Protection of Marine Fish Stocks at Risk of Extinction

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POLICY

The American Fisheries Society (AFS) recommends that regulatory agencies closely scrutinize both marine fish and invertebrate stocks that may be at risk of extinction and take remedial action before populations are *threatened* or *endangered*. Initial AFS analyses of marine stocks at risk in North America show at least four primary geographic "hot spots" with stocks at risk—the Florida Keys; the Indian River Lagoon area of Florida; Puget Sound, Washington and adjacent Canadian waters; and the Gulf of California.

Further AFS analyses show that certain groups of fishes are particularly vulnerable because they have slow growth and late maturity. Severe population declines have been documented for several snappers and groupers (Lutjanidae, Serranidae) in the Atlantic and the Gulf of California, several rockfishes (Sebastinae) in the Pacific, and some sharks (Selachei), skates (Rajidae), and sawfishes (Pristidae). Regulatory agencies should be apprised that these groups are extraordinarily vulnerable, and priority management should be given to these species.

The greatest threat to many long-lived marine species may be bycatch (including regulatory discard) in fisheries targeting other, often more-productive species. Regulatory agencies must monitor bycatch of long-lived species and move to implement conservation actions if population declines are recorded. The most effective management strategy for some species taken as bycatch and for targeted species such as deeper-water groupers and Pacific rockfishes, may be establishment of large, protected marine reserves to supplement traditional management practices outside of the protected areas. The AFS supports the development, use, and evaluation of large marine reserves or Marine Protected Areas to protect and rebuild vulnerable populations. These reserves must have clearly defined goals, include a wide variety of environmental conditions, be of sufficient number to protect marine ecosystems within each region, allow adaptive management, and be large enough to be self-sustaining. The AFS encourages its members to become involved by providing technical information needed for protection of at-risk marine stocks to international, federal, state, and provincial policy makers, so decisions are made on a scientific, rather than emotional or political, basis.

A. Issue definition

Extinction risk in freshwater and anadromous fishes has received close scrutiny for many years, but the risk for marine fishes has been largely ignored. Many freshwater and anadromous (migrating between fresh and saltwater) species have limited ranges or specialized habitats that render them vulnerable to environmental impacts from human activity (Nehlsen et al. 1991; Warren and Burr 1994). Conversely, most marine fishes occupy broad ranges and habitats that appear to be buffered from acute human perturbation. Few fisheries professionals have considered extinction risk in marine fishes until quite recently.

The threat of extinction of marine fish populations is a growing problem, and some populations have already been documented to be extirpated. Species with small ranges or limited habitat are particularly at risk. Also, those species with low intrinsic increase rate and/or late-maturity and infrequent and unpredictable recruitment tend to be at risk.

The AFS convened workshops in 1990 and 1992 to consider the possibility of endangerment to marine fishes (Anonymous 1991; Huntsman 1994). Certain species were recognized on regional endangered species lists (Gilbert 1992; COSEWIC 1997). The International Union for the Conservation of Nature (IUCN) convened a 1996 workshop in London to evaluate the risk of extinction for marine fish species using new quantitative criteria for extinction risk adopted in 1994 (Hudson and Mace 1996; Vincent and Hall 1996). The consensus of AFS and IUCN scientists who studied the issue was that some species had declined sufficiently to be considered at risk.

Recently, Casey and Myers (1998) noted that a large, once plentiful marine fish—the barndoor skate (*Raja laevis*)—had been reduced by bycatch overfishing to the point of extirpation in a large part of its range. The National Marine Fisheries Service (NMFS) was recently petitioned to list barndoor skates and populations of Pacific cod (*Gadus macrocephalus*), Pacific hake (*Merluccius productus*), Pacific herring (*Clupea pallasi*), walleye pollock (*Theragra chalcogramma*),

and several species of rockfishes (*Sebastes* spp.) in Puget Sound under the Endangered Species Act (ESA) of 1973. The NMFS determined that the information on declines of these stocks is substantial, that listing may be warranted for seven species, and that a full review of their status should be pursued (Federal Register 1999). Therefore, NMFS has noted that protection of stocks or populations (not only species) from extinction is extremely important. Loss of populations can be an indicator of risk of extinction for the species, and can mean loss of genetic material essential for the species' survival.

Although extinction has not been widespread in marine species to date, there is no reason for lack of concern—threats (harvesting, human overpopulation, habitat damage) are growing and probably cumulative (Powles et al., in press). Consequently, the risk of extinction among marine fishes appears to be a real and immediate threat to be addressed.

B. Background

The AFS has developed a draft list of North American marine fishes at risk (Musick 1998). The list, composed of 68 species or stocks, is currently being reviewed by marine fish experts, including members of the AFS Marine Fisheries Section and the Environmental Quality Committee of the American Society of Ichthyologists and Herpetologists (ASIH). These fishes are considered to be at risk because of extremely limited range or habitat, or recent precipitous declines in population size associated with life history limitations (Musick 1998). In 1997, the Marine Fisheries Section of AFS sponsored a symposium, "Ecology and Conservation of Long-lived Marine Animals," (Musick 1999a) to unite experts working on a diversity of marine taxa (i.e., sharks, whales, sea turtles, sea birds, groupers, and other reef fishes). The symposium sought to identify populations of long-lived species at risk, to better understand why these species are so vulnerable to human-caused mortality, and to develop strategies for conserving long-lived marine animals (Musick 1999a).

