ECOLOGY AND MANAGEMENT OF DEPREDATING BLACKBIRDS IN ONTARIO FIELD CORN

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INTRODUCTION

Blackbird damage to field corn in southwestern Ontario has been a problem for farmers for many years (Whitney 1954; Dyer 1968). Historically, Kent and Essex counties were the major corn-growing regions in Ontario, and the most significant centers of corn depredation by blackbirds were in these counties. However, the development of new short-season cultivars has afforded the expansion of field corn production and corn depredation problems throughout southern Ontario. The Ontario Ministry of the Environment (OME) provided funding commencing in 1976 in response to these increased instances of corn depredation for a 4-year research program on the importance, ecology and control of blackbirds.

OME, as the registration body for pesticides in Ontario, required efficacy data for Avitrol® (4-aminopyridine) and Mesurol® (methiocarb); and this was provided. However, the ultimate objective was to develop a management plan for control of depredating blackbirds. Dyer (1976) emphasized the importance of obtaining information on blackbird biology and behaviour in conjunction with control programs. Thus chemical trials in Ontario to reduce blackbird depredation of field corn (Joyner et al. 1980; Somers et al. 1981a) were completed in conjunction with ecological studies (Gartshore et al. 1982a, 1982b; Somers et al. 1981b, Struger et al. 1983). This report is a compilation of ecological considerations of the chemical control studies, and includes data from Joyner et al. 1980, Somers et al. 1981a, b, and unpublished data.

Specific objectives included: (1) evaluate the efficacy of chemical repellents in relation to bird pressure; (2) examine temporal patterns of crop depredation by red-winged blackbirds *(Agelaius phoeniceus);* (3) examine the relative importance of the sex and age-classes in crop depredation; (4) investigate the foraging dispersal patterns of marked birds; (5) determine if a fidelity for foraging habitats exists; and (6) recommend management (control) programs for blackbird depredation in Ontario.

STUDY AREA AND METHODS

Field studies were conducted in Kent (1976) and Simcoe counties (1977-79; Fig. 1). Applications of 4-aminopyridine (4-AP) in 1976 were made to 5 fields (2-20.3 ha; 3-12.2 ha) on different farms. Bait was applied by hand-operated cyclone seeders. The Simcoe county 4-AP trials in 1977 involved 8 sites treated manually (cf. 1976), and 8 sites selected randomly totaling 74.2 ha were treated aerially (Piper Pawnee aircraft with Venturi spreader). All applications followed the regulations specified by the EPA registration label, and every effort was made to maintain a practical approach to the 4-AP trials.

Six fields (2.1-4.1 ha) in Simcoe County were sprayed with 75% methiocarb (W.P.) via Piper Pawnee aircraft fitted with spray booms and Micronair nozzles. Treatment levels (see Table 2) were varied to control costs, and were assigned randomly. Both 4-AP and methiocarb trials used nontreated (control) areas of equal size containing the same corn varieties for comparison of treated areas. Specifics of experimental design, damage assessment and statistical analysis are detailed in Joyner et al. 1980 and Somers et al. 1981a.

Pilot studies with Starlicide® and α-chloralose were completed in Simcoe County in 1979 to assess the potential for lethal control of blackbirds at foraging sites. Two corn fields (6.1 and 4.1 ha) utilizing 8 and 6

