was the possibility that predation by double-crested cormorants could significantly lower warm water fish abundance in the Stony Island area, due to the proximity of the Little Galloo Island nesting colony.

Results and Discussion

2003 Summary:

The 2003 warm water assessment was conducted as scheduled with 29 standard net gangs set at predetermined randomly chosen locations between August 4 and August 11. The net gangs were set and retrieved by NYSDEC Watertown personnel utilizing two 19-22 foot boats, which allowed completion of the sampling in just seven days (5 nights of netting). After being retrieved, the net gangs were taken to Cape Vincent Fisheries Station to be picked and readied for resetting. The fish were all processed by staff from the Cape Vincent Station. The thermocline was moderately deep and quite stable throughout the first week of sampling (August 4-8), with bottom temperatures above 60°F for nets set shallower than the 78-foot contour. Northeast winds over the weekend of August 9-10 caused the thermocline to shift upwards, and nets set deeper than 65 feet on August 11 were subjected to bottom temperatures as low as 46.5°F.

Species and numbers of fish captured by depth strata in 2003, and stratified CPUE estimates with their corresponding 95% confidence limits, are presented in Table 1. As in other years, numbers of fish and warm water fish species diversity were highest in strata 1 and 2, declining in stratum 3. Total catch of warm water species was 813 fish, with over half (467 fish) in depth stratum 1. Yellow perch, smallmouth bass, walleye, and rock bass, were the most commonly captured species contributing 83.4% of the total number of warm water fish sampled (yellow perch 35.5%, smallmouth bass 25.7%, walleye 11.3%, and rock bass 10.8%). Two lake sturgeon were captured in 2003 marking the seventh year among the last nine that at least one individual has been captured. Prior to 1995, only one lake sturgeon was captured in 19 years of sampling.

Species Trends 1976-2003:

Catch per unit effort data for warm water fish collected in the 1976-2003 assessments are shown in Table 2. Trends in abundance for the total of all warm water fish, and for 14 of the more important warm water species, are presented in Figures 2-6. Figures 2-6 also contain graphs of 3-year moving average catches plotted against the midpoint of the three years averaged (i.e., average 1976-78 catch plotted against 1977, average 1977-79 catch plotted against 1978, etc.). This is a method often

used to help dampen fluctuations due to yearly sample variation, and to more clearly show trends in catch data. Overall the warm water fish community in New York waters of Lake Ontario's eastern basin has undergone significant change during the 28-year sampling period, declining from a high of approximately 200-250 fish per net gang in 1976-79, to just over 20 fish per net gang in 1999-2003 (Table 2, Figure 2). This has involved significant declines among most species that were abundant at the start of the assessment program. The stratified mean for all warm water species in 2003 was 22.92 fish per standard 450 ft net gang, a 20.3% increase compared to the 2002 overall CPUE.

Yellow perch, white perch, rock bass, gizzard shad, and alewife, were all important members of the warm water community in 1976-79, and have all shown a pattern of declining abundance over the 28-year sampling period. Of these species, gizzard shad showed the earliest and most precipitous decline in abundance (Table 2, Figure 4), declining from a high of approximately 50 fish per net gang in 1977 and 1978 to less than one fish per net gang in 1982. Gizzard shad abundance has remained low since, with zero catches in 1995-97 and again in 2001 and 2003. White perch was arguably the most common pan fish in Lake Ontario in the 1970s with catches averaging 90 fish per net gang in 1976-79 (Table 2, Figure 3). White perch catches declined through the 1980s and early 1990s, reaching a low of just 0.06 fish per net gang in 1995. Abundance appears have increased somewhat in recent years, but white perch catches remain very low compared to 1976-79, are highly variable, and concentrated in the larger embayments. Yellow perch (Tables 2 and 5, Figure 2) catches declined dramatically in the early and mid 1980s, but have remained comparatively stable since at lower abundance levels. Fall trawl sampling conducted by the USGS Oswego Biological Field Station showed increased production of age-0 yellow perch in 1991-95, raising expectations for increased abundance and increased gill net catches in subsequent years (O'Gorman and Burnett 2001). However, these stronger year classes were apparently negated by increases in mortality rates, including increases among fish age 0-2 (perch too small to be exploited by recreational or commercial fisheries). The fact that yellow perch were the most commonly captured fish in the 2000-2003 assessment netting is due largely to decreases in catches of other species. Rock bass catch rates declined sharply

in the early 1980s, remained moderately stable through the early 1990s, but then began a second more gradual decline that continued through 2002 (Tables 2 and 6, Figure 3). The stratified mean CPUE estimate for 2003 was 1.84 rock bass per net gang, a 64.5% increase compared to 2002, but still the fifth lowest CPUE estimate among the years sampled. Alewife catches show more yearly variation, with an overall pattern of declining catches from the late 1970s through the early 1990s, followed by consistently low catches through 2003 (Table 2, Figure 6). Other sampling programs confirm lower alewife abundance in Lake Ontario as well as shifts in temporal distribution, particularly in the eastern basin since the mid 1990s (O'Gorman et al. 2000, O'Gorman et al. 2003). Alewife catches in the warm water netting are also potentially influenced by gill net selectivity. Since only larger adult alewives are readily captured in the smallest mesh sizes used (2 inch stretch mesh), comparatively small changes in age composition or growth rate may significantly change vulnerability to the standard net gangs used.

Smallmouth bass have always been an important component of the Lake Ontario warm water community, and the most commonly sought species in the eastern basin recreational fishery (McCullough and Einhouse 1999). From 1976-1979 smallmouth bass were typically the third or fourth most commonly captured fish in the assessment netting (Table 2), with CPUE estimates less than half the most common species. As abundance of these other species declined, smallmouth bass became an increasingly larger proportion of the fish sampled, and since 1986 have been either the first or second most commonly captured species in the assessment netting. Smallmouth bass have shown a cyclic pattern of abundance over the 28-year sample period, with obvious peaks in CPUE estimates around 1980 and 1989 (Tables 2 and 4, Figure 2). These peaks were directly attributable to recruitment of large numbers of bass from the strong 1973 and 1983 year classes, respectively (Chrisman and Eckert 1999). Catches of age 2-4 bass in the assessment netting also indicated strong year classes in 1987, 1988, 1995, and 1997 (Casselmann et al. 2002, Eckert 2000). Despite the presence of four strong year classes since 1987, smallmouth bass catches began an overall pattern of decline in 1990. The two lowest CPUE estimates among the years sampled were recorded in 2001 and 2002. In 2003, smallmouth bass CPUE rose slightly with an estimate of 5.43 fish per net gang.

The decline of smallmouth bass in the eastern basin is in direct contrast to smallmouth bass populations along the southern shore of Lake Ontario. The NYSDEC fishing boat census has documented a significant increase in smallmouth bass catch rates between 1985 and 2003 (the largest increases occurring after 1996), suggesting a corresponding increase in smallmouth bass abundance (Eckert 2004). This increase in smallmouth bass was corroborated by gill net sampling conducted near Pultneyville, NY (20 miles east of Rochester) in 1976-79 and in 2000-01, utilizing the same standard net gangs and methods as the eastern basin warm water assessment (Eckert and Pearsall 2002). Mean smallmouth bass CPUE at the Pultneyville site rose from 15.35 bass in 1976-79 to 82.62 bass in 2000-01, a 438% increase. Eastern basin mean CPUE estimates declined from 27.59 bass in 1976-79 to just 4.00 bass in 2000-01, an 86% decrease.

Of the eight remaining species shown in Figures 3-6, four show a rather obvious downward trend in abundance, while one species shows an overall upward trend. Northern pike (Figure 6) shows an early and dramatic decline in CPUE over the years sampled similar to gizzard shad, but in contrast to gizzard shad, was never a major component of the warm water catch in the eastern basin. White sucker and brown bullhead (Figure 4), and common carp (Figure 6), all show a pattern of declining abundance over the 28-year sampling period, although yearly CPUE estimates are relatively more variable than for the more common species. Channel catfish, pumpkinseed, and freshwater drum (Figure 5) all show relatively high variability in yearly CPUE estimates, with no obvious long-term trends in abundance, especially if the high data points observed in 1979 are discounted. Walleye is the only relatively common species that has shown a long-term trend with increased abundance (Figure 3), but CPUE estimates have also declined for this species since 1993.

Distribution Shifts:

Analysis of changes in depth or geographic distribution was attempted using relative catches of smallmouth bass, yellow perch, walleye, and rock bass (the four most common and recreationally important species over the range of years sampled), plus the total of all warm water species. Relative CPUE values were calculated separately each year for the three depth strata, and the five area strata, from the 1980-2003 sampling. The mean

catch in each of the three depth strata in any given year was divided by the highest depth strata value for that year; and similarly, the mean catch in each of the five area strata (depth strata 1 and 2 only) was divided by the highest area strata value for that year. This resulted in a value of 1.0 for the depth and area strata that had the highest mean catch for that species or species group in any given year, with values less than 1.0 for the remaining two depth and four area strata that are directly proportional to the catch within that strata (Tables 3-7, Figures 7-16). Trends in the relative CPUE values over the 24 years sampled were tested using least-squares regression analysis (REG Procedure, SAS 1985).

Relative catches of all warm water fish (Table 3, Figure 7) showed no significant trends in any of the depth strata, with typically the highest, least variable catches in depth stratum 1 (12-30 ft, 24-year average 0.960), lower, more variable catches in depth stratum 2 (31-50 ft; 24-year average 0.796); and the lowest and most variable catches in depth stratum 3 (51-100 ft; 24-year average 0.341). Smallmouth bass, yellow perch, and rock bass, all had slightly higher average relative catches in depth stratum 2 than in stratum 1, and all showed some statistically significant ($P < 0.05$) trends in relative catches in depth strata 1 and 2. Smallmouth bass (Table 4, Figure 8) show a statistically significant trend towards higher relative catch in depth stratum 1 ($P = 0.0255$), with the highest relative catches in stratum 1 in 9 of the last 12 years (despite this, 24-year average relative catch remains higher in stratum 2). Yellow perch (Table 5, Figure 9) show the opposite, with a significant downward trend in relative catches in depth stratum 1 ($P = 0.0217$). Rock bass (Table 7, Figure 11) relative catches show both a statistically significant upward trend in depth stratum 1 ($P < 0.0029$, highest relative catches in stratum 1 in 7 of the last 8 years), and a statistically significant downward trend in depth stratum 2 ($P < 0.0015$). Walleye (Table 6, Figure 10) show statistically significant upward trends in relative catch in both stratum 2 ($P = 0.0008$) and stratum 3 ($P = 0.0101$). Although walleye did show a significant trend towards higher relative catch in depth stratum 3, catch of walleye, and all other warm water species, remained at or near zero at depths where bottom temperatures were consistently below 50°F.

Graphs of relative CPUE by area strata are given in Figures 12-16. Relative catches of all warm water

species (Table 3, Figure 12) show a statistically significant upward trend in Chaumont Bay ($P=0.0170$), and statistically significant downward trends in the Henderson Bay ($P=0.0183$) and Stony Island areas ($P=0.0285$). Smallmouth bass relative catches (Table 4, Figure 13) show statistically significant downward trends in the Grenadier Island ($P=0.0020$) and Stony Island ($P<0.0001$) areas, and a statistically significant upward trend in the Chaumont Bay area ($P=0.00017$). Relative catch data for yellow perch (Table 5, Figure 14) show only one statistically significant trend, a downward trend in the Stony Island areas ($P=0.0015$). This downward trend in the Stony Island area is particularly striking, and although relative catches of yellow perch were never high in the Stony Island area, catches have been zero in 13 of the last 16 years (5 net gangs per year, 12-50 ft depths) with only three yellow perch total caught in the last four years. Significant trends in relative catches for both walleye and rock bass were confined to the Stony Island area. Walleye (Table 6, Figure 15) show a significant upward trend in the Stony Island area ($P=0.0063$, highest relative catches in 12 of the last 13 years), while rock bass (Table 7, Figure 16) show a borderline downward trend ($P=0.0542$).

Smallmouth Bass Age, Mortality, and Growth

Summary:

Percent age composition and mean age of smallmouth bass sampled from 1976-2003 are shown in Table 8. Age 4 fish from the 1999 year class was the most common age group collected in 2003, comprising 27.3% of the total. Fish from the 1999 year class were also the most abundant group collected in the 2002 and 2001 assessment netting, contributing 47.3% (age 3) and 25.8% (age 2), respectively. Age two smallmouth bass was the second most common age sampled in 2003, comprising 16.7% of the total. No age 1 bass were observed in 2003, although age 1 fish have been collected in 7 of the last 10 years. Younger fish have contributed a much larger portion of the overall smallmouth bass catch in recent years, with age 1-4 fish averaging 60.2% of the total from 1996-2003 as compared to only 27.9% from 1976-95. Increased contribution of younger fish has caused a general decline in the mean age of smallmouth bass collected. The mean age of smallmouth bass sampled in 2003 did increase to 5.54 years, the highest mean age estimated since 1995, but that is still well below the means estimated during the 1980s (10-year mean age 6.45

years). The oldest smallmouth bass observed in 2003 were four age 13 fish from the 1990 year class.

Comparisons of age distribution of smallmouth bass among the three depth and five area strata utilized in the 1980-2003 assessment netting were carried out with chi-square tests (numbers observed compared to numbers expected) to help gain further insight into the changes in relative bass distribution previously discussed (Table 4, Figures 8 and 13). To avoid small samples sizes, bass sampled over the 24-year period were lumped into four age groups (ages 2-4, 5-7, 8-10, and 11&up) and six year groups of four years each (see data in Table 9). These data show that smallmouth bass of all age groups are common within all three depth strata and most of the area strata. Over the 24-year sample period, fish from the 2-4 and 5-7 age groups are equally distributed among depth strata 1 and 2, while age groups 8-10 and 11&up are significantly more abundant ($P<0.005$) in depth stratum 2. Age distribution in depth stratum 3 was significantly different ($P<0.005$) from depth strata 1 and 2, with relatively fewer age 2-4 fish and more age 5-7 fish. Differences of this sort between depth stratum 3, and strata 1 and 2, were not unexpected. Smallmouth bass abundance and distribution in stratum 3 is highly variable from year to year, depending largely on water temperatures and thermocline depth and fluctuation. Tests between year groups utilizing just depth strata 1 and 2 confirm higher relative bass abundance in depth stratum 1 in recent years (see Figure 8), with significant contributions ($P<0.005$) from the 2-4, 5-7, and 8-10 age groups. Bass age 11&up was the only age group that did not show a significant increase in relative abundance in depth stratum 1 over the period of years sampled. Comparisons by area strata over the 24-year sample period show significant differences ($P<0.005$) among all age groups, with higher than expected numbers of age 2-4 bass in the Chaumont Bay area, and higher than expected numbers of age groups 5-7, 8-10, and 11&up, in the Grenadier and Stony Island areas. Relative abundance of the 8-10 and 11&up age groups was lowest in the Chaumont Bay area. Tests between year groups, show statistically significant differences ($P<0.005$) in relative abundance among all five area strata, and confirm the previously described trends with higher relative abundance of all ages in the Chaumont Bay area in recent years, and lower relative abundance in the Grenadier and Stony Island areas (see Figure 13). Trends between year groups among the different age

groups and depth and area strata are more erratic, but there have been consistent significant declines in the relative number of age 2-4 bass in the Stony Island area in recent years, and an increase in relative number of age 2-4 fish in recent years in the Chaumont Bay area.

Mean lengths of smallmouth bass ages 1-14 collected in the 1976-2003 sampling are shown in Table 10, excluding those year and age groups with sample sizes less than four fish. Previously reported trends towards increasing length of bass age 6 and older (Chrisman and Eckert 1999, Eckert 2000) are still very apparent. Estimated mean lengths of age 6-12 bass in the 2003 assessment were all among the highest observed, with record highs recorded for age 6 and age 10 bass (Table 10, Figure 17). Regression analysis of the yearly mean values from 1976-2003 (REG Procedure, SAS 1985) show statistically significant upward trends ($P < 0.001$) for each age group. These increases in growth have dramatically increased the number of large smallmouth bass, fish 18 inches or larger. From 1976-1991, bass 18 inches or larger averaged just 0.30% of the fish sampled. That percentage increased to an average of 2.13% from 1992-1998, and then increased to an average of 10.22% from 1999-2003. In 2003, 17.22% of the smallmouth bass sampled were 18 inches or larger, the highest percent observed among the years surveyed. Regression analysis of yearly mean lengths of smallmouth bass ages 2-5 also show statistically significant upward trends, although substantial declines in mean length have recently occurred (Table 10, Figure 17). Estimated mean lengths of age 2 and age 3 bass peaked in 1999, and in 2003 were down 10.4% and 13.9%, respectively. Mean length of age 4 bass peaked in 2000, and in 2003 was down 15.2%. Mean length of age 5 smallmouth bass peaked in 2002, and in 2003 was down 14.2%.

Mean lengths of smallmouth bass age 2-12 sampled in the five area strata from 1980-2003 were compared with a factorial analysis of variance (GLM Procedure, SAS 1985) using year and area as classification variables (24-year area means shown in Table 10). Differences in mean lengths between the five areas were statistically significant for ages 2-10 ($P < 0.002$). The Grenadier and Stony Island areas consistently had the smallest mean size for each age group, even among the age 11 and 12 fish. The largest mean sizes varied between ages among the Chaumont, Black River, and Henderson Bay areas. Further comparisons of the area means (Student-

Newman-Keuls Test, GLM Procedure, SAS 1985) showed that the largest statistical differences were among the younger fish (ages 2-6). These growth differences between areas are likely due in part to water temperature differences. Chaumont, Black River, and Henderson Bays are more protected areas that warm more quickly in the spring, have higher mean temperatures, and are at least partially protected from the effects of thermocline fluctuations, factors that would likely enhance smallmouth bass growth.

