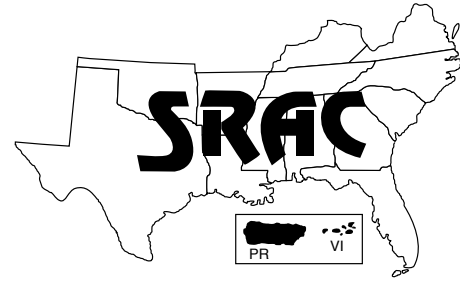


Southern Regional Aquaculture Center



December 2007
Revision

Avian Predators at Aquaculture Facilities in the Southern United States

Scott C. Barras¹

Fish-eating birds are a common sight at aquaculture facilities and hatcheries throughout the United States. The broad expanses of open water found at fish farms are attractive to migratory and wintering birds. These ponds are important to many species of birds whose habitat has been lost to development or other land uses. Unfortunately, fish-eating birds can cause problems for producers, although the economic impact these birds have can vary widely among species and from one farm to another. Birds also may respond differently to various management strategies over time and in different locations. Therefore, producers must constantly adapt their bird management programs to effectively prevent and reduce damage.

All fish-eating birds are protected by federal law under the Migratory Bird Treaty Act. With the appropriate permits and depredation orders, producers can protect their fish from predation using nonlethal and even lethal methods. However, depredation permits and orders are issued only under the authority of the U.S. Fish and Wildlife Service and are species specific. An aquaculture depredation order was issued for Double-crested Cormorants in certain states in 1998 and renewed in 2003. Depredation permits are farm-specific and list the

exact species and number of birds of each species that can be taken on each farm. Therefore, aquaculturalists must be able to identify the species in question.

This publication describes common avian predators that affect aquaculture and discusses options for managing them. There are brief summaries on other species that frequent aquaculture facilities but rarely cause serious losses (or for which the economic impact has not been established). Following each species description is a list of related or look-alike species.



Figure 1. Double-crested Cormorant.

Cormorants and Anhingas

Double-crested Cormorant (*Phalacrocorax auritus*)

Description: Double-crested Cormorants are large (33 in., 83 cm), goose-sized birds with slender, elongated bodies and legs set far back, which gives them an upright stance. They are primarily

black, but can have mottled brown or whitish chests and bellies, especially in young individuals. During the breeding season (March–June), they may have pronounced ear-like tufts of feathers or crests on the head; these are lost after egg-laying. Cormorants feed by diving and swimming under water to catch their prey. They feed mostly during the day, will consume any species they can catch, and will use the entire pond. They appear to prefer fish 6 to 8 inches long.

Range and timing: Double-crested Cormorants breed along the coasts of the United States, but the interior population, which primarily affects aquaculture, breeds throughout the Great Lakes region, the prairie states and the Canadian provinces. Colonies are increasingly common in the southeastern states. Migratory cormorants concentrate during winter in the aquaculture-rich areas of Alabama, Arkansas, Mississippi, Louisiana and Texas. Cormorants breeding from New York to New England winter in the Carolinas, Georgia and the coastal regions of Florida.

Hazard: Double-crested Cormorants eat about 1 pound of fish per day and are the most destructive birds to inland aquaculture, especially catfish production. A recent study estimated that the damage they cause to catfish production is \$10 million to \$13 million annually in Mississippi.

¹ U. S. Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Mississippi State, MS.

Management options: During winter, cormorants forage within about 15 miles of their night roosts. They can be managed with a combination of lethal and nonlethal methods on farms and the coordinated dispersal of night roosts near aquaculture facilities. An aquaculture depredation order was issued in 1998 and expanded in 2003 to allow producers to remove Double-crested Cormorants from their farms and allow wildlife management agencies to remove them from nearby roosts in most of the southeastern states. These states include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Minnesota, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee and Texas. This authority does not apply to marine systems. Producers should contact the USDA Wildlife Services agency in their state before taking action under this order. There are many nonlethal options for harrasing these birds.

