Roger

REPORT OF THE FORAGE TASK GROUP - 1987

Group members met during December, 1986, to address three charges from the STC: (1) identify available information, (2) identify indicators of forage status from existing data and (3) identify knowledge deficiencies. Additionally, we discussed the standardization of data collection procedures among agencies.

Available Information

Available data were summarized previously (FTG report, 1986). However, two additional sources may be useful: impingement of forage fishes in power plants and zooplankton size distributions in the eastern basin. Impingement data are available for recent years from power plants in Ontario, Michigan, and possibly Ohio, and may supplement abundance assessments from bottom trawls. Zooplankton sampling has been conducted since 1984 by Dr. Edward Mills of Cornell University and may provide insights into predator-prey interactions in the eastern basin.

Indicators

Indicators of forage status can be separated into two components: direct (forage fish population parameters) and indirect (e.g., predator diet composition and growth rates). We will focus our efforts at six forage species: gizzard shad, alewife, smelt, emerald and spottail shiners, and trout-perch.

Summer and fall bottom trawl surveys conducted by the USFWS and ODW provide the most extensive (>25 years) abundance data for targeted fish

species in the western and, to a lesser extent, central basins. Limited trawl data from the central and eastern basins (Ontario, Pennsylvania) are also available. Annual trends of relative abundance (catch per trawling hour) for most of the six species are difficult to interpret, owing to the high variability associated with trawl catches. Additionally, trends often differ between seasons (Figure 1) and between agencies (Figure 2) within a year. Therefore, these data should be analyzed (see later section) with the intent of improving the precision of index values before attempting to assess changes in relative abundance.

Age composition and growth data from trawl surveys also are available for forage species. Ages are assigned from length classifications and percent composition is calculated from index values; hence, age composition also is subject to high variability. Cursory examination of USFWS and ODW summaries indicate annual differences in mean lengths are not substantial for any of the six species.

Indirect indicators include predator growth and maturity rates, diet composition and feeding rates of predators, prey-size selectivity by walleyes, and zooplankton size compositions (eastern basin). These data will be used in conjunction with direct measures to quantitatively link forage and predator responses. For example, changes in growth and maturity rates of walleyes probably are related to changes in walleye and forage fish densities. Attempts at quantifying these relationships

have not been successful thus far, possibly owing to the lack of precision for estimates of predator population sizes and forage fish abundance.

Knowledge Deficiencies

A major factor that hinders efforts to determine and eventually forecast forage base stability is the ability to accurately sample forage fishes. Trawling provides our only long-term data, yet the variability of annual index values diminishes their utility substantially. The amount of annual variation and sources of variation have not been defined. It seems prudent if we are to continue expensive trawl surveys that we examine ways to improve the estimates we obtain.

Toward this goal, ODW personnel have entered summer trawl catches (1970-86) and abiotic data (Secchi transparencies, water temperatures, DO levels) into computer files from original catch reports. Their objective is to reconstruct index values with less variability from available statistical techniques (i.e., ANOVA, time-series analysis). Because of differences in sampling design between agencies, Ken Muth has provided USFWS trawl data to supplement this effort. Sources of variation will be examined in this analysis.

Other areas of knowledge deficiencies are as follows: forage fish energetics, catchabilities of various species to trawls, predator densities, and invertebrate data. Stocking records (salmonids) across agencies could be updated annually (e.g., Appendix B, 1978 GLFC Annual Report) in the minutes of the LEC meeting.

Standardized Sampling

Coordinated interagency sampling of forage fishes is appropriate and can be incorporated into recruitment assessments of targeted predator species. Standardized sampling gear would allow direct comparisons among agencies. We will develop a tentative sampling program based on gears currently used and results from the analysis of historical trawl data.

Summary

We have addressed the three charges as follows:

1. Available Information:
   - add forage fish impingement and eastern basin zooplankton data to that previously defined (FTG report, 1986).
2. Indicators (existing data):

Direct	Indirect
forage fish abundance index	predator growth rates
forage fish age ~~consumption~~ composition	predator maturity rates
forage fish growth rates	predator diet compositions
	predator consumption rates
	walleye prey size selectivity
	zooplankton size structure

3. Knowledge deficiencies:
   - amounts and sources of annual variation in trawl index values
   - forage fish energetics
   - catchabilities of various fishes to trawls

- predator densities

- invertebrate data

Future Plans and Recommendations

Our plan is to examine available data and develop criteria to annually assess forage status. Indicators, as defined above, provide a reasonable starting point. Efforts initially will be directed toward the evaluation of trawl data (our most extensive information) for six forage fish species and the improvement of indexing procedures by using techniques to lower variance. Impingement data will be examined for their suitability as independent estimates of forage fish abundance to compare with trawl data. We intend to use these results to develop standardized interagency sampling procedures and recommend a committment by the LEC toward this goal.

Available data for other indicator variables will be assimilated within agencies (where collected). Annual summaries across agencies can then be maintained by the FTG and inter-relationships among variables can be examined. We urge agencies to contribute pertinent data where possible.