Condition factor (relative plumpness) of smallmouth bass has shown less dramatic trends over the years sampled than growth in length. Condition factor was calculated separately for each fish processed (weight in grams times 100,000, divided by length in millimeters cubed), and organized into mean values by one inch size groups (see Table 11). Lake Ontario smallmouth bass show a consistent significant increase (REG Procedure, $P < 0.0001$) in condition factor from 8-20 inches. Overall condition factor of 6- and 7-inch bass is higher than expected, but this is probably an artifact of gill net selectivity. Small bass are incompletely vulnerable to the gill nets used, and only the largest most robust individuals in the 6 and 7-inch size groups will have a girth sufficiently large that they are likely to be captured. Bass in the 8-inch size group show a significant downward trend (REG Procedure, $P = 0.0027$) in condition over the years sampled, with lower mean values between 1990 and 2002. Bass in the 11-inch size group also show a significant downward trend (REG Procedure, $P = 0.0154$), with the lowest mean value among the years sampled observed in 2003. Smallmouth bass in the 14 to 18-inch size groups show statistically significant (REG Procedure, $P < 0.002$) upward trends in condition factor. A comparison of the yearly mean condition of all size groups combined, shows no significant trend over the 28 years sampled.

Changes in growth can have a number of important consequences, especially when the changes are as large as those recently documented for smallmouth bass in New York waters of the eastern basin of Lake Ontario. Basic life history attributes such as age of maturity, and mortality factors such as sport fishing (generally bass >12 inches) and predation (generally bass <14 inches), will be altered, potentially leading to a significant change in the dynamics of the bass population. Growth changes also significantly impact the numbers and ages

of younger bass caught in the assessment gill nets. Lake Ontario smallmouth bass are not fully vulnerable to the standard gill net gangs used until approximately 12 inches long. Bass catches observed in the 1970's and 1980's tended to peak at age-6, a mean length of approximately 12 inches, for any given year class. Catches of fish less than age-6 were typically lower, even though the actual number of fish in that year class would have been higher at each younger age. Increased growth does increase the vulnerability of younger bass to the gill nets used, resulting in higher catches for any given number of fish and biasing comparisons with years having slower growth rates. Considering the recent growth increases that have occurred among age 2-5 smallmouth bass, it is likely that increases in relative contribution of younger fish previously noted (see Table 8) may be due in part to increased vulnerability to the sampling gear, rather than to an actual increase in the number of fish.

Indices of smallmouth bass abundance at each age and for each year class have been made by proportionately allocating the total annual CPUE estimate (Table 2) by the annual relative age contribution (Table 8). CPUE estimates for the 1965-2002 year classes, by age, are shown in Table 12. These data show wide variations in year class strength, but based on the data currently available, suggest that the total contribution (sum of the age specific CPUE estimates) of the 1989-2001 year classes will be low compared to the 1973-1988 year classes. Also, the data in Table 12 show increased relative contribution of younger bass beginning with year classes produced in the late 1980s, and apparently continuing through the present. In contrast to the 1970s and early 1980s where the modal or peak CPUE was generally at age 5-7, the modal CPUE estimate for the 1993-1998 year classes, and probably the 1999 year class, was either age 2 or age 3.

Declines in smallmouth bass CPUE since 1990 have been most directly linked to increases in mortality of bass between ages 3 and 6 (Chrisman and Eckert 1999; Lantry et al. 2002). Although absolute estimates of annual mortality are currently not possible for fish that are incompletely vulnerable to the sampling gear used (fish <12 inches), estimates of relative mortality were calculated for each year class using the ratio of age-3 CPUE divided by age-6 CPUE (Lantry et al. 2002). This analysis showed fairly consistent ratios of less than 1.0

for the 1973-85 year classes (age-6 catches higher than age-3 catches), suddenly increasing to values above 1.0 beginning with the 1986 year class (age-3 catches higher than age-6 catches). This increase in age3/age6 ratio indicated a substantial increase in relative mortality between ages 3 and 6, and coincided with documented increases in the number of double-crested cormorants and their predation on smallmouth bass. Comparisons of age3/age6 relative mortality estimates between years was dependent on the assumption that vulnerability of the age 3 and age 6 bass did not change significantly over time. Recent increases in smallmouth bass growth would clearly violate that assumption, and invalidate continued use of the age3/age6 statistic. Despite this, the facts remain that the modal CPUE estimates for recent year classes occur at either age 2 or age 3 for bass with an average length below 12 inches. This would indicate that mortality of subadult smallmouth bass continues to be high in New York waters of the eastern basin.

Estimates of adult smallmouth bass mortality by year class have routinely been calculated directly from CPUE data (Table 12), and continue to show no statistically significant trends over the period of years sampled (REG Procedure, SAS 1985). Annual mortality estimates of adult bass from the 1966-1996 year classes range from a low of just 4.4% (1977 year class) to a high of 56.8% (1966 year class), with a 31-year average of 30.5% (annual survival equals 69.5%). The 14-year average mortality for the 1966-1979 year classes was 32.2%, the 10-year average for the 1980-1989 year classes was 34.5%, and the 7-year mortality average for the 1990-1996 year classes was 27.6%.

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Table 1. Numbers of fish caught, stratified mean catch per standard 450 ft gill net gang, and 95% confidence intervals, for the 2003 warm water assessment netting conducted August 4 - August 12 in New York waters of Lake Ontario's eastern basin.

Common Name	Number Caught				Strat. CPUE	95% CI	
	Stratum 1	Stratum 2	Stratum 3	Total		Lower	Upper
Warm Water Species:							
Lake Sturgeon	1	1	0	2	0.04	0	0.10
Alewife	1	0	1	2	0.08	0	0.22
Northern Pike	4	3	0	7	0.15	0	0.31
Common Carp	1	0	0	1	0.02	0	0.07
White Sucker	10	9	21	40	1.66	0	3.93
Silver Redhorse	5	0	0	5	0.10	0	0.29
Brown Bullhead	19	0	0	19	0.40	0	0.84
Channel catfish	6	0	0	6	0.12	0	0.28
White Perch	15	5	0	20	0.42	0	0.89
Rock Bass	65	23	0	88	1.84	0.67	3.00
Pumpkinseed	22	0	0	22	0.46	0	1.09
Smallmouth Bass	101	81	27	209	5.43	3.05	7.80
Yellow Perch	154	39	96	289	9.82	2.91	16.72
Walleye	53	34	5	92	2.12	1.28	2.96
Freshwater Drum	10	0	1	11	0.27	0.02	0.52
Warm Water Total	467	195	151	813	22.92	14.37	31.46
Standard Gill Net Gangs	10	9	10	29			
Cold Water & Misc Species:							
Chinook Salmon	0	0	2	2			
Lake Trout	0	0	4	4			
Burbot	0	0	3	3			

Table 2. Stratified mean catch per unit effort data from the 1976-2003 warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

	Mean Catch per 450 ft Monofilament Gill Net Gang											
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Lake Sturgeon	0	0	0	0	0	0.02	0	0	0	0	0	0
Longnose Gar	0	0	0	0	0.04	0	0	0.04	0	1.19	0.04	0
Bowfin	0	0	0	0	0.02	0.02	0	0	0	0	0	0
American Eel	0	0	0.06	0.03	0	0	0	0	0	0	0	0
Alewife	20.96	2.07	14.83	11.57	4.30	8.18	7.53	6.90	17.65	3.35	7.61	2.32
Gizzard Shad	17.82	53.45	47.38	19.95	4.52	2.78	0.10	0.29	0.87	0.50	0.48	0.44
Northern Pike	0.83	1.04	0.93	0.16	0.08	0.02	0.04	0.06	0.02	0.17	0.17	0.08
Goldfish X Carp	0	0	0	0.17	0	0	0	0	0	0	0	0
Common Carp	0.25	0.55	0.33	0.45	0.17	0.10	0.35	0.21	0.17	0.17	0.10	0.20
Golden Shiner	0	0	0	0	0.02	0	0	0	0.04	0.02	0	0
Spottail Shiner	0	0	0	0	0	0	0	0.15	0	0	0	0
Quillback	0	0	0	0.31	0.04	0.06	0	0.04	0	0	0.02	0
Longnose Sucker	0	0	0	0	0.02	0	0	0	0	0	0	0
White Sucker	4.04	0.63	2.90	3.11	1.84	1.42	4.34	1.40	1.58	0.93	2.47	1.49
Silver Redhorse	0.06	0.05	0.20	0.43	0.04	0.10	0.15	0.38	0.06	0	0.02	0.02
Shorthead Redhorse	0	0	0	0	0	0	0	0	0	0	0	0
Brown Bullhead	1.12	0.20	1.41	4.17	0.66	0.23	1.29	0.76	0.86	1.70	2.14	1.96
Channel Catfish	0.41	1.03	1.75	3.64	0.60	0.56	1.27	0.86	0.29	0.63	1.25	0.77
Stonecat	0	0.04	0.26	0.08	0	0.23	0.30	0.02	0.04	0.06	0.04	0
Trout-perch	0	0	0	0	0	0.15	0.15	0	0.08	0	0	0.08
White Perch	63.00	136.42	74.11	86.98	26.20	44.53	25.98	34.02	20.78	12.23	13.94	11.14
White Bass	0	0	0.13	0	0.02	0.06	0.26	0	0.06	0.02	0.06	0.06
Rock Bass	7.10	10.75	22.13	13.94	14.69	10.09	7.06	4.69	6.99	3.96	7.58	4.76
Pumpkinseed	0	0.44	0.06	3.06	0.14	0.32	0.73	0.43	0.09	0.59	0.57	0.40
Bluegill	0	0	0	0	0	0	0.04	0	0	0	0	0
Smallmouth Bass	24.51	24.05	26.04	35.74	38.02	23.47	14.55	14.96	12.44	9.76	18.14	10.89
Largemouth Bass	0	0	0	0	0	0	0	0	0	0	0	0
Black Crappie	0	0	0	0.04	0.02	0.02	0.02	0.06	0.02	0.10	0	0
Yellow Perch	69.09	26.20	44.44	67.32	27.63	43.81	36.07	50.85	24.02	15.35	13.32	8.36
Walleye	0.05	0.20	0.12	0.27	0.28	0.12	0.59	0.09	0.09	0.41	0.19	0.75
Freshwater Drum	0.19	0	0.74	1.43	0.34	0.09	0.34	0.59	0.31	0.25	0.16	0.25
Total	209.43	257.13	237.81	252.83	119.72	136.42	101.19	116.82	86.50	51.38	68.30	43.98

Table 2 (continued). Stratified mean catch per unit effort data from the 1976-2003 warm water assessment netting.

	Mean Catch per 450 ft Monofilament Gill Net Gang											
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lake Sturgeon	0	0	0	0	0	0	0	0.02	0	0.02	0.06	0.04
Longnose Gar	0	0	0.08	0	0	0.48	0.35	0	0	0.02	0.02	0.08
Bowfin	0	0	0	0	0.02	0	0	0	0	0	0	0
American Eel	0	0	0.02	0	0	0	0	0	0	0	0	0
Alewife	9.64	0.59	1.29	1.27	2.26	0.18	0	0.48	0.92	0	0.06	0.12
Gizzard Shad	0.24	0.69	1.26	1.39	1.79	0.12	0.06	0	0	0	0.08	0.08
Northern Pike	0	0.02	0	0.15	0.04	0.10	0.06	0.04	0.04	0.08	0.06	0.06
Goldfish X Carp	0	0	0	0	0	0	0	0	0	0	0	0
Common Carp	0.23	0.37	0.35	0.29	0.33	0.35	0.06	0.10	0.15	0.12	0.10	0.33
Golden Shiner	0	0	0	0	0	0	0	0	0	0	0	0
Spottail Shiner	0	0	0	0	0.06	0	0	0	0	0	0	0
Quillback	0.02	0.04	0.04	0.08	0	0.04	0	0	0.04	0	0.04	0
Longnose Sucker	0	0	0	0	0	0	0	0	0	0	0	0
White Sucker	0.91	0.75	3.47	0.41	0.88	1.18	0.81	1.13	2.01	1.31	1.02	1.02
Silver Redhorse	0.07	0.17	0.29	0.22	0.18	0	0.08	0.12	0.02	0.13	0.12	0.10
Shorthead Redhorse	0	0	0	0	0	0	0.02	0	0	0.02	0	0
Brown Bullhead	0.61	0.84	0.66	0.86	0.87	0.35	0.35	0.06	0	0.83	0.06	0.21
Channel Catfish	0.97	2.40	3.34	1.20	1.35	1.12	0.35	0.19	0.47	1.42	0.75	0.68
Stonecat	0	0.02	0	0.02	0	0	0	0	0	0	0	0
Trout-perch	0.15	0	0	0.12	0	0	0	0	0	0	0	0
White Perch	4.87	7.95	4.36	7.83	5.49	5.04	6.01	0.06	0.31	0.48	0.29	1.36
White Bass	0.13	0.08	0	0.10	0	0.02	0	0	0	0	0.04	0
Rock Bass	4.94	7.53	8.08	6.86	3.09	6.99	3.99	1.41	3.79	2.33	2.13	3.08
Pumpkinseed	0.25	0.64	0.78	0.14	0.34	0.23	0.04	0.06	0.04	0.08	0.29	0.27
Bluegill	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth Bass	15.92	39.05	21.72	29.40	19.13	19.91	11.99	5.01	6.98	6.03	9.36	10.68
Largemouth Bass	0	0	0	0	0	0	0	0	0	0	0.02	0
Black Crappie	0.02	0.02	0.06	0	0	0.04	0	0	0	0	0.02	0
Yellow Perch	2.19	10.06	13.61	6.97	6.72	2.78	5.87	3.68	8.76	5.53	5.01	4.47
Walleye	0.80	0.96	1.31	1.68	1.59	3.84	3.29	1.91	2.97	1.76	2.13	1.32
Freshwater Drum	0.45	0.53	0.62	0.34	0.43	0.52	0.74	0.63	0.23	0.41	0.25	0.50
Total	42.42	72.71	61.35	59.34	44.57	43.32	34.08	14.91	26.73	20.58	21.94	24.40

Table 2 (continued). Stratified mean catch per unit effort data from the 1976-2003 warm water assessment netting.

	Mean Catch per 450 ft Monofilament Gill Net Gang			
	2000	2001	2002	2003
Lake Sturgeon	0.10	0.02	0	0.04
Longnose Gar	0	0.02	0	0
Bowfin	0	0	0	0
American Eel	0	0	0	0
Alewife	0.26	0.95	0.02	0.08
Gizzard Shad	0.13	0	0.06	0
Northern Pike	0.08	0.07	0.19	0.15
Goldfish X Carp	0	0	0	0
Common Carp	0.04	0	0	0.02
Golden Shiner	0	0	0	0
Spottail Shiner	0	0	0	0
Quillback	0	0	0	0
Longnose Sucker	0	0	0	0
White Sucker	0.35	0.38	0.78	1.66
Silver Redhorse	0.12	0.05	0.17	0.10
Shorthead Redhorse	0	0.02	0	0
Brown Bullhead	0.21	0.32	0.21	0.40
Channel Catfish	0.54	0.09	0.21	0.12
Stonecat	0	0	0	0
Trout-perch	0	0	0	0
White Perch	0.92	1.04	1.09	0.42
White Bass	0	0	0	0
Rock Bass	1.47	1.22	1.10	1.84
Pumpkinseed	0.31	0.28	0.46	0.46
Bluegill	0	0	0	0
Smallmouth Bass	5.01	2.99	3.76	5.43
Largemouth Bass	0	0	0	0
Black Crappie	0	0	0.06	0
Yellow Perch	8.58	6.37	9.65	9.82
Walleye	1.53	1.70	1.08	2.12
Freshwater Drum	0.25	0.20	0.23	0.27
Total	19.92	15.73	19.06	22.92

Table 3. Stratified mean catch per standard 450 ft gill net gang, 95% confidence intervals, relative annual CPUE by depth strata, and relative annual CPUE by area for depth strata 1 and 2, for all warm water fish from warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

