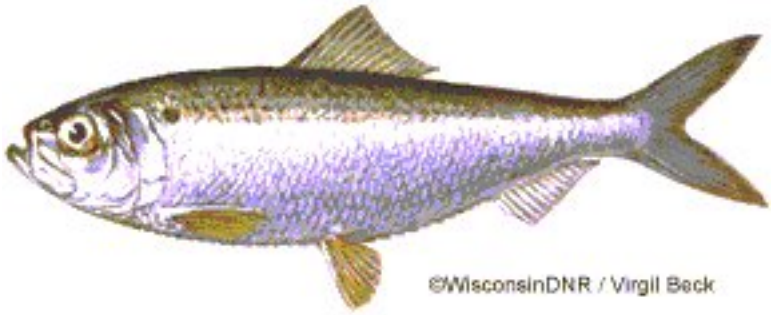
Probabilistic Forecasts of Alewife Fall Condition

Primary Investigator: Tom Croley (Emeritus), Doran Mason - NOAA GLERL

This project concluded in 2001

Overview

The Alewife is a key species in the Great Lakes food web that undergoes dramatic fluctuations in abundance and is susceptible to high rates of over-winter mortality. It is believed that the condition of Alewife entering the winter season determines the proportion of Alewife surviving to the following spring. GLERL, in collaboration with Dr. Charles Madenjian (USGS-BRD Great Lakes Science Center, Ann Arbor, MI), will: (1) determine the best fall condition index for Alewife based on available historical data from USGS-Biological Resources Division annual forage fish surveys, (2) hindcast past thermal structures using the 1-D lake thermodynamics model and compare hindcast results to known thermal structure, (3) quantify Alewife thermal habitat during the growing season by using various model-based indices (e.g., spatially-explicit growth rate potential, integral of preferred thermal habitat, etc.) from thermodynamics model hindcasts and relate indices to Alewife condition in the fall, and (4) use the AHPS probabilistic forecasts to predict Alewife fall condition given various summer weather scenarios and weather forecasts. Potential products should include a predictive understanding of the factors responsible for determining Alewife condition in the fall, a model that is capable of predicting Alewife condition in the fall from predictions of thermal habitat, and the ability to evaluate Alewife thermal habitat in response to various meteorological scenarios.



GLERL has developed a series of probabilistic hydrology outlooks by using recorded historical meteorological data, present hydrological conditions, and probabilistic weather forecasts. These forecasts are available daily at GLERL and at several customer sites (see GLERL AHPS Products and Great Lakes Net Basin Supply Forecast Model. The technology may be extended to generate other derivative probabilistic outlooks if sufficient modeling ability exists to tie the derivative forecast variables (such as Alewife fall condition) to meteorology and or other hydrological variables that are themselves tied to meteorology. The technology to make derivative forecasts already exists under these conditions. However, the provision of additional probabilistic forecasts of Alewife fall condition further extends the usefulness of the technology and enables useful forecasts in other fields.

2001 Plans

To understand the effect of thermal conditions during the summer growing season on fall condition of Alewife and to use this information with summer weather forecasts to predict Alewife fall condition.

To develop a prediction model for Lake Michigan Alewife fall condition by using the 1-D Great Lakes thermodynamics model and the Advanced Hydrologic Prediction System (AHPS).

2001 Accomplishments

Calibrated lake thermodynamics model for Lake Michigan and provided Lake Michigan modeled daily temperature-depth profiles for 1948-1995 for relating Alewife fall condition to preceding water conditions. Applied a bioenergetics model for the Alewife across the growing season using the one dimensional water temperature model for Lake Michigan.

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