Similar species: Neotropic Cormorant, Anhinga



Figure 2. Neotropic Cormorant.

Neotropic Cormorant (*Phalacrocorax brasilianus*)

Description: Neotropic Cormorants resemble Double-crested Cormorants but are smaller (25 in., 63 cm), lack crests, and have white feathers bordering the mouth below the eye. Some breeding adults may have white plumes on the neck. Their foraging habits are the same as those of Double-crested Cormorants, though they may prefer smaller fish.

Range and timing: Neotropic Cormorants are found throughout

South and Central America and as far north as New Mexico, Texas and southern Louisiana. They may breed in Texas and Louisiana from February to October; they winter along the Texas coast and in the Rio Grande Valley.

Hazard: Although current population levels are unknown, Neotropic Cormorants are far less abundant and less widely distributed than Double-crested Cormorants. Large local concentrations of Neotropic Cormorants could pose a hazard to individual farms.

Management options: The standing cormorant depredation orders do not apply to the Neotropic Cormorant. Nonlethal hazing may be used to disperse these birds from farms, but no lethal methods are authorized without a specific depredation permit from the U.S. Fish and Wildlife Service.

Similar species: Double-crested Cormorant, Anhinga



Figure 3. Anhinga.

Anhinga (*Anhinga anhinga*)

Description: This large (34 in., 85 cm), black, diving bird resembles a cormorant in shape. However, Anhingas have white-to-silver feathers on the upper wings and shoulders that give the impression of

white patches in flight. The Anhinga's bill is more sharply pointed and its tail longer than a cormorant's. Anhingas may swim submerged with only their heads and necks protruding above the surface, giving them a snake-like look. They eat whatever fish are available. They feed during the day on all parts of a pond, but are likely to be very wary and keep their distance from human activity.

Range and timing: Anhingas occur in eastern Texas and Louisiana and up the Mississippi Valley to Tennessee. They are also found along the lower coastal plain northward to central North Carolina. Anhingas may migrate to Central America and coastal swamps during winter.

Hazard: Anhingas are secretive birds that spend most of their time in cypress swamps and slow-moving streams. Their population is very small compared to cormorants and they are not thought to be a significant threat to aquaculture. However, these birds may be a concern at Florida facilities that specialize in tropical aquaculture.

Management options: Nonlethal harassment can be used if needed.

Similar species: Double-crested Cormorant, Neotropic Cormorant



Figure 4. American White Pelican.

Pelicans

American White Pelican (*Pelecanus erythrorhynchos*)

Description: The American White Pelican is a very large (62 in., 155 cm), white bird with a long, orange-

to-yellow bill and throat pouch and black wing tips. White pelicans weigh up to 17.5 pounds (8 kg). Large flocks of 50 to several hundred birds often loaf on pond levees, in flooded fields, or on sandbars. Pelicans may soar great distances in a single day and, therefore, may not feed near their loafing areas. Pelicans feed day and night and may alter their feeding times to avoid harassment. They feed by scooping fish out of the water as they swim. All fish in all ponds are vulnerable to pelican predation year-round.

Range and timing: American White Pelicans breed extensively in the western U.S., the prairie states, and the western Canadian provinces. Most of the pelicans that affect aquaculture in the eastern U.S. breed in the Dakotas and Minnesota, though there are some scattered small colonies along the Gulf Coast. White pelicans winter along the Gulf Coasts of Mexico, Texas, Louisiana, Mississippi and Alabama, and in the aquaculture areas of Alabama, Arkansas, Louisiana and Mississippi. Some individuals (likely immature birds) do not migrate.

Hazard: American White Pelicans consume roughly twice as much as cormorants, about 2.2 pounds (1 kg) per day, so the potential for damage on farms is extreme. Unlike most fish-eating birds, pelicans are large enough to consume most market-sized foodfish in addition to fingerlings. Preliminary estimates suggest that large flocks of pelicans may cost catfish producers thousands of dollars per day. However, pelicans are much less numerous and less widely distributed during winter than cormorants, so the cumulative effect of their foraging is likely less than that of Double-crested Cormorants on a large scale.

