Wildlife Services

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National Wildlife Research Center

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

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Major Cooperators

- Catfish Farmers of America
- Canadian Wildlife Service
- Cornell University
- 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
- Ontario Ministry of Natural Resources
- Southern Regional Aquaculture Center
- Vermont Fish and Game Department

Groups Affected by These Problems

- Aquaculture producers, distributors and retailers
- Sportfish guides and outfitters
- Wildlife managers

NWRC 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 develop methods to reduce the impacts of fish-eating birds on aquaculture stocks.

In the past 30 years, populations of fish-eating birds have increased dramatically and caused substantial economic impacts to 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 natural resources, and to develop methods to reduce depredation of southeastern catfish, baitfish, 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 techniques for reducing damage.

Applying Science & Expertise to Wildlife Challenges

Population Trends—NWRC scientists are studying population trends, demographics, and movement patterns of double-crested cormorants and American white pelicans, by tracking large-scale movements through the use of telemetry and banding techniques. This research will provide a better understanding of population trends and bird movements and will be used to evaluate various alternatives for managing impacts of these birds on southeastern aquaculture and natural resources.

Cormorant Damage to Catfish Aquaculture—The catfish industry in the United States is valued at more than $650 million per year in processed product sales, with nearly 65% of catfish production originating from Mississippi. NWRC biologists completed a field study that evaluated the distribution and numbers of cormorants on catfish aquaculture tying together almost a decade of research on cormorant food habits, bioenergetics and abundance data. Cormorants used catfish ponds extensively during the period January through April, with the greatest economic damage occurring in February and March. During the study, between 1,347 and 1,775 metric tons of catfish were consumed by cormorants in the Delta region of Mississippi. This depredation translated into a loss to the industry of $10.3 to $13.7 million annually or approximately 4-5% of farm level value.

Cormorant Movements—NWRC scientists evaluated movements and migration patterns of double-crested cormorants captured near southeastern catfish aquaculture ponds. Results demonstrated that satellite transmitter-equipped cormorants migrated along the Mississippi, Missouri, and Ohio River Valleys. The average duration of spring migration was 12 days traveling 70 km per day. These data show that cormorants tend to stay in one general region throughout winter if adequate food resources are available and their roosting sites are undisturbed. These data provide further evidence that aquaculture is utilized extensively by wintering cormorants. Aquaculturists and resource managers are using these data to refine cormorant management strategies.

Cormorant Breeding Colony Dynamics—NWRC scientists and partners completed a long-term study of cormorant breeding colony dynamics in the Great Lakes. This research was a cooperative effort involving, Mississippi State University, the Canadian Wildlife Service, Ontario Ministry of Natural Resources, Ontario Parks, and Trent University. Survival estimates indicate approximately 80% mortality for first year birds, decreasing to over 20% thereafter. The data show some regional differences in reproductive parameters suggesting that management decisions should be based on local or regional population

information. Population models indicate that a combination of adult culling and egg oiling would have the greatest efficacy for reducing population growth.

Aging Cormorants—NWRC scientists and collaborators at West Virginia University have identified a biomarker in the skin that is a linear (R2 = 0.93) predictor of age in double-crested cormorants. This information may lead to a rapid technique for identifying age of cormorants and many other species of birds without the need for more costly and logistically difficult methods. This technique will help provide a better understanding of the demographics of cormorant populations allowing for development of optimal management strategies for maintaining population viability while minimizing damage.

Pelican Diet and Aquaculture—A study of diet of American white pelicans in the southeastern United States reflect opportunistic foraging across locations. The diet of pelicans collected near catfish aquaculture was comprised of almost 90% commercial catfish. Pelicans collected near non-aquaculture areas included prey such as shad and sunfish. The body condition of pelicans foraging near aquaculture was improved compared to other pelicans possibly causing increased survival and reproductive success. This research demonstrated that the superabundant, large-sized, and vulnerable food source (i.e., catfish in aquaculture ponds) are used extensively by pelicans frequenting aquaculture producing areas.

