

## DEPARTMENT OF THE INTERIOR

## Fish and Wildlife Service

## 50 CFR Part 21

RIN 1018-AE11

**Migratory Bird Permits; Establishment of a Depredation Order for the Double-Crested Cormorant**

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

**SUMMARY:** The U.S. Fish and Wildlife Service (hereinafter Service) establishes a depredation order for the double-crested cormorant (*Phalacrocorax auritus*). In those States in which double-crested cormorants have been shown to be seriously injurious to commercial freshwater aquaculture, and when found committing or about to commit depredations upon aquaculture stocks, persons engaged in the production of commercial freshwater aquaculture stocks may, without a Federal permit, take or cause to be taken such double-crested cormorants as might be necessary to protect aquaculture stocks.

**DATES:** This rule is effective March 4, 1998.

**ADDRESSES:** The complete file for this rule is available for inspection, by appointment, during normal business hours at U.S. Fish and Wildlife, Room 634, Arlington Square Building, 4401 N. Fairfax Drive, Arlington, Virginia.

**FOR FURTHER INFORMATION CONTACT:** Paul R. Schmidt, Chief, MBMO, U.S. Fish and Wildlife Service, (703) 358-1714.

**SUPPLEMENTARY INFORMATION:****Background**

Double-crested cormorant (*Phalacrocorax auritus*) populations are at an all-time high in the modern era, and commercial aquaculturists (especially catfish farmers) in many parts of the country are experiencing economic losses due to cormorant depredation. Three avenues currently are available to aquaculturists for dealing with cormorant depredation problems: (1) birds can be harassed (with shotgun blasts, fire crackers, propane cannons, or other scare devices) without a Federal permit; (2) ponds can be fitted with physical barriers (or exclusionary devices) such as wire or mesh netting that prevent birds from landing; and (3) private aquaculturists and State-operated fish hatcheries can apply to the Service for a permit to kill cormorants.

The Service is the Federal agency with the primary responsibility for

managing migratory birds. The Service's authority is based on the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-711), which implements conventions with Great Britain (for Canada), the United Mexican States (Mexico), Japan, and the Soviet Union (Russia). The double-crested cormorant is afforded Federal protection by the 1972 amendment to the Convention for the Protection of Migratory Birds and Game Animals, February 7, 1936, United States—Mexico, as amended, 50 Stat. 1311, T.S. No. 912, as well as the Convention Between the United States of America and the Union of Soviet Socialist Republics [Russia] Concerning the Conservation of Migratory Birds and Their Environment, November 26, 1976, 92 Stat. 3110, T.I.A.S. 9073 (16 U.S.C. 703, 712). The take of double-crested cormorants is strictly prohibited except as may be permitted under regulations implementing the MBTA. In addition to Federal statutes, the double-crested cormorant may also be protected by State regulations.

Regulations governing the issuance of permits for migratory birds are authorized by the MBTA and subsequent regulations (50 CFR Parts 13 and 21). Regulations in Subpart D of Part 21 deal specifically with the control of depredating birds. Section 21.41 outlines procedures for issuing permits. Sections 21.43 through 21.46 deal with special depredation orders for specific species of migratory birds to address particular problems in specific geographical areas, establishing a precedent for species and geographic treatments in the permitting process. Service policies for issuing depredation permits for aquaculture were described by Trapp et al. (1995).

Federal responsibility for the management of depredating wildlife, including migratory birds, lies with the Wildlife Services (WS) formerly Animal Damage Control program of the U.S. Department of Agriculture's Animal and Plant Health Inspection Service. The primary authority for WS activities is the Animal Damage Control Act of 1931, as amended, (7 U.S.C. 426-426c). Animal damage control activities are conducted at the request of, and in cooperation with, other Federal, State, and local agencies; private organizations; and individuals. Management responsibilities of WS in the cormorant-aquaculture conflict were reviewed by Acord (1995).

**Commercial Aquaculture Industry**

Aquaculture, the cultivation of finfish and invertebrates in captivity, has grown exponentially in the past several decades (Price and Nickum 1995). The

five principal aquaculture fish species in the United States are catfish, trout, salmon, tilapia, and hybrid striped bass. There are also two categories of non-food fish: baitfish and ornamental fish (U.S. Department of Agriculture, 1995). While each of these industries has its own unique set of bird depredation problems, they all share a basic concern for developing and implementing the best methods for protecting fish stocks from predation.

The market for channel catfish (*Ictalurus punctatus*) is the largest segment of the aquaculture industry, and the one which is perhaps most susceptible to predation by cormorants. The catfish accounts for about one-half of the value of aquaculture in the United States.

The number of catfish farms in the United States increased 44 percent between 1982 and 1990 (from 1,494 to 2,155). Most of this increase occurred between 1982 and 1987. Growth was fairly steady throughout the 1980s, with production leveling off in the past few years. Production was estimated at 224,875 metric tons (247,933 short tons, or 496 million pounds, or 225 million kilograms) worth \$353 million in 1993 and is expected to expand 5-7 percent annually due to increasing sales prices.

Mississippi is the center of catfish production, producing 75-80 percent of the United States output. Alabama, Arkansas, and Louisiana are also major producers. California, Florida, Illinois, Kentucky, Missouri, North Carolina, Oklahoma, South Carolina, Texas, and Virginia also produce catfish and all have, or will have, problems with fish-eating birds. In the four principal catfish-producing States, the number of farms increased 67 percent between 1982 and 1992 (from 794 to 1,193); increases in individual States were 24 percent in Alabama (327-405), 40 percent in Mississippi (316-442), 67 percent in Arkansas (115-191), and 330 percent in Louisiana (36-155).

The more than 64,300 hectares (158,840 acres) of catfish ponds in the United States in 1995 represented a 2.3-fold increase from about 28,300 hectares (69,900 acres) in production in the 1970s. The four principal catfish-producing States accounted for 93 percent of the total area, with Mississippi alone accounting for about 60 percent. Catfish ponds range in size from 4-14 hectares (10-35 acres) each, with a mean size of 5 hectares (12 acres). Farms with 100 hectares (247 acres) in production are not uncommon, and many are more than 400 hectares (990 acres). In the Delta region of Mississippi, catfish farms average about 100 hectares (247 acres) of ponds, with

a typical rectangular pond size of 8 hectares (20 acres); ponds are shallow, ranging from 1–2 meters (3.3–6.6 feet) deep. The large size of the ponds makes them highly visible to fish-eating birds from the air, and the high stocking levels (from 5,000 to more than 150,000 fish/hectare [or 2,000 to more than 60,700 fish/acre], Glahn and Stickley 1995) make them especially attractive to cormorants. The catfish industry's practice of using large ponds developed in the early 1970s when cormorant numbers were low.

The physical dimensions of the ponds are the secret to the catfish farmers' success (as well as the source of today's predation problem). The most efficient production ponds are circular, but they can not be harvested as easily. So, the ponds are generally rectangular and can be as wide as 80–95 meters (262–312 feet). At harvest time, crews drag 100 meter (325 foot) wide seine nets strung between tractors on both sides of the rectangular ponds along the length of each pond. Undersize fish slip through the mesh and are harvested the next year. Because catfish farmers stock more than one year class of fish in a pond, it is not possible to drain the ponds and to reconfigure them to a size and shape that can be covered easily with bird-excluding nets. Also, the levees between the ponds are not wide enough to install extensive net structures and yet leave room for tractors to maneuver. Thus, several economic factors (e.g., low profit margin, the cost to modify the ponds, and a heavy investment in current harvest technologies) combine to preclude major changes in pond shape and size at the present time.

#### **Population Status of the Double-crested Cormorant**

The size of the North American breeding population of the double-crested cormorant was recently estimated at about 360,000 pairs (Hatch 1995). Using values derived from the published literature of 1–4 nonbreeding birds for each breeding pair yields an estimated total population of about 1–2 million birds (Hatch 1995).

The double-crested cormorant breeds widely throughout much of coastal and interior North America. As of 1992, it had been found breeding in 40 of the 50 United States, all 10 Canadian provinces, and in Mexico, Cuba, and the Bahamas (Hatch 1995). However, it is not uniformly distributed across this broad area. Sixty-one percent of the breeding birds belong to the Interior population, while another 26 percent belong to the Atlantic population. Two major areas of concentration are apparent in the vast range of the Interior

population: (1) the prairie lakes of Alberta, Manitoba, and Saskatchewan (which account for 69 percent of the Interior population); and (2) the U.S. and Canadian Great Lakes (accounting for another 12 percent).

Seven political units account for 70 percent of the North American breeding birds, with Manitoba alone accounting for 36 percent. Thirty (52 percent) of the 58 political units listed by Hatch (1995) each harbor fewer than 100 breeding pairs. In the catfish-producing States identified by Price and Nickum (1995), only Florida and California have sizeable breeding populations.