The greatest hazard posed by American White Pelicans may be from their transmission of the *Bolbophorus damnificus* trematode, a parasite that infects channel catfish. Pelicans are the final host for this trematode that kills fingerlings and reduces growth and feed consumption in larger catfish. Recent data from the Thad Cochran National Warmwater Aquaculture

Center and Mississippi State University suggest that even light infections may cause economic losses. The eggs of the parasite are shed in the pelican's feces within a few days of consuming infected fish. Because pelicans may travel great distances over short periods, they can widely disseminate parasites from an infected pond.

Management options: Pelicans should be moved from aquaculture facilities with all available methods. Nonlethal options include harassment with pyrotechnics and other devices. Producers must have depredation permits to kill pelicans, but this option (usually shooting) is recommended as a reinforcement for nonlethal options. Because pelicans are nocturnal, bird harassment patrols should continue on a 24-hour basis when pelicans are present. Birds should be moved away from loafing sites near areas of intensive aquaculture.

Similar species: Brown Pelican

Brown Pelican (*Pelecanus occidentalis*)

Description: The Brown Pelican is a very large (50 in., 125 cm) bird with a long, grayish bill and dark throat pouch. Its head is white with a yellow tint or plumes. The back of the neck is brown and the underparts are dark brown or grey. The back has a streaked grey appearance. Brown Pelicans are found in or near marine environments. They usually feed by diving head-first into the water, but may occasionally feed on the surface. In an aquaculture setting they can consume any size of fish and may use ponds or raceways.

Range and timing: Brown pelicans are a coastal species found in marine environments throughout North and South America. In the southeastern U.S., they can be found near the coast from Maryland to Texas. Although most of these pelicans are nonmigratory, some from the northern part of their range may migrate down the coast during winter to southern Florida and Mexico.

Hazard: Predation by Brown Pelicans has been reported at coastal aquaculture facilities, including earthen ponds and race-

ways. However, their damage has been localized and doesn't occur often. Analysis shows that pelicans feeding in open water eat a varied diet of mostly noncommercial schooling fish.

Management options: Most populations of Brown Pelicans are protected by the Endangered Species Act and state laws in addition to the Migratory Bird Treaty Act. If they cause damage at an aquaculture facility it should be reported immediately to the nearest U.S. Fish and Wildlife Service and USDA Wildlife Services offices. Those agencies can help producers explore management options. These birds should not be harassed or killed without special approvals. At small management units, such as small ponds and raceways, it may be effective to exclude them with netting and grid-wires.

Similar species: American White Pelican



Figure 5. Wood Stork.

Wood Stork (*Mycteria americana*)

Description: Wood Storks are large, white, wading birds with black wing tips and tails. They have naked or nonfeathered heads and long, grey or yellow bills. Wood Storks stand up to 47 inches (120 cm) tall. These birds fly with their necks extended, which distinguishes them from most other wading

birds. They feed during the day in shallow water a few inches deep in wetlands and along the shorelines of ponds and lakes. They can grab fish in the same manner as a heron, but they usually wade through the water, sweeping their bills from side to side to catch the fish they contact. They feed on dead and sick fish that float into shallow water, but will also eat live, healthy fish. Storks are not likely to be a threat to fish in water deeper than 3 feet, but they may forage extensively on fish in ponds that have been drawn down for harvest, or where fish are brought to the surface by low oxygen or feeding.

Range and timing: Wood Storks breed in Florida and may be found in the coastal swamps of South Carolina, Georgia and Alabama; they are more plentiful in South America. During summer, they may wander as far north as North Carolina and Arkansas. Storks are usually associated with one of two populations that breed in Florida or Central America. Birds from both populations may mix in Louisiana and Mississippi during summer. At present, storks east of the Alabama/Mississippi border are protected by the Endangered Species Act. Most Wood Storks migrate south during winter, away from most aquaculture production areas.

