Effect of Altered Salmonid Stocking Methods on Cormorant Predation in Eastern Lake Ontario

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The impact of predation by double-crested cormorants (Phalacrocorax auritus) on stocked salmonids in the eastern basin of Lake Ontario is of considerable concern to fishery managers and the sport fishing community alike. Many thousands of brown trout (Salmo trutta) and lake trout (Salvelinus namaycush) have been stocked in the eastern basin over the past decade for put-grow-and-take fishery (brown trout) and restoration (lake trout) purposes (Eckert and Schneider 1998). Predation of newly stocked salmonids by double-crested cormorants has been frequently observed in eastern Lake Ontario but poorly quantified, at least in the case of brown trout. Estimates of losses from lake trout stocking events were 13.6% and 8.8% in 1993 and 1994 (Ross and Johnson 1995, in press). Since then stocking techniques were altered spatially (stocked further off shore) to reduce predation by the opportunistic double-crested cormorant. The purpose of this study is to determine whether the altered stocking strategy successfully reduced predation on economically and ecologically important salmonids in the eastern basin of Lake Ontario.

Methods

On 21 May 1998 37,000 yearling brown trout and 92,700 yearling lake trout were stocked during the day from a barge off Stony Point 8-9 km from Little Galloo Island (LGI), well within the foraging range of the LGI cormorant population. No other salmonid stockings took place in the eastern basin of Lake Ontario within 5 days of this stocking event. On three subsequent days (days 1, 2, and 4 post-stocking) approximately 150 cormorant pellets were collected each day from LGI and identified for fish species and number, as was done in previous years (Ross and Johnson 1995) to quantify salmonid stocking losses. The number of salmonids of each species eaten by cormorants at LGI was estimated by first determining the proportion of all pellets produced on a given day at LGI that were sampled (e.g., 151 pellets sampled/11,678 pellets produced = 0.01293). An estimate of the total number of pellets produced per day at LGI was determined by assuming two adult birds per nest, one pellet produced per adult per day, and using the 1998 nest count for LGI of 5,839. Then the ratio of the number of salmonids of a given species found in the sampled pellets to the total number of salmonids of that species eaten (i.e., those found in all pellets produced at LGI on a given day: x) was equated to the ratio of the proportion of pellets sampled to total pellets produced (e.g., 2 brown trout/xbrown trout = 0.01293/1). Predation over a 4-day (rather than a single-day) period was then determined from knowledge of relative predation rates on lake trout as a function of day post-stocking (Ross and

Johnson 1995; Figure 2). A comparison was then made for both species to similar stocking events in 1993 and 1994, i.e., those taking place from the same location in eastern Lake Ontario and for which pellet collections were made at LGI within 4 days of the stocking events.

Results and Discussion

Estimated 4-day post-stocking predation on brown trout and lake trout by cormorants at LGI in 1998 was 189 (0.5%) and 0 (0%), respectively (Table 1). Previous analyses of lake trout stocking losses benefitted from the return of coded wire tags, in addition to otoliths or other diagnostic hard tissues, in sampled pellets. Since counts of lake trout based on coded wire tags were somewhat higher than those based solely on diagnostic hard tissues, 1998 lake trout stocking losses are probably underestimated. In addition, double-crested cormorants from other breeding colonies, though much further from the stocking site than LGI, could have foraged and eaten salmonids near the Stony Point stocking location. Thus the 1998 estimates should be considered conservative. Even accounting for such additional potential predation, it is unlikely losses would exceed 1-2% for brown trout and <1% for lake trout.

For brown trout our data do not allow a comparison of predation rates for shore stocking versus barge stocking. However, data presented by Eckert (1998) for 1997 showed barge stocked-fish were nearly four times more abundant in the sport fishery than were shore-stocked fish. Clearly stocking of brown trout by barge in 1998 resulted in insignificant losses of fish due to the cormorant population at LGI. In the case of lake trout, switching from shore to barge stocking appeared to reduce predation by double-crested cormorants at LGI somewhat (13.6 to 8.8%), but other (unknown) factor(s) may have further reduced the impact of LGI cormorants by 1998 as well (8.8 to 0%).

These results suggest that current stocking practices for brown trout and lake trout result in little opportunity for cormorants in eastern Lake Ontario to exploit stocked fish. Added costs incurred from implementing these practices appear to be readily justifiable.

References

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Table 1. Comparison of stocked salmonid losses due to double-crested cormorants from Little Galloo Island (LGI). All stockings are of brown trout and lake trout from Stony Point shore or barge, approximately 8-10 km from LGI.

Salmonid/Cormorant	**Brown Trout**	**Brown Trout**	**Lake Trout**	**Lake Trout**	**Lake Trout**
Variable	**1994**	**1998**	**1993**	**1994**	**1998**
Date of stocking	June1	May 21	May 25	June 3	May 21
Type of stocking	barge	Barge	shore	barge	barge
No. fish stocked	17,860	37,000	40,000	117,000	92,700
No. cormorant pellets examined	156	447	132	116	447
Adult cormorant population at LGI	7,490		10,796	7,490	11,678
Predation due to cormorant at LGI					
Loss estimate (no. fish)	0	189	5,453	10,296	0
% of stocking	0	0.5	13.6	8.8	0