A Double-crested Cormorant (*Phalacrocorax auritus*) × Neotropic Cormorant (*P. brasilianus*) hybrid in Oklahoma

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Figure 1. Typical adult Double-crested Cormorant in breeding condition at Salt Plains National Wildlife Refuge, Oklahoma, 16 May 2008. The all-black plumage, bright orange supraloral and loral region, and bright orange gular pouch are all characteristic of breeding and post-breeding adults. The tail is relatively short (see Figure 6), and the tips of the scapulars are rounded. *Photograph by James W. Arterburn.*

Abstract

This paper describes an apparent Double-crested Cormorant (*Phalacrocorax auritus*) × Neotropic Cormorant (*P. brasilianus*) hybrid discovered on a nest at Ralstin Island, a 2.4-ha island on the northern section of Great Salt Plains Reservoir in the Salt Plains National Wildlife Refuge, Alfalfa County, Oklahoma on 16 May 2008. This adult bird, in definitive alternate plumage, was present in an area in which Double-crested Cormorants have been breeding since at least 1995 (Shepperd 1996). It also occurred in an area in which nests of Neotropic Cormorant were found on 16 May 2008, the first for the location, and where a few adult Neotropic Cormorants in alternate plumage have been observed during previous breeding seasons. Expansion of Neotropic Cormorant into the breeding range of Double-crested is discussed herein and is postulated as one circumstance that occasioned this heretofore undocumented hybrid combination.

Field encounter and description

On 16 May 2008, Shepperd, Arterburn, Jim Thayer, and Paul Bjornen were conducting a rookery survey on Ralstin Island in the Salt Plains National Wildlife Refuge, Alfalfa County, Oklahoma. Arterburn was photographing the second of two Neotropic Cormorant (*Phalacrocorax brasilianus*) nests on the island when he noticed and photographed an oddly plumaged cormorant on a nest in the same tree. This bird did not have the orange lores of a Double-crested Cormorant (*P. auritus*) but did have the orange gular pouch. However, the gular pouch appeared more angular at its rear terminus than is typical of Double-crested, and the bird had a few white filoplumes around the head and neck. At that time, he considered the possibility of a hybrid, but he thought that it was more likely an atypically plumaged Double-crested Cormorant.

After returning home, Arterburn examined his photographs of the odd cormorant and consulted references on identification of both species. After this review, he concluded the bird was very probably a hybrid. Ray Telfair, David Sibley, Victor Fazio, Alvaro Jaramillo, and others then examined photographs of the Oklahoma bird and all agreed that it was likely a hybrid; two others who reviewed the images, Michael Patton and Michael Morrison, were less certain that a hybrid was involved.

Arterburn and Shepperd returned to Ralstin Island on 27-28 May and 24 June 2008. Shepperd saw the hybrid cormorant for the first time on 27 May and concurred that the bird was a probable hybrid. The nest was in a dead Red Mulberry (*Morus rubra*) about 6 meters high and was located near the end of a branch. This individual was still sitting low on the nest and appeared to be incubating eggs on both dates. Hatch and Weseloh (1999) state the first young of Double-crested Cormorants appear approximately 30 days af-

ter the first eggs are laid. The 40-day interval between visits suggests that the eggs were probably not fertile.

Adult definitive-basic and definitive-alternate plumages in both cormorant species are adequately described in the literature (Palmer 1962, Oberholser 1974, Telfair and Morrison 2005, Hatch and Weseloh 1999, Harrison 1983, Harrison 1987, Enticott and Tipling 1997). In the summary below, we focus on the most useful features for distinguishing these species in the field: on the coloration and shape of the gular pouch, loral area, and bill; on the feathering of the head and neck; and on the proportions of body and tail.

Adult Double-crested Cormorants in definitive alternate plumage are distinguished by their bright orange to yellow-orange supraloral/loral region (that area above and anterior to the eye) and by their large, bright orange gular pouch with broad, rounded posterior border (Figure 1). Adult Neotropic Cormorants in definitive alternate plumage are distinguished by a relatively small horizontal gular pouch with a narrower, acutely angled posterior border, the pouch being pale yellowish brown in color and bordered thinly but prominently with white feathers. Adult Neotropics in breeding condition also have white filoplumes on sides of the head, neck, and sometimes the ventral region; the longest of these filoplumes are post-auricular. The supraloral/loral area has black feathering speckled with white feathering, as do the forehead and supercilium (Figure 2). Other features commonly mentioned as distinguishing characteristics between these two species include body size and shape, bill size, and tail length. The difference in body size and shape is helpful when the two species are together, but it is less helpful for identification of lone birds. In Neotropic, the tail length in proportion to body length is noticeably longer than in Double-crested; this difference is noticeable even on lone birds. Telfair and Morrison (2005) state that the tail length in Neotropic measures about two-fifths of body length, whereas in Double-crested it is about one-fifth. Double-crested Cormorants do have a longer and thicker bill than Neotropic Cormorants, but the difference is not always useful when trying to identify lone birds. However, a mark that we have not seen mentioned in the literature is the stark difference in bill shape: Double-crested's bill has a bulbous tip, which Neotropic's bill lacks. This gives the culmen of the Double-crested Cormorant a concave look, while the culmen on the Neotropic Cormorant has a straight or flat profile, as it lacks the bulbous nail. Finally, the shape of the scapular tips also differs between the species—rounded in Double-crested, more sharply pointed in Neotropic (Clark 1992)—and this appears to be diagnostic for birds in fresh plumage. Overall plumage color, eye and eyelid color, the color of the mouth lining, and the color of the legs and feet are less useful characteristics for identification, as there appears to be much overlap between the two species in these aspects, depending on age and breeding condition.

