Report of the

FORAGE TASK GROUP

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I. INTRODUCTION

This report briefly describes 1992 forage status for each basin of Lake Erie as viewed by the Forage Task Group (FTG). The FTG's annual synopsis of forage status collates some results of independent assessment activities conducted by members of the group. A separate endeavor by the FTG to estimate rainbow smelt consumption by predators is presented under a separate cover. Recommendations for future activities of the FTG are outlined in the last section of this report (Section III).

II. FORAGE STATUS

A) Eastern Basin (Summarized by L. Witzel)

Forage fishes known to comprise important components of piscivore diets in eastern Lake Erie include rainbow smelt, alewife, gizzard shad, white perch, and spottail and emerald shiners. Relative contributions of these species to the diets of fish predators varies with annual fluctuations in abundance.

The status of forage fish in the eastern basin of Lake Erie has been determined annually by independent bottom trawl assessments conducted in the fall by OMNR, NYDEC, and PFC. Indices of relative abundance of forage fish are summarized in agency annual reports to the Lake Erie Committee. Other forage indicators monitored annually in eastern Lake Erie include predator growth rates, piscivore diet composition and zooplankton size structure.

The summary of forage status reported below is based largely on annual trawl assessments conducted by OMNR in offshore (using a 10-m trawl) and nearshore (using a 6.1-m trawl) waters of Long Point Bay, Lake Erie. All indices of abundance from OMNR trawl surveys are reported as geometric mean catch per trawl hour (GMCPTH).

Smelt are the most abundant forage species available to predators in the offshore waters of eastern Lake Erie. Smelt typically comprise 90% or more of index trawl catches (by number) in Long Point Bay and are generally the dominant food item found in the diets of salmonids and walleye.

Recruitment of young-of-the-year (YOY) smelt was good in 1992 (GMCPTH=872), much improved from the very poor year class produced in 1991 (GMCPTH=37.5). YOY comprised 94% by number and 74% by weight of the smelt catch in 10-m index trawls in Long Point Bay. The relative abundance of yearling-and-older (YAO) smelt in 1992 (GMCPTH=25.2) was the lowest observed in Long Point Bay since 1984. The YAO component of smelt catches was highest in 1986 (predominately two-year-old) and has declined steadily following elimination of the strong 1984 year class. This recent downward trend in YAO smelt abundance was also observed in NYDEC's trawl assessments (1989-1992). A basin-wide partnership (membership: Ontario Fish Producers Association, the Ontario Federation of Anglers and Hunters, and OMNR) trawl survey initiated in 1991 and commercial trawl catches in Long Point Bay also indicate a strong 1992 year class and low abundance of YAO smelt. YOY made up 74% (by number) of the smelt harvested by Ontario commercial trawlers during November to December, 1992.

Clupeids typically make up less than 3% (by number) of index trawl catches in the offshore waters of Long Point Bay, and indices of their abundance may not accurately reflect recruitment. Year-to-year variations in offshore trawl catches of YOY alewife and gizzard shad have fluctuated in a similar direction, but not magnitude. A recent (1988-1992) downward trend in recruitment of YOY alewife and shad was apparent from the offshore trawl survey. Alewife recruitment in 1992 (GMCPTH=2.7) decreased from 1991 (GMCPTH=6.6) and was below the historical average (1984-1991 GMCPTH=5.1). Zero YOY gizzard shad were caught offshore in 1992 compared to a long-term (1984-1991) average of 2.6 (GMCPTH).

Catches of alewife and gizzard shad are typically low in the nearshore waters of Long Point Bay. YOY alewife abundance increased in consecutive years from 1990 (GMCPTH=0.2) to 1991 (GMCPTH=1.9) to 1992 (GMCPTH=5.0). Conversely, recruitment of YOY gizzard shad was poor in 1992 (GMCPTH=0.1), and was preceded by an equally poor year in 1991. The historical (1980-1991) average abundance index (nearshore trawling) for YOY shad is 2.7 (GMCPTH).

OMNR trawl surveys have characterized the 1992 year class of emerald shiner as being moderate to poor. Relative abundance of YOY emerald shiners in 1992 (offshore survey GMCPTH=1.4) was unchanged from 1991. Recruitment of YOY emerald shiners was highest (since 1984) in 1987 (GMCPTH=6.5), declined sharply in 1988 (GMCPTH=5.5) and 1987 (GMCPTH=2.1), and has remained low, but relatively stable during the last three years (GMCPTH=1.4 - 1.5). The relative abundance of adult (YAO) emerald shiners (since 1984) peaked in 1986 (GMCPTH=45.1), then exhibited mostly successive annual decreases. The 1992 YAO index of abundance (GMCPTH=1.4) was the lowest observed since 1985.