Year Sampled	Strat. CPUE	95% CI		Rel CPUE by Depth			Relative CPUE by Area					
		Lower	Upper	Strat 1	Strat 2	Strat 3	Area 1	Area 2	Area 3	Area 4	Area 5	
1976	209.43											
1977	257.13											
1978	237.81											
1979	252.83											
1980	119.72	86.40	153.04	1.00	0.76	0.39	0.63	0.43	0.32	1.00	0.41	
1981	136.42	93.47	179.36	1.00	0.93	0.25	0.60	0.62	0.78	1.00	0.39	
1982	101.19	71.72	130.65	0.94	1.00	0.21	0.89	0.61	0.86	1.00	0.51	
1983	116.82	35.94	197.69	1.00	0.87	0.51	0.59	0.58	0.36	1.00	0.33	
1984	86.50	62.65	110.34	1.00	0.58	0.13	0.51	0.39	0.65	1.00	0.45	
1985	51.38	38.83	63.94	1.00	0.84	0.04	0.61	0.84	0.77	1.00	0.40	
1986	68.30	42.17	94.44	0.96	1.00	0.41	0.64	0.86	0.87	1.00	0.50	
1987	43.98	30.19	57.76	1.00	0.55	0.06	0.46	1.00	0.68	0.87	0.40	
1988	42.42	29.70	55.13	1.00	0.77	0.36	0.43	0.49	0.51	1.00	0.62	
1989	72.71	46.85	98.58	0.84	0.88	1.00	0.34	0.82	0.49	1.00	0.43	
1990	61.35	41.54	81.16	0.84	1.00	0.51	0.99	1.00	0.69	0.97	0.53	
1991	59.34	43.05	75.63	0.99	1.00	0.51	0.47	1.00	0.51	0.29	0.36	
1992	44.57	31.62	57.53	1.00	0.68	0.44	0.77	1.00	0.39	0.92	0.29	
1993	43.32	31.32	55.32	1.00	0.59	0.45	0.55	0.73	1.00	0.69	0.37	
1994	34.08	23.91	44.25	1.00	0.90	0.21	0.38	1.00	0.87	0.78	0.45	
1995	14.91	10.13	19.69	1.00	0.50	0.05	0.47	1.00	0.74	0.65	0.59	
1996	26.73	13.48	39.99	0.94	1.00	0.50	0.54	0.61	1.00	0.15	0.41	
1997	20.58	12.67	28.49	1.00	0.69	0.32	0.44	0.96	1.00	0.50	0.46	
1998	21.94	14.58	29.30	1.00	0.59	0.25	0.68	1.00	0.44	0.60	0.43	
1999	24.40	16.70	32.09	1.00	0.91	0.48	0.38	1.00	0.74	0.51	0.23	
2000	19.92	11.48	28.36	0.79	1.00	0.37	0.65	0.68	0.37	1.00	0.24	
2001	15.73	10.01	21.45	1.00	0.58	0.13	0.56	0.69	0.22	1.00	0.31	
2002	19.06	10.46	27.66	0.74	1.00	0.24	0.60	0.79	1.00	0.83	0.22	
2003	22.92	14.37	31.46	1.00	0.46	0.32	0.66	1.00	0.85	0.71	0.30	

Table 4. Stratified mean catch per standard 450 ft gill net gang, 95% confidence intervals, relative annual CPUE by depth strata, and relative annual CPUE by area for depth strata 1 and 2, for smallmouth bass from warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

Year Sampled	Strat. CPUE	95% CI		Rel CPUE by Depth			Relative CPUE by Area					
		Lower	Upper	Strat 1	Strat 2	Strat 3	Area 1	Area 2	Area 3	Area 4	Area 5	
1976	24.51											
1977	24.05											
1978	26.04											
1979	35.74											
1980	38.02	17.40	58.64	0.56	0.61	1.00	1.00	0.36	0.07	0.27	0.98	
1981	23.47	14.28	32.67	0.95	1.00	0.26	0.60	0.67	0.52	0.58	1.00	
1982	14.55	6.04	23.07	0.58	1.00	0.23	1.00	0.81	0.44	0.33	0.86	
1983	14.96	9.70	20.22	0.44	1.00	0.08	0.66	0.23	0.58	0.52	1.00	
1984	12.44	7.03	17.86	1.00	0.95	0.03	1.00	0.16	0.21	0.47	0.85	
1985	9.76	5.35	14.17	0.52	1.00	0.00	0.83	0.32	0.04	0.22	1.00	
1986	18.14	7.51	28.76	0.57	1.00	0.70	0.86	0.34	0.52	0.35	1.00	
1987	10.89	5.93	15.86	1.00	0.74	0.01	0.84	0.10	1.00	0.49	0.84	
1988	15.92	9.96	21.87	0.96	1.00	0.26	0.47	0.29	0.33	0.76	1.00	
1989	39.05	14.35	63.75	0.29	0.39	1.00	0.52	0.05	0.41	0.97	1.00	
1990	21.72	13.13	30.31	0.38	1.00	0.57	1.00	0.28	0.02	0.45	0.68	
1991	29.40	14.64	44.16	0.33	1.00	0.72	0.37	1.00	0.08	0.25	1.00	
1992	19.13	11.45	26.80	1.00	0.86	0.96	0.74	0.50	0.08	1.00	0.41	
1993	19.91	12.87	26.96	0.65	0.69	1.00	0.73	0.70	0.30	1.00	0.53	
1994	11.99	7.75	16.23	1.00	0.94	0.60	0.48	0.72	0.00	1.00	0.93	
1995	5.01	3.20	6.82	1.00	0.54	0.06	0.81	0.67	1.00	0.69	0.69	
1996	6.98	2.99	10.97	1.00	0.98	0.37	0.59	1.00	0.91	0.10	0.34	
1997	6.03	4.00	8.05	1.00	0.66	0.24	0.59	1.00	0.49	0.78	0.43	
1998	9.36	4.95	13.78	1.00	0.44	0.46	0.55	1.00	0.27	0.81	0.84	
1999	10.68	6.84	14.51	1.00	0.98	0.51	0.27	1.00	0.59	0.31	0.23	
2000	5.01	2.65	7.38	0.93	1.00	0.48	1.00	0.80	0.28	0.80	0.86	
2001	2.99	1.46	4.51	1.00	0.31	0.00	0.23	1.00	0.09	0.38	0.40	
2002	3.76	1.71	5.81	0.74	1.00	0.08	0.11	0.73	1.00	0.32	0.32	
2003	5.43	3.05	7.80	1.00	0.89	0.27	0.35	0.59	1.00	0.79	0.27	

Table 5. Stratified mean catch per standard 450 ft gill net gang, 95% confidence intervals, relative annual CPUE by depth strata, and relative annual CPUE by area for depth strata 1 and 2, for yellow perch from warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

Year Sampled	Strat. CPUE	95% CI		Rel CPUE by Depth			Relative CPUE by Area					
		Lower	Upper	Strat 1	Strat 2	Strat 3	Area 1	Area 2	Area 3	Area 4	Area 5	
1976	69.09											
1977	26.20											
1978	44.44											
1979	67.32											
1980	27.63	19.64	35.63	1.00	0.96	0.44	1.00	0.59	0.77	0.83	0.14	
1981	43.81	18.68	68.93	0.99	1.00	0.54	0.41	0.41	1.00	0.40	0.39	
1982	36.07	17.09	55.06	1.00	0.72	0.23	0.84	0.42	1.00	0.30	0.26	
1983	50.85	6.58	95.12	1.00	0.72	1.00	0.48	0.56	0.11	1.00	0.07	
1984	24.02	12.30	35.73	0.59	1.00	0.42	0.65	0.88	1.00	0.57	0.50	
1985	15.35	7.47	23.23	0.94	1.00	0.14	0.41	0.59	0.60	1.00	0.04	
1986	13.32	1.54	25.10	1.00	0.74	0.58	0.31	0.65	1.00	0.65	0.06	
1987	8.36	3.02	13.71	1.00	0.96	0.17	0.14	1.00	0.33	0.29	0.02	
1988	2.19	0.30	4.08	0.65	1.00	0.12	0.80	1.00	0.00	0.83	0.00	
1989	10.06	2.93	17.18	0.43	1.00	0.80	0.01	1.00	0.34	0.36	0.00	
1990	13.61	3.52	23.70	0.59	1.00	0.44	0.14	0.82	1.00	0.21	0.08	
1991	6.97	1.69	12.24	1.00	0.77	0.34	0.01	0.78	1.00	0.05	0.00	
1992	6.72	1.82	11.63	0.66	1.00	0.70	0.15	0.85	1.00	0.47	0.00	
1993	2.78	0.59	4.97	0.74	1.00	0.33	0.01	0.49	0.00	1.00	0.00	
1994	5.87	1.29	10.44	0.93	1.00	0.01	0.00	0.26	1.00	0.64	0.00	
1995	3.68	0.31	7.05	1.00	0.62	0.06	0.00	1.00	0.62	0.44	0.00	
1996	8.76	2.75	14.77	0.39	1.00	0.90	0.10	0.32	1.00	0.19	0.00	
1997	5.53	0.32	10.74	0.63	0.76	1.00	0.10	0.09	1.00	0.28	0.00	
1998	5.01	1.27	8.74	0.68	1.00	0.09	0.73	1.00	0.32	0.61	0.00	
1999	4.47	1.39	7.54	0.69	0.34	1.00	0.00	0.36	0.27	1.00	0.00	
2000	8.58	1.25	15.91	0.33	1.00	0.48	0.25	0.07	0.16	1.00	0.01	
2001	6.37	1.17	11.58	0.80	1.00	0.27	0.39	0.04	0.07	1.00	>0.01	
2002	9.65	2.11	17.18	0.23	1.00	0.36	0.75	0.05	0.89	1.00	0.00	
2003	9.82	2.91	16.72	1.00	0.28	0.62	0.93	1.00	0.35	0.67	0.00	

Table 6. Stratified mean catch per standard 450 ft gill net gang, 95% confidence intervals, relative annual CPUE by depth strata, and relative annual CPUE by area for depth strata 1 and 2, for walleye from warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

Year Sampled	Strat. CPUE	95% CI		Rel CPUE by Depth			Relative CPUE by Area					
		Lower	Upper	Strat 1	Strat 2	Strat 3	Area 1	Area 2	Area 3	Area 4	Area 5	
1976	0.05											
1977	0.20											
1978	0.12											
1979	0.27											
1980	0.28	0.00	0.71	1.00	0.14	0.00	1.00	0.00	0.00	0.00	0.00	0.13
1981	0.12	0.01	0.24	1.00	0.00	0.00	0.40	1.00	0.00	0.67	0.00	
1982	0.59	0.15	1.04	1.00	0.13	0.00	1.00	0.00	0.31	0.42	1.00	
1983	0.09	0.00	0.24	1.00	0.56	0.00	0.00	0.00	0.00	1.00	0.30	
1984	0.09	0.00	0.20	1.00	0.00	0.00	0.00	0.75	0.00	1.00	0.60	
1985	0.41	0.06	0.76	1.00	0.00	0.00	0.29	0.71	0.00	0.00	1.00	
1986	0.19	0.02	0.35	1.00	0.22	0.00	0.27	1.00	0.00	0.00	0.53	
1987	0.75	0.34	1.16	1.00	0.46	0.00	0.78	0.56	0.83	0.19	1.00	
1988	0.80	0.26	1.34	1.00	0.77	0.10	1.00	0.38	0.00	0.38	0.15	
1989	0.96	0.03	1.90	1.00	0.35	0.11	0.22	0.07	0.00	0.19	1.00	
1990	1.31	0.62	2.00	1.00	0.77	0.04	1.00	0.35	0.14	0.46	0.56	
1991	1.68	0.31	3.05	1.00	0.67	0.07	0.26	0.20	0.16	0.11	1.00	
1992	1.59	0.78	2.40	1.00	0.56	0.03	0.54	0.05	0.10	0.63	1.00	
1993	3.84	1.78	5.91	1.00	0.75	0.40	0.35	0.05	0.11	0.24	1.00	
1994	3.29	1.80	4.78	0.75	1.00	0.22	0.59	0.28	0.13	0.11	1.00	
1995	1.91	0.78	3.05	1.00	0.32	0.03	0.83	0.38	0.21	0.28	1.00	
1996	2.97	1.01	4.92	1.00	0.61	0.10	0.66	0.04	0.11	0.02	1.00	
1997	1.76	0.85	2.68	0.38	1.00	0.11	0.42	0.20	0.20	0.18	1.00	
1998	2.13	1.02	3.24	1.00	0.95	0.67	0.60	0.15	0.10	0.40	1.00	
1999	1.32	0.64	2.00	1.00	0.60	0.31	0.24	0.20	0.10	0.27	1.00	
2000	1.53	0.58	2.48	0.64	1.00	0.20	1.00	0.27	0.08	0.05	0.37	
2001	1.70	0.50	2.91	1.00	0.66	0.12	0.52	0.21	0.07	0.23	1.00	
2002	1.08	0.31	1.85	1.00	0.29	0.09	0.42	0.24	0.00	0.06	1.00	
2003	2.12	1.28	2.96	1.00	0.71	0.09	0.57	0.27	0.12	0.40	1.00	

Table 7. Stratified mean catch per standard 450 ft gill net gang, 95% confidence intervals, relative annual CPUE by depth strata, and relative annual CPUE by area for depth strata 1 and 2, for rock bass from warm water assessment netting conducted late July through mid August in New York waters of Lake Ontario's eastern basin.

Year Sampled	Strat. CPUE	95% CI		Rel CPUE by Depth			Relative CPUE by Area					
		Lower	Upper	Strat 1	Strat 2	Strat 3	Area 1	Area 2	Area 3	Area 4	Area 5	
1976	7.10											
1977	10.75											
1978	22.13											
1979	13.94											
1980	14.69	8.59	20.79	0.72	1.00	0.75	1.00	0.23	0.44	0.18	0.66	
1981	10.09	5.21	14.96	0.50	1.00	0.27	0.70	0.11	1.00	0.30	0.24	
1982	7.06	2.86	11.27	0.38	1.00	0.21	0.81	0.11	1.00	0.28	0.62	
1983	4.69	1.93	7.45	0.59	1.00	0.08	1.00	0.08	0.75	0.19	0.18	
1984	6.99	3.00	10.98	0.53	1.00	0.24	1.00	0.18	0.33	0.20	0.87	
1985	3.96	1.78	6.14	0.64	1.00	0.04	1.00	0.03	0.05	0.10	0.56	
1986	7.58	4.05	11.11	0.44	1.00	0.27	0.89	0.07	1.00	0.41	0.46	
1987	4.76	2.05	7.46	1.00	0.39	0.06	1.00	0.12	0.90	0.28	0.93	
1988	4.94	2.04	7.84	0.90	1.00	0.36	0.80	0.08	1.00	0.19	0.66	
1989	7.53	3.16	11.91	0.33	0.91	1.00	1.00	0.00	0.77	0.10	0.55	
1990	8.08	3.36	12.80	1.00	0.67	0.31	0.35	0.00	0.11	1.00	0.27	
1991	6.86	2.79	10.93	0.58	1.00	0.24	1.00	0.15	0.85	0.12	0.07	
1992	3.09	1.67	4.50	0.61	1.00	0.46	1.00	0.41	0.27	0.41	0.27	
1993	6.99	1.50	12.48	1.00	0.72	0.27	1.00	0.03	0.81	0.08	0.21	
1994	3.99	1.17	6.81	0.39	1.00	0.18	1.00	0.00	0.12	0.12	0.54	
1995	1.41	0.42	2.40	0.93	1.00	0.09	0.61	0.00	0.56	0.11	1.00	
1996	3.79	0.00	7.74	1.00	0.71	0.52	1.00	0.05	0.87	0.03	0.42	
1997	2.33	0.89	3.77	1.00	0.39	0.04	0.19	0.76	1.00	0.14	0.50	
1998	2.13	0.97	3.28	1.00	0.27	0.15	1.00	0.03	0.65	0.08	0.48	
1999	3.08	0.89	5.26	0.57	1.00	0.23	1.00	0.12	0.45	0.44	0.11	
2000	1.47	0.67	2.27	1.00	0.53	0.13	1.00	0.25	0.83	0.11	0.27	
2001	1.22	0.45	1.99	1.00	0.77	0.00	1.00	0.03	0.62	0.23	0.30	
2002	1.10	0.21	1.99	1.00	0.34	0.56	1.00	0.23	0.83	0.25	0.07	
2003	1.84	0.67	3.00	1.00	0.39	0.00	0.52	0.17	1.00	0.31	0.11	

Table 8. Percent age composition and mean age of smallmouth bass collected in August warm water assessment netting in New York waters of the eastern basin of Lake Ontario, 1976-2003.

Year Sampled	Percent Frequency by Age Group												Mean Age
	1	2	3	4	5	6	7	8	9	10	11	12+	
1976	0	0	34.8	5.2	6.9	3.6	28.5	2.3	7.9	10.2	0.7	0	5.79
1977	0	0	5.7	44.9	6.8	8.0	6.5	16.0	3.4	4.4	3.8	0.3	5.74
1978	0	0	3.6	2.3	57.5	3.9	4.9	3.8	14.0	3.7	2.2	4.1	6.34
1979	0	1.2	0.2	9.9	7.3	68.1	2.3	2.8	1.9	4.0	1.2	1.2	6.11
1980	0	2.4	0.3	1.1	11.4	6.0	71.0	1.6	3.0	0.8	1.4	1.1	6.77
1981	0	1.5	6.8	2.9	1.3	22.0	18.2	40.2	4.2	1.3	1.1	0.4	6.91
1982	0	0.4	5.5	22.6	5.1	2.6	21.9	20.4	19.0	1.1	0.7	0.7	6.64
1983	0	0.2	8.5	10.6	20.6	1.7	1.9	16.3	15.8	23.4	0.5	0.5	7.13
1984	0	0	2.6	18.1	17.7	21.3	9.0	2.9	5.8	5.2	13.2	4.2	6.83
1985	0	10.0	1.6	6.8	30.3	15.9	12.0	4.0	2.4	2.4	3.2	11.6	6.36
1986	0	0.7	29.9	0.7	5.5	24.7	13.3	8.9	4.8	1.8	1.1	8.5	6.16
1987	0	0	2.9	46.8	4.7	6.8	12.6	5.0	10.4	3.2	1.1	6.5	6.12
1988	0	1.3	2.9	12.3	54.2	5.2	3.6	9.1	4.9	2.6	1.0	2.9	5.79
1989	0	13.9	2.6	2.8	14.8	48.0	3.2	2.8	5.6	1.9	1.3	3.2	5.81
1990	0	4.4	24.6	3.8	3.1	9.4	38.8	4.6	3.6	2.9	2.7	2.1	5.95
1991	0	2.0	27.5	31.9	4.8	3.2	6.1	14.8	3.5	2.1	2.2	2.0	5.20
1992	0	1.9	4.6	25.1	32.8	4.6	1.9	6.4	12.7	3.5	3.3	3.3	6.00
1993	0	2.0	9.9	10.8	32.7	21.8	4.0	2.9	6.2	4.6	3.2	1.9	5.83
1994	0.5	0.5	24.9	12.2	8.4	26.5	15.0	1.5	1.8	3.8	3.3	1.5	5.53
1995	0.5	8.6	2.3	32.9	11.7	8.1	13.1	8.1	2.7	2.3	5.4	4.5	5.81
1996	0	27.8	24.3	2.7	15.3	9.8	4.3	7.1	2.7	0.8	2.0	3.1	4.55
1997	1.3	20.7	24.6	9.5	3.4	12.9	6.0	3.9	9.1	2.6	1.3	4.7	5.05
1998	1.3	7.9	42.3	13.4	9.2	3.9	6.6	3.6	3.3	6.2	1.3	1.0	4.60
1999	3.8	35.2	9.3	18.1	12.1	5.8	1.4	5.8	1.1	1.4	3.6	2.5	4.23
2000	2.3	32.6	24.4	5.8	14.5	4.7	1.7	2.9	4.7	0.6	2.9	2.9	4.16
2001	0	25.8	14.4	18.9	4.5	9.8	8.3	2.3	3.8	6.8	3.0	2.3	4.93
2002	0.6	4.8	47.3	13.3	13.9	1.8	6.1	3.6	4.8	1.2	0	2.4	4.44
2003	0	16.7	4.8	27.3	12.9	7.7	3.3	7.7	7.7	5.3	2.4	4.3	5.54

Table 9. Mean number of smallmouth bass captured per 10 standard net gangs in August warm water assessment conducted in New York waters of the eastern basin of Lake Ontario from 1980-2003, by age and year groups, depth strata, and area strata.