Risk criteria. Identifying species at risk because of range or habitat limitations has been easier than recognizing those species that have simply undergone population declines (usually because of overexploitation) (Safina 1995; Musick 1997). A critical question is: what quantitative criteria related to population decline best reflect risk of extinction for marine fishes? In March 1999, the AFS held a workshop to examine and develop quantitative risk criteria; scientists from the Society, NMFS, Canada Department of Fisheries and Oceans (DFO), and IUCN Species Survival Commission (SSC) all contributed from this and other workshops. AFS has developed a set of criteria to define risk in marine fishes (Musick 1999b). Work is underway to apply these criteria to determine extinction risk of North American marine fishes.

The AFS Endangered Marine Fishes Initiative's objectives are to determine the factors contributing to decreased biodiversity and to identify species and populations at risk. Stocks at risk should be identified early enough to allow conservation actions. The probability of underestimating or overestimating the risk of extinction should be minimized, using the best existing understanding of stock dynamics at low population levels. The risk categories are based on the knowledge of conservation status and life history by experts on the species. Expert scientific advice pertaining to marine fish stocks at risk is to be provided to regulatory agencies and other interested parties.

C. Needed actions

Assessment. Examination of the AFS Draft List of Marine Stocks at Risk (Musick 1998) shows that at least four primary "hot spots" have many stocks at risk and are of particular concern. These are: (1) the Florida Keys; (2) the Indian River Lagoon area of Florida, (3) Puget Sound, Washington, and adjacent Canadian waters; and (4) the Gulf of California.

The AFS urges the State of Florida to protect those species and their habitats already recognized to be at risk in Gilbert (1992). They also urge the State of Washington, NMFS, and the DFO move to assess, protect, and restore stocks of marine fishes recognized to be at risk in Puget Sound and adjacent areas. The AFS further recommends that the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) continue its work on assessment of risk of extinction in marine species and that any eventual Canadian endangered species legislation allow for protection of marine species. The AFS also recommends that the Mexican government, through the Federal Secretary of Environment, Natural Resources, and Fisheries (SEMARNAP), should move to assess and protect vulnerable fish stocks in the Gulf of California, particularly the endemic groupers. Additional analyses may reveal other "hot spots" that will require future action.

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Like many rockfish populations, the China rockfish (*Sebastes nebulosus*) species is on the decline.

Regulation. The greatest threat to many long-lived marine species is bycatch in fisheries targeting more productive species (Musick 1999a). In some cases, the long-lived, late-maturing species can be driven toward extirpation while the target fisheries thrive (Musick 1995, 1999a). Regulatory agencies should be more aware of and monitor bycatch of long-lived species and should move to implement conservation actions if population declines are recorded.

The AFS recommends that regulatory agencies closely scrutinize both marine fish and invertebrate stocks or

conservation units that may be at risk of extirpation. Conservation units should be defined as a population or group of populations that is substantially isolated from other conspecific units (groups of the same species) and represents an important component in the evolutionary legacy of the species. These are Evolutionarily Significant Units (ESU), as currently recognized for Pacific salmon conservation (Waples 1995), or DPSs, as NMFS and the U.S. Fish and Wildlife Service (FWS) have used for other vertebrates (Federal Register 1996). Although the ESA does not allow NMFS and FWS to list invertebrates as DPSs (Nammack 1998), AFS should recognize them in future reviews.

The AFS also recommends that regulatory agencies take a more precautionary approach to managing DPSs potentially at risk by affording protection or remedial action before populations are reduced to the point of being *threatened* or *endangered*. Consequently, AFS recommends that NMFS review marine species placed or suggested for placement on the ESA Candidate Species List, and protect those species through regional cooperative conservation plans with states, regional fishery management councils, and regional marine fisheries commissions.

Analysis of the AFS List of Marine Fish Stocks at Risk also shows that certain groups of fishes are particularly vulnerable because they have slow growth and late maturity (Musick 1998, 1999a). Severe population declines have been documented for several groupers (Serranidae) in the Atlantic and several rockfishes (Sebastinae) in the Pacific, and some sharks (Selachei), skates (Rajidae), and sawfishes (Pristidae). Regulatory agencies should be apprised that these groups are extraordinarily vulnerable to additional sources of mortality and resulting population decline because of their demographics and thus should be given priority recognition for timely management.

Management. Fishery Management Plans (FMPs) may prove to be effective vehicles for protecting some species. It is important to recognize those populations potentially at risk at an early stage in their declines, and to implement conservation measures that will preclude further population reductions and listing under the ESA. The Candidate Species List is of prime importance to responsible conservation of potentially vulnerable species. Recent policy decisions, restricting the Candidate Species List for species under FWS jurisdiction, makes conservation of those species more difficult.

The most effective management strategy for some species taken as bycatch and for targeted species such as deeper-water groupers and Pacific rockfishes, may be establishment of large marine reserves, protected from fishing mortality to supplement traditional management practices outside of the protected areas. Scientists in the fishery management councils, NMFS, DFO, and SEMARNAP should assess the efficacy of large marine reserve systems as soon as possible and implement them where judged to be appropriate.

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