

Water Regurgitation by Adult Double-crested Cormorants: A Possible Mechanism to Assist in Chick Thermoregulation

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Abstract.—A previously undocumented thermoregulatory behavior of adult cormorants for their pre-fledged young was recorded during observations of a Double-crested Cormorant (*Phalacrocorax auritus*) colony in Lake of the Woods, Ontario. Many adult cormorants were observed regurgitating water over their chicks' bodies. The authors believe that the warm temperature, intense sun, and calm winds during the observation periods were the primary factors triggering this previously undocumented thermoregulatory behavior. Received 16 May 2007, accepted 18 September 2007.

Key words.—chick, Double-crested Cormorant, *Phalacrocorax auritus*, evaporative cooling, thermoregulatory behavior, water.

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Wing drooping (Johnsgard 1993) and gular fluttering (Lasiewski and Snyder 1969) are commonly observed thermoregulatory mechanisms utilized by cormorants (*Phalacrocorax* spp.) during warm and windless conditions. Additionally, cormorants and the Australian Darter (*Anhinga melanogaster*) have been reported to regurgitate water into their chicks' open mouths (van Tets 1959, 1965; Vestjens 1975). Observers conducting demographic studies of Double-crested Cormorants (*Phalacrocorax auritus*, hereafter termed cormorants) during the summers of 2006 and 2007 recorded a previously undocumented thermoregulatory behavior of adult cormorants for their pre-fledged young.

OBSERVATION

The authors witnessed this thermoregulatory behavior while observing a colony of about 280 cormorant pairs from a blind on an island less than one km north of Lemon Island in Lake of the Woods (approximately 7 km south of Kenora, Ontario, Canada) on 22 July 2006 and again on 23 July 2007. At 12.00 h the weather was recorded as 26°C and 30°C (2006 and 2007 respectively), partly cloudy skies, and no wind. The 30 year daily average temperature for July was 19.5°C (min. 14.5, max. 24.4) and the average daily wind speed was 13.1 km/h (Environment Canada 2007).

All cormorants (adults and older chicks) were gular fluttering and the adults tending nests were shading or brooding their chicks. At 13.00 h in 2006, a color banded 3-year-old cormorant was observed regurgitating what appeared to be clear water into the mouths of its two chicks, as well as over their bodies. The adult had just returned to its nest and had wet plumage. The water regurgitation process was similar to food regurgitation whereby the lower abdomen was flexed inward and the upper body and neck were extended toward the chick. After scanning the colony, many other adult cormorants were noticed regurgitating water into their chicks' mouths and over their bodies. From 13.00-15.15 h, observers noted that $\geq 20\%$ of the adults were regurgitating water over their chicks' bodies at any given time. Although one adult was observed regurgitating water into its chick's mouth and onto its body at 18.50 h, this behavior had basically ceased by 16.00 h when the temperature began to noticeably cool. This same behavior was repeated during the 2007 observation.

DISCUSSION

The previously documented thermoregulatory behaviors of wing drooping, gular fluttering, and adults regurgitating water into their chicks' open mouths were recorded during the observation periods on 22 July

2006 and 23 July 2007 (van Tets 1959, 1965; Lasiewski and Snyder 1969; Vestjens 1975; Johnsgard 1993). The authors found no reference of adult cormorants regurgitating water over their chicks' bodies to aid in thermoregulation through evaporative cooling. Dunn (1976) reported that parental brooding of chicks ceases at about two weeks of age when effective internal temperature regulation is attained by cormorant nestlings. However, most of the chicks in this colony were about four weeks of age at the time of these observations. If the adult cormorants had not performed these behaviors, the authors feel that many of the chicks may have died due to heat stress. The authors believe that the warm temperature, intense sun, and calm winds were the primary factors triggering this previously undocumented behavior.

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