Recruitment of YOY spottail shiners was poor in 1991. Trawl surveys in Inner Bay and Outer Long Point Bay indicate consecutive, annual declines in their relative abundance since 1990. YOY recruitment in 1992 (Outer Bay GMCPTH=14.2, Inner Bay GMCPTH=1.7) was below the 12-year (1980-1991) average for both surveys (GMCPTH=25.8 and 10.1, respectively). Inner and Outer Long Point Bay trawl surveys indicate conflicting changes in the relative abundance of adult (YAO) spottail shiners from 1991 to 1992; the Inner Bay survey showed a decrease (1991 and 1992 GMCPTH=0.3 and 0.1), the Outer Bay survey an increase (GMCPTH=1.6 and 3.0, respectively). Adult spottail shiner abundance in 1992 was below the long-term average for both surveys (1980-1991 GMCPTH for: Inner Bay=1.0, Outer Bay=3.1).

Widely conflicting trends in abundance indices of clupeids and shiners between surveys (nearshore vs offshore) and among agencies may be attributable to large variations in catches associated with widely clumped distributions of these species. Furthermore, temporal and spatial variations may be confounded by differential effects exerted on fish distributions by zebra mussels. For instance, increased water clarity may render bottom trawls increasingly less effective in the nearshore versus offshore areas of the lake.

Spawning success of white perch was poor in 1992. No YOY white perch were caught offshore in 1992; the historical (1980-1991) average GMCPTH is 1.4. The nearshore recruitment index of YOY white perch in 1992 (GMCPTH=0.7) was also below the long-term average (1980-1991 GMCPTH=2.4).

In summary, the availability of forage fish, other than smelt, appeared to be low to moderate in 1992 compared to recent years. Poor YOY recruitment by clupeids, shiners, and white perch and relative low abundance of adult shiner species may increase forage pressure on the relatively strong 1992 year class of smelt, which will be the dominant cohort in 1993.

B) Central Basin (Summarized by R. Knight)

Assessment of central basin forage was made from ODNR and PFC fall bottom trawl catch data, ODNR growth trends for various forage fishes and key predators (walleye and yellow perch), and walleye prey-size selectivity.

Relative abundance estimates were below average for most of the six targeted forage species in fall trawling surveys. Emerald and spottail shiners generally were of low abundance in both Ohio and Pennsylvania waters, though age-0 emeralds were highly abundant in Ohio's eastern part of the basin. Gizzard shad and trout-perch were of low to moderate abundance in all waters. Two species, alewife and rainbow smelt, apparently produced large year classes in 1992, as evident throughout the basin as well as in the other basins. Ontario commercial fishermen also reported high numbers of age-0 smelt in their fall trawling. Relative abundance of age-1 and older forage fishes was low for virtually all species.

Walleye size-at-age and feeding characteristics reflect prey fish availability. In fall 1992, age-1 walleyes averaged 325 mm and 326 g, making them among the smallest on record at this age and supporting the WTG's assessment of a strong 1991 year class. Older walleyes generally were shorter and lighter than in 1991 (a year of fast growth for most ages), but were near the 1983-1992 averages for most ages, suggesting forage fish availability was moderately high in 1992. In prior years, walleye growth rates have been inversely related to the size of clupeids they eat in fall. In 1992, age-1 walleyes ate clupeids averaging 76 mm, age-2 walleyes ate 81-mm clupeids on average, and age-3 fish ate 88-mm prey, which are much lower than in recent years. Thus, walleyes were able to be selective due to high availability of small prey. This supports high relative abundance estimates for age-0 alewife and smelt in trawl surveys. Diet composition data are not yet available to determine if these species were the predominant prey of walleye in fall 1992.

Growth rates of age-0 fishes and of older yellow perch are indicators of the availability of invertebrates, their primary prey. Mean lengths of the six targeted forage species were near long-term averages in ODNR trawl surveys, suggesting that availability of zooplankton was moderate in 1992. Cursory observations by Joe Leach (OMNR) also suggest that numbers of crustacean zooplankton have remained fairly stable over recent years. The average size of age-1 and older yellow perch was generally higher than last year for nearly all age groups, but was still below levels of the 1970's, despite much lower population sizes in recent years. This may signify increased availability of benthic macro-invertebrates in 1992 relative to 1991, but not necessarily a gradual recovery of benthos in a historic sense.

C) Western Basin (Summarized by K. Muth)

Data on relative abundance and growth of young-of-year (YOY) and forage fishes in the western basin of Lake Erie are collected by bottom trawl surveys conducted by the Ohio Department of Natural Resources (ODNR) and the U.S. Fish and Wildlife Service (FWS) each summer and fall. These data are compared to historic information and serve as indications of changes in food availability for piscivorous fishes.

Summer survey data for YOY fish suggested reproductive success of emerald and spottail shiners, alewives, and smelt was good while all other species was low. However, the size of YOY fish was observably smaller than is typical for this time of year, and trawl catches may not have been representative of relative abundance of most species. The fall survey data provide the most reliable indexes of abundance of YOY fish.