Figure 2. Typical adult Neotropic Cormorant in breeding condition at Salt Plains National Wildlife Refuge, Oklahoma, 16 May 2008. The white feathering surrounding the pale brown gular pouch and the white filoplumes about the head and neck are characteristic of breeding adults. *Photograph by James W. Arterburn*.

The Oklahoma cormorant described below, and shown in Figures 3–6, has features that are attributable to, or intermediate between, both species. Figures 3 and 4 show the large, bright orange-yellow gular pouch as in Double-crested Cormorant, but the rear border tapers to an acute angle more like that of Neotropic. There are no white feathers bordering the rear of the pouch, as would be present in an adult Neotropic in breeding condition. The Oklahoma bird lacks the bright orange supraloral/loral region of Double-crested but does show a small spot with a hint of orange in this area. The rest of the supraloral region has black feathering speckled with white, as in Neotropic. The forehead and supercilium also show some white feathering, as in Neotropic. The bird has white filoplumes on the sides of the head and neck

Figures 3, 4. Apparent hybrid cormorant at Salt Plains National Wildlife Refuge, Oklahoma, 16 May 2008. Notice the bright orange gular pouch and hint of orange in supraloral and loral region. The bill is smaller than that of Double-crested, with just a hint of a bulbous tip. *Photographs by James W. Arterburn.*

Figure 5. Apparent hybrid cormorant at Salt Plains National Wildlife Refuge, Oklahoma, 27 May 2008. Note the sharply pointed ends to the scapulars. *Photograph by James W. Arterburn.*

Figure 6. Apparent hybrid cormorant at Salt Plains National Wildlife Refuge, Oklahoma, 27 May 2008. Note the long tail in proportion to the body. *Photograph by James W. Arterburn.*

characteristic of Neotropic. The bill appears thin as in Neotropic but has a moderately bulbous tip, as in Double-crested. The sharply pointed scapular tips, diagnostic of Neotropic, can be seen in Figure 5, while Figure 6 shows the noticeably longer tail in proportion to body length, also as expected in Neotropic.

Behaviorally, this apparent hybrid and the Neotropic Cormorant that was on a nest in the same tree never flushed even when we walked under the nests to the base of the tree. However, the six Double-crested Cormorants that were on nests in the same tree always flushed when we got within 8-9 meters. A second Neotropic Cormorant on a nest on another part of the island also never flushed, regardless of how closely we approached. All Double-crested Cormorants on nests throughout the island would flush before we walked within 8-9 meters' distance.

Discussion

As has been abundantly documented in regional reports of the present journal, populations of both species of cormorant have been expanding in many parts of the continent, and extralimital records have also increased. Double-crested Cormorant, the most numerous and most widely distributed cormorant in North America, is also the only cormorant species to occur in large numbers in the continent's interior (Hatch and Weseloh 1999). Neotropic Cormorant is also widely distributed but is found mostly in the tropics from southern North America, the Caribbean, and Central and South America to Cape Horn (Enticott and Tripling 1997). In North America, the breeding range of Neotropic Cormorant covers the southern states from southern Arizona to southwestern Louisiana and extends northward through north-central Texas into southeastern Oklahoma and southwestern Arkansas (Telfair and Morrison 2005). These two species are the only cormorants regularly found in the interior of North America, and so it is not unexpected that they would form mixed colonies, particularly because their nesting habits are similar. In the Bahamas, a small subspecies of Double-crested Cormorant (*P. a. heuretus*) coexists with Neotropic Cormorant, and this situation needs study (Hatch and Weseloh 1999).

Both species show variation in size, plumage, or both over their large ranges. In Double-crested Cormorant, there is considerable variation in size and in the color of the crest. The size of the crest increases from south to north along both coasts and also from east to west across the interior. Darkness of feathering and the proportions of black and white in the nuptial plumes of the crest varies geographically, with southeastern birds having an all-black crest, northeastern birds having occasional white or parti-colored plumes, especially mid-continental populations; southern Pacific birds show frequent white plumes, while those from northern Pacific areas often have all-white plumes (Palmer 1962). Neotropic Cormorants vary in size, with the smallest occurring in North America, Mexico, Central America, and the Bahamas, and the largest occurring in extreme southern South America (Palmer 1962). Double-crested and Neotropic Cormorants are thought to be closely related and are treated as allospecies by Sibley and Monroe (1990); however, they have not been known to interbreed either in captivity or at breeding colonies where the two occur together (McCarthy 2006).