Year Groups	Depth Strata 1-3, All Areas			Areas 1-5, Depth Stratum 1					Areas 1-5, Depth Stratum 2				
	Stratum 1 (12-30')	Stratum 2 (31-50')	Stratum 3 (51-100')	Area 1 Grenadier	Area 2 Chaumont	Area 3 Black R	Area 4 Henderson	Area 5 Stony	Area 1 Grenadier	Area 2 Chaumont	Area 3 Black R	Area 4 Henderson	Area 5 Stony
Ages 2-4:													
1980-1983	22.0	28.9	20.6	15.0	33.3	20.0	18.8	16.3	32.5	57.5	20.0	10.0	25.0
1984-1987	42.8	41.9	3.4	43.8	17.5	47.5	36.3	83.8	68.3	5.0	17.5	7.5	47.5
1988-1991	26.5	58.0	42.4	33.8	7.5	27.5	40.0	33.8	44.2	185.0	2.5	6.7	60.8
1992-1995	60.8	41.1	15.0	51.3	49.2	52.5	102.5	50.0	32.5	77.5	17.5	50.0	42.5
1996-1999	81.0	62.5	35.0	41.3	180.0	52.5	27.5	40.0	59.2	137.5	127.5	35.0	28.3
2000-2003	47.2	50.0	8.0	52.9	70.8	32.5	40.0	21.3	29.2	102.5	132.5	37.5	30.0
Ages 5-7:													
1980-1983	69.3	84.2	73.8	73.8	48.3	20.0	60.0	130.0	113.3	90.0	65.0	7.5	85.0
1984-1987	49.5	65.8	14.1	60.0	26.7	47.5	47.5	76.3	101.7	10.0	15.0	10.0	84.2
1988-1991	52.0	70.9	83.9	41.3	36.7	32.5	87.5	60.0	65.0	65.0	17.5	30.0	106.7
1992-1995	57.5	48.6	72.0	50.0	59.2	12.5	83.8	58.8	53.3	57.5	17.5	47.5	51.7
1996-1999	34.5	20.8	11.0	26.3	37.5	15.0	46.3	36.3	25.8	20.0	22.5	17.5	16.7
2000-2003	24.1	11.1	4.5	11.4	31.7	15.0	33.8	18.8	3.3	17.5	12.5	7.5	17.5
Ages 8-10:													
1980-1983	47.5	84.7	49.4	23.8	27.5	42.5	67.5	83.8	95.8	27.5	37.5	25.0	128.3
1984-1987	21.5	16.1	4.7	13.8	12.5	40.0	21.3	33.8	31.7	0.0	7.5	7.5	11.7
1988-1991	17.3	28.9	21.3	15.0	7.5	5.0	16.3	41.3	19.2	25.0	0.0	3.3	55.8
1992-1995	15.3	18.9	16.8	25.0	10.0	5.0	17.5	16.3	25.0	2.5	5.0	22.5	21.7
1996-1999	16.5	10.0	7.8	15.0	5.0	12.5	31.3	22.5	14.2	5.0	7.5	2.5	10.8
2000-2003	13.1	6.7	3.8	4.3	11.7	7.5	16.3	22.5	5.0	5.0	7.5	12.5	6.7
Ages 11 & up:													
1980-1983	2.5	2.8	2.5	2.5	0.0	2.5	1.3	7.5	3.3	0.0	0.0	0.0	5.0
1984-1987	11.0	23.6	2.8	11.3	1.7	5.0	7.5	31.3	32.5	0.0	5.0	2.5	35.8
1988-1991	3.8	8.3	7.9	5.0	1.7	0.0	2.5	8.8	5.0	0.0	2.5	6.7	16.7
1992-1995	6.3	11.1	5.8	15.0	4.2	2.5	3.8	5.0	15.0	5.0	5.0	12.5	10.8
1996-1999	4.3	8.1	2.5	5.0	0.0	0.0	8.8	7.5	4.2	0.0	0.0	0.0	20.0
2000-2003	2.8	5.0	1.5	0.0	0.0	2.5	5.0	7.5	7.5	2.5	0.0	7.5	4.2

Table 10. Mean lengths (inches) of aged smallmouth bass from the 1976-2003 August warm water assessment in New York waters of the eastern basin of Lake Ontario, by year sampled, and by geographic area. Age and year groups with sample sizes less than four fish have been deleted.

Year Sampled	Age														Overall Length	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
1976			9.49	11.02	12.25	12.71	13.74	15.07	15.63	15.25						12.28
1977			7.86	9.93	11.15	13.00	13.95	14.42	14.83	15.78	15.51					11.73
1978			7.49	8.39	11.06	13.11	14.43	14.68	15.40	15.72	16.15	16.65				12.34
1979		7.43		9.74	10.53	12.22	13.99	15.24	15.92	15.69	16.39					12.22
1980		7.42		10.21	11.04	11.68	13.00	14.68	15.65		16.15					12.74
1981		7.28	9.61	11.04	13.14	12.61	13.73	14.55	16.11	16.23	17.02					13.53
1982			8.66	10.76	11.55	13.08	13.93	14.76	15.12							13.23
1983			8.07	10.14	11.48	13.10	13.17	14.17	15.26	15.40						13.09
1984			8.54	10.05	11.53	12.90	13.50	13.52	14.87	14.93	15.64	15.95				12.81
1985		7.64	9.23	10.27	11.21	12.66	14.11	13.93	14.89	14.98	16.28	16.11				12.35
1986			8.45		11.39	12.08	13.29	14.34	14.51	14.94		16.89	16.24			11.85
1987			7.61	10.00	12.01	12.03	13.19	14.39	15.33	15.92		16.34	16.56	16.36		12.02
1988		7.54	7.85	9.55	11.29	12.48	13.94	14.43	14.78	15.93		17.65				11.89
1989		7.51	8.86	10.14	11.32	12.49	13.61	15.55	15.45	16.08	17.09			17.20	17.02	12.04
1990		7.42	8.93	10.77	11.41	12.69	13.99	14.82	16.05	16.40	16.36	16.75				12.45
1991		7.85	8.76	11.08	12.29	13.08	14.49	15.19	15.77	16.61	16.49	17.02				11.83
1992		7.55	9.02	10.06	12.06	13.30	14.33	15.24	16.05	16.90	17.58	17.27				12.69
1993		7.89	8.63	9.47	10.91	13.13	14.09	16.08	16.23	16.46	16.74	17.93				12.12
1994			8.81	10.85	11.29	12.42	14.10	15.96	16.12	17.08	17.08	17.37				11.96
1995		8.04	8.34	10.37	11.85	12.66	14.07	16.12	17.40	17.30	17.21	17.46				12.46
1996		8.16	9.12	10.30	11.48	13.33	13.98	14.99	16.18		17.85	17.84				10.99
1997		8.17	9.73	11.24	13.11	14.40	15.41	16.29	16.62	17.38				17.87		12.14
1998	7.49	8.49	9.02	11.41	12.89	15.33	15.21	16.38	16.83	17.07	17.14					11.52
1999	7.52	8.79	11.23	11.73	13.63	14.94	16.27	16.88	17.71	17.36	17.53	19.43				11.80
2000	7.52	8.18	10.41	12.92	13.11	14.86		17.66	17.82		18.90					11.53
2001		8.25	9.70	12.57	14.38	14.58	16.98		18.10	18.15	18.46					12.68
2002		8.61	10.66	12.13	15.27		16.80	17.09	17.66							12.73
2003		7.88	9.67	10.96	13.10	16.17	16.64	17.63	17.97	18.44	18.86	18.69	18.89			13.22
Area Sampled	Age															
	2	3	4	5	6	7	8	9	10	11	12					
Grenadier	7.83	8.56	10.06	11.20	12.40	13.77	15.05	15.74	16.13	16.80	16.89					
Chaumont	8.58	9.79	11.46	12.58	13.75	14.71	15.68	16.24	16.85	17.30	17.49					
Black R	8.27	9.83	10.82	12.03	13.98	14.60	15.76	16.04	16.66	16.98	17.89					
Henderson	8.19	9.65	11.46	12.60	14.10	14.79	15.63	16.65	17.12	17.48	17.64					
Stony	7.59	8.49	10.23	11.43	12.73	13.56	14.53	15.46	16.09	16.48	17.02					

Table 11. Mean condition factor of smallmouth bass from the 1976-2003 August warm water assessment in New York waters of the eastern basin of Lake Ontario, by one inch size groups. Size and year groups with sample sizes less than four fish have been deleted.

Year Sampled	One inch size groups															
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	all
1976		1.326	1.408	1.397	1.511	1.461	1.482	1.440	1.479	1.514	1.465					1.460
1977		1.358	1.327	1.355	1.379	1.422	1.429	1.356	1.398	1.417	1.468					1.387
1978		1.289	1.374	1.317	1.330	1.407	1.415	1.462	1.488	1.493	1.464	1.456				1.411
1979		1.376	1.361	1.360	1.389	1.411	1.439	1.500	1.481	1.472	1.555					1.436
1980		1.370		1.345	1.361	1.404	1.429	1.488	1.525	1.527	1.511					1.451
1981		1.304	1.347	1.294	1.309	1.332	1.353	1.434	1.481	1.523	1.530	1.544				1.434
1982		1.290	1.416	1.346	1.359	1.362	1.423	1.451	1.514	1.534	1.471	1.517				1.446
1983		1.304	1.342	1.338	1.358	1.357	1.328	1.436	1.433	1.457	1.494	1.457				1.406
1984			1.371	1.271	1.320	1.333	1.356	1.410	1.395	1.429	1.440	1.413				1.370
1985		1.369	1.403	1.349	1.368	1.436	1.408	1.468	1.448	1.505	1.513	1.440				1.431
1986	1.362	1.323	1.419	1.376	1.402	1.430	1.445	1.445	1.451	1.473	1.502					1.426
1987		1.359	1.396	1.386	1.425	1.455	1.431	1.461	1.475	1.516	1.436	1.426				1.436
1988		1.287	1.286	1.293	1.333	1.367	1.402	1.416	1.446	1.501	1.433	1.454				1.374
1989	1.492	1.387	1.406	1.349	1.388	1.422	1.435	1.458	1.469	1.461	1.426	1.409				1.425
1990		1.285	1.262	1.321	1.314	1.352	1.344	1.393	1.415	1.418	1.447	1.495				1.365
1991		1.258	1.273	1.306	1.354	1.384	1.420	1.423	1.451	1.470	1.496	1.450	1.372			1.377
1992		1.276	1.277	1.284	1.320	1.359	1.382	1.439	1.462	1.450	1.479	1.461	1.407			1.383
1993		1.301	1.265	1.284	1.313	1.334	1.386	1.425	1.470	1.455	1.455	1.443	1.379			1.363
1994		1.271	1.300	1.347	1.366	1.365	1.409	1.419	1.483	1.532	1.493	1.527				1.397
1995		1.265	1.277	1.281	1.319	1.347	1.376	1.461	1.501	1.574	1.518	1.560	1.542			1.398
1996		1.286	1.262	1.321	1.322	1.364	1.410	1.406	1.509	1.546	1.586	1.579	1.545			1.363
1997		1.331	1.318	1.333	1.360	1.407	1.497	1.410	1.562	1.550	1.589	1.601	1.524			1.438
1998		1.310	1.326	1.336	1.351	1.386	1.449	1.385	1.517	1.507	1.558	1.635	1.628			1.407
1999		1.315	1.295	1.337	1.366	1.374	1.437	1.474	1.496	1.543	1.596	1.649	1.620	1.704		1.419
2000		1.287	1.307	1.283	1.304	1.340	1.451	1.393		1.568	1.654	1.549	1.604	1.487		1.381
2001		1.325	1.272	1.333	1.364		1.451	1.412	1.534	1.560	1.581	1.571	1.673			1.444
2002		1.319	1.307	1.300	1.355	1.374	1.465	1.459	1.519	1.508	1.601	1.512	1.598	1.555		1.433
2003		1.318	1.364	1.333	1.308	1.322	1.382	1.432	1.551	1.575	1.608	1.573	1.577	1.542		1.441
All	1.407	1.311	1.306	1.324	1.353	1.383	1.409	1.438	1.466	1.485	1.504	1.517	1.561	1.539	1.568	1.405

Table 12. CPUE data by age and year class for smallmouth bass collected in August warm water assessment netting in New York waters of the eastern basin of Lake Ontario, 1976-2003.

Year Class	CPUE by Age of Capture												CPUE Sum
	1	2	3	4	5	6	7	8	9	10	11	12+	
1965											0.16	0.47	0.63
1966									2.50	0.92	0.90		4.32
1967								1.93	1.07	0.58	0.48		4.06
1968							0.56	0.82	0.96	0.42	0.00		2.75
1969						6.98	3.86	3.64	1.43	0.52	0.16		16.57
1970					0.88	1.56	0.98	0.67	0.31	0.26	0.13		4.79
1971				1.70	1.94	1.28	1.01	1.13	0.31	0.11	0.07		7.54
1972			1.27	1.64	1.03	0.84	0.62	0.98	0.16	0.07	0.60		7.20
1973		8.54	10.80	14.96	24.33	27.00	9.44	2.76	3.50	1.65	2.53		105.51
1974		0	1.37	0.61	2.60	2.27	4.28	2.97	2.37	0.64	0.31	0.81	18.23
1975	0	0	0.94	3.52	4.33	5.16	3.19	2.44	0.72	0.23	0.20	0.92	21.65
1976	0	0	0.08	0.41	0.31	0.37	0.28	0.36	0.23	0.33	0.12	0.70	3.21
1977	0	0.42	0.10	0.67	0.74	0.25	1.12	0.39	0.87	0.35	0.16	0.26	5.33
1978	0	0.93	1.60	3.29	3.08	2.65	1.17	1.61	1.14	0.41	0.50	0.43	16.80
1979	0	0.36	0.80	1.59	2.21	1.56	2.41	0.55	0.78	0.75	0.59	0.46	12.05
1980	0	0.05	1.27	2.25	2.96	4.48	1.37	1.45	2.17	0.63	0.64	0.65	17.93
1981	0	0.04	0.32	0.66	1.00	0.74	0.57	1.09	0.78	0.61	0.64	0.30	6.74
1982	0	0	0.16	0.13	0.51	0.83	1.25	1.00	1.01	0.67	0.64	0.20	6.41
1983	0	0.97	5.42	5.09	8.63	18.73	8.43	4.36	2.42	0.91	0.40	0.34	55.71
1984	0	0.13	0.31	1.96	5.77	2.04	1.79	1.23	1.24	0.46	0.27	0.29	15.51
1985	0	0	0.47	1.09	0.67	0.95	0.36	0.57	0.21	0.11	0.14	0.14	4.70
1986	0	0.21	1.00	0.82	1.42	0.87	0.81	0.18	0.14	0.05	0.08	0.12	5.70
1987	0	5.44	5.35	9.37	6.27	4.33	1.80	0.41	0.19	0.16	0.12	0.15	33.58
1988	0	0.97	8.09	4.80	6.51	3.17	0.65	0.49	0.55	0.58	0.38	0.16	26.35
1989	0	0.58	0.87	2.15	1.01	0.41	0.30	0.23	0.31	0.15	0.15	0.05	6.19
1990	0	0.36	1.98	1.46	0.59	0.68	0.36	0.34	0.12	0.03	0.09	0.15	6.16
1991	0	0.40	2.99	1.65	1.07	0.78	0.61	0.62	0.23	0.20	0	0.13	8.68
1992	0	0.06	0.11	0.19	0.21	0.37	0.15	0.15	0.11	0.05	0.13		1.52
1993	0.06	0.43	1.70	0.57	0.86	0.62	0.09	0.07	0.18	0.29			4.86
1994	0.02	1.94	1.48	1.26	1.29	0.23	0.25	0.14	0.42				7.03
1995	0	1.25	3.96	1.94	0.73	0.29	0.23	0.42					8.81
1996	0.08	0.74	1.00	0.29	0.14	0.07	0.18						2.49
1997	0.12	3.76	1.22	0.57	0.52	0.42							6.61
1998	0.41	1.63	0.43	0.50	0.70								3.68
1999	0.12	0.77	1.78	1.48									4.15
2000	0	0.18	0.26										0.44
2001	0.02	0.91											0.93
2002	0												0.00

Figure 1. Map of New York waters of Lake Ontario's eastern basin showing the five area strata used in the DEC 1980-2003 warm water assessment.