In the south-central United States (Arkansas, Louisiana, Mississippi, and west Tennessee), the double-crested cormorant has been known since pre-colonial times and has been recorded as an occasional breeder throughout the swampy forests of the region since at least the early 1800s (Jackson and Jackson 1995). Jackson and Jackson predicted that (in the absence of major limiting factors) the cormorant will once again become a regular member of the mid-South breeding avifauna, with birds dispersed more widely because of reservoir construction and with concentrations expected in the vicinity of aquaculture facilities.

The double-crested cormorant has always been widely distributed as a breeding species. The only suspected instance of range expansion in the 20th century is in the United States and Canadian Great Lakes, which apparently were colonized by birds expanding eastward from the Canadian prairies beginning with Lake Superior about 1913 and ending with lakes Erie and Ontario in the late 1930s (Weseloh et al. 1995). It is possible, however, that these events represented recolonization of former (but previously undocumented) breeding localities from which the species was extirpated before 1912. For example, although Barrows (1912: 67) knew of no breeding records for Michigan, he noted that it was "generally distributed over the State during the migrations" (with specimens from almost every county) and speculated that "probably there are few sheets of water any size within our limits which are not visited by this bird at least occasionally."

The core of the wintering range (i.e., the regions of greatest density) did not change appreciably between 1959–1972 and 1959–1988 (Root 1988: 11, Sauer et al. 1996b). Cormorant wintering populations are concentrated in coastal States and Provinces, from North Carolina to Texas in the east and from California to British Columbia in the west. In the midsouth, there also are

appreciable concentrations inland from the coast (e.g., east Texas, eastern Oklahoma, southeastern Arkansas, west-central Mississippi, and northeastern Alabama). Of the 9 catfish-producing States for which Christmas Bird Count data are available, 6 have indices of relative abundance that exceed the national mean; the median abundance in these 6 States (including the major catfish-producers of Alabama, Louisiana, and Mississippi) was 2.0 times the national mean (range: 1.4–9.6).

The scattered occurrence of early winter stragglers throughout much of the interior of the continent as far north as Minnesota and southern Saskatchewan (Sauer et al. 1996b) is probably a natural phenomenon of longstanding (i.e., it probably does not represent a northward expansion of the wintering range). As evidence of this, we find that 11 percent of 227 winter recoveries (December–February 1923–1988) of birds banded in Saskatchewan, Lake Huron, and eastern Lake Ontario were from latitudes north of the major catfish-producing States of Alabama, Arkansas, Louisiana, and Mississippi (Dolbeer 1991). Forty percent of these 227 winter recoveries are from 1° blocks of latitude and longitude that intersect the Gulf Coast and another 22 percent are from degree blocks that intersect the main stem of the Mississippi River. Analysis of 5,589 band recovery records for the period 1923–1988 (Dolbeer 1991) revealed that southward movement from areas north of latitude 42° N occurs primarily in October and November. Cormorants of all ages are at their greatest median distance from northern nesting areas—about 1,900 kilometers (1,200 miles)—from December through March.

Cormorants nesting in Canada and the northern United States from Alberta to the Gulf of St. Lawrence migrate in winter primarily to the southern United States between Texas and Florida. There is considerable mixing and overlap in winter of nesting populations from widely divergent areas. From 38 to 70 percent of the birds from Saskatchewan through the Great Lakes region winter in the lower Mississippi Valley (States of Arkansas, Louisiana, and Mississippi) as do 10 percent of the birds from such disparate areas as Alberta and the New England coast (Dolbeer 1991). In other words, the major catfish-producing States of the lower Mississippi may be envisioned as lying at the apex of an inverted triangle, with cormorants from a 3,000 kilometer (1,860 mile) expanse of breeding range being funneled into the region in the winter by topographic features and the flow of the major rivers. In commenting on this funneling effect,

Jackson and Jackson (1995) noted that "It is a most unfortunate coincidence that the very heart of the catfish-farming industry is located in the Mississippi Delta at the confluence of the Arkansas and Mississippi rivers."

Our knowledge of double-crested cormorant population trends before 1959 is based on fragmented and largely anecdotal accounts from scattered portions of the range. Syntheses of much of this information (Hatch 1995, Weseloh et al. 1995, and Jackson and Jackson 1995) reveal the following general patterns: (1) by 1900, cormorant numbers had been reduced, and their range possibly restricted, by human persecution and the extensive drainage and degradation of natural wetlands; (2) the widespread construction of reservoirs and impoundments (beginning in the 1920s), in concert with sport fish stocking programs and the creation of refuges and other conservation lands (beginning in the 1930s), had beneficial effects on cormorant numbers; (3) the widespread use of DDT and other pesticides (beginning in the 1940s) had devastating effects on cormorant reproductive success, with the result that populations reached their lowest point in the mid-1970s; (4) the ban on DDT in 1972 and the general decrease in levels of environmental contamination, in concert with development of the catfish industry in the mid-1970s, created a favorable environment for the growth of cormorant populations.

Quantitative information on double-crested cormorant population trends is available from three sources: (1) Breeding Bird Survey data (1966–1994), (2) Christmas Bird Count data (1959–1988), and (3) published accounts of censuses of breeding colonies. Trend information from these sources is discussed in the following paragraphs:

(1) Between 1966 and 1994, the continental breeding population increased at an estimated rate of 6.1 percent/year (Sauer et al. 1996a). The very high rate of growth in the early years (13.0 percent/year), and to a lesser extent for the entire period, is partly an artifact of the extremely small population in the early years of the survey period (late 1960s and early 1970s). Compared to the earlier (1966–1979) time period, the growth of the continental and Canadian populations appears to have slowed appreciably in the later (1980–1994) period; however, the U.S. population has continued to show a significant rate of increase in the 1980s and 1990s, apparently due primarily to the continued rapid growth of populations in the mountains and plains States. The only significant

declines noted were in the West Coast region (1966–1994) and in North Dakota (1980–1994), although the West Coast trend appears to be contradicted by rather dramatic site-specific increases in British Columbia, Washington, and California (Carter et al. 1995). Most of the recent increase in numbers has occurred within the known historical breeding range (Hatch 1995).

(2) Between 1959 and 1988, the continental wintering population increased at an average rate of 7.3 percent/year (Sauer et al. 1996b); significant increases were registered for 17 of the 20 States or Provinces for which data were available. Trends are available for 9 of the primary catfish-producing States; 6 of these States (Alabama, Louisiana, Mississippi, Oklahoma, Texas, and Virginia) have trends (median 16 percent, range 12–19 percent) that are well above the continental average. Most of the localities in the mid-South for which information is available show dramatic population increases between the mid-1970s and the early 1990s, with the trends paralleling a similar magnitude of growth in the area of catfish ponds in the region during the same period (Jackson and Jackson 1995).

(3) Rather dramatic increases in breeding pairs are documented at colonies in the Great Lakes (Weseloh et al. 1995), the St. Lawrence River and associated waters (Chapdelaine and B°dard 1995), New England (Krohn et al. 1995), the West Coast (Carter et al. 1995), and elsewhere (Weseloh et al. 1995). The trends documented by these studies generally parallel those from the Breeding Bird Survey and the Christmas Bird Count.

#### **Foraging Behavior of the Double-crested Cormorant at Aquaculture Facilities**

##### *Daily Movements and Activity Budgets*

In the Mississippi Delta, cormorants fly an average of 16 kilometers (25 miles) from their night roosts to feeding sites. Each bird spends about 18 percent of daylight hours feeding; 88 percent of their foraging is done at catfish ponds and 12 percent near roost sites. The average cormorant forages for 60 minutes each day, but spends just 20 minutes underwater in actual pursuit of fish (King et al. 1995).

##### *Feeding Rates*

Feeding rates may be dependent on the size and abundance of the available fish and the metabolic demands of the birds, and can be quite variable. Actively feeding cormorants in commercial catfish ponds capture an

average of about 5 fish/cormorant/hour (Stickley 1991, Stickley et al. 1992), but can vary from 0–28 (Schramm et al. 1984). Partly because of this variability, the rate of 5 fish/cormorant/hour reported by Stickley et al. (1992) is highly skewed; the median was only 2 fish/cormorant/hour, and the mean was equaled or exceeded at only 3 (21 percent) of the 14 ponds studied. Stickley et al. (1992) did not find a significant relationship between the mean number of cormorants present and the number of catfish consumed, but ponds with 40 or more cormorants generally had a feeding rate of 1 or fewer fish/cormorant/hour. Similarly, cormorant feeding rates were not related to the density of fingerling catfish, density of all catfish (all size classes combined), or mean length of fish.

