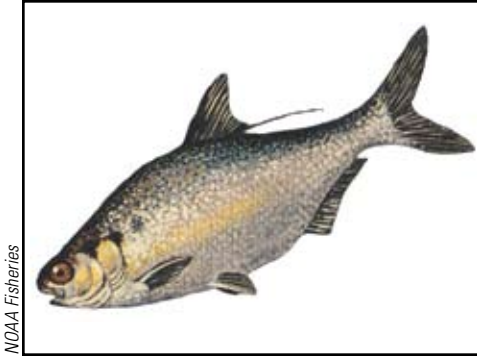


Developing Barriers to Biological Invasions

by Bob Pitman



NOAA Fisheries

The pathways used by non-native species are not always obvious. Many problematic species, diseases, and parasites have been transferred to new locations as undetected (and unplanned) hitchhikers. As many as 80 percent of endangered species may be threatened by pressure from non-native species.

Where sufficient documentation was available, introduced species were cited as contributing factors in 48 of the 69 fish listings made through 1991 under the Endangered Species Act. The Fish and Wildlife Service takes the position that no introductions are accidental, just unplanned. Responsible people and agencies evaluate their actions and take appropriate steps to make sure only intended species or materials are introduced. In fact, Executive Order 13112, issued in February 1999, states: "Each Federal agency whose actions may affect the status of invasive species shall not authorize, fund, or carry out actions that it believes are likely to cause or promote

the introduction or spread of invasive species in the United States or elsewhere." Unintended introductions result from failure to manage pathways and remove entrained organisms (e.g., those that enter through ballast water in ships).

The planning formula developed by industry to prevent food contamination has been adapted by the Service and its partners to help prevent unintended introductions of species and diseases. Hazard Analysis and Critical Control Points (HACCP) planning uses common-sense methods to help biologists and managers systematically identify hitchhikers (or hazards) and define actions that reduce the risk of spreading them through specific pathways.

In the early 1990s, gizzard shad (*Dorosoma cepedianum*) hitched a ride in a stocking of largemouth bass (*Micropterus salmoides*) fingerlings from Inks Dam National Fish Hatchery in Texas across the Continental Divide to Morgan Lake on the Navajo Reservation

The unplanned introduction of gizzard shad (above) into the Colorado River system may affect efforts to recover the Colorado pikeminnow (right) and other native fishes.





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in northwest New Mexico. Gizzard shad are prolific and ubiquitous throughout most of their native range, the Mississippi River basin. In their non-native habitat, they quickly multiplied from the small numbers introduced with the large-mouth bass and spread downstream to the Colorado River and Lake Powell. Biologists expect continued population expansion within the Colorado River system. We do not know how this non-native species will affect interagency efforts to restore native endangered fishes of the Colorado: the razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and Colorado pike minnow (*Ptychocheilus lucius*).

The Service responded to its error by making HACCP a permanent fixture to prevent future unplanned introductions. Universal use of the HACCP concept develops multiple layers of prevention and biological security for critical habitats and species. Planning support is

provided by the Service at www.HACCP-NRM.org.

The Aquatic Invasive Species Program within the Service's Fisheries and Habitat Conservation Program contributes to the recovery of threatened and endangered species by working to prevent additional introductions and controlling established invaders.

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Zebra mussels (*Dreissena polymorpha*) probably moved from European waters to the Great Lakes via ballast water in large ships. The small mussels, shown here encrusting a larger native mussel, have invaded many other U.S. waters, causing economic and environmental harm.