Hazard: Large numbers (hundreds to thousands) of Wood Storks can be found on individual farms during summer. Little is known about the effect they have on aquaculture, but they may be attracted to diseased or dying fish that are near the surface of the water. Storks are attracted to concentrations of fish and may be stimulated to feed by falling water levels (e.g., draw-downs).

Management options: Because they are protected in Alabama and points east, management options are limited. In fact, other fish-eating birds, including cormorants, cannot be hazed or shot while storks are present. Therefore, any damage at aquaculture facilities should be reported immediately to

the nearest U.S. Fish and Wildlife Service and USDA Wildlife Services offices. These birds should not be harassed or killed without special approvals.

Similar species: White Ibis



Figure 6. Great Blue Heron.

Herons and egrets

Great Blue Heron (*Ardea herodias*)

Description: Great Blue Herons are tall (51 in., 130 cm), bluish-grey, wading birds with white heads, black plumes, and pointed yellow bills. These birds have long necks and legs and fly with their necks pulled back under their heads and legs extended. They typically wade or wait along wetland or pond margins and strike their prey—fish or small vertebrates. They will also perch on raceways, tanks and socks to catch fish that are confined and easy to access. They

feed on fish near the surface of the water, especially weak or sickened fish; they will also consume healthy fish that rise to feed or rise because of low oxygen levels. They feed primarily during the day but may also feed at night, especially in areas where they are harassed. Because of their erect profiles, herons and egrets are obvious and easy to see.

Range and timing: Great Blue Herons are common in the eastern U.S. and breed from the Gulf Coast to the Great Lakes. Most migrate south in winter. They are found on aquaculture facilities in the southeastern U.S. year-round.

Hazard: Great Blue Herons eat about 0.77 pound (350 g) of fish per day. Because they most often eat dead or weakened fish, they do not appear to have an economically significant effect on aquaculture. However, they can consume significant amounts of healthy catfish when the fish are near the surface or around pond margins. Great Blue Herons probably do more damage to minnow and other baitfish production, and economic projections indicate that losses in baitfish production can be significant. The minnows consumed are market-sized, so the herons are consuming finished product. Also, the ponds are shallow and the fish are more accessible. The broodfish of many species may also be damaged from spearing by Great Blue Herons in raceways or other systems, though the economic impact of these injuries is unknown.

Management options: Great Blue Herons should be excluded from raceways and other small production systems. Harassment, reinforced with lethal control, should be practiced in baitfish systems. Depredation permits are required for the use of lethal methods. In catfish production systems, Great Blue Herons should be hazed when fish are being fed floating feeds or when the fish are concentrated in a sock or other confinement. If ponds are drawn down for seining to depths of 2 feet or less, all wading birds should be hazed from these

areas until water levels are returned to normal. At other times, the dispersal of these birds is not economically justified.

Similar species: Little Blue Heron, Sandhill Crane



Figure 7. Black-crowned Night Heron.

Night herons

Description: **Black-crowned Night Herons** (*Nycticorax nycticorax*) are short (28 in., 70 cm), thick-bodied birds with short necks. They are grey with white underparts, yellow legs, reddish eyes, and black backs and crowns as adults. Immatures of the species are brown with white spots or flecks. **Yellow-crowned Night Herons** (*Nyctanassa violacea*) are very similar in size to Black-crowned Night Herons but are mostly grey with yellow legs, orange eyes, a black face and throat, and a white crown and cheek patch. Immatures are similar to immature Black-crowned Night Herons. Night herons are largely nocturnal and may be seen standing and waiting around pond edges at dusk or after dark. Because they are small and nocturnal, they may rarely be seen even if they are often present. Night herons are extremely adaptable

and feed in various ways. They stalk, wait and wade along shorelines primarily, but are known to swim and to catch fish while in flight. They are attracted to locations where fish are confined and easy to catch at the surface. They will consume whatever species of fish are available and can eat fish up to 10 inches long, but may prefer 6- to 7-inch fish.