##### *Diet Composition*

Cormorants eat a wide variety of prey items, and there is thus a great deal of variation in prey composition, both geographically and seasonally. Nearly all of the published information on diet composition at aquaculture facilities has been gathered in the vicinity of catfish farms in the southeastern United States (Bivings 1989, Conniff 1991, Glahn and Stickley 1992, Glahn et al. 1995, and Glahn and Brugger 1995). These studies show that, among birds actively feeding on catfish ponds, the average proportion of catfish in the winter diet (by number) is most commonly in the range of 50–55 percent. The proportion varies seasonally from less than 30 percent in October and November to more than 80 percent in February, March, and April.

##### *Prey Size*

Although cormorants are capable of taking catfish up to 42 centimeters (16 inches) in length (Campo et al. 1993), studies repeatedly have shown that the vast majority of catfish caught by cormorants at commercial facilities are in the range of 7–20 centimeters (3–8 inches), with most averaging about 10–15 centimeters (4–6 inches) (Schramm et al. 1984, Stickley 1991, Stickley et al. 1992). This range of prey sizes is remarkably close to that of prey taken by cormorants in natural freshwater habitats. In five such studies (Durham 1955, Hirsch 1986, Haws 1987, Hobson et al. 1989, Campo et al. 1993), prey size ranged from 6–21 centimeters (2–8 inches), with a median value of about 12 centimeters (5 inches).

##### *Prey Preferences*

Lacking a precise knowledge of the species composition and size distribution of the prey population, it is impossible to make definitive

statements about prey preferences. However a few tendencies are apparent. For example, the 10–15 centimeter (4–6 inch) fingerling catfish preferred by cormorants in one study represented about 64 percent of the catfish (by number) in the ponds (from Stickley et al. 1992), suggesting that the birds were merely preying on the most readily available fish. In this same study, 1 of the 14 ponds contained gizzard shad in addition to catfish. Nineteen shad were consumed for every catfish eaten, even though the pond contained about 5,100 fingerling catfish/hectare (2,100/acre). The apparent preference for gizzard shad in this instance may be related to their being more easily caught, handled, and swallowed by cormorants (the mean handling time for catfish was 6–7 times greater than that of gizzard shad).

#### Daily Food Consumption Rates

Estimates of daily food consumption rates of cormorants at or in the vicinity of aquaculture facilities in the southeastern United States vary widely, from 208–504 grams (7–17 ounces, or 0.4–1.1 pounds) (Schramm et al. 1984, Schramm et al. 1987, Bivings et al. 1989, Conniff 1991, Brugger 1993, Glahn and Brugger 1995). The most widely accepted figure is about 320 grams (11 ounces, or 0.7 pounds) of fish/day, of which about one-half (or 160 grams [5.5 ounces, or 0.35 pounds]) would be catfish (Brugger 1993).

#### Impacts of Double-Crested Cormorants on Aquaculture

With the exception of catfish, quantitative accounts of the impacts of cormorants on freshwater aquaculture stocks generally are lacking. The fairly large body of literature that has developed in the past 12 years represents an attempt to assess the impacts of cormorants on the commercial catfish industry. Synopses of the pertinent literature are given in the following paragraphs.

In the past, cormorants have been reported only infrequently at fish hatcheries. For example, questionnaire surveys conducted in 1977 (Scanlon et al. 1979) and 1984 (Parkhurst et al. 1987) indicate that cormorants were considered to be problems at only 4–5 percent of these facilities nationwide. Of the more than 90 other (including non-avian) species mentioned as predators, 45–50 percent were listed more frequently than cormorants. Purported instances of cormorant damage to hatchery fish in Texas (Dukes 1987) include the loss of 90 percent of the smallmouth bass (*Micropterus dolomieu*) 2-year-old brood stock at the Jasper facility.

The frequency of occurrence of cormorants at a given catfish pond is a function of many interacting factors, including: (1) size of the regional cormorant population; (2) the number, size, and distribution of catfish ponds; (3) the size distribution, density, health, and species composition of fish populations in the catfish ponds; (4) the number, size, and distribution of “natural” wetlands in the immediate environs; and (5) the size distribution, density, health, and species composition of “natural” fish populations in the surrounding landscape. Cormorants are adept at seeking out the most favorable foraging sites. As a result, cormorants rarely are distributed evenly over a given region, but rather tend to be highly clumped or localized. For example, in 27 weekly surveys at 50 catfish ponds in Humphreys County, Mississippi, 1987–1988, cormorants were observed at only 9 of the 50 ponds and only on 14 occasions (Hodges 1989). Thus, it is not uncommon for many fish farmers in a region to suffer little or no economic damage from cormorants, while a few farmers experience exceptionally high losses.

Cormorants clearly respond in a positive way to the presence of shallow-water ponds stocked with high densities of easy-to-capture prey fish. For example, within two weeks of stocking 2 ponds in Hendry County, Florida, with 5–20 centimeter (2–8 inch) fingerling catfish, 12 cormorants were feeding in the ponds and roosting on nearby poles. A nearby 2.5 hectare (6 acre), 2.5-meter (8-foot) deep pond, stocked with 75,000 3–8 centimeter (1–3 inch) fish in August 1980, had attracted 13 cormorants by September. These birds continued to feed at the pond throughout the fall and winter, and in spring 1981 they nested in a nearby cypress dome. By November 1981, about 50 cormorants were feeding in the pond (Schramm et al. 1984). The positive response of cormorants to the presence of shallow-water ponds stocked with high densities of easy-to-capture prey fish (as illustrated above) is clearly a major factor responsible for their impacts in a variety of aquaculture situations (e.g., baitfish ponds in Minnesota, koi ponds in Missouri and elsewhere, ornamental fish ponds in Florida, and catfish ponds in the southeastern United States and elsewhere).

Assuming averages of 5 fingerling catfish consumed/cormorant/hour and 30 cormorants/pond (a constant number of feeding birds present throughout an 8-hour day), the catfish population of a typical pond in the Mississippi Delta

(51,000 fish/hectare in a 8-hectare pond, which is equivalent to 20,650 fish/acre in a 20-acre pond) would be halved in 167 days (Stickley et al. 1992). However, if actual values were nearer the median values of 2 fish/cormorant/hour and 15 birds/pond (from Stickley et al. 1992), the number of days required for the cormorants to reduce the population by half would be increased to 850 days (a 5-fold increase).

Of 281 catfish farmers queried on the Mississippi Delta in 1988 (Stickley and Andrews 1989), 87 percent felt that they had a bird problem. Moderate to heavy cormorant activity (defined as at least 25 birds/day) was reported by 57 percent of Delta farmers. Losses to birds (harassment costs plus value of fish lost) were estimated at \$5.4 million (3 percent of total sales).

Overall, there appears to be little conflict between cormorants and the food- or game-fish industry in Florida (Brugger 1992), but losses of food fish, primarily catfish, can be locally severe (Brugger 1995); for example, cormorants were responsible for the loss of up to 50 percent of the fingerling catfish in open 0.125 hectare (0.31 acre) ponds during 1991 at the University of Florida.

Although fish of commercial value made up only a small percentage of the diet of cormorants collected in the vicinity of aquaculture facilities in central and southeast Arkansas from mid-October to early December, the finding of a few fish of very high value (e.g., grass carp with wholesale value of about \$4 and koi worth \$5–10 each) suggests that cormorant depredations can be locally or seasonally severe.

On the Mississippi Delta, cormorants consumed an estimated 18–20 million catfish during the winters of 1989–1990 and 1990–1991, which was equivalent to 842–939 metric tons (928–1,035 short tons, or 1.86–2.07 million pounds, or 844–939 thousand kilograms). Based on the cost of replacing these fish, annual losses to the catfish industry were estimated at \$1.8–2.0 million, which corresponds to about 4 percent of the estimated catfish standing crop each year. Although losses were documented over a six-month period, the majority (about 64–67 percent) occurred in February and March (Glahn and Brugger 1995).

At catfish farms in Oklahoma (with about 324 hectares [800 acres] of surface water in production) in 1993, cormorants consumed an estimated 7,196 kilograms (15,900 pounds, or 7.9 short tons) of catfish valued at \$14,000–36,000 (depending on size of the fish consumed), or about 3–7 percent of Oklahoma catfish sales (Simmonds et al. 1995).

### Cormorant Depredation Permits

Depredation permits to take double-crested cormorants at commercial aquaculture facilities have been issued by the Fish and Wildlife Service since 1986. Composite data for a recent two-year period (1993–1994) show that about 8,200 cormorants were taken each year by 2,261 permit holders.

Cormorants represented the majority (about 57 percent) of the total number of birds killed nationwide; two-thirds of the cormorants were taken in the southeastern region of the United States, with substantial numbers also taken in the southwest and the upper Midwest.

Between 1989 and 1996, the number of permits issued to take double-crested cormorants in the southeastern United States more than quadrupled, from 50 to 215 (Coon et al. 1996). The reported take of 4,000–8,000 birds annually has had no noticeable effect on the size of the regional wintering population.

