Effects of Double-crested Cormorants on a nest tree at a newly formed colony

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Observation

On the sunny afternoon of 7 July 2019, I was paddling my canoe at Big Crow Lake in Algonquin Provincial Park (*Nipissing District*) when I noted the unusual appearance of an Eastern White Pine (*Pinus strobus*, henceforth "pine") that was growing near the lake's edge on a point. The pine stood an estimated 25 m in height. Its base was situated approximately 2 m above the water level and 4 m overland from the water's edge. The tree was interesting as the central portion of its otherwise live crown seemed devoid of foliage (Figure 1). The pine was closely surrounded by other, shorter trees, mainly Eastern Hemlock (*Tsuga canadensis*) and Northern White Cedar (*Thuja occidentalis*) standing to a maximum of two thirds of the pine's height, with minor representation of Balsam Fir (*Abies balsamea*) and White Birch (*Betula papyrifera*). Speckled Alder (*Alnus rugosa*) grew immediately along the waterline. As I approached, I noticed that there were three substantial stick nests in the tree; two of the nests were placed in crotches formed by two or more large branches adjoining the main trunk, one nest approximately 2 m above the other and on the opposite side of the trunk from the first; a third nest was situated in a fork along a large branch approximately 3 m away from the trunk. An adult Double-crested Cormorant (*Phalacrocorax auritus*) was sitting on the latter nest. As I paddled around the tree for a better view, I saw a second adult bird sitting on the lower of the two nests by the trunk and then a third bird perched on a branch 2 m above the upper nest (Figure 2). From these circumstances, I deduced that the pine held an active cormorant colony comprised of three nests and that the sitting birds were either incubating eggs or brooding young. I did not notice the same tree in this general state (nor nests or cormorants) during my last visit to this site in July 2017.

Figure 1. The white pine tree with a small colony of Double-crested Cormorants at Big Crow Lake in Algonquin Provincial Park, Ontario, on 7 July 2019. Circles indicate the three nests. Note that the nearby branches are nearly devoid of pine needle foliage.

Photo: Justin Peter

Figure 2. Three nests of Double-crested Cormorants (lower three circles) at Big Grow Lake in Algonquin Provincial Park, Ontario, on 7 July 2019. Cormorants were sitting on the two lower nests while a third cormorant (top circle) was perched on a branch above the uppermost nest. Again, the reduction in needle foliage can be seen on branches extending outward from the area of the nests.

Photo: Justin Peter

I was interested in how the sparse appearance of the tree might relate to the cormorants' presence. With 8x42 binoculars, I determined that the nests appeared to be composed entirely of pine branches with needles attached. The needles were rust-coloured, indicating that the twigs had been dead for at least a few weeks. The near-absence of live twigs with needles within proximity of each nest and along the large branches closest to the nests up to approximately 1 m from the large branches' tips suggested that the birds had foraged for live twigs from this very tree, gathering what they were able to break off while perched as close to the nest site as possible and only so far from the trunk as the branches might support their weight. I examined the mainly bare large branches and counted over 50 discrete points where pine resin glistened brightly in the sunlight. I deduced that these were the points where the cormorants had broken off twigs they would use in their nests, and the fact the resin glistened suggested that the birds had removed the twigs earlier during the current breeding season. The live twigs in the lower crown within 3 m of the trunk seemed to bear a yellowish cast as distinct from the vibrant green of the foliage on the crown periphery and in the upper crown above the nests. I could not discern whitewash in the discoloured area and could form no conclusions as to whether the needles were yellowed, or covered by a fine spray of guano, or both. There was whitewash visible on branches immediately below each nest and a branch adjacent to one nest was covered with guano. I estimated that the pine

Figure 3. Speckled Alder foliage beneath the nest tree of the colony of Double-crested Cormorants at Big Crow Lake in Algonquin Provincial Park, Ontario, on 7 July 2019, showing scattered guano deposition. *Photo: Justin Peter*

had made approximately 25 cm of height growth in the current season. At the shoreline below, there was light, scattered guano deposited on alder foliage approximately 6 m from the base of the pine (Figure 3). I did not notice any guano on the ground below the nest tree.

Discussion

The Double-crested Cormorant is a habitually colonial bird; males select a nest site on the ground or in a tree and once it is accepted by a female, the pair proceeds to build the nest using various materials including seaweed, sticks and extraneous materials (Dorr *et al.* 2020). Tree-nesting cormorants prefer to use tall trees (Koh *et al.* 2012, Lafferty *et al.* 2016) and Eastern White Pine is the preferred species in Algonquin Park (Tozer 2012). It is well established that tree-nesting cormorant colonies can have adverse effects on their nest trees and other vegetation in their midst, and perennial occupation by large numbers of birds can result in the death of the nest trees (Hebert *et al.* 2005, 2014, Koh *et al.* 2012). I was curious as to whether — given the young age of this colony — the effects on the nest tree thus far would be detrimental. Cormorants impact live nest trees in various ways; first, as seen here, they will preferentially collect twigs from the host tree, by stripping branches within proximity of the nest (Lemmon *et al.* 1994). It stands to reason that the removal of live foliage beyond a certain volume would irreversibly impact the pine's photosynthetic capacities and, therefore, self-maintenance abilities. Based on a visual approximation of the remaining twig volume in the pine's crown and what had already been harvested to construct the three nests, I would estimate that there remained sufficient and accessible live twigs to support the construction of four to six additional cormorant nests in this tree and using twigs from this tree alone. In considering the impacts of the related Great Cormorant (*Phalacrocorax carbo*) in Europe on pines as nesting trees, Goc *et al.* (2005) suggested that a pair would require 12.7 kg of pine twigs (dry mass) to construct a nest, and that most of this quantity was in fact dropped and not retrieved. Assuming a pine contained 30 kg of needles (Suliñski 1997 in Goc *et al.* 2005), the supply of materials from the nest tree itself would be quickly exhausted. I was unable to find information on the maximum percentage of canopy loss that an Eastern White Pine can withstand. Observations of ice storm damage to this species suggest that compared to other species, notably various hardwoods, Eastern White Pine does not readily re-sprout branches following their removal (Brommit *et al.* 2004), so twig loss due to nest construction would represent a permanent reduction of photosynthetic capacity.

