SeaWeb background

American Eel Decline

The American eel (*Anguilla rostrata*) is found over a large geographic range - much of the eastern coast of North America including the St. Lawrence River and Lake Ontario, deep into the Mississippi drainage basin, through Central America into northern South America, and as far northeast as southern Greenland. Yet only one area - a stretch of ocean east of the Bahamas, the Sargasso Sea - is the source for all the eels that blanket this region.

Mating is random at the one spawning site in the Sargasso Sea, and ultimately means that the species is a single population. After hatching, larvae (also termed leptocephali) drift with the ocean currents and, after some months, arrive in coastal areas. Now, as glass eels, they begin moving into estuaries and the beginning reaches of freshwater where, after development into elvers, they either migrate up streams and rivers or remain in coastal brackish waters. The subsequent growth phase results in what are known as yellow eels and, after reaching sexual maturity, the silver eel migrates back to the ocean to spawn and then die.

The American eel is considered a freshwater fish, though catadromous - it matures in fresh or brackish water and reproduces in saltwater. The species is highly migratory with multiple habitat requirements including the open ocean, coasts and estuaries, rivers and streams, lakes, and ponds.

The Problem

- Declines in American eel numbers and fishery landings over part of its range in eastern Canada and the U.S. has prompted concern over the status of this species. Most notably, the number of juvenile eels migrating to Lake Ontario fell from 935 000 in 1985 to approximately 8000 in 1993 and, finally, to levels approaching zero in 2001. Declines have also been documented in New York and Virginia, as well as in New Brunswick and Prince Edward Island in Canada.
- Understanding and effectively addressing the decline of the American eel is likely to prove difficult because of numerous uncertainties and unknowns. There has been virtually no management of the species and, thus, little effort has gone into longterm monitoring of population trends or towards understanding potential threats to survival. There is limited information on the full extent and geographic distribution of the decline, on the impacts associated with human activity, and on the life history and ecology of the species. The American eel underscores the considerable complexities of the natural world and the difficulties associated with understanding the effects of environmental change on wildlife.

The Causes

- The major threats facing eels are considered to be commercial fisheries, habitat loss, chemical pollutants, disease arising from introduced parasites, and oceanographic changes. These factors may be operating in tandem and their impacts may have gradually accrued over time.
- Despite the importance of eel fisheries, there is little data relevant to fisheries landings and impacts, including bycatch. Eels aggregate seasonally to migrate, which facilitates high catch levels, and all life stages, with the exception of eggs and larvae, are marketable and thus targeted. The cumulative effects of heavy fishing on multiple life stages are likely considerable.
- Three species of parasite have been introduced into the American eel population, a result of the eel aquaculture trade and, possibly, ballast water transfer. There is particular concern over the Asian swimbladder nematode, Anguillicola crassus, and the possibility that any widespread infestation could lead to significant declines in overall eel numbers.
- The long lifespan and high fat content of eels have exposed them to relatively high levels of persistent, bioaccumulating contaminants (e.g., PCBs, mirex, mercury) over parts of their range. Increased mortality, reduced reproductive ability and disruption of migratory behavior are among the many potential effects, but few studies specifically on eels have been conducted. High levels of contaminants have prompted human health advisories concerning eel consumption in some states.
- A variety of habitat changes and losses are affecting eel abundance and distribution. Most significant is the construction of over 15,000 dams along U.S. Atlantic coastal streams which have restricted or precluded access to an estimated 84% of the species historical stream habitat. As well, high numbers of pre-spawning eels are killed passing through hydroelectric turbines during downstream migration. Other habitat changes that may be detrimental include channel dredging and filling, and wetland loss.
- Unfavorable oceanographic currents can reduce the dispersal of larvae into coastal regions, and suggests that the species may be particularly vulnerable to any longterm oceanic change or variation.

The Context

- While the economic value of the commercial eel fishery in the U.S. is poorly documented, it is nonetheless considered important to various multi-species fisheries as well as to full-time and casual fishers. Declines in eel numbers would also be expected to have some impact on the range of non-human species that require them as a food source component, such as other fish and aquatic birds and mammals.
- Much concerning the American eel remains obscure. Historical data that could be used to track longterm changes in eel population dynamics are virtually non-existent. The species' complex and

unconventional life cycle and its use of a wide range of different habitats and extensive geographic distribution further complicate assessments of fishery and environmental change effects. The longer term impacts of a changing climate - involving shifting oceanographic conditions and sea level rise - may be important but little can be said at this time.

- Concern from scientists, fishers, and others has resulted in the recent development (2000) of a Fisheries Management Plan for the species. Nonetheless, the numerous uncertainties and wide range of issues associated with eels and eel management suggest that conservation approaches must be extremely conservative (i.e., precautionary), and that significant commitment from a variety of marine, coastal and inland management bodies and stakeholders will be required.

Further Reading

Atlantic States Marine Fisheries Commission. 2000. *Interstate Fishery Management Plan for American Eel*. Fishery Management Report No. 36. Atlantic States Marine Fisheries Commission, Washinton, DC. (available online at: http://www.asmfc.org/PUB/FMRs/American%20Eel%20FMP.pdf)

Haro, A. et al. 2000. Population decline of the American eel: Implications for research and management. *Fisheries* 25(9): 7-16.