Hatch and Weseloh (1999) note that Double-crested Cormorant is currently expanding but mostly within its historical range and is a rare breeder in Louisiana. They also note that until recently, Double-crested Cormorant was the only cormorant to occur in large numbers in the interior. Telfair (2006) indicates that Double-crested Cormorants were first discovered breeding in Texas in 1926, followed by a gap in documented breeding from 1939 to 1974, whereas all known U.S. colonies of Neotropic Cormorant were along the Texas

and Louisiana coast from 1883 through 1973, with most of those along the upper Texas coast. From these data, it would appear that Double-crested and Neotropic Cormorants were geographically isolated in the United States for some time.

Double-crested Cormorants have bred locally at scattered localities in the Great Plains. They have long been noted nesting at Cheyenne Bottoms Wildlife Management Area in central Kansas, Kirwin Reservoir and Glen Elder Reservoir in north-central Kansas (Thompson and Ely 1989), Salt Plains National Wildlife Refuge in north-central Oklahoma, and Robert S. Kerr Reservoir in eastern Oklahoma (Baumgartner and Baumgartner 1992), with recently documented nesting colonies at Quivira National Wildlife in central Kansas, Wolf Creek Reservoir in eastern Kansas (Busby and Zimmerman 2001), and Lake Eufaula in eastern Oklahoma (Reinking 2004).

Telfair and Morrison (2005) note that since 1974, inland breeding colonies of Neotropic Cormorants have been established in Texas, New Mexico, Arkansas, Oklahoma, and Arizona. In recent decades, Neotropics have wandered widely in the Great Plains as far north as northern Saskatchewan, the upper Midwest, including Minnesota, and the Northeast as far north as southeastern Pennsylvania. This species was first confirmed breeding in Kansas at Cheyenne Bottoms Wildlife Management Area in August 2007 (Corder 2008) and first confirmed breeding in Oklahoma at Ward Lake in 2001 (Reinking 2004). Confirmed breeding was observed at the Salt Plains National Wildlife Refuge in May 2008 (Arterburn and Shepperd, present paper).

Hybridization at the Salt Plains may be a local phenomenon resulting from Neotropic Cormorant's rarity relative to Double-crested there. Mayr (1965) considers this scenario a typical circumstance that would drive hybridization between species that have species-specific courtship displays and extended pair bonds. Arterburn and Grzybowski (2003) speculated that these were the conditions that led to hybridization between Glossy Ibis (*Plegadis falcinellus*) and White-faced Ibis (*P. chihi*) at this same site in 2002. With the expansion of Neotropic Cormorants into areas with breeding populations of Double-crested Cormorants, and this apparent hybrid found at the Salt Plains National Wildlife Refuge, one expects that more such hybrids will be detected. If the expansion of Neotropic Cormorant into new areas continues, the frequency with which this hybrid combination occurs will likely depend on the effectiveness of isolating mechanisms between the two species.

Conclusions

A single adult *Phalacrocorax* cormorant with characters intermediate between Double-crested and Neotropic Cormorant was found at the Salt Plains National Wildlife Refuge in northwestern Oklahoma in May 2008. Given the rarity of Neotropic Cormorant at the Salt Plains, this case suggests that hybridization may occur at other regional locations where Neotropic in rare relative to Double-crested, such as Red Slough Wildlife Management Area in Oklahoma, Cheyenne Bottoms Wildlife Management Area and Quivira National Wildlife Refuge in Kansas. In eastern Texas and southwestern Louisiana, where Double-crested Cormorants are known to breed and/or are rare relative to Neotropic Cormorants, hybridization may also occur. The current expansion of Neotropic Cormorant into the breeding range of Double-crested (including extralimital single Neotropic Cormorants), and the documentation of this apparent hybrid, raise cautions for identifying extralimital cormorants. Observers of apparent Neotropic Cormorants out of typical range—and even within its U.S. range—should study them carefully for features that may suggest hybrid derivation. Documentation systems are critical elements in assessing the distributional patterns of both species and particularly of Neotropical Cormorants. Submission of photographs and written descriptions to state and provincial records committees will be important for these assessments.

Acknowledgments

We thank Joseph A. Grzybowski who reviewed, and greatly improved, an earlier version of this paper. We also thank Ray Telfair, David Sibley, Victor Fazio, Alvaro Jaramillo, Michael Patton, and Michael Morrison for review and comments on the initial photographs. The views represented in this document are the authors; and do not necessarily reflect those of the United States Fish and Wildlife Service.

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