Mastrangelo et al. (1995) noted that the reported take never exceeded 68 percent of the authorized take and attributed this to the frightening effect that lethal control has on bird behavior. Hess (1994) described a recent study in which catfish farmers at three complexes in Mississippi were authorized (under Fish and Wildlife Service permits) to remove as many as 2,500 cormorants in a 19-week period. Participants were supplied with ammunition and encouraged to kill as many birds as allowed by the permit. The fact that only 290 birds had been killed by the end of the project was attributed to a learned behavior by the birds to avoid areas where they might be shot (Hess 1994).

### Environmental Consequences of This Rule

#### Cormorant Population

The depredation order is expected to result in a moderate increase in the number of double-crested cormorants taken at aquaculture facilities. The impact is expected to be localized (e.g., possible reductions in the size of wintering populations in the immediate vicinity of catfish farms). To calculate the potential maximum harvest, we can assume that 42 cormorants (the average number reported taken by holders of depredation permits in the southeastern United States, 1989–1995; from Coon et al. 1996) will be shot at each of the about 2,200 catfish farms in the United States. The resultant annual take of 92,400 birds will represent about 5–10 percent of the continental population. This level of take will be more than offset by the recruitment of young birds into the population; a reproductive

success of 1.7–3.2 young/nest (Duffy 1995) will equate to a minimum recruitment, at current population levels, of 612,000 young into the population each year. In reality, the action is expected to result in only a modest increase in the number of double-crested cormorants taken at aquaculture facilities.

#### Socio-Economic

The rule is expected to reduce the direct economic losses caused by cormorants at commercial aquaculture facilities. It also will enhance the effectiveness of current nonlethal control programs, thus reducing overall damage control costs to producers. The depredation order will reduce paperwork and costs associated with administering the current permit system and will promote quicker and more efficient depredation control operations by shifting responsibility to the individual aquaculturists. The depredation order will demonstrate cooperation between the Federal agency responsible for protecting and enhancing wildlife (Service), the Federal agency responsible for dealing with wildlife damage issues (WS), and the individual producers in dealing with a problem that has the potential to expand far beyond the wildlife management arena.

#### Other Fish-Eating Birds

Although the action does not authorize the taking of other fish-eating birds, it is possible that a few birds could be taken accidentally on occasion. The two species that are most likely to be confused with the double-crested cormorant are the neotropical cormorant (*Phalacrocorax brasilianus*) and the anhinga (*Anhinga anhinga*). These species have foraging habits very much like those of the double-crested cormorant and may occur on or in the vicinity of catfish ponds in the Gulf Coast States. The likelihood of other fish-eating birds being mistaken for double-crested cormorants and shot accidentally is not expected to increase above that which presently occurs. However, because of a projected increase in the number of producers conducting lethal control operations for cormorants, it is possible that there will be a slight to moderate increase in the actual number of other fish-eating birds (especially neotropical cormorants and anhingas) taken accidentally. Any negative effects on these species would be extremely localized, and long-term impacts on populations would be unlikely.

### Endangered and Threatened Species

Negligible impacts to endangered or threatened species are expected under the action. Few endangered or threatened species have ever been taken by aquaculturists with depredation permits. The likelihood of endangered or threatened species being taken by accident is not expected to increase.

### Summary of Public Comments

On June 23, 1997, the Service published a proposed rule (62 FR 33960) to establish a depredation order for the double-crested cormorant. Three hundred and thirty letters or postcards were received from 347 individuals, businesses, organizations, agencies, and elected officials during the 60-day public comment period. Some parties submitted multiple letters, other letters were signed by more than one entity, and letters from two organizations were supplemented by form letters or postcards submitted by individual members.

For consistency and standardization in analyzing the comments, each of the following examples was regarded as one distinct set of comments: (a) 1 letter from an aquaculture facility signed by 2 individuals, (b) 5 identical letters from 5 different employees of an aquaculture facility, (c) 2 different letters (signed by the same individual) from 1 aquaculture facility, (d) 3 different letters from a private citizen, (e) 2 identical letters from an aquaculture-related business signed by 2 different individuals, (f) 1 letter from the Louisiana Catfish Farmers Association supplemented by 42 identical letters signed by individual members of LCFA, (g) 1 letter from the Catfish Farmers of Mississippi supplemented by 112 postcards supporting the position of CFM and signed by individual members, (h) 7 identical letters from an aquaculture facility signed by 7 different individuals, (i) 2 different letters from an elected State official, (j) 1 letter from the National Audubon Society co-signed by representatives of 6 other environmental organizations (i.e., American Bird Conservancy, Center for Marine Conservation, Defenders of Wildlife, Environmental Defense Fund, Izaak Walton League of America, and World Wildlife Fund), and (k) 1 letter signed by 13 different Congressmen.

Thus, the 330 letters are considered to represent 161 distinct sets of comments distributed among segments of the public as follows: private individuals (52), aquaculture-related businesses (50), aquaculture organizations (21), environmental organizations (18), State agencies (13, representing 10 States),

Federal agencies (5), Federal elected officials (1), State elected officials (1).

The proposed action was supported by 13 members of the U.S. House of Representatives (Representatives from the states of Alabama, Arkansas, Louisiana, and Mississippi), who emphasized the economic importance of the aquaculture industry in their States and the potentially devastating impacts of cormorants on that industry.

The action was supported (or at least not opposed) by State agencies in 9 of the 10 States from which comments were received: Alabama, Arkansas, Illinois, Louisiana, Mississippi, North Carolina, Oklahoma, Texas, and Vermont. The Missouri Department of Conservation questioned why the current permit procedure was inadequate, and noted that if the depredation order were implemented "it will be important to monitor control records to evaluate changes in numbers, locations, and dates that cormorants are taken."

The WS—a program of the U.S. Department of Agriculture's Animal and Plant Health Inspection Service and the only Federal agency that submitted comments—supported the action, with the recommended addition of several items (e.g., include roost sites, western States, control on breeding grounds, sport fisheries, mariculture facilities, and unintentional or "incidental" take of similar species) and recommended deletion of the certification requirement.

The proposed rule received overwhelming support from aquaculture-related businesses and organizations. Many of the comments received from this group expressed concern that the scope of the depredation order was not broad enough (e.g., expand geographically, include additional species, add roost control, implement widespread population control).

Among the scientific and environmental organizations commenting on the proposed action, it was supported by the Wildlife Management Institute and the Arkansas Wildlife Federation. The action was opposed (or at least not supported) by 12 national organizations and 7 State or local organizations. A sample of the concerns raised by these opponents includes the following: lack of good scientific data on magnitude of economic impacts; non-lethal techniques have not been adequately implemented; will remove incentives for using non-lethal control; will result in unintentional take of non-target birds; adequate methods (e.g., non-lethal and permits) are already available; effects on cormorants and other species should be

monitored; geographic scope is unnecessarily broad; minimize effects on non-target species (educational materials); does not address spatially-localized nature of problem; does not address seasonal nature of problem; and sets a dangerous precedent for other bird species.

Written comments received during the comment period are discussed in the following summary. Comments of a similar nature are grouped into general issues. These issues and the Service's response to each are discussed below.

*Issue 1:* Numerous individuals and a few organizations, including the Bass Anglers Sportsman Society (BASS), commented that the depredation order should be expanded to include situations in which double-crested cormorants commit depredations on sport fish populations in public waters.

*Service Response:* Based on a review of the best available science, the Service concludes that cormorants generally have only minor direct impacts on sport fish populations (Trapp *et al.* 1997). Cormorants are just one of myriad biotic and abiotic factors, including water quality, aquatic habitat, natural predation, and angler take, that can affect sport fish populations. However, the Service also recognizes that there may be highly localized situations in which cormorants can potentially impact sport fish populations. These are generally situations in which sport fish are concentrated in extremely high densities, often by human activities (e.g., massive releases of hatchery-reared fingerlings, intensively managed put-and-take fisheries, and temporary congregations of fish at nearshore spawning sites). The Service currently does not issue cormorant depredation permits to benefit sport fish populations in public waters, but is exploring potential options that could be used to deal on a case-by-case basis with localized cormorant predation when it has been proven to be a significant problem. Two possible options include: (1) Modification of release practices for hatchery-reared fish to reduce their vulnerability to cormorant predation, and (2) harassment of depredating birds.

*Issue 2:* Wildlife Services, as well as a majority of aquaculturists, requested that the depredation order be expanded to allow lethal take in conjunction with roost dispersal activities.

*Service Response:* Studies conducted in the Mississippi Delta by WS over the past 6–7 years indicate that coordinated roost harassment/dispersal (without lethal take) is a promising technique for diverting roosting cormorants away from the immediate vicinity of aquaculture facilities. Typically, the

effort has involved coordinated teams of fish farmers harassing birds as they return to night roosts by shooting cracker shells, screamers (whistlers), and other nonlethal noise-making devices. The major objective of coordinated roost harassment is to move birds from the interior Delta (*i.e.*, the location of major catfish aquaculture facilities) to sites along the Mississippi River.