Range and timing: Black-crowned Night Herons are found throughout North America and across much of the world. They are found throughout the year in the aquaculture production areas of the southeastern U.S. Yellow-crowned Night Herons have a more restricted range; they are found in the Mississippi River Valley, throughout the southeastern U.S., and south to Central and South America.

Hazard: Night herons are opportunistic predators and may consume many types of fish, crustaceans, amphibians, and other small vertebrates. Recent studies have demonstrated that night herons can consume large amounts of catfish (approximately 250 g or 0.55 pound per day) under the right circumstances. As with other wading birds, cultured fish are most vulnerable when they are near the surface. Therefore, night herons pose the greatest threat when fish are near the surface because of disease or low oxygen, or when they are feeding or are concentrated in a net or sock. Fish that surface in shallow water (less than 1 foot) are at greatest risk.

Management options: Night herons are difficult to manage because they are nocturnal and they habituate quickly to harassment. Because they are small and must feed along pond edges, steep pond edges help reduce predation from these birds. If large numbers of night herons are present, netting in a raceway or small pond and perimeter fencing in a larger pond may be effective and economically justified. These birds are protected by federal regulations in all states and may not be killed without a species- and site-specific depredation permit.

Similar species: Green Heron



Figure 8. Great Egret.

Great Egret (*Ardea alba*)

Description: The Great Egret is a large (41 in., 105 cm), white heron with a yellow bill and black legs and feet. These wading birds feed in shallow water on fish, amphibians, crustaceans, and other small vertebrates. They may feed alone or in large groups in areas of abundant prey, such as ponds with diseased fish. They feed mainly by stalking and waiting along pond edges.

Range and timing: Great Egrets breed in the southeastern U.S. and South America, north to the upper Midwest, and up the eastern coast to Massachusetts. Great Egrets winter throughout the aquaculture production areas of the Southeast and are present on southeastern aquaculture facilities year-round.

Hazard: Great Egrets consume about 0.66 pound (300 g) of fish daily. However, they eat mostly dead or diseased fish and forage only at pond edges and the water's surface. They may pose a hazard to cultured fish in easily accessed raceways or shallow ponds, and when fish are at the surface to feed or at times of low oxygen.

Management options: Foraging by Great Egrets does not pose an economic threat to catfish production in most cases. Healthy catfish are available to these birds only when fish are at the surface of the water, as when they rise to feed or fre-

quent the shallow zones of hillside ponds. In fact, they may even help producers identify ponds with disease problems because they are attracted to weakened or dead fish near the pond edges. However, the losses to baitfish production and the spearing damage they cause to broodfish or trout should not be underestimated. They should be hazed from areas where such damage could occur. They can be excluded from raceways or small ponds with netting or perimeter fencing. Federal and state depredation permits are required for any lethal control.

Similar species: Snowy Egret, Little Blue Heron (immature)

Little Blue Heron (*Egretta caerulea*)

Little Blue Herons are medium-sized birds (24 in., 60 cm) that are blue-grey with dark legs and brownish necks and heads as adults. The immatures are white with bluish bills and greenish legs; they resemble Snowy Egrets. Little Blue Herons are found throughout the eastern U.S. and South America. They prey on small fish by stalking in shallow water along pond edges. They may consume up to 0.2 pound of fish per day and are a particular threat to baitfish and tropical fish.

Green Heron (*Butorides virescens*)

The Green Heron is a small (22 in., 55 cm), dark heron with bluish-green back, brown neck with white flecks, yellow to orange legs, and black crown. Green Herons are found throughout the eastern U.S., southern Canada and South America. They feed on small fish, crustaceans and insects and usually hunt by waiting along the shorelines of ponds. They may eat up to 0.15 pound of fish per day and, like Little Blue Herons, are a threat to baitfish and tropical fish.

Snowy Egret (*Egretta thula*)

Snowy Egrets are medium-sized (27 in., 68 cm), white herons with dark legs and yellow feet. These birds are found throughout the aquaculture production areas of the southeastern U.S. and along the Atlantic Coast to Maine. They feed by stalking and waiting along pond banks.