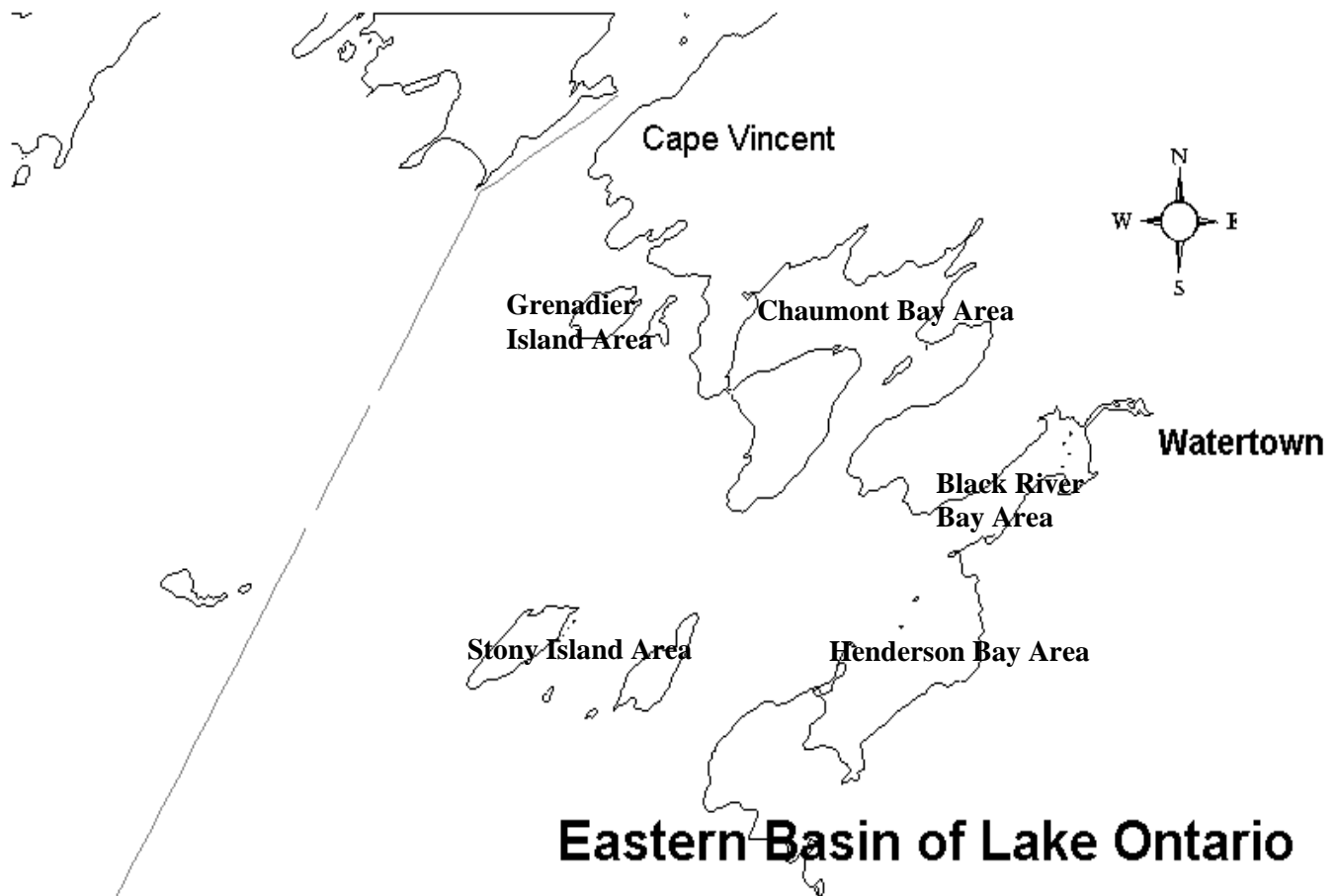


Figure 2. Stratified mean catch per 450 ft gill net gang and 95% confidence intervals for all warm water fish, smallmouth bass, and yellow perch, from the 1976-2003 warm water assessment conducted in New York waters of Lake Ontario's eastern basin. The inset graphs show 3-year moving average catch per unit effort data plotted against the mid point of the years sampled.

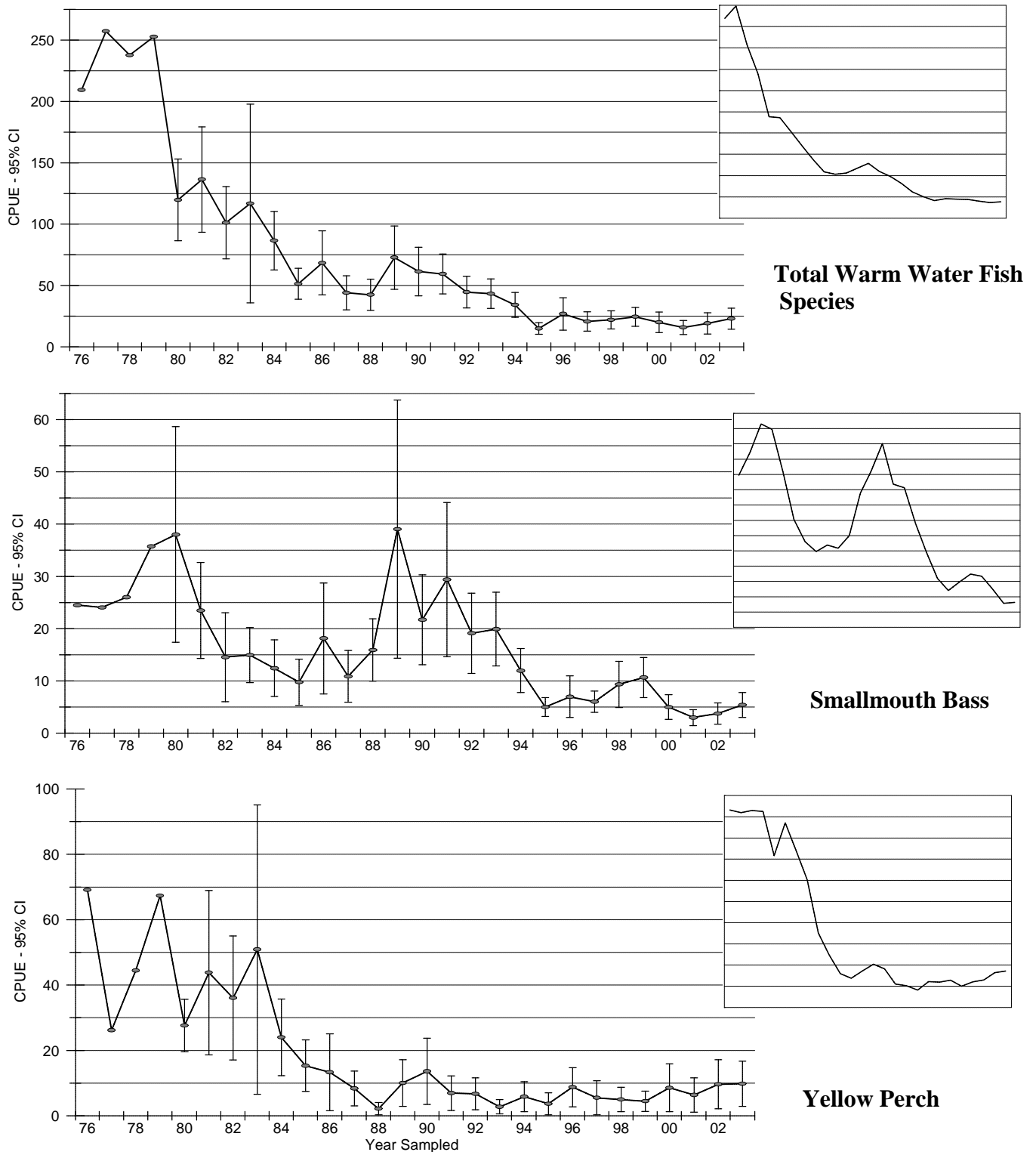


Figure 3. Stratified mean catch per 450 ft gill net gang and 95% confidence intervals for walleye, white perch, and rock bass, from the 1976-2003 warm water assessment conducted in New York waters of Lake Ontario's eastern basin. The inset graphs show 3-year moving average catch per unit effort data plotted against the mid point of the years sampled.

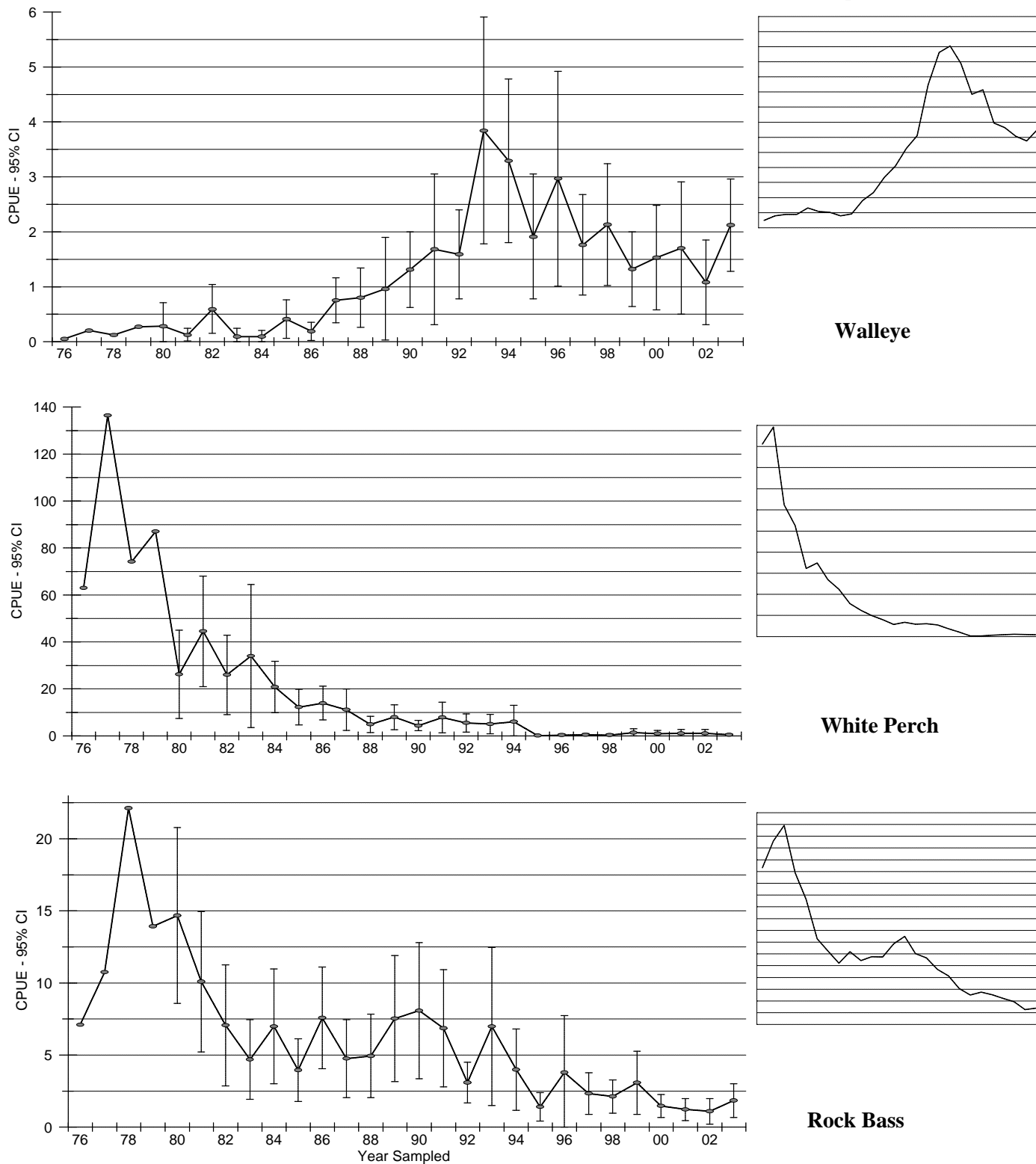


Figure 4. Stratified mean catch per 450 ft gill net gang and 95% confidence intervals for gizzard shad, white sucker, and brown bullhead, from the 1976-2003 warm water assessment conducted in New York waters of Lake Ontario's eastern basin. The inset graphs show 3-year moving average catch per unit effort data plotted against the mid point of the years sampled.

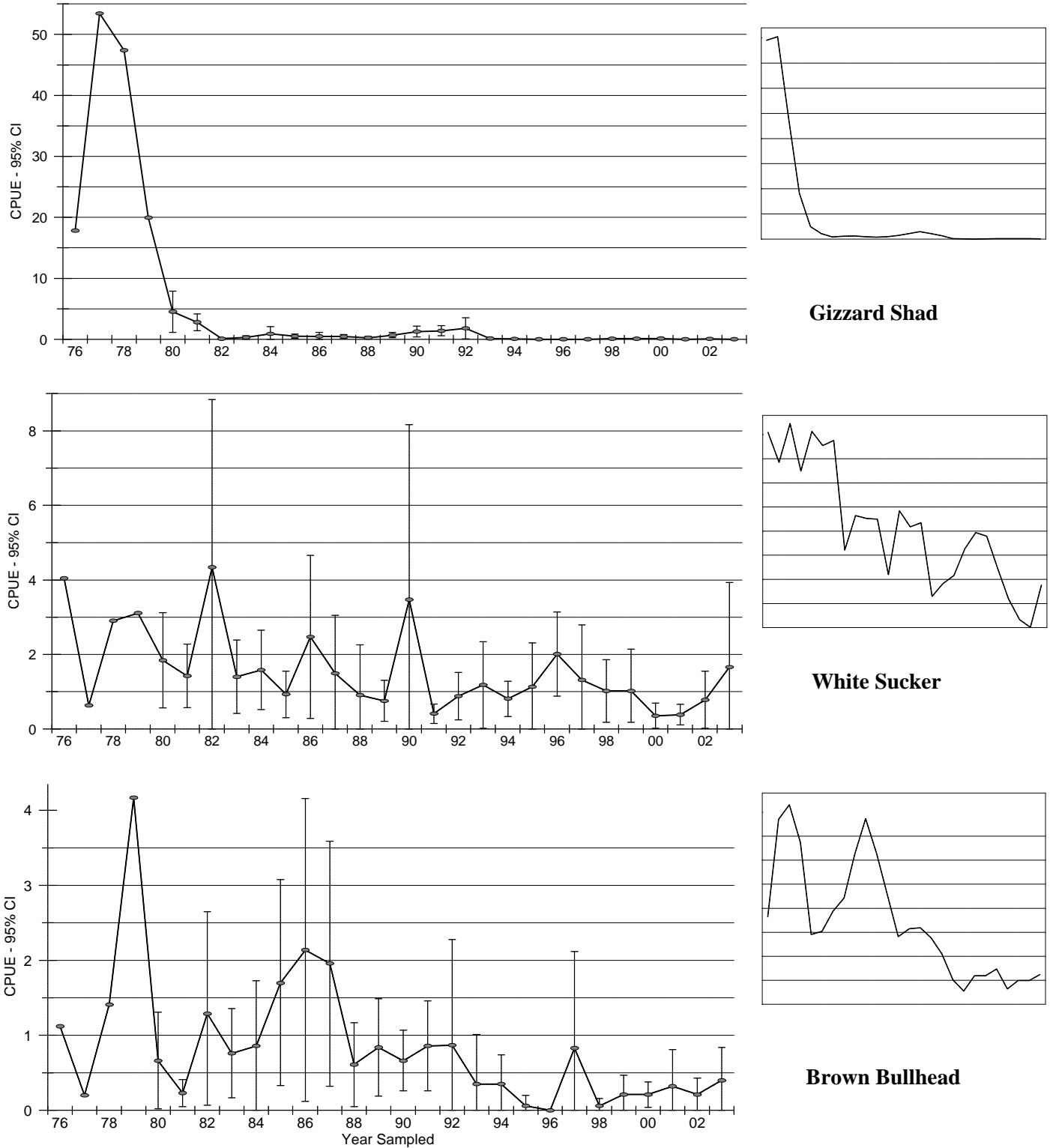
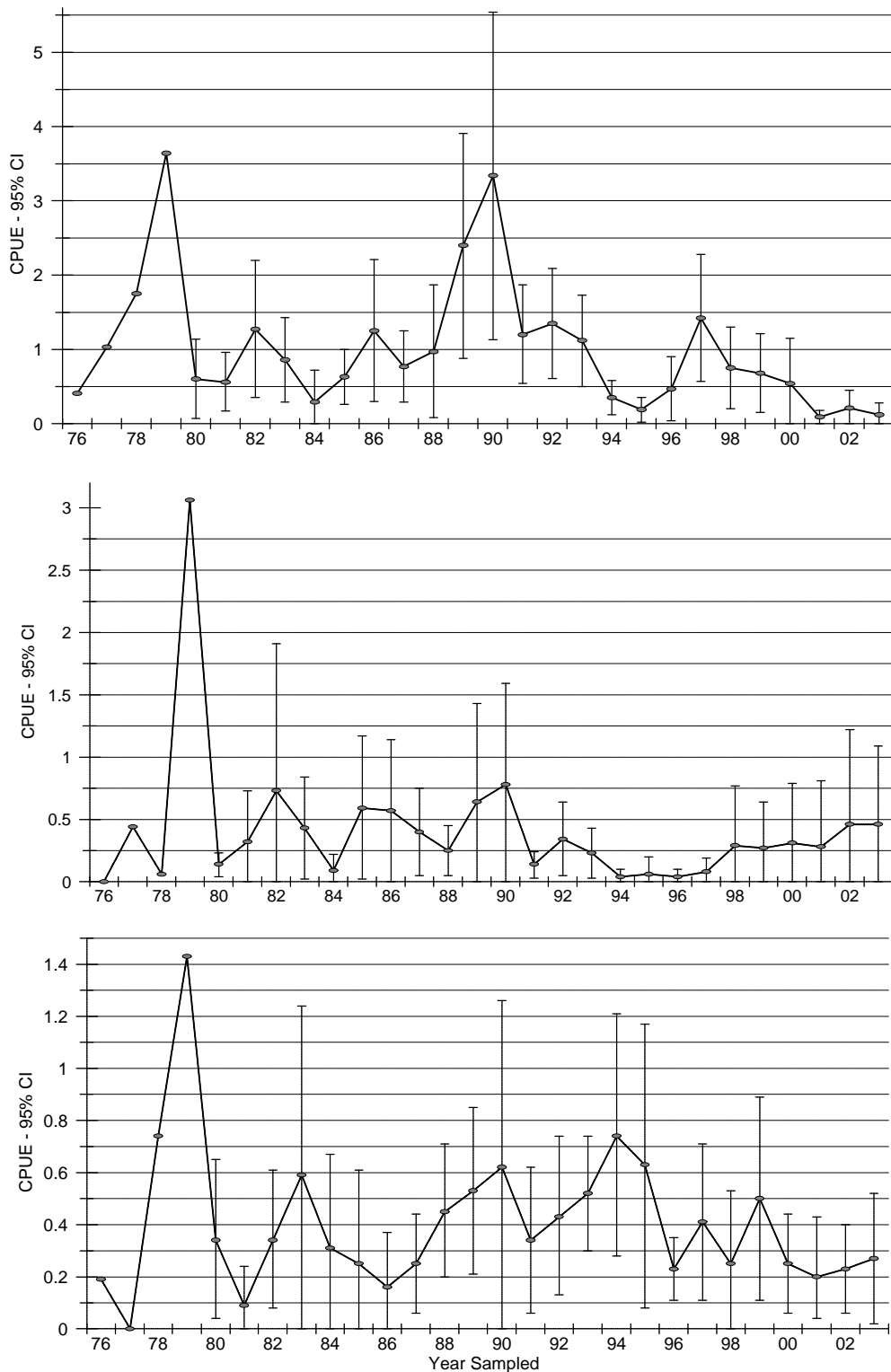