American White Pelican Disease Ecology—In collaboration with parasitologists at two state universities, the Thad Cochran Warmwater Aquaculture Center, and the Southern Regional Aquaculture Center, NWRC scientists described the life cycle and confirmed that American white pelicans serve as host for the species of trematode infecting catfish in the southeastern United States. Results showed American white pelicans can 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. Parasite life-cycle studies indicate low infection of trematodes in pelicans can result in large numbers of trematode eggs deposited into catfish ponds. In addition NWRC scientists found an introduced species of snail can serve as an intermediate host to the parasite. These studies underscore the importance of preventing pelican use of aquaculture facilities and understanding the biology and epidemiology of the disease organism.

Management Activities on Nesting Cormorants—Large colonies of double-crested cormorants breed in the Les Cheneaux Islands region of Lake Huron, Michigan. NWRC Scientists have collaborated with the Michigan Department of Natural Resources, USGS, and Lake Superior State University to evaluate the effectiveness of Wildlife Services cormorant management as a means of improving the local yellow perch fishery. Management activities include egg-oiling and lethal control. Results showed management efforts reduced the number of young cormorants by more than 90% annually and overall cormorant numbers by 60%. Results also indicated cormorants from the colonies were feeding extensively in the specific areas of perch decline, and that perch numbers and harvest following the first four years of management have increased substantially.

Evaluating Cormorant Management Programs—WS and the U.S. Forest Service in Michigan have been working to reduce predation of sportfish by double-crested cormorants during spring migration. The management program enlists wildlife damage management specialists to protect fishery resources through an integrated program of non-lethal harassment supplemented by limited lethal take of cormorants. The designated specialists receive training, supervision, and supplies from WS. In return the specialists volunteer their time to conduct harassment operations. NWRC research documented a large decline in numbers of cormorant foraging attempts, and an increase in walleye populations at Brevoort Lake, Michigan a location where management and research have been conducted.

Selected Publications:

Chastant, J. E. 2008. Population characteristics of interior double-crested cormorants breeding across the southern border of Ontario. Thesis. Mississippi State University, Mississippi.

Dorr, B.S., L.W. Burger, and S.C. Barras. 2008. Evaluation of Aerial cluster sampling of double-crested cormorants on aquaculture in Mississippi. The Journal of Wildlife Management,
72 (1634:1640).

Fallon, J. A., R. L. Cochran, B. Dorr, and H. Klandorf. 2006. Interspecies comparison of Pentosodine accumulation in birds. Auk 123: 870-876.

Pearse, A. T., B. S. Dorr, S. J. Dinsmore, and R. M. Kaminski. 2007. Comparison of sampling strategies to estimate abundance of double-crested cormorants in western Mississippi. Human-Wildlife Conflicts 1:27-34.

Pote, L. M., and 18 other authors. 2008. A team approach in the study and control of the digenetic trematode Bolbophorus damnificus in commercial catfish. In Press. In Proceedings of the 7th International Symposium on Fish Parasites. Sept. 24-28, Viterbo, Italy.

Stahl, R. S., B. S. Dorr, S. C. Barras, and J. J. Johnston. 2006. Use of fatty acid profiles to distinguish between selected game fish and farm-raised channel catfish. Proceedings of the Vertebrate Pest Conference 22:389-392.

Werner, S. J., and B. S. Dorr. 2006. Influence of fish stocking density on the foraging behavior of double-crested cormorants Phalacrocorax auritus. Journal of the World Aquaculture Society 37: 121-125.

Yost, M. C, L. M. Pote, D. J. Wise and B. S. Dorr. 2008. Biompholaria havensis identified as a potential intermediate snail host for the digenetic trematode, Bolbophorus damnificus. In Press. North American Journal of Aquaculture.

Major Research Accomplishmnets:

- WS research showed double-crested cormorants tend to stay in one general region throughout winter if adequate food resources are available and their roosting sites are undisturbed. These data provide further evidence that aquaculture provides an ideal environment for wintering cormorants.
- WS and collaborators identified a biomarker in the skin of double-crested cormorants that is a linear predictor of age.
- 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 research documented a large decline in numbers of double-crested cormorant foraging attempts, and an increase in walleye populations at lakes in Michigan as a result of an ongoing cormorant management program.

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