They eat up to 0.2 pound of fish and crustaceans per day. These birds may pose a threat to baitfish and tropical fish.

Cattle Egret (*Bubulcus ibis*)

Cattle Egrets are small, white egrets with yellow plumes. They are often seen feeding in large groups on pond banks and in pastures. They eat mainly insects and pose little threat to aquaculture. They may be dispersed with non-lethal techniques if their presence seems to attract other, more hazardous fish-eating birds.

Glossy Ibis (*Plegadis falcinellus*) and White Ibis (*Eudocimus albus*)

Ibises are medium-sized (25 in., 63 cm) wading birds found in rice fields, crawfish ponds and other shallow-water habitats in southern Louisiana, Texas and Florida. The White Ibis is white with a curved red bill, red face, and black wing tips. The Glossy Ibis is an iridescent brown with a dark bill and legs. Ibises feed by wading through shallow water. These birds may consume up to 0.3 pound of crawfish per day, though the economic effect they have is unknown.

Waterfowl

Lesser Scaup (*Aythya affinis*) and Greater Scaup (*Aythya marila*)

These large diving ducks (18 to 20 in., 45 to 50 cm) have greenish or purple iridescent heads, black breasts, grey backs, black rumps and blue bills. Females are dull brown with white feathers at the base of the bill. These ducks winter throughout the southeastern U.S., with the Greater Scaup frequenting more coastal or marine environments. Scaup may be seen in extremely large rafts (more than 1,000 birds) on aquaculture facilities. Scaup feed mainly on invertebrates at the bottom of fish ponds, but damage to baitfish is well-documented. These ducks usually feed by diving under water and sifting through sediments or catching prey near the pond bottom. Scaup may also consume fish food, though the economic impact of this behavior is unknown.

Hooded Merganser (*Lophodytes cucullatus*)

Hooded Mergansers are medium-sized ducks (19 in., 48 cm). Their unique, slender bills have serrated edges for catching fish. Males have black heads and backs with white crests and rusty brown flanks. Females are dull brown with rusty brown crests. These birds are found throughout the eastern U.S. They feed on fish, snails, crustaceans and amphibians. Hooded Mergansers usually choose secluded habitats and occur in small groups or pairs, though larger groups may congregate during winter. These ducks pose little threat to aquaculture. They may be hunted in many states or may be harassed on facilities where they do congregate in large numbers.

Mallard (*Anas platyrhynchos*)

Mallards are large (28 in., 70 cm) ducks familiar for their green heads. They have white neck rings, olive-colored bills, brown breasts, silver-grey vermiculated backs and flanks, dark rumps, and white tail feathers. The female is mottled brown and her orange bill has a black patch. Mallards breed throughout the northern U.S. and Canada and winter throughout the southeastern U.S. They use many types of habitats within a wetland complex to meet their daily needs, including aquaculture ponds. They are dabbling ducks and usually feed on the water's surface or by tipping up with their heads under water. These ducks eat many types of animal and plant foods, including small fish or fish feeds when available and easy to access. Producers have reported that these birds sometimes eat large amounts of baitfish.

Gulls and terns

Gulls

Several species of gulls are found on aquaculture facilities in the southeastern U.S., including **Herring Gulls (*Larus argentatus*)**, **Ring-billed Gulls (*Larus delawarensis*)**, **Laughing Gulls (*Larus atricilla*)**, and

Bonaparte's Gull (*Larus Philadelpha*). Herring Gulls are the largest of these species (26 in., 65 cm). They are white with grey wings, black wing tips, pink legs, and a large, yellow bill with a red spot on the lower mandible. Adult Ring-billed Gulls are about 19 inches (48 cm) and also white with grey wings and black wing tips. They have yellow legs and a yellow bill with a black ring just below the tip of the bill.