Figure 5. Stratified mean catch per 450 ft gill net gang and 95% confidence intervals for channel catfish, pumpkinseed, and freshwater drum, from the 1976-2003 warm water assessment conducted in New York waters of Lake Ontario's eastern basin. The inset graphs show 3-year moving average catch per unit effort data plotted against the mid point of the years sampled.



Channel Catfish

Pumpkinseed

Freshwater Drum

Figure 6. Stratified mean catch per 450 ft gill net gang and 95% confidence intervals for alewife, northern pike, and common carp, from the 1976-2003 warm water assessment conducted in New York waters of Lake Ontario's eastern basin. The inset graphs show 3-year moving average catch per unit effort data plotted against the mid point of the years sampled.

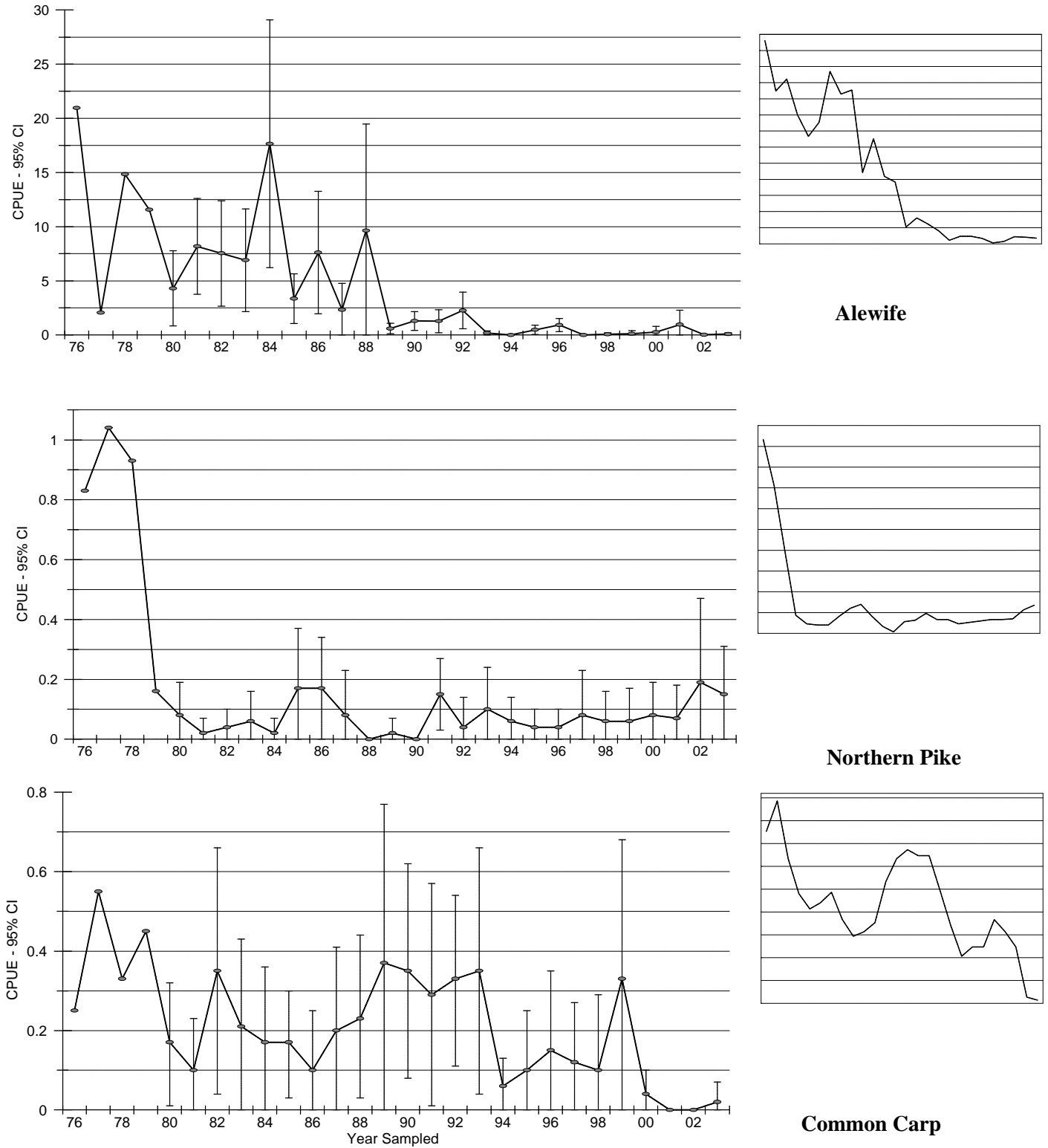


Figure 7. Relative CPUE by depth strata for all warm water fish collected in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

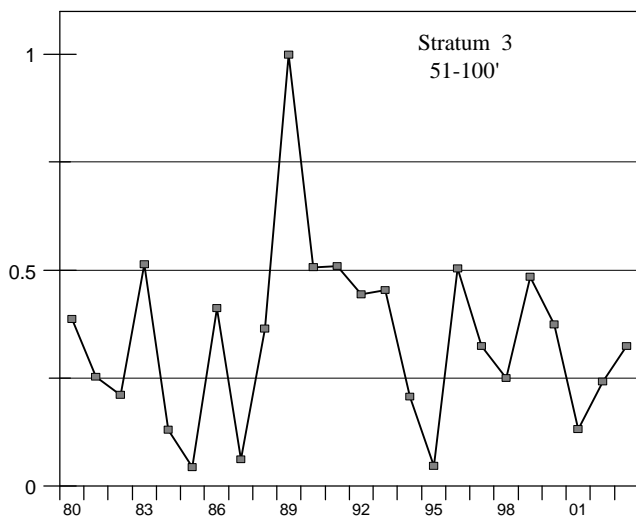
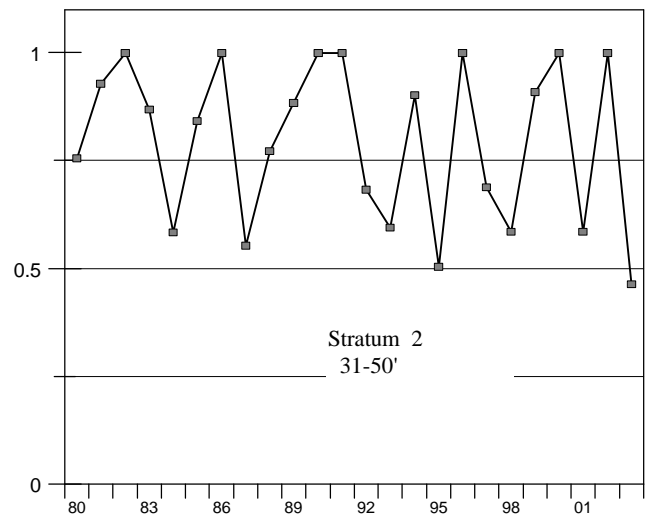
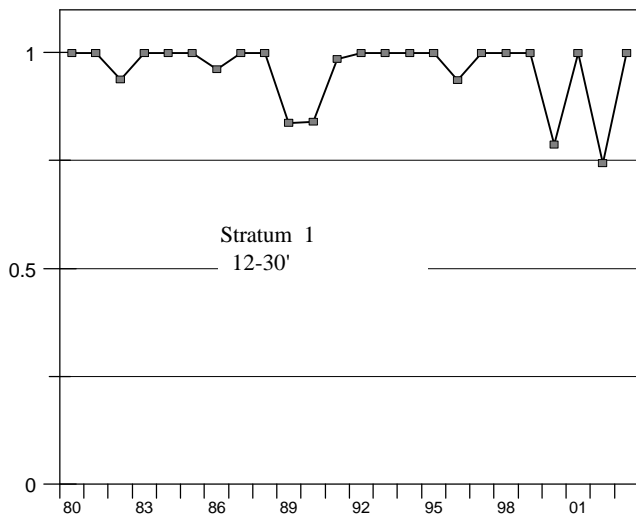


Figure 8. Relative CPUE by depth strata for smallmouth bass collected in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

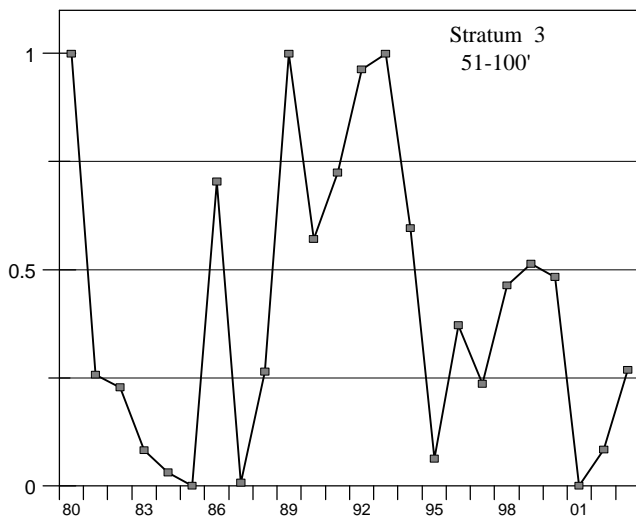
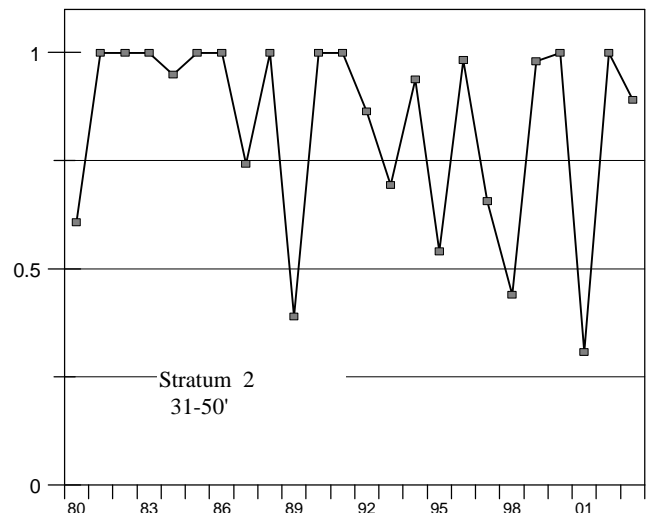
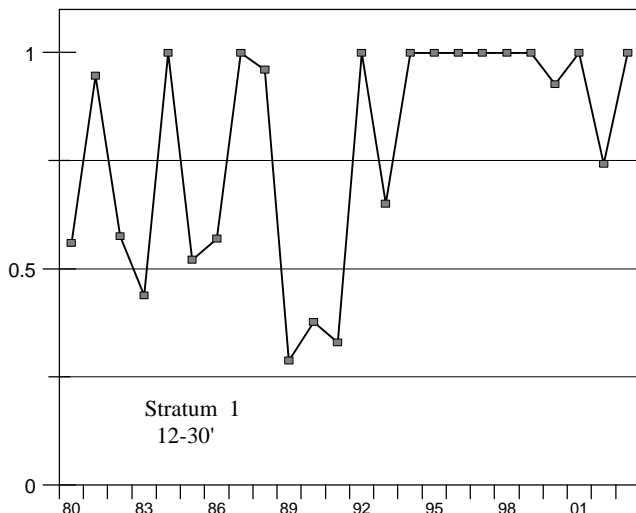


Figure 9. Relative CPUE by depth strata for yellow perch collected in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

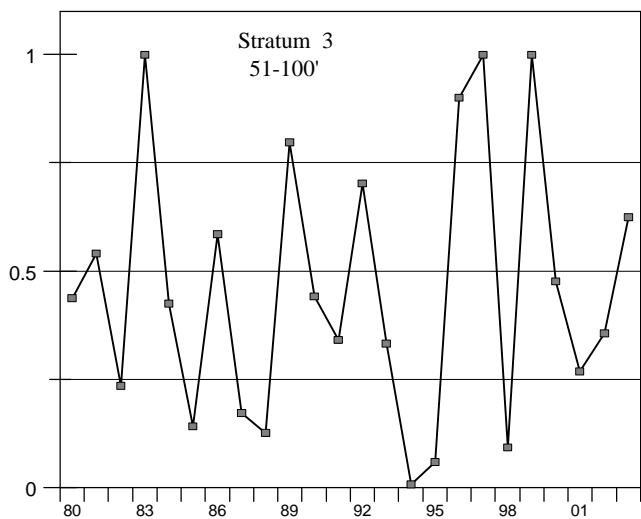
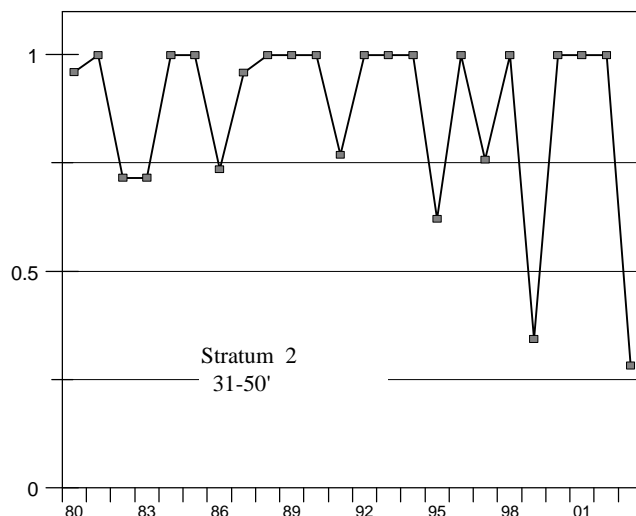
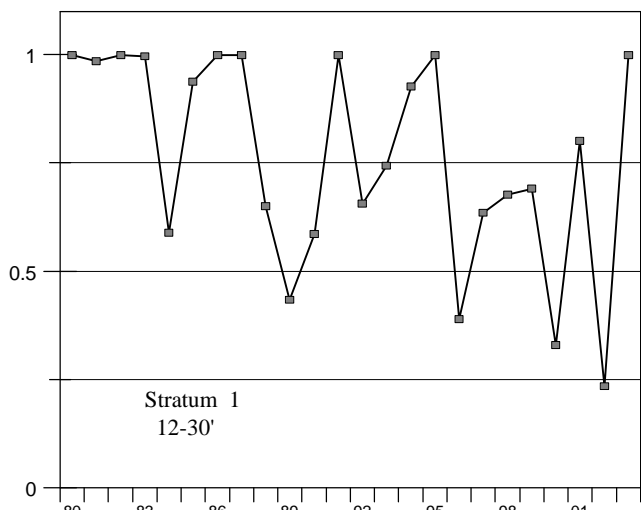


Figure 10. Relative CPUE by depth strata for walleye collected in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