Cormorants may also impact nest trees through guano deposition. It has long been assumed that guano deposition is the means by which Double-crested Cormorants kill nest trees (Palmer 1962). More recent authors reaffirmed the impact of guano deposition at colonies of the Great Cormorant to be more important than cropping of nesting materials (Klimaszyk and Rzymski 2016). The importance of guano deposition is reinforced by observations of this same cormorant species on roost trees — where the birds do not nest nor collect twigs — and which eventually die anyway as guano accumulates. However, most such observations have been conducted at colonies or roosts consisting of at least tens of birds, not a few pairs, and colony density of nesting birds appears to be an important factor in the degree of impacts observed (Koh e*t al.* 2012, Klimaszyk and Rzymski 2016). Guano may impact the tree directly through whitewash deposition on the tree, blocking sunlight and impeding the leaf's biochemical processes, as well by changing the soil chemistry when guano reaches the ground (Lemmon *et al.* 1994). The negative effects on nest trees appear to be invariably progressive in large colonies (Koh *et al.* 2012). Detrimental effects of guano were not readily apparent at the site described in this note, neither on the nest tree nor on the surrounding understory.

It is premature to make any pronouncements about the future impacts that this new cormorant colony may have on the nest tree or surrounding habitat. Subsequent, finer and systematic observations of such a colony might provide additional insights into the pathways to habitat alteration occasioned by cormorants, notably if it remains a small colony. I believe this observation is significant in detailing the early environmental impacts on a nest tree at a cormorant colony site in Ontario and vividly illustrating what we understand about the nest construction process in this species.

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Literature Cited

Brommit, A.G., N. Charbonneau, T.A. Contreras and **L. Fahrig.** 2004. Crown loss and subsequent branch sprouting of forest trees in response to a major ice storm. Journal of the Torrey Botanical Society 131:169-176.

Dorr, B.S., J.J. Hatch and **D.V. Weseloh** 2020. Double-crested Cormorant (*Phalacrocorax auritus*), version 2.0. *In* The Birds of the World (A.F. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York, USA. https://doi.org/10.2173/bow.doccor.01

Goc, M., L. Ilyszko and **L. Stempniewicz.** 2005. The largest European colony of the Great Cormorant on the Vistula Spit (N Poland) — an impact on the forest ecosystem. Ecological Questions 6:93-103.

Hebert, C.E., J. Duffe, D.V.C. Weseloh, E.M.T. Senese and **G.D. Haffner**. 2005. Unique island habitats may be threatened by Double-crested Cormorants. Journal of Wildlife Management 69:68-76.

Hebert, C.E., J. Pasher, D.V.C. Weseloh, T. Dobbie, S. Dobbyn, D. Moore, V. Minelga and **J. Duffe**. 2014. Nesting cormorants and temporal changes in island habitat. Journal of Wildlife Management 78:307-313.

Klimaszyk, P. and **P. Rzymski**. 2016. The complexity of ecological impacts induced by great cormorants. Hydrobiologia 771:13-30.

Koh, W., A. Tanentzap, G. Mouland, T. Dobbie, L. Carr, J. Keitel, K. Hogsden, G. Harvey, J. Hudson and **R. Thorndyke.** 2012. Double-crested Cormorants alter forest structure and increase damage indices of individual trees on island habitats in Lake Erie. Waterbirds 35(Special Publication 1):13-22.

Lemmon, C.R., G. Bugbee and **G.R. Stephens**. 1994. Tree damage by nesting Double-crested Cormorants in Connecticut. Connecticut Warbler 14:27-30.

Lafferty D.J.R., K.C. Hanson-Dorr, A.M. Prisock and **B.S. Dorr.** 2016. Biotic and abiotic impacts of Double-crested Cormorant breeding colonies on forested islands in the southeastern United States. Forest Ecology and Management 369:10–19.

Palmer, R.S. 1962. Handbook of North American Birds, Volume 1. Yale University Press. New Haven, Connecticut. 567 pp.

Suliñski, J. 1997. The amount of biomass as a function of the height and density of a tree stand. Pp. 85-90 *in* Proceedings 3rd National Conference on Applications of Mathematics in Biology and Medicine, Mądralin, Poland 1997 Sep 16.

Tozer, R. 2012. Birds of Algonquin Park. The Friends of Algonquin Park. Whitney, Ontario. 474 pp.

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