During the winter of 1996–1997, WS monitored the movements of 50 cormorants outfitted with radio transmitters and examined the effects of a Delta-wide roost harassment effort (Tobin and King 1997). Harassment substantially reduced the fidelity of cormorants to roost sites (e.g., 11 percent of birds returned to the roost within 48 hours versus 81 percent at control roosts). Compared to birds from control roosts, birds from roosts that were harassed tended to move long distances between successive night roosts (*i.e.*, 0 and 26 km, respectively) and travelled further to feed (*i.e.*, 22 and 31 km, respectively). Ninety-six percent of the birds that roosted in the interior Delta foraged there the next day compared to only 7 percent of birds that roosted along the Mississippi River, and catfish comprised 80 percent of the diet of birds from Delta roosts versus 20 percent of the diet of birds from river roosts. The evidence clearly shows that the roost harassment efforts conducted by WS in conjunction with commercial fish farmers has been successful in dispersing roosting cormorants away from the immediate vicinity of aquaculture facilities on the interior Delta, and is an effective nonlethal means for reducing cormorant damage at catfish farms.

Wildlife Services contends that the ability to shoot double-crested cormorants at their night roosts in conjunction with harassment would make it much easier to disperse them from such areas, and would probably increase the effectiveness of the technique (e.g., increased dispersal distance, longer period of roost abandonment). However, the Service is not aware of any documented evidence that the addition of lethal take would significantly increase the efficacy of roost harassment.

Roost dispersal/harassment efforts such as those conducted on the Mississippi Delta can continue unabated under auspices of WS. The Service will consider applications for depredation permits for lethal take of double-crested cormorants at roosts on a case-by-case basis. The Service will also consider a request for a depredation permit to take cormorants at roost sites in conjunction

with a research study designed to determine if lethal take significantly increases the effectiveness of roost harassment.

*Issue 3:* Conflicting comments were received on the geographical focus of the depredation order. Aquaculturists requested that the geographical extent of the order be expanded, citing actual or potential problems in States (e.g., western U.S.) not covered by the proposed rule. Environmentalists noted a lack of documented evidence of problems in some of the geographical areas (e.g., northcentral and northeastern U.S.) included in the proposed rule.

*Service Response:* In the proposed rule, the Service proposed that the action be applicable to 32 States in the eastern U.S. Based on the public comments received, the Service re-evaluated the need for a depredation order based on documented evidence of the magnitude of the problems that double-crested cormorants posed to commercial aquaculture in individual States.

The Service concludes that double-crested cormorants pose significant problems to the commercial aquaculture industry in the following 12 States in the southcentral and southeastern U.S.: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. This finding is based on the following lines of evidence: (1) Existing commercial catfish industry is sizeable, with predicted continued growth; (2) sizeable populations of migrant or wintering double-crested cormorants, with predicted continued growth; (3) documented evidence of economic losses due to cormorant predation on catfish (Stickley and Andrews 1989, Brugger 1995, Glahn and Brugger 1995, Simmonds *et al.* 1995); (4) history of issuing aquaculture depredation permits to take substantial numbers of double-crested cormorants (Coon *et al.* 1996); (5) predicted increase in conflicts between catfish industry and cormorants due to projected expansion of industry and growth of cormorant population; and (6) potential conflicts between cormorants and other aquaculture industries, including baitfish, ornamental fish, and tilapia (Bivings *et al.* 1989).

The Service also finds that double-crested cormorants pose significant problems to the commercial aquaculture industry in the State of Minnesota. Within the northcentral region of the U.S. (encompassing eight States), Minnesota accounts for 67 percent of all aquaculture depredation permits issued,

93 percent of all cormorants reported taken, and 82 percent of all economic losses claimed. A total of \$388,750 in losses due to double-crested cormorant predation was claimed by Minnesota aquaculturists in 1997. Most of the aquaculture conflicts with cormorants in Minnesota involve the baitfish industry, although a variety of other stocks are also involved (U.S. Fish and Wildlife Service, unpubl. data).

Individual aquaculture depredation permits will still be available on a case-by-case basis for dealing with damages caused by cormorants at commercial aquaculture facilities in States not covered by the depredation order. The Service will also consider adding additional States to the depredation order upon receipt of evidence that double-crested cormorants are responsible for significant economic losses at aquaculture facilities.

*Issue 4:* Wildlife Services thought that it was excessive and burdensome to require aquaculturists to contact one of its State offices to obtain certification of non-lethal harassment activities prior to implementing lethal control activities under the depredation order.

*Service Response:* Prior to implementing the lethal control activities authorized by this rule, an aquaculturist must obtain a statement from WS certifying that his or her facility has a cormorant depredation problem and that lethal take of cormorants is necessary to supplement existing non-lethal harassment efforts. This requirement does not differ substantially from the certification statement that the Service requires before issuing a depredation permit. The Service considers this a reasonable and prudent measure that will help to ensure that (1) the privileges and purposes of the depredation order are not abused; and (2) non-lethal harassment remains an essential part of integrated cormorant management activities at aquaculture facilities.

*Issue 5:* Both aquaculturists and environmentalists stressed the need for an accurate system for documenting the number of cormorants taken under the depredation order, and several environmental organizations recommended that the reporting requirements be strengthened.

*Service Response:* The rule requires that any person exercising the privileges of the depredation order must keep and maintain a monthly log recording the date and number of all birds killed each month under this authorization, that the log must be maintained for a period of three years (and that three previous years of takings must be maintained at all times thereafter), and that the log be

made available to Federal and State wildlife enforcement officers upon request. Any mandated reporting requirement would be difficult to enforce, and the submitted information difficult to interpret due to non-reporting bias. The Service intends to supplement the monthly log of cormorants shot with phone or mail surveys of a stratified random sample of aquaculturists. This survey is anticipated to provide more reliable and useful information on levels of take than reports submitted by individual aquaculturists. These surveys are also subject to OMB approval under the Paperwork Reduction Act of 1995.

*Issue 6:* Aquaculturists indicated a desire for a provision to allow the unintentional (or "incidental") take of similar species, while environmentalists pointed out that any such take would be a potential problem.

*Service Response:* Control actions taken under this order can be effectively implemented without killing other species of birds. Therefore, authorization to take is limited to double-crested cormorants. To the extent a person takes a bird or birds other than double-crested cormorants, it is a violation of the MBTA. In that event, the Service will exercise its discretion in determining what enforcement action, if any, is appropriate.

The Service will attempt to minimize the unintentional take of non-target species by (1) restricting shooting to daylight hours; and (2) working with WS and nongovernmental organizations to develop educational identification materials.

*Issue 7:* Aquaculturists interpreted the proposed rule as applying only to the owners of aquaculture facilities, which would make on-site implementation of the depredation order much more restrictive than that of existing depredation permits.

*Service Response:* The rule was intended to be applicable to landowners, operators, and tenants actually engaged in the production of commercial freshwater aquaculture stocks (plus their employees or agents). The wording of the depredation order has been changed to more accurately reflect this fact.

*Issue 8:* Many aquaculturists suggested that the depredation order be expanded to include other species of fish-eating birds, such as egrets and herons, that cause damage at aquaculture facilities.

*Service Response:* Of the approximately 46 species of fish-eating waterbirds that occur in freshwater habitats of the contiguous U.S., the

double-crested cormorant is by far the greatest economic threat to commercial aquaculture because of its abundant and increasing population, its attraction to certain types of aquaculture facilities, its habit of foraging in large flocks, and its ability to consume large quantities of fish daily (i.e., about 320 grams, or 0.7 pounds). This is reflected in the distribution of aquaculture depredation permits over the past decade.

Nationwide, double-crested cormorants have accounted for about 57 percent of the individual birds of all species reported taken under aquaculture depredation permits annually; this species is an even greater problem in the southcentral and southeastern U.S., where it has represented about 65 percent of all individuals taken at aquaculture facilities.

Other species frequently cited as causing damage at aquaculture facilities include the great blue heron (*Ardea herodias*), great egret (*Casmerodius albus*), and black-crowned night-heron (*Nycticorax nycticorax*). Based on a review of the available information, the Service does not believe that inclusion of these or any other species of fish-eating birds in the depredation order is warranted at this time. Individual depredation permits will still be available on a case-by-case basis for dealing with damages caused by other species of fish-eating birds.

Thus, while aquaculturists may take unlimited numbers of double-crested cormorants under the depredation order without need of a permit, they will still be required to obtain a depredation permit to take any other species that may be causing economic damages.

*Issue 9:* Aquaculturists noted that a prohibition against removing dead cormorants from the aquaculture facility at which they were killed would present logistical and potential health problems.