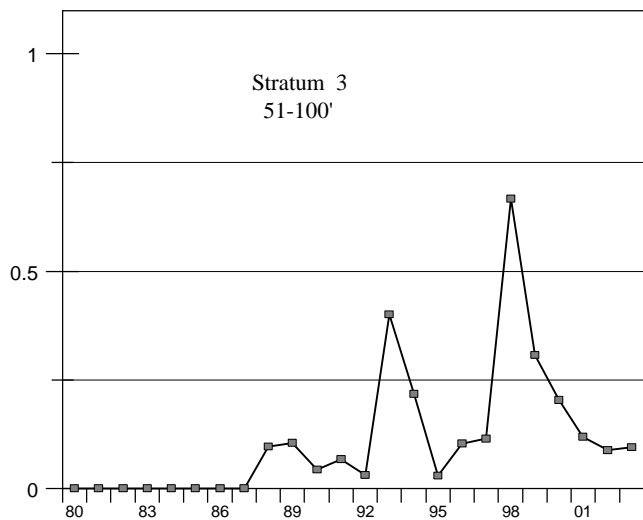
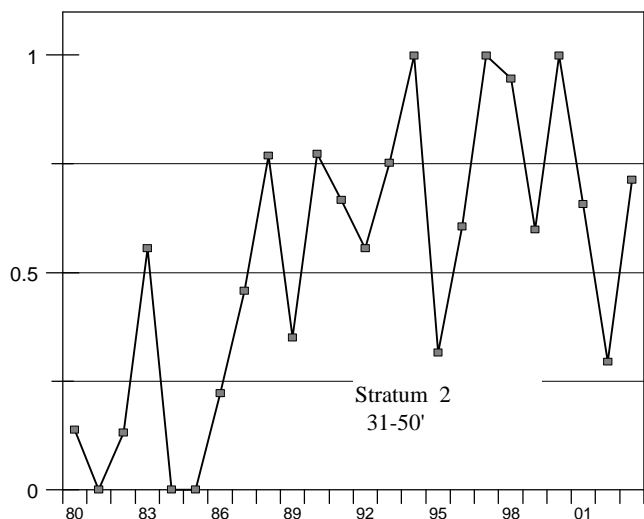
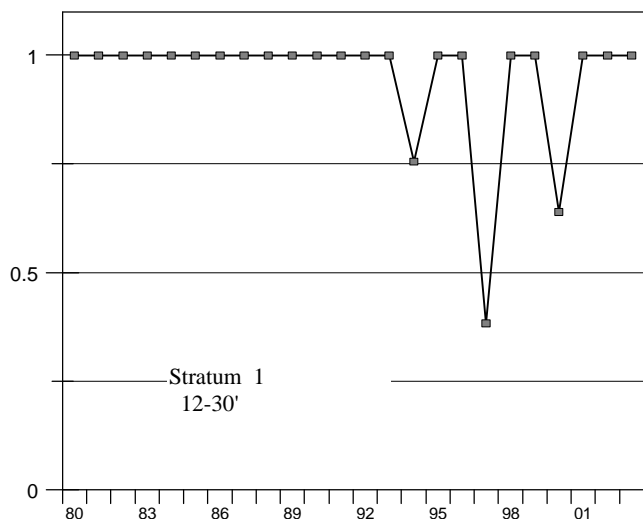


Figure 11. Relative CPUE by depth strata for rock bass collected in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

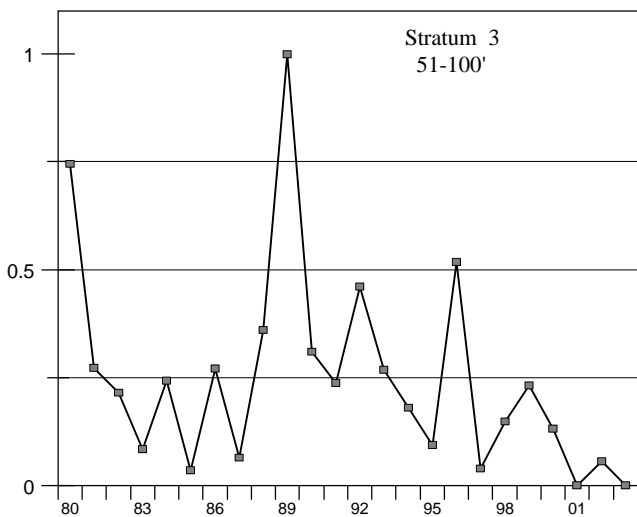
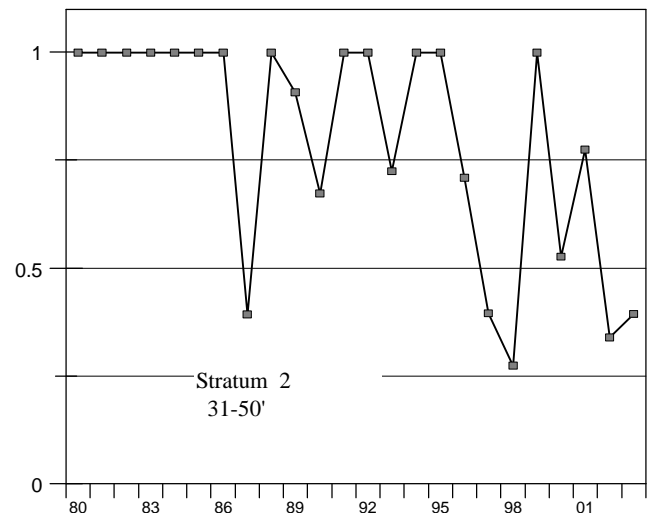
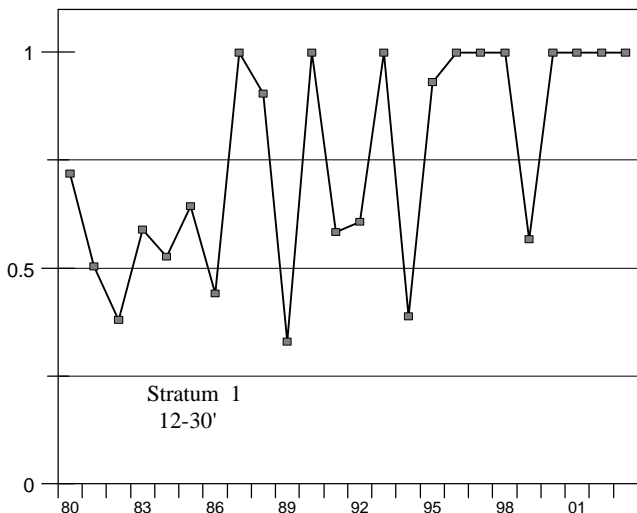


Figure 12. Relative CPUE by geographic area for all warm water fish collected in depth strata 1 and 2 in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

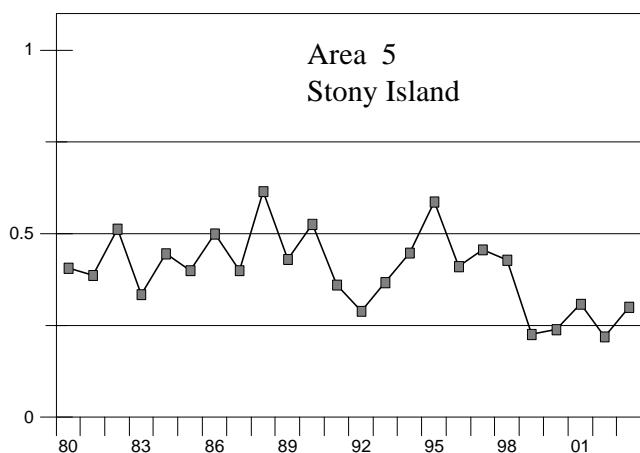
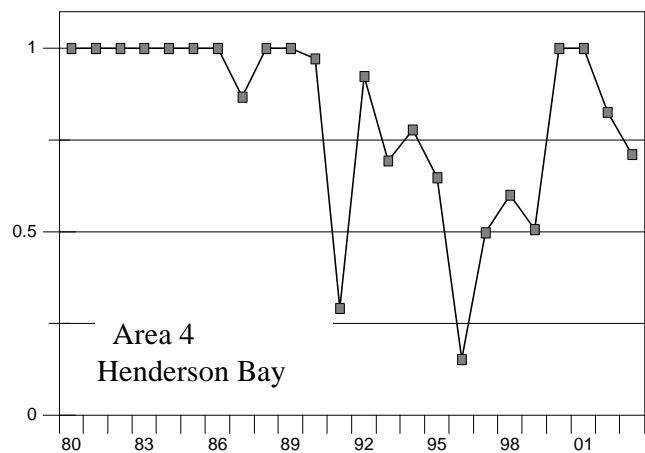
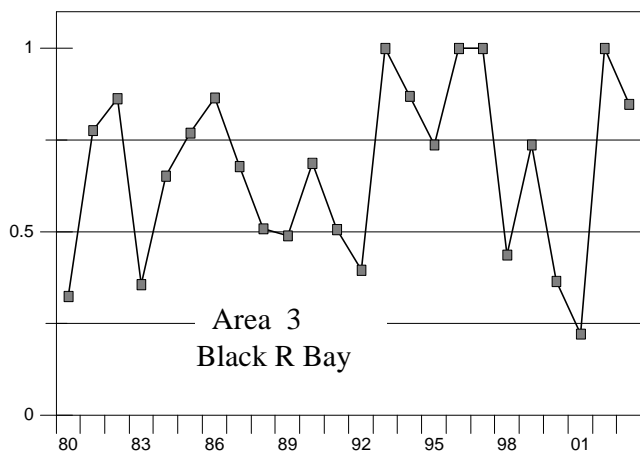
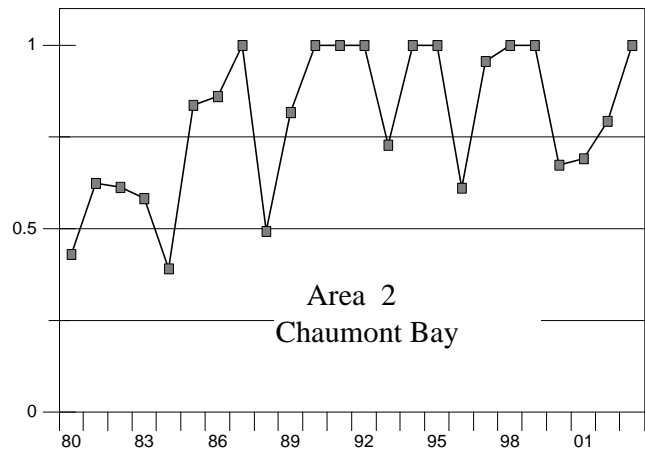
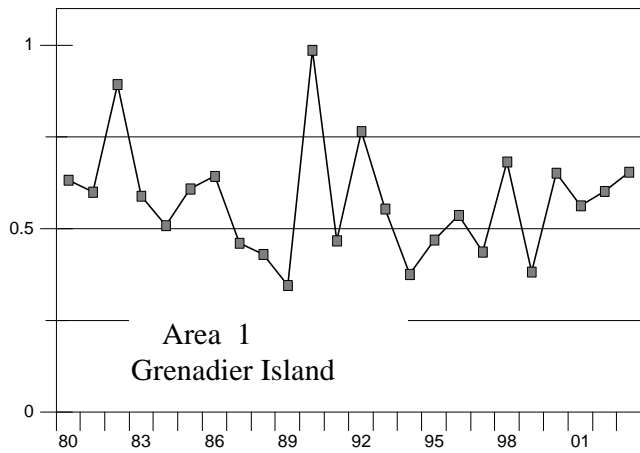


Figure 13. Relative CPUE by geographic area for smallmouth bass collected in depth strata 1 and 2 in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

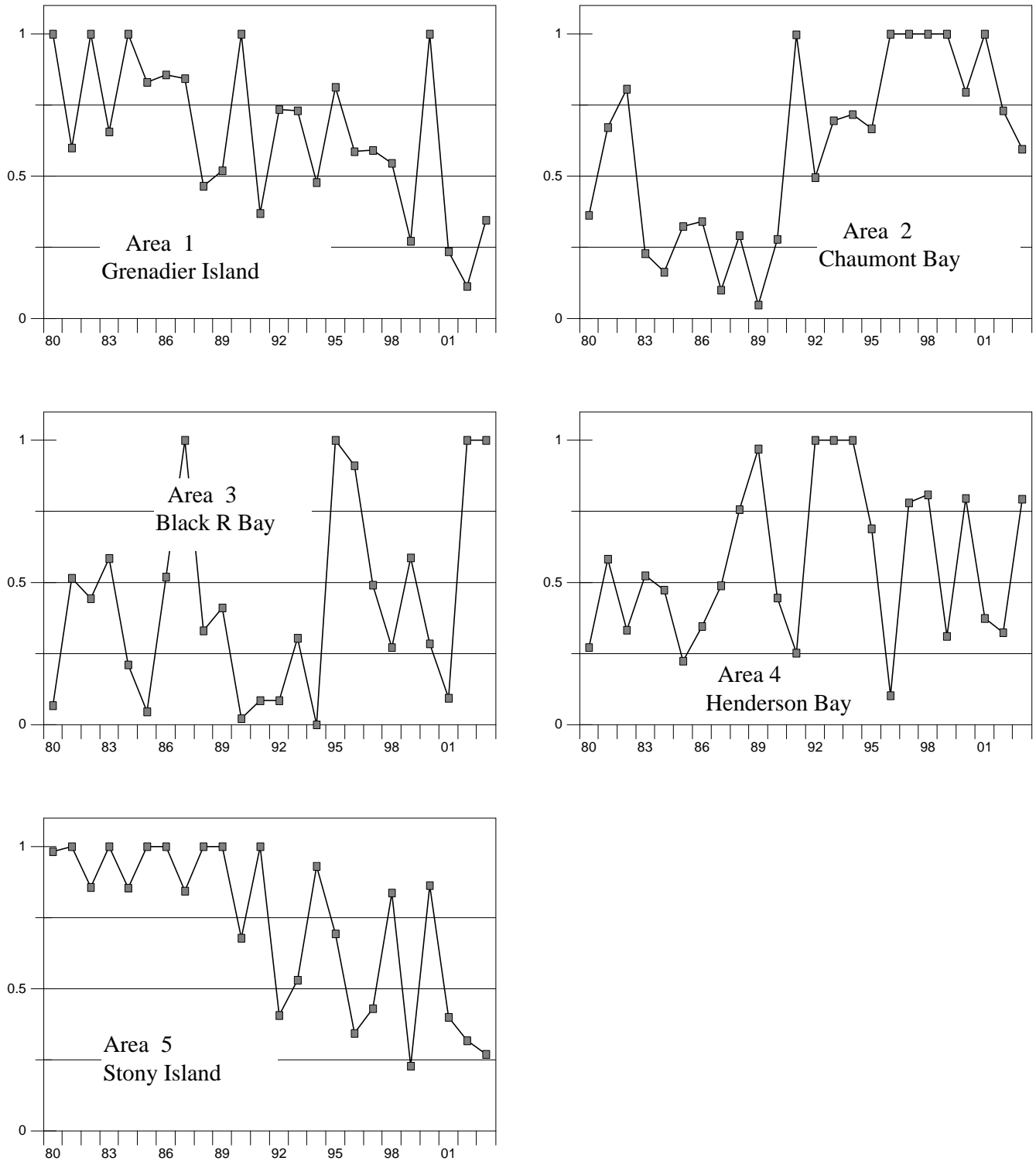


Figure 14. Relative CPUE by geographic area for yellow perch collected in depth strata 1 and 2 in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

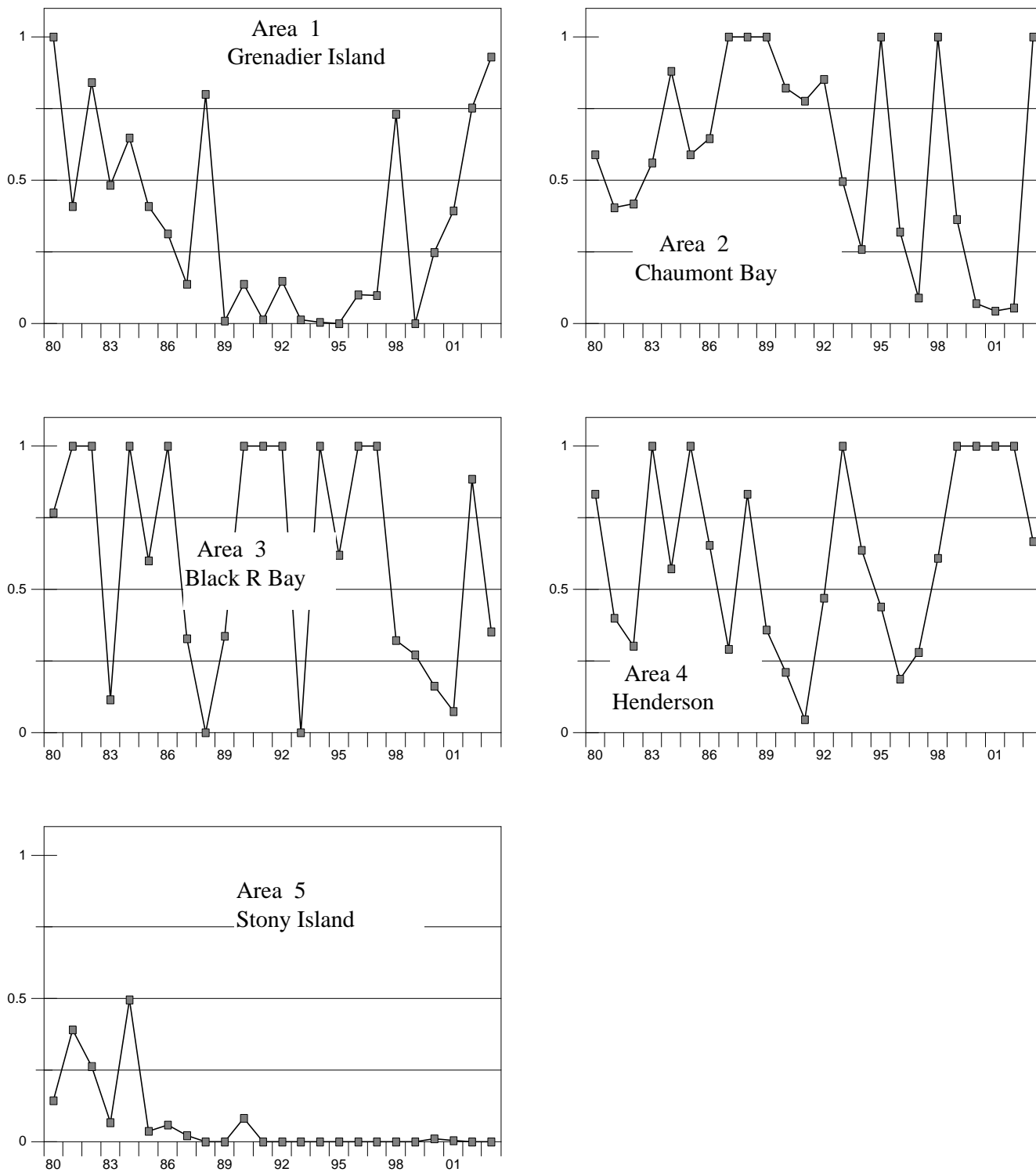


Figure 15. Relative CPUE by geographic area for walleye collected in depth strata 1 and 2 in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