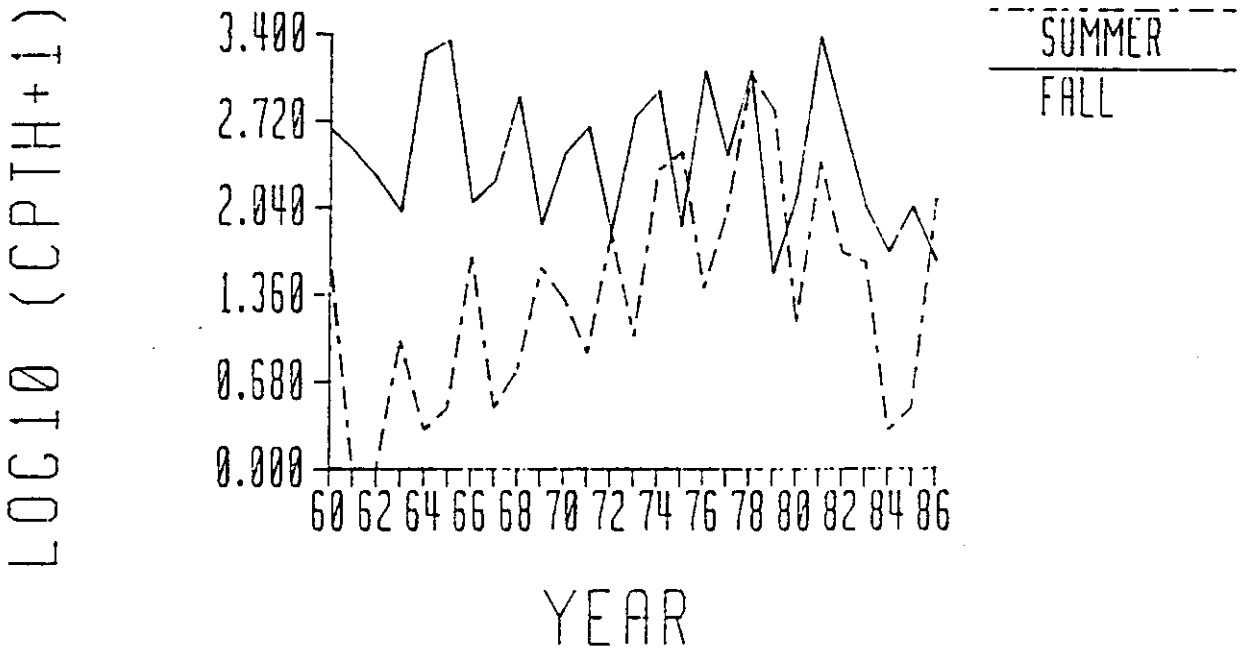

Figure 1. Log-transformed index values for age-0 emerald shiners from USFWS trawl surveys at East Harbor.

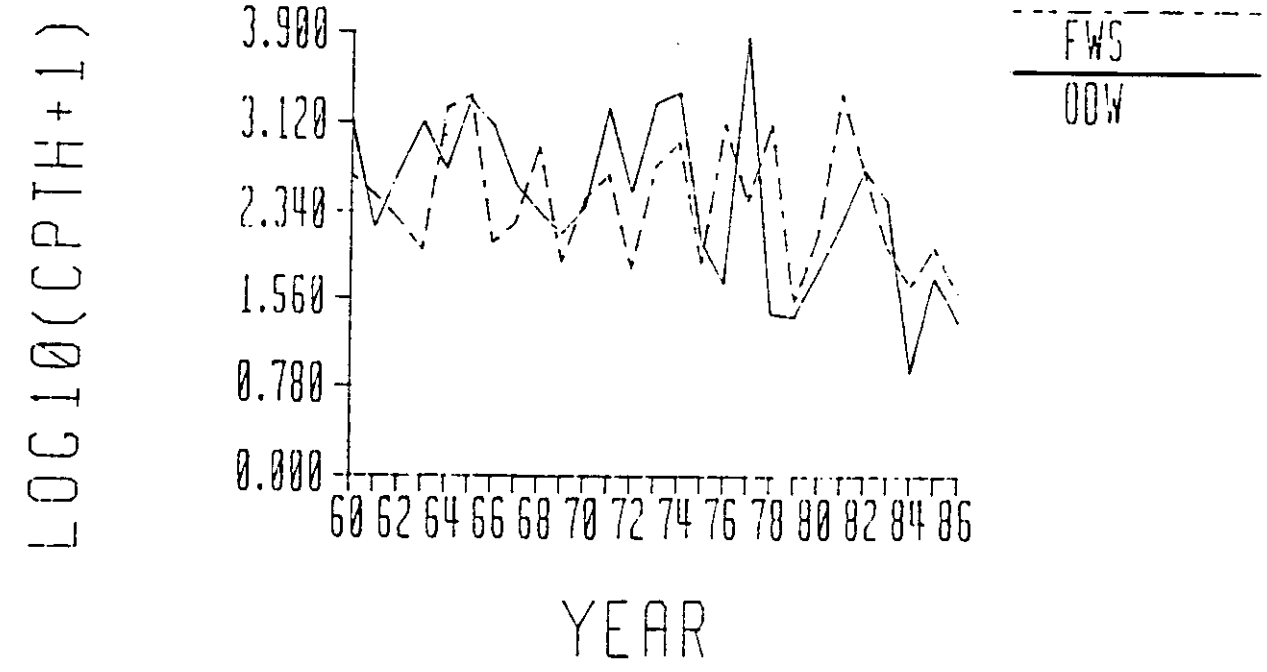

Figure 2. Log-transformed index values for age-0 emerald shiners from USFWS trawl surveys at East Harbor and from Ohio's western basin fall trawl surveys.