*Service Response:* The Service reviewed this issue and found no valid reason for prohibiting off-site disposal of carcasses. The depredation order has been reworded to allow both on-site and off-site burial or incineration of dead cormorants.

*Issue 10:* Many respondents in the aquaculture community felt that State agencies should have more authority in the management of aquaculture-cormorant depredation conflicts.

*Service Response:* There is a long tradition of Federal-State cooperation in the management of migratory bird populations. Typically, the Service issues broad regulatory guidelines (such as this rule) while individual States retain the authority to implement regulations that are more, but not less, strict than the Federal regulations. In

this regard, it is important to note that the depredation order does not authorize the killing of cormorants contrary to the laws or regulations of any State, and that the privileges of the depredation order may not be exercised unless the person possesses any appropriate State permits that may be required. The Service is committed to working closely with State (as well as other Federal) agencies in developing and implementing long-term solutions to the aquaculture-cormorant problem.

*Issue 11:* Widespread population management of the double-crested cormorant, including actions on the breeding grounds, was advocated by aquaculturists and WS to reduce the size of the North American population.

*Service Response:* A widespread, coordinated effort to reduce the cormorant population would be extremely labor-intensive and expensive, with little likelihood of long-term success. Furthermore, there is no guarantee that regional reductions in cormorant populations would reduce impacts at individual aquaculture facilities. The purpose of the depredation order is to provide individual aquaculturists an opportunity to deal with site-specific cormorant depredation problems in a timely and effective fashion, not to achieve a broadscale reduction in the continental double-crested cormorant population.

*Issue 12:* Aquaculturists noted that methods of lethal take other than shooting (such as netting and traps) may be effective in killing cormorants, and that such methods should be authorized in the depredation order.

*Service Response:* To the Service's knowledge, shooting with firearms has been the only method employed for the lethal take of cormorants in aquaculture settings. In the event that other effective and safe methods of taking cormorants are developed, the Service will consider adding these to the depredation order.

*Issue 13:* Aquaculturists requested authorization to use decoys, vocalizations, and other lures to bring cormorants into closer gun range.

*Service Response:* Anything that makes it easier to kill depredating double-crested cormorants by bringing them into closer range is considered beneficial to the purposes of the depredation order. Consequently, language has been inserted allowing the use of such devices.

The intent of this provision is not to lure cormorants onto aquaculture facilities from the surrounding landscape (which would clearly be counter-productive), but to make it easier to shoot birds that are already

present and committing or about to commit depredations on fish stocks.

*Issue 14:* Some aquaculturists suggested that the depredation order be expanded to include mariculture facilities located in brackish and saltwater situations.

*Service Response:* In the past decade, the Service has issued a very limited number of cormorant depredation permits to mariculture operations. The problems caused by cormorants to mariculture facilities are not well documented, and are not deemed to be of sufficient magnitude to warrant their inclusion in the depredation order at this time. Mariculture operators experiencing significant problems due to cormorant predation can still apply for individual depredation permits.

*Issue 15:* Efforts should be made to monitor the numbers of cormorants taken under the depredation order, as well as trends in cormorant populations.

*Service Response:* In addition to gathering information on the numbers of cormorants shot (see response to Issue 5), the Service intends to monitor potential impacts of the depredation order on regional and continental cormorant populations by means of: (a) Breeding Bird Survey and Christmas Bird Count trend data; (b) breeding colony survey data; (c) counts of cormorants on waterfowl breeding pairs surveys; and (d) analysis of band recovery data.

*Issue 16:* The National Audubon Society et al. and other environmental groups argued that non-lethal control techniques were effective in alleviating conflicts between cormorants and commercial aquaculture and should remain a high priority, while also expressing concern that the depredation order would effectively discourage aquaculturists from investing in non-lethal, long-term solutions to depredation.

*Service Response:* The Service has long recognized non-lethal control as the preferred alternative for dealing with cormorant damage complaints (Trapp et al. 1995), as has WS (Accord 1995). Of the many non-lethal (exclusionary and frightening) devices tested over the last decade, none has proven totally effective in deterring cormorants from aquaculture facilities. Typically, birds learn to avoid or ignore these devices in a relatively short period of time through habituation. Some form of behavioral reinforcement (such as limited lethal take) helps to reinforce and prolong the effectiveness of non-lethal deterrents. In reality, then, the take of limited numbers of birds will always have to be considered as a viable option in an effective, integrated

strategy for minimizing the deleterious effects of cormorants on aquaculture.

The depredation order does not absolve aquaculturists from the responsibility of employing non-lethal techniques (see response to Issue 4); rather, it simply provides them with another tool for application in an integrated management approach designed to reduce problems caused by cormorants at their facilities.

The Service believes that the aquaculture industry shares responsibility for alleviating bird depredation problems and that the industry should aggressively promote: (1) The design of new facilities (and the retrofitting of old ones where economically feasible) that exclude or repel cormorants; and (2) the use of nonlethal deterrents.

The Service also encourages WS to continue an aggressive research effort to develop effective nonlethal means of alleviating bird depredation problems in aquaculture.

*Issue 17:* The Ornithological Council and other scientific and environmental groups stated their opinion that there is very little good scientific data and no consensus on the extent and magnitude of the cormorant predation problem at commercial fish ponds.

*Service Response:* The Service believes that an objective review of the available scientific information (as presented in the **SUPPLEMENTARY INFORMATION** section) provides an accurate indication of the actual and potential problems caused by cormorants at commercial aquaculture facilities, as well as reliable figures on the magnitude of economic losses. In reviewing *Foraging Behavior of the Double-crested Cormorant at Aquaculture Facilities*, the Service synthesized data from 17 peer-reviewed scientific papers to summarize what is currently known about daily movements and activity budgets, feeding rates, diet composition, prey size, prey preferences, and daily food consumption rates. This information provides the basic background for understanding the nature of potential interactions between cormorants and aquaculture.

In assessing Impacts of Double-crested Cormorants on Aquaculture, the Service provided synopses of 12 peer-reviewed scientific papers that furnished information of a quantitative nature on actual or potential impacts. For the catfish industry, economic losses in the Mississippi Delta have been calculated by different methods as about 3 percent of total sales (Stickley and Andrews 1989) or about 4 percent of the estimated standing crop (Glahn and

Brugger 1995), and in Oklahoma as about 3–7 percent of sales (Simmonds et al. 1995). It is important to recognize that these are average values.

Cormorants rarely are distributed evenly over a given region, but rather tend to be highly clumped or localized. Thus, economic losses also tend to be clumped or localized, with a minority of growers suffering a majority of losses in a given year. Since the distribution and severity of economic losses is unpredictable from year to year, it is prudent to provide all aquaculture producers in the affected States an opportunity to avail themselves of the privileges of the depredation order.

The Service finds no reason to question the validity or conclusions of the scientific studies that it has reviewed, but acknowledges that others might interpret the same data differently. Although it agrees that better scientific information is always desirable, the Service must make management decisions using the best information available while relying on accepted ecological and wildlife management principles. The Service will continue to review new scientific studies documenting the impacts of double-crested cormorants on commercial aquaculture stocks as they become available.

*Issue 18:* The proposed action appeared to be an application for recreational hunting to Animal People, who viewed it as a pretext to kill double-crested cormorants for sport and revenge, not because they are genuinely a threat or problem.

*Service Response:* The Service is not establishing a recreational hunting program. Depredation orders are an established method for dealing with situations in which migratory birds are causing significant damage to human interests. Damages to freshwater commercial aquaculture stocks due to cormorant predation have been well documented in the scientific literature (see response to Issue 17).

A decision to propose establishment of a depredation order was made only after: (1) determining that there was documented scientific evidence that cormorants were indeed a source of severe economic losses at aquaculture facilities; and (2) evaluating 12 different potential management options for reducing the problem (U.S. Fish and Wildlife Service 1997). The depredation order was determined to be the best alternative. The depredation order authorizes the take of double-crested cormorants, under limited conditions, for the express purpose of reducing economic impacts to aquaculture facilities. This rule will allow

aquaculturists to shoot cormorants not for fun, but because they are causing damage to commercial fish stocks.

*Issue 19:* Many environmental groups believed that aquaculturists should modify their ponds to incorporate the use of physical barriers and other exclusionary devices to reduce the impacts of double-crested cormorants on fish stocks.

*Service Response:* This would be an ideal situation if economically feasible. But the reality is that requiring aquaculturists to retrofit existing ponds to accommodate physical barriers and other exclusionary devices would create an economic hardship for small businesses and local economies. Nevertheless, the Service encourages the aquaculture industry to aggressively promote the design of new facilities (and the retrofitting of old ones where economically cost-effective) that exclude or repel cormorants.

*Issue 20:* Concern was expressed by one environmental group that the depredation order would allow an aquaculturist to implement lethal control of cormorants regardless of whether or not they are a persistent threat and without having to demonstrate economic impacts due to cormorant predation.

