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## Defining Economic Impacts and Developing Strategies for Reducing Avian Predation in Aquaculture Systems

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### National Wildlife Research Center Scientists Address Aquaculture Losses

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research facility devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques. NWRC's field station in Starkville, MS, is located in the heart of the primary aquaculture producing area of the southeastern United States and was established to address problems associated with fish-eating birds on aquaculture stocks.

In the past 30 years, fish-eating birds have had a substantial economic impact on aquaculture production. Aquaculture industry costs associated with bird damage and damage prevention are estimated to exceed \$25 million annually. The goal of NWRC's research is to determine the impact of fish-eating birds on aquaculture production, and to develop methods to reduce depredation of southeastern catfish, baiffish, and crawfish industries. Current research is aimed at gaining information about the abundance, distribution, and foraging behavior of fish-eating birds, the economic impacts associated with their foraging activities, and the diseases they transmit at aquaculture facilities. This information will help to develop new damage management techniques.



### Applying Science and Expertise to Wildlife Challenges

**Population Trends**—NWRC scientists are studying population trends of double-crested cormorants and American white pelicans,

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**Major Research Accomplishments:**

- WS documented the impact of cormorants on the catfish industry. This research was used to develop a Standing Depredation Order for the control of cormorants on farms in 1998, an Environmental Impact Statement and 2 depredation orders for control of cormorants in winter roosts and breeding areas to protect aquaculture and natural resources in 2003.
- WS and their cooperators demonstrated that American white pelicans are a host of the *Bolbophorus trematode*, which can be devastating to the catfish aquaculture industry.
- WS demonstrated that low-powered lasers can disperse double-crested cormorants from night roosts adjacent to catfish farms.

tracking large-scale movements through the use of satellite telemetry, and constructing computer models that describe population dynamics. This research will provide a better understanding of population trends and movements and will be used to evaluate various alternatives for managing double-crested cormorant and American white pelican impacts on southeastern aquaculture.

NWRC scientists recently evaluated the distribution and abundance of double-crested cormorants at catfish aquaculture ponds in the Delta region of Mississippi. Cormorants were observed foraging on an average of more than 25 percent of the ponds that were surveyed aerially from February through April in 2001. The average number of cormorants on each pond ranged from 5 to more than 46, depending on the month. Using the collected data, NWRC scientists will relate the distribution and abundance of cormorants to types and condition of the ponds, and the health of the fish in the ponds. This study is providing a biological basis for estimating economic losses caused by cormorants on a large scale.

**Biology and Impact of Fish-Eating Birds on Aquaculture**—An understanding of the biology of fish-eating birds and their economic impacts on aquaculture will enable the successful application of various management strategies. For example, given the feeding preferences of double-crested cormorants, American white pelicans, great blue herons, little blue herons, and great egrets, NWRC researchers

are working to develop economic threshold predictions to determine their impacts on aquaculture production.

Changes in the catfish aquaculture industry have resulted in changes in production systems and dominance of multiple-batch farming. This type of aquaculture involves growth of multiple size classes of fish simultaneously in the same pond and periodic harvest of market-ready fish. NWRC scientists have initiated research to address these production changes and characterize the impacts of foraging by captive double-crested cormorants on channel catfish in multiple-batch cropping systems. These data will be combined with results of a study to determine the distribution and abundance of double-crested cormorants on catfish aquaculture in the Mississippi Alluvial Valley. NWRC scientists will integrate the results of these studies of cormorant habitat-use patterns with detailed studies of foraging impacts to investigate the potential for economic impacts from cormorant depredations and suggest management strategies to alleviate the damage.

### **Developing Methods for Reducing Damage to Aquaculture and Natural Resources**

As part of an integrated approach to reduce the impact of fish-eating birds on southeastern aquaculture, several non-lethal tools have been developed. Field studies recently documented the effectiveness of low-powered lasers for dispersing double-crested cormorants from night roosts near aquaculture facilities while minimizing disturbances to waterfowl and other non-target species.

NWRC biologists are working with WS operations personnel to determine the behavioral response of cormorants to different management activities. NWRC biologists, WS operations biologists, and Michigan Department of Natural Resources biologists initiated a study in the Les Cheneaux region of Michigan in 2004 in response to localized depletions of harvest-sized yellow perch in the region. These biologists are collecting information on perch populations, cormorant habitat use, and cormorant reproductive parameters in specific bodies of water where perch problems have persisted. Information on these parameters will be combined with investigations of cormorant diet patterns and cormorant behavioral response to specific management strategies including egg-oiling, nest destruction, and limited control of adult cormorants. These studies will help determine the role of cormorants in perch depletion and whether cormorant management can effectively reverse these trends.

### **Groups Affected by This Problem:**

- Aquaculture producers, distributors and retailers
- Wildlife managers

### **Major Cooperators:**

- Catfish Farmers of America
- Michigan Department of Natural Resources
- Mississippi State University, College of Veterinary Medicine
- Mississippi State University, Department of Wildlife and Fisheries
- Mississippi Agricultural and Forestry Experiment Station
- Delta Research and Extension Center, Thad Cochran National Warmwater Aquaculture Center
- New York Department of Environmental Conservation
- Southern Regional Aquaculture Center

**American White Pelican Disease Ecology**—NWRC researchers, in collaboration with parasitologists at two state universities, have completed studies to determine the species of trematode currently infecting commercially grown catfish in the southeastern United States. Researchers also completed studies to determine whether fish-eating birds can serve as hosts for this parasite. Biologists at the NWRC Mississippi Field Station artificially infected captive American white pelicans with larvae of *Bolbophorus* spp. trematodes that were isolated from infected catfish collected from commercial ponds, demonstrating in successive studies that American white pelicans have the potential to transmit this disease among catfish ponds. Double-crested cormorants, great blue herons, and great egrets did not appear to serve as hosts for these trematodes.

### **Selected Publications:**

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- Glahn, J. F.; Werner, S. J.; Hanson, T.; Engle, C. R. 2002. Cormorant depredation losses and their prevention at catfish farms: economic considerations. In: Clark, L.; Hone, J., et al., eds. *Human conflicts with wildlife: economic considerations; 1-3 2000; Fort Collins, CO.* Fort Collins, CO: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center: 138-146.
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- Glahn, J. F.; Tobin, M. E.; Blackwell, B. F. 2000. A science-based initiative to manage Double-crested cormorant damage to southern aquaculture. *Technical Bulletin* 11-55-010. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.