Bonaparte's Gulls are small (13 in., 33 cm). Their heads are black during summer and white with a black spot during winter. They have white bodies and grey wings with white wing tips and black on the trailing edges of the wings. Laughing Gulls are small (17 in., 43 cm) with white bodies and dark grayish-black wings with black wing tips. They have black heads during summer and white heads during winter. Laughing Gulls occur mainly along the coast and are seen only rarely at inland aquaculture facilities. Most immature gulls have brownish or faded plumage until their third or fourth year and may be difficult to distinguish without a detailed guide. Gulls may scavenge on dead or sick fish at aquaculture facilities and feed on small fish such as baitfish and tropical fish near the surface. Gulls can feed while swimming or by diving and skimming prey while in flight.

Terns

Common Terns (*Sterna hirundo*) and **Forsters Terns (*Sterna forsteri*)** are small (16 in., 40 cm; 15 in., 38 cm, respectively), gull-like birds that occasionally may be seen feeding at aquaculture facilities, especially during spring and fall migration. Adult terns have forked tails, white necks and underparts, grey wings and backs, and black crowns. Common Terns have darker wings with black wing tips. The immature Common Tern has a black patch on the back of the head and neck instead of a fully black crown. The immature Forsters Tern has black, tear-shaped patches on the sides of the head trailing rearward from the

eye. Unlike gulls, terns are graceful fliers that may hover and dive to feed on aquatic prey at the water's surface. Terns will eat small numbers of fish at the surface but are not usually an economic threat unless they concentrate in large numbers. Many species of terns are protected by state and federal law. Producers should determine the status of these birds in their areas before attempting to manage them.

Raptors

Ospreys (*Pandion haliaetus*) are large (24 in., 61 cm), hawk-like birds that prey almost exclusively on fish. These birds have brown backs and wings and white necks, heads and underparts. The Osprey's brown eye stripe makes it easy to recognize. Ospreys breed along the Atlantic and Gulf Coasts and into the interior of the northern U.S. and Canada. They spend winters in the southern U.S., along the Atlantic and Gulf Coasts, and into southern Louisiana and Texas. They were once rare, but Osprey populations are increasing throughout their range. Ospreys hover and dive feet-first into the water to capture large, market-sized fish. They are considered a species of special concern in many states and no action should be taken to manage them on aquaculture facilities without first consulting local wildlife authorities and the U.S. Fish and Wildlife Service.

Great Horned Owls (*Bubo virginianus*) are large (25 in., 65 cm), mostly brown birds with large, yellow eyes and horn-like ear tufts. These owls are widely distributed throughout the eastern U.S. They occasionally take large, market-sized or broodfish that are near the surface, especially trout. However, they are not considered an economic threat to aquaculture.

Bald Eagles (*Haliaeetus leucocephalus*), familiar as our national symbol, are large (31 in., 78 cm) birds of prey that eat mostly fish and carrion. The adult is brown with white head and tail; a large, yellow bill; and yellow legs. Immature birds lack the white

head and tail and are mostly brown. Bald Eagles are increasing throughout their range and may be seen throughout the aquaculture production areas of the Southeast, especially during winter. These birds swoop over the surface of the water and grab large fish with their talons. They are not known to cause economic damage to aquaculture, so management is not recommended and may not be legal. Bald Eagles have been removed from the federal list of endangered species, but are protected by state law in many states. The Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act protect them nationwide. They may not be harassed without a permit.

Other Species

The **Belted Kingfisher (*Ceryle alcyon*)** is a small (13 in., 33 cm) fish predator with a large, crested head; white throat and belly; blue-grey back, head and tail; and a sharp, black beak. Females have a reddish-brown band across the breast, whereas males have a blue-grey band. These birds hunt from perches or hover and dive on fish or crawfish at the surface of the water. Although they occur throughout the southeastern U.S., they usually forage singly or in pairs so they likely have little economic impact.