*Service Response:* The proposed rule and the Environmental Assessment (U.S. Fish and Wildlife Service, 1997) established that double-crested cormorants can cause severe damage at aquaculture facilities under certain circumstances, and that lethal take (in conjunction with a suite of non-lethal harassment techniques) was an appropriate depredation control action. The depredation order merely provides individual aquaculturists the opportunity to deal with site-specific cormorant depredation problems in a timely and effective manner.

*Issue 21:* The National Audubon Society et al. and others stated that the proposed action does not acknowledge the seasonal nature of cormorant depredation problems, and suggested that authority to take cormorants should be limited to those months when depredation is most common.

*Service Response:* The intent of the depredation order is to give aquaculturists the flexibility to take double-crested cormorants whenever they are present at their facilities and committing or about to commit depredations on fish stocks. The Service anticipates that the take of depredating cormorants at aquaculture facilities will be self-limiting and directly related to the numbers of birds present (e.g., catfish producers in the southcentral and southeastern U.S. will take birds

primarily in the winter months, and baitfish producers in Minnesota will take birds primarily in the summer months). Thus, while the Service acknowledges the seasonal nature of cormorant depredation problems, it does not believe that seasonal restrictions are necessary.

*Issue 22:* The creation of a depredation order for the double-crested cormorant establishes a dangerous precedent for other bird species and is contrary to the purposes of the Migratory Bird Treaty Act.

*Service Response:* The MBTA provides strong measures for the protection and conservation of migratory birds, while at the same time providing opportunities for people to use the migratory bird resource for sport, recreation, and scientific endeavors. The MBTA also provides considerable flexibility for dealing with situations where birds may come into conflict with human interests, such as the aquaculture-cormorant situation (Trapp et al. 1995).

Depredation orders have been in place for various species of migratory birds since at least 1974. Brief descriptions of each of the existing depredation orders authorizing take of designated species without need of a Federal permit follow:

Blackbirds (*Agelaius* spp., *Euphagus* spp., *Xanthocephalus xanthocephalus*), cowbirds (*Molothrus* spp.), grackles (*Quiscalus* spp.), crows (*Corvus brachyrhynchus*, *C. caurinus*, *C. ossifragus*), and magpies (*Pica* spp.) "when found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance" (50 CFR 21.43).

Horned larks (*Eremophila alpestris*); golden-crowned, white-crowned, and other crowned sparrows (*Zonotrichia* spp); and house finches (*Carpodacus mexicanus*) "when seriously injurious to agriculture or other interests" in California (50 CFR 21.44).

Purple gallinules (*Porphyryla martinica*) "when found committing or about to commit serious depredations to growing rice crops" in Louisiana (50 CFR 21.45).

Scrub jays (western scrub-jays, *Aphelocoma californica*) and Steller's jays (*Cyanocitta stelleri*) "when found committing or about to commit serious depredations to nut crops" in Washington and Oregon (50 CFR 21.46).

*Issue 23:* Several organizations and individuals questioned why the current procedure of issuing individual depredation permits to aquaculturists

experiencing problems with cormorants was not adequate.

*Service Response:* Because of the administrative procedures involved in the issuance of permits, there may be lag time of several weeks between an aquaculturist's request for a permit and his or her receipt of a permit authorizing lethal take; in the interim, cormorant depredations can result in significant economic losses. The depredation order will allow aquaculturists to employ lethal take as soon as it becomes apparent that cormorant depredation is a problem.

*Issue 24:* The Ornithological Council expressed concern that the estimated take of 92,000 double-crested cormorants annually was "way too high," as it could represent a tremendous proportion of the North American population.

*Service Response:* The figure of 92,400 cormorants published in the proposed rule was a calculation of the potential maximum harvest, and was presented as a worst-case scenario. The Service estimates that adult and juvenile cormorants will be taken in proportion to their occurrence in the population, and that the annual take will never exceed 10 percent of the total population. Enactment of the depredation order is expected to result in only a modest increase in the number of depredating cormorants killed at aquaculture facilities under depredation permits (e.g., about 10,900 birds currently reported killed annually in the 13 affected States), and is not likely to have a detrimental impact on the population.

Cormorants are difficult to kill in large numbers, as indicated by one study (Hess 1994) in which investigators were able to kill only 11.6 percent of the number authorized (2,500) over a 19-week period. From 1989–1995, aquaculturists in the southeastern U.S. reported taking only about 65 percent of the cormorants that they had been authorized to take (Coon et al. 1996). Impacts of the depredation order on double-crested cormorants will be monitored by reviewing several independent sets of data (see responses to Issues 5 and 15).

*Issue 25:* The Wisconsin Society for Ornithology and others pointed out the value of bird band recovery information.

*Service Response:* Substantial numbers of double-crested cormorants have been banded on their breeding grounds. Recoveries of banded birds at aquaculture facilities provides valuable scientific information on the origin of birds causing depredation problems, and are potentially useful for documenting effects of the depredation

order on cormorants. Aquaculturists will be encouraged to submit band recovery information to the Bird Banding Laboratory via its toll-free telephone number.

*Issue 26:* The Arkansas Game and Fish Commission and several other respondents recommended that nontoxic shot be required for use in all control efforts using shotguns.

*Service Response:* The Service agrees, and language requiring the use of nontoxic shot has been included in the depredation order.

The detrimental impacts of lead shot on waterfowl and non-target species such as bald eagles (*Haliaeetus leucocephalus*), as well as secondary impacts on the environment, are well-documented (U.S. Fish and Wildlife Service, 1986). Based on this evidence, the Service adopted regulations (50 CFR 20.108) in 1991 requiring the use of nontoxic shot for hunting waterfowl, coots, and certain other species throughout the U.S. Recent studies (e.g., Locke et al. 1991, DeStefano et al. 1992, Elliott et al. 1992, Blus 1994, Daury et al. 1994, and Franson and Hereford 1994) further document lead poisoning in a variety of migratory bird species due to the ingestion of spent lead shot.

Holders of aquaculture depredation permits in Minnesota have been required to use steel shot since 1989, while permittees in the southeastern U.S. have not heretofore been required to use nontoxic shot. Beginning in 1998, all aquaculture depredation permits issued by the Service will require the use of nontoxic shot. As producers of commodity products marketed for human consumption, aquaculturists have a vested interest in maintaining high environmental quality standards on their facilities.

The 30-day delay between publication of this final rule and its effective date is provided by the Administrative Procedures Act (5 U.S.C. 553(d)). March is a critical time for the fish farmers as the cormorants congregate heavily in the areas in question feeding in preparation for the Spring migration north. Since this a peak depredation time on catfish, the Service is providing relief to the farmers by allowing a streamlined process of dealing with cormorant depredation. Further, the Service has been directed to move on this issue by report language from the House and Senate dated October 22, 1997, mandating that the Service effectively respond to this issue by January 1, 1998. Therefore, the Service believes good cause exists to waive the 30-day effective date.

### National Environmental Policy Act

In accordance with the National Environmental Policy Act of 1969, the Service prepared an Environmental Assessment, and issued a Finding of No Significant Impact. Copies of these documents are available from the Chief, Office of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, ms 634-ARLSQ, Arlington, VA 22203.

### Endangered Species Act Consideration

A consultation was conducted to ensure that actions conducted in accordance with the deprecation order will not likely jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of their critical habitat. Findings from this consultation are included in a biological opinion, which is available for public inspection at the address indicated under the caption ADDRESSES.

### Regulatory Flexibility Act, Executive Order (E.O.) 12866 and Paperwork Reduction Act

Based on the economic impacts discussed in "Impact of Double-crested Cormorants on Aquaculture," the Service determined under the Regulatory Flexibility Act of 1980 (5 U.S.C. 601 *et seq.*) that this rule would not have a significant effect on a substantial number of small entities, which include businesses, organizations and governmental jurisdictions. This rule was reviewed by the Office of Management and Budget under E.O. 12866.

The Service examined the rule under the Paperwork Reduction Act of 1995 and found that it does contain information collection requirements. OMB has issued the following emergency information collection number 1018-0087, which expires August 31, 1998. Information collection is required to better enable the Service to assess the benefits of the deprecation order on aquaculturists and to assess impacts to the double-crested cormorant population. Burden hours to aquaculturists are calculated as follows: An average of 41 birds may be taken by each of some 2,200 aquaculturists per season. An estimated total of 800 hours will be required to keep and maintain the monthly logs, and produce the logs for inspection, yielding an average of 22 minutes per aquaculturists per year.

### Unfunded Mandates

The Service has determined and certifies, in compliance with the requirements of the Unfunded Mandates Act, 2 U.S.C. 1502 *et seq.*, that this rule

will not impose a cost of \$100 million or more in any given year on local or State government or private entities.