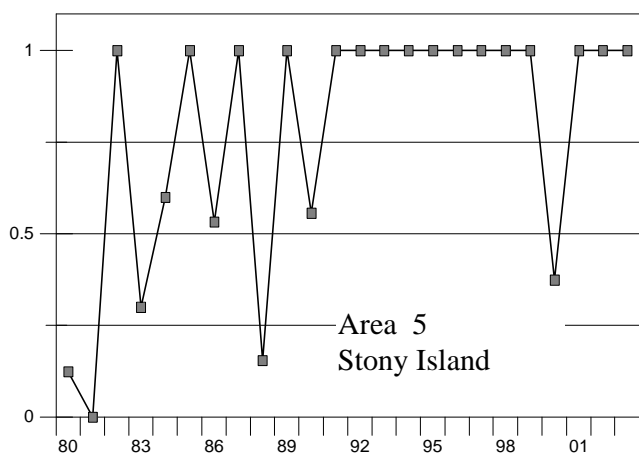
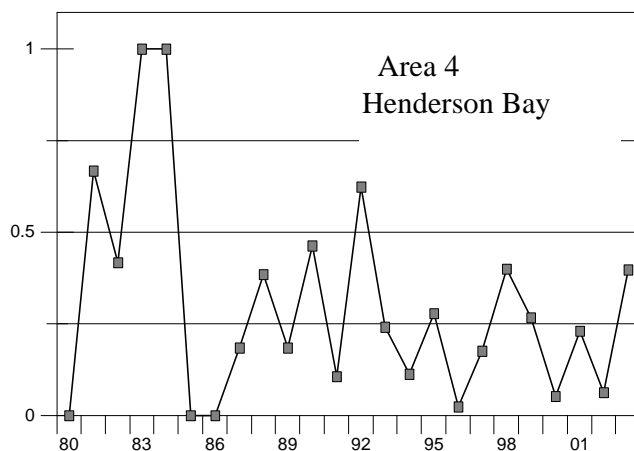
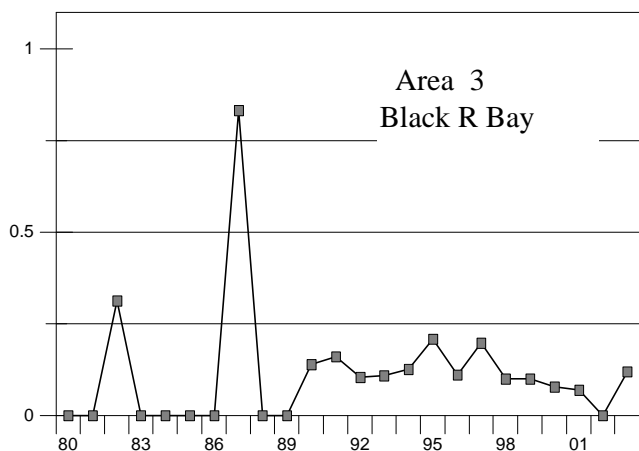
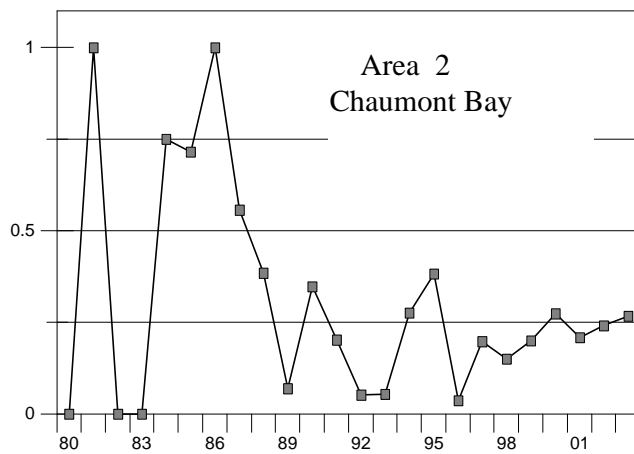
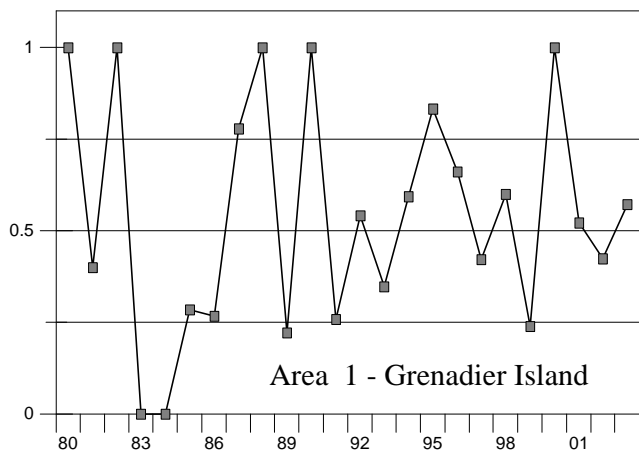


Figure 16. Relative CPUE by geographic area for rock bass collected in depth strata 1 and 2 in warm water assessment netting in New York waters of Lake Ontario's eastern basin, 1980-2003. Relative CPUE on Y-axis, year collected on X-axis.

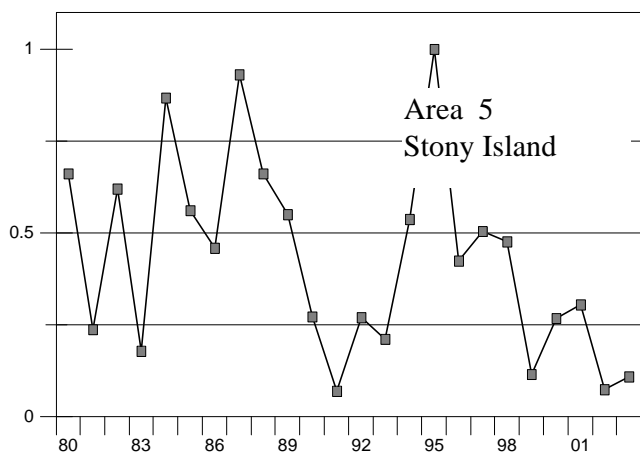
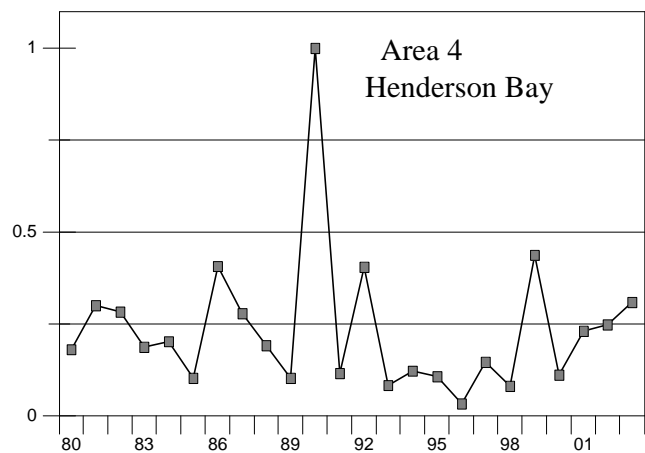
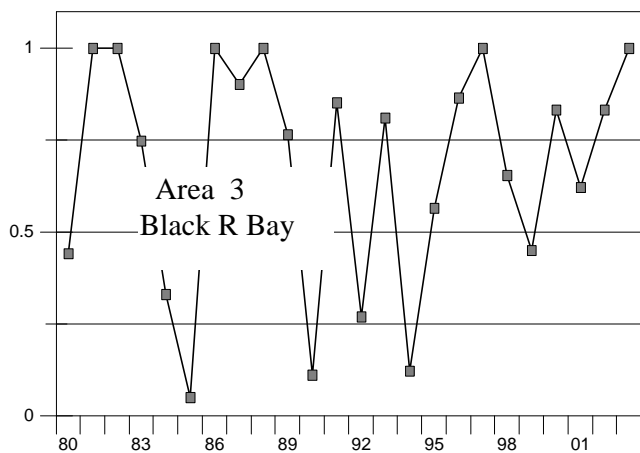
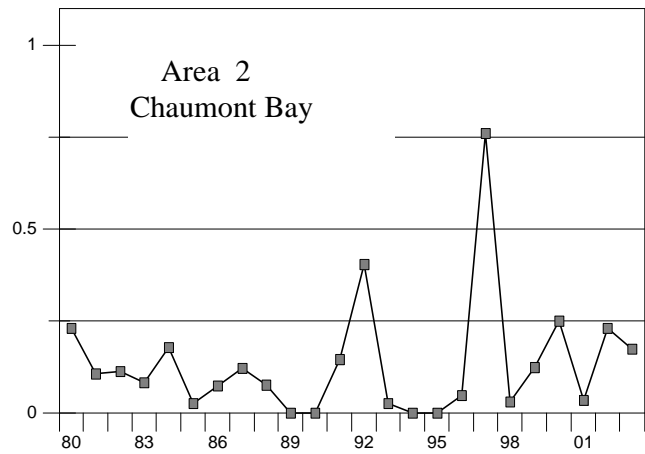
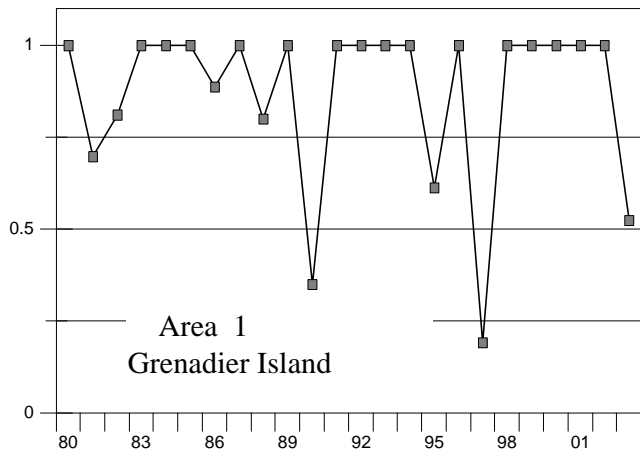


Figure 17. Means lengths of age 2-12 smallmouth bass from the 1976-2003 August warm water assessment in New York waters of the eastern basin of Lake Ontario. Year sampled on the X-axis, total length in inches on the Y-axis; dashed horizontal lines show the 28-year composite mean length; years with samples of less than four fish for any particular age group have been deleted.

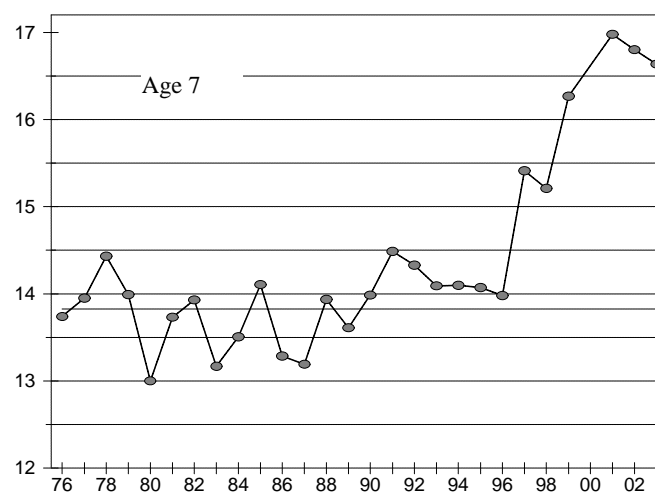
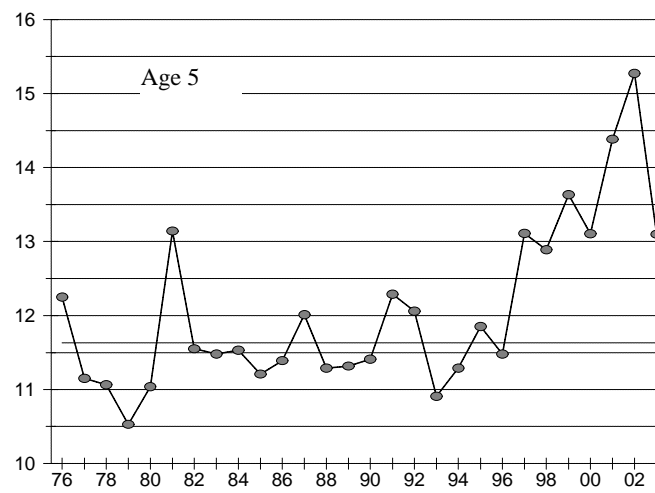
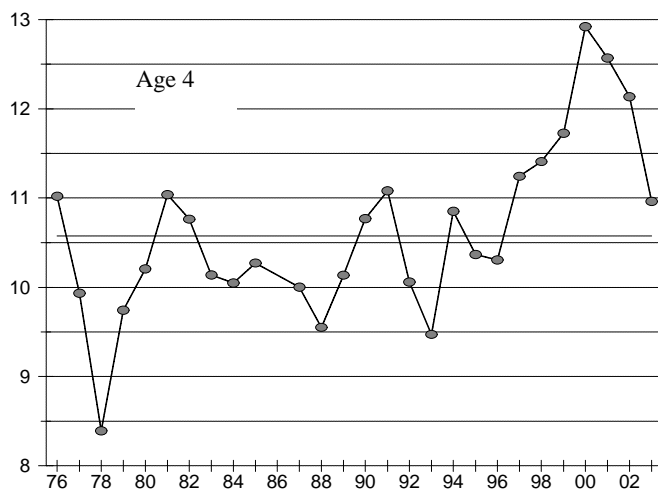
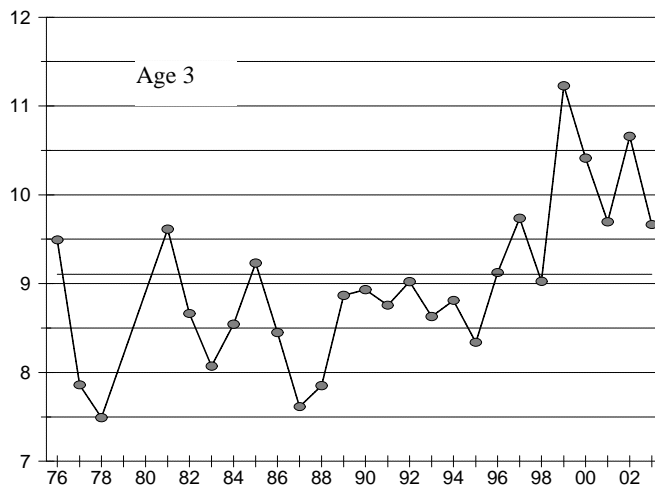
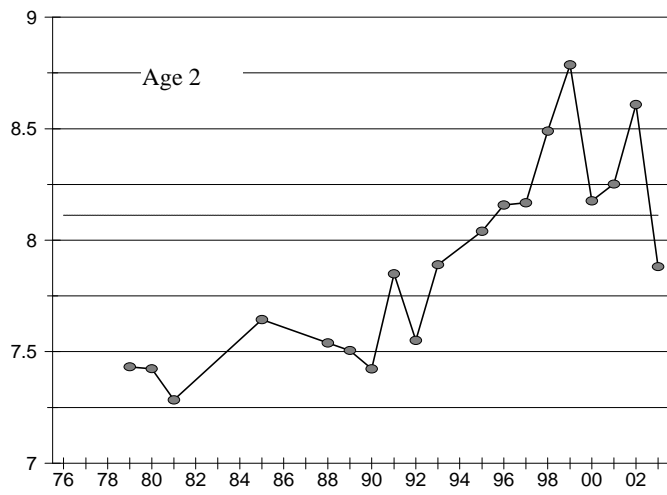


Figure 17 (continued). Means lengths of age 2-12 smallmouth bass from the 1976-2003 August warm water assessment in New York waters of the eastern basin of Lake Ontario. Year sampled on the X-axis, total length in inches on the Y-axis; dashed horizontal lines show the 28-year composite mean length; years with samples of less than four fish for any particular age group have been deleted.