The **Common Grackle (*Quiscalus quiscula*)** is a large (13 in., 34 cm) blackbird with a long tail and yellow eyes. The plumage in males is iridescent purple, green or bronze, depending on light conditions. The female has a shorter tail and relatively dull plumage with less iridescence. Grackles eat baitfish, especially minnows. Even though individual birds may catch relatively few fish at the water's surface, winter flocks of grackles can easily number in the thousands. If large numbers of grackles gather at baitfish facilities they should be moved. Producers should learn about local regulations before using lethal methods.

Technical assistance

For assistance with managing fish-eating birds, contact your USDA Wildlife Services State Director at www.aphis.usda.gov/ws or operational support staff at (301) 734-7921. For more information on reducing predation, see SRAC Publications 401 and 402.

References

- Bull, J. and J. Farrand, Jr. 1988. The Audubon Society Field Guide to North American Birds, Eastern Region. Alfred A. Knopf, Inc.: New York, NY.
- Cooper, A.L. 2007. Black-crowned Night Heron foraging habits and use of a catfish aquaculture facility in Mississippi. M.S. Thesis, Mississippi State University, Mississippi State, MS. 53 pp.
- Dorr, B.S. 2006. Distribution and abundance and economic impacts of double-crested cormorants on channel catfish aquaculture in the Yazoo Basin of Mississippi. Ph. D. Dissertation, Mississippi State University, Mississippi State, MS. 139 pp.
- Dorr, B.S. and J.D. Taylor, II. 2003. Wading bird management and research on North American aquaculture facilities. Wildlife Damage Management Conference 10:52-61.
- Glahn, J.F., B.S. Dorr and M.E. Tobin. 2000. Captive great blue heron predation on farmed channel catfish fingerlings. *North American Journal of Aquaculture* 62:149-156.
- Glahn, J.F., B.S. Dorr, J.B. Harrel and L. Khoo. 2002. Foraging ecology and depredation management of great blue herons at Mississippi catfish farms. *Journal of Wildlife Management* 66(1):194-201.
- Glahn, J.F. and King, D.T. 2004. Bird Predation. Pages 503-529 in C.S. Tucker and J.A. Hargreaves, eds., *Biology and Culture of Channel Catfish*. Elsevier: New York, NY.
- Glahn, J.F., D.S. Reinhold and P. Smith. 1999. Wading bird depredations on channel catfish *Ictalurus punctatus* in Northwest Mississippi. *Journal of the World Aquaculture Society* 30:107-114.
- Gorenzal, W.P., F.S. Conte and T.P. Salmon. 1994. Bird Damage at Aquaculture Facilities. Pages E5-E18 in S.E. Hyngstrom, R. M. Timm and G.E. Larson, eds., *Prevention and Control of Wildlife Damage*, University of Nebraska Cooperative Extension Service, Lincoln, NE.
- Johnsgard, P.A. 1993. *Cormorants, Darters, and Pelicans of the World*. Smithsonian Institution Press: Washington, DC.
- Littauer, G.A., J.F. Glahn, D.S. Reinhold and M.W. Brunson. 1997. Control of bird predation at aquaculture facilities: strategies and cost estimates. Southern Regional Aquaculture Center Publication No. 402.
- Mastrangelo, P., C. Sloan and K. Bruce. 1997. Incorporating depredation permits into integrated damage management plans for aquaculture facilities. Proceedings of the Eastern Wildlife Damage Management Conference 7:36-43.
- Stickley, A.R. 1990. Avian predators on southern aquaculture. Southern Regional Aquaculture Center Publication No. 400.
- Peterson, R.T. 2002. *Birds of Eastern and Central North America*. Houghton Mifflin Co.: Boston, MA.
- Stokes, D.W. and L.Q. Stokes. 1996. *Field Guide to Birds, Western Region*. Little, Brown, and Company: Boston, MA.

SRAC fact sheets are reviewed annually by the Publications, Videos and Computer Software Steering Committee. Fact sheets are revised as new knowledge becomes available. Fact sheets that have not been revised are considered to reflect the current state of knowledge.



The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 2005-38500-15815 from the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service.