Smelt and alewives were the only two forage species with high abundance indexes in the fall, suggesting strong recruitment from the 1992 year class. Typically, these two species are not very abundant in the western basin, but the 1992 indexes were significantly higher than previous index values recorded during the past 30 years of surveys. Both species provide substantial contributions to the diets of piscivorous predators and their high abundance may be important to sustaining predator populations. Early indications of good shiner abundance provided by the summer index values were either erroneous or these species suffered high mortality after the summer survey. Fall abundance indexes indicated that YOY emerald and spottail shiner abundance was generally lower than in 1991 and significantly lower than the 10-year average indexes for these species. Likewise, the abundance index for YOY gizzard shad was the lowest value since 1986, and we do not expect this species to provide much forage for piscivores.

Abundance of YOY predator species in the western basin was depressed in 1992. Indexes for both walleye and yellow perch were lower than in 1990 and 1991 when these species produced good year classes. Although the weak 1992 year classes of these species will probably not provide much recruitment for future fisheries, their reproductive success this year still remains higher than in 1988 and 1989. Abundance of YOY white perch in 1992, while relatively high, is the lowest index since 1984 when major increases of this species began to occur in the western basin. The 1992 abundance index for YOY freshwater drum was low and contributes to the low pattern of abundance observed during the past 5 years.

Growth of YOY fish, as determined by fall length measurements, was generally lower for all species except walleye when compared to the good growth observed in 1991 (FWS data). Reasons for the decreased size (length) of YOY fish are unknown, but may be related to water temperatures this year, which were about 5 degrees Fahrenheit below average summer temperatures. This could have caused delayed spawning or slower growth rates that are reflected in smaller size fish in the fall. Alternately, zebra mussels may be affecting the food web and reducing the availability of food resources needed to sustain growth of YOY fish. Whatever the causes, average fall lengths for most species were lower this year than 10-year averages with the most notable decreases occurring for alewives and gizzard shad. Length values (mm) for key species (sample size in parentheses) are:

Walleye	Y. Perch	Drum	Alewife	G. Shad	E. Shiner	S. Shiner
212.6	84.3	94.1	97.4	81.2	59.8	73.4
(50)	(151)	(54)	(78)	(100)	(87)	(52)

Based on the fall abundance indexes for YOY fishes (both ODNR and FWS data), we conclude that the overall availability of forage fish was low in 1992. This conclusion may be supported by decreased growth of age-1 and 2 walleye and the age-2 and older yellow perch observed this year (ODNR data). Furthermore, walleye prey-size selectivity was probably lower this year, suggesting more opportunistic feeding was required because of reduced forage availability.

III. ALEWIFE AND SMELT DIE-OFF

During spring, 1992, a large die-off of alewife was observed in Lake Erie. This alewife die-off was apparent soon after ice-out, as many age-1 and older individuals accumulated along the entire Eastern Basin shoreline. Subsequent offshore bottom trawling programs conducted in New York were distinguished by the collection of many fish carcasses. Most of the carcasses appeared to be alewives, but decomposition prevented positive identification of many of these fishes. White perch were also present in these collections of dead fish. The magnitude of these 1992 collections of carcasses was not quantified, but incidentally-caught dead fish were infrequently encountered during previous years' trawling activities by New York. This die-off was apparently attributable to prolonged cold water stress that characteristically produces mortality alewife populations.

Rainbow smelt in Eastern Lake Erie also experienced a die-off during May, 1992. This was apparently the largest observed die-off in at least 10 years. Some smelt were collected by New York and submitted to the New York State Fish Pathology Laboratory at Cornell University for histological observations. An external saprolegnia infestation was evident, along with high numbers of budding algal cells on the skin and in the stomach. However, there was no invasion of fungus into the major organs, which would cause the widespread mortalities that smelt suffered (Rod Getchell, personal communication). The fungi were probably secondary invaders during this post-spawning die-off.

IV. FUTURE PLANS

The 1992 charges to the Forage Task Group included a continuation of efforts to quantify predator consumption of rainbow smelt in Central and Eastern Lake Erie. A summary of this effort is available in a report under a separate cover. Any future investigations of salmonine predator demand should first address several knowledge deficiencies that may represent a significant source of error in the current consumption estimates produced by the Forage Task Group. These include salmonine juvenile and adult survival estimates, food habits, and measurement of predator and prey caloric densities that are more descriptive of Lake Erie's fish community.

During 1993, the FTG plans to pursue the recommendations of the Ad Hoc Interagency Trawl Group. Specifically, this assignment calls for summarizing results of interagency trawling efforts, pursuing trawl calibration among agencies, and developing a standard trawling protocol for Eastern Basin waters. In addition, the FTG will continue to evaluate hydroacoustic techniques as a method to assess rainbow smelt status. This charge is a continuation of a previous assignment that was hampered by equipment problems and poor sampling conditions during the brief 1992 investigation.