### Civil Justice Reform—Executive Order 12988

The Department, in promulgating this rule, has determined that these regulations meet the applicable standards found in Sections 3(a) and 3(b)(2) of Executive Order 12988.

### References Cited

A complete list of all references cited herein is available upon request from John L. Trapp, Office of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, ms 634-ARLSQ, Arlington, Virginia 22203.

### Author

The primary author of this rule is John L. Trapp, Office of Migratory Bird Management.

### List of Subjects in 50 CFR Part 21

Exports, Hunting, Imports, Reporting and recordkeeping requirements, Transportation, Wildlife.

### Regulation Promulgation

Accordingly, the Service hereby amends part 21, Subpart D, of subchapter B, chapter I, title 50 of the Code of Federal Regulations, as set forth below:

#### PART 21—[AMENDED]

1. The authority citation for part 21 continues to read as follows:

**Authority:** Pub. L. 95-616, 92 Stat. 3112 (16 U.S.C. 712(2)).

2. Section 21.47 is added to Subpart D to read as follows:

#### SUBPART D—CONTROL OF DEPREDATING BIRDS

\* \* \* \* \*

##### § 21.47 Depredation order for double-crested cormorants at aquaculture facilities.

The Service examined the rule under the Paperwork Reduction Act of 1995 and found that it does contain information collection requirements. OMB has issued the following emergency information collection number, 1018-0097, which expires on August 31, 1998. Information collection is required to better enable the Service to assess the benefits of the deprecation order on aquaculturists and to assess impacts to the double-crested cormorant population. Burden hours to aquaculturists are calculated as follows: an average of 41 birds may be taken by each of some 2,200 aquaculturists per season. An estimated total of 800 hours

will be required to keep and maintain the monthly logs, and produce the logs for inspection, yielding an average of 22 minutes per aquaculturists per year. Landowners, operators, and tenants actually engaged in the production of commercial freshwater aquaculture stocks (or their employees or agents) in the States of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Minnesota, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas may, without a Federal permit, take double-crested cormorants (*Phalacrocorax auritus*) when found committing or about to commit depredations to aquaculture stocks on the premises used for the production of such stocks: Provided that:

(a) Double-crested cormorants may be taken by shooting during daylight hours only, and only when necessary to protect freshwater commercial aquaculture and State-operated hatchery stocks from depredation; none of the birds so taken may be sold; and all dead birds must be buried or incinerated, except that any specimens needed for scientific purposes as determined by the Director must not be destroyed, and information on birds carrying metal leg bands may be submitted to the Bird Banding Laboratory by means of a toll-free telephone number at 1-800-327-BAND (or 2263).

(b) Double-crested cormorants may be shot at freshwater commercial aquaculture facilities or State-operated hatcheries only in conjunction with an established non-lethal harassment program as certified by officials of the Wildlife Services' program of the U.S. Department of Agriculture's Animal and Plant Health Inspection Service.

(c) Double-crested cormorants may be taken with firearms only within the boundaries of freshwater commercial aquaculture facilities or State-operated hatcheries, and persons using shotguns are required to use nontoxic shot.

(d) Persons operating under the provisions of this section may use decoys, taped calls, or other devices to lure birds committing or about to commit depredations within gun range.

(e) Any person exercising the privileges of this section must keep and maintain a log recording the date and number of all birds killed each month under this authorization, that the log must be maintained for a period of three years (and that three previous years of takings must be maintained at all times thereafter), that the log and any related records be made available to Federal or State wildlife enforcement officers upon request during normal business hours.

(f) Nothing in this section authorizes the killing of double-crested cormorants

contrary to the laws or regulations of any State, and none of the privileges of this section may be exercised unless the person possesses the appropriate State permits, when required; nor the killing of any migratory bird species other than double-crested cormorants when committing or about to commit depredations to aquaculture stocks.

(g) The authority granted in this section will automatically expire on April 30, 2005, unless revoked or specifically extended prior to that date.

Dated: January 30, 1998.

**Donald J. Barry,**

*Acting Assistant Secretary for Fish and Wildlife and Parks.*

[FR Doc. 98-5485 Filed 3-3-98; 8:45 am]

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## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

#### 50 CFR Part 622

[Docket No. 970606131-8033-02; I.D. 041497C]

RIN 0648-AG25

#### Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic; Amendment 8

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Final rule.

**SUMMARY:** NMFS issues this final rule to implement the approved measures in Amendment 8 to the Fishery Management Plan for the Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic (FMP). These measures revise the earned income requirement for a commercial vessel permit for king or Spanish mackerel, establish a moratorium on the issuance of commercial vessel permits for king mackerel, extend the management area for cobia to include the exclusive economic zone (EEZ) off the states of Virginia through New York, specify allowable gear in the fisheries for coastal migratory pelagic resources, allow the retention of up to five cut-off king mackerel in excess of an applicable commercial trip limit, and add to the management measures that may be established or modified by the FMP's framework procedure. In addition, NMFS clarifies that a Federal vessel permit is not required for the use of a

sea bass pot north of Cape Hatteras, NC; clarifies what constitutes commercial fishing for the purpose of obtaining a commercial vessel permit; revises the definition of "charter vessel" to conform to a new definition of charter fishing in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act); and makes explicit the authority of NMFS to reopen a fishery that has been closed prematurely, i.e., prior to a quota having been reached. The intended effects of this rule are to protect king and Spanish mackerel from overfishing and maintain healthy stocks while still allowing catches by important commercial and recreational fisheries and to clarify and correct the regulations.

**DATES:** This rule is effective April 3, 1998, except that changes to § 622.4 are effective March 4, 1998.

**ADDRESSES:** Copies of the final regulatory flexibility analysis (FRFA) may be obtained from the Southeast Regional Office, NMFS, 9721 Executive Center Drive N., St. Petersburg, FL 33702.

Comments regarding the collection-of-information requirements contained in this rule should be sent to Edward E. Burgess, Southeast Regional Office, NMFS, 9721 Executive Center Drive N., St. Petersburg, FL 33702, and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), Washington, DC 20503 (Attention: NOAA Desk Officer).

**FOR FURTHER INFORMATION CONTACT:** Mark Godcharles, 813-570-5305.

**SUPPLEMENTARY INFORMATION:** The fisheries for coastal migratory pelagic resources are managed under the FMP. The FMP was prepared jointly by the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council (Councils) and is implemented under the authority of the Magnuson-Stevens Act by regulations at 50 CFR part 622.

On June 23, 1997, NMFS published a proposed rule to implement the measures in Amendment 8 and additional measures proposed by NMFS (62 FR 33800). The background and rationale for those measures are contained in the preamble to the proposed rule and are not repeated here. On July 23, 1997, NMFS partially approved Amendment 8. Two measures were not approved, namely, the removal of the current prohibition on the use of a drift gillnet in a directed fishery for coastal migratory pelagic fish north of Cape Lookout, NC, and revisions of the FMP's definitions of overfishing and overfished.

#### Drift Gillnets in Directed Fisheries North of Cape Lookout

NMFS disapproved the proposal to authorize the use of drift gillnets in directed fisheries for coastal migratory pelagic species north of Cape Lookout, NC, because Amendment 8 does not contain any rationale for such use. Specifically, Amendment 8 describes neither impacts on existing harvesters under the current prohibition on the use of this gear nor any benefits that would result from approving its use. Under section 303(a)(1) of the Magnuson-Stevens Act, an FMP must contain, among other things, the conservation and management measures that are necessary and appropriate for the conservation and management of the fishery. In addition, E.O. 12866 specifies that NMFS should promulgate only such regulations that are required by law, necessary to interpret the law, or are made necessary by compelling public need and must base its decisions regarding appropriate regulations on the best reasonably obtainable information concerning the need for, and consequences of, the intended regulations. Finally, the Administrative Procedure Act requires NMFS to incorporate in a final rulemaking a concise statement of its basis and purpose. Lacking information on the need for and consequences of the proposal to authorize the use of drift gillnets in directed fisheries for coastal migratory pelagic species north of Cape Lookout, NC, NMFS disapproved this measure.

#### Definitions of Overfishing and Overfished

NMFS disapproved the revised FMP definitions of overfishing/overfished for all coastal migratory pelagic species because they were found to be inconsistent with the Magnuson-Stevens Act definitions of overfishing and overfished, and with national standards 1 and 2. Specifically, reducing the overfished threshold from 30 percent to the 20 percent level of the spawning potential ratio (SPR) would allow the Councils to recommend a higher level of fishing mortality, which could jeopardize the capacity of the fisheries to produce maximum sustainable yield (MSY) on a continuing basis. Retention of the overfished threshold at the 30 percent SPR level, in combination with the Magnuson-Stevens Act mandate to rebuild an overfished stock within a definite time period if it falls below that threshold, will provide a more risk-averse management strategy for attaining MSY on a continuing basis than would be the case with the 20-