Predicting the distribution of anadromous fish in fresh water using habitat models

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Effective management of anadromous species under the Endangered Species Act is facilitated by a comprehensive understanding of historical distribution. Elevation, climate and hydrologic data can be used with a number of modeling approaches to predict species distributions for large areas. In this paper I review methods based on bioclimatic envelopes, multivariate distance metrics, and literature-derived habitat preferences and applications to green sturgeon, coho salmon and steelhead. Output from these models has been influential in designating management units, critical habitat, and recovery goals for anadromous species inhabiting the U.S. west coast.

Deciphering environmental patterns and effects from messy data

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Alaska Atka mackerel (*Pleurogrammus monopterygius*) are an important component of the Aleutian Islands ecosystem and support a large commercial fishery. Sustainability of this population has been dependent on highly variable recruitment and the consistent appearance of strong year classes. Interestingly, strong year classes of Aleutian Islands Atka mackerel have occurred in years of hypothesized climate regime shifts 1977, 1988, and 1999, as indicated by indices such as the Pacific Decadal Oscillation. El Nino Southern Oscillation (ENSO) events are another source of climate forcing that influences the North Pacific. Preliminary analyses have not indicated a relationship between strong year classes of Aleutian Atka mackerel and ENSO events. We reexamine this relationship in light of significant recent recruitment events. Quantitative observations about the ENSO effects on fishes can be difficult, and as such we also examine anomalies of weight at age tracked by cohort to decipher potential patterns that may reflect environmental influences. We suggest ways that environmental indicators of growth patterns may be incorporated into the stock assessment.

The role of SEAMAP plankton surveys in monitoring the pelagic habitats of early life stages of fishes in the Gulf of Mexico

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Plankton samples and associated environmental data have been collected during annual Southeast Area Monitoring and Assessment Program (SEAMAP) surveys in the Gulf of Mexico since 1982. This time series of observations has produced an extensive database on the early life stages (ELS) of fishes and their pelagic habitats. The associated environmental (hydrographic) data have not undergone the same rigorous scrutiny as plankton sample data and, therefore, their value is not fully realized. In recent years, habitat-related data collection has been expanded to include: fluorometric chlorophyll a measurements; quantification of net-collected *Sargassum* and gelatinous zooplankton; and continuous surface zooplankton sampling with corresponding environmental measurements. The vertical dimension of larval fish habitat is also now being described through discrete depth sampling during SEAMAP surveys on an 'as time permits' basis. These new data on pelagic habitats along with recent analysis of archived hydrographic data reveal the importance of considering habitat when interpreting survey-generated occurrence and abundance data for gray triggerfish, snappers and groupers. This set of georeferenced observations describes the physical and environmental characteristics of habitats where larvae of fishery species have been consistently found over the past three decades. These depictions of essential ELS habitat represent baselines for future habitat assessments and marine spatial planning. They also provide guidance for improving SEAMAP survey design

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