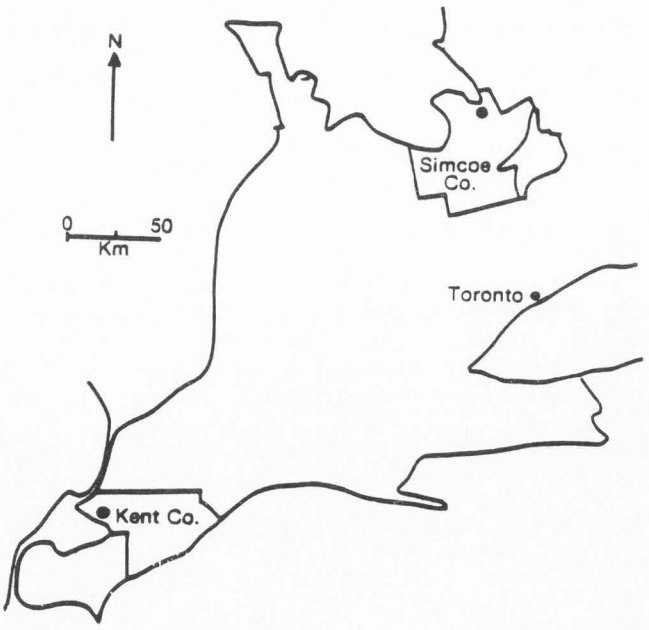

Figure 1. Ontario Blackbird Study Areas

ground bait-stations (350 m^2) respectively were treated with a total of 136 and 91 kg of bait proportioned over 6 applications from 22 August through 7 September. Total application averaged 22.2 kg/ha/site. Two additional fields of ca 4 ha each were selected as controls and were observed over the same time period. Efficacy of Starlicide® treatments was evaluated by observation of fields to estimate changes in bird visitation, by searching treated fields and adjacent areas for dead birds, by monitoring the roost population, and by assessing crop damage upon termination of baiting.

One field of 1.6 ha was used for the α-chloralose trial. Bait was prepared by mixing 10 g α-chloralose with 1 kg of screened cracked corn (2-4 mm) and 20 ml mineral oil yielding a 1% (wt/wt) mixture. Twelve 1-kg lots were prepared separately by mixing the oil with the corn and then mixing small amounts of α-chloralose into the oil-corn preparation. A homogeneous mixture was obtained by placing all 12 lots in a plastic bag within a cardboard drum and rolling for 15 min. Half the field (0.8 ha) received a 6-kg application of treated bait on 31 August and 4 September yielding a total level of 15 kg/ha. Two swathes of ca. 750 m^2 were baited in the initial application, while three-500 m^2 areas received bait during the second application in an effort to increase bait distribution. The remaining 0.8 ha of the study field served as the non-treated control area. Efficacy was assessed by 30-min observations of bird pressure followed by searches for stupified or dead birds, and by estimating corn damage.

BIRD MARKING AND OBSERVATION

Red-winged blackbirds in 1978 and 1979 were marked with salmon pink patagial tags (10.5 cm × 3.0 cm) or a similarly coloured leg tag and tagging followed a predetermined code that allowed differentiation of age and sex. Sightings of colour-tagged birds were obtained from opportunistic observations, by driving all roads up to 11 km from the roost; by completing a stratified random sampling (Steel and Torrie 1960) survey, and during monitoring of radio-tagged birds.

In 1978, 8 male red-winged blackbirds equipped with radio transmitters were each monitored for 3 to 26 days. In 1979, 10 male red-winged blackbirds and 1 starling were monitored. Capture, instrumentation and tracking procedures are detailed in Somers et al. 1981b. Only the observations of three male red-winged blackbirds and one male starling *(Sturnus vulgaris)* are reported herein. Other birds were followed for only short time periods. All movement studies were completed in Simcoe County.

RESULTS AND DISCUSSION

The potential foraging population of blackbirds in the Kent County study area was estimated at over 1 million birds, while in Simcoe County the 3-year average was about 100,000 birds. Although some individual corn fields are always more susceptible than the average to depredation, the vast monocultural corn acreages in Kent County provide extensive alternate feeding areas for foraging birds. In contrast, individual corn fields and the overall acreages grown in Simcoe County are smaller, thus alternate sites for repellent stressed birds are not available. This increased foraging pressure is illustrated on comparision of corn damage data of Tables 1 and 2. A cost-benefit analysis of 1977 4-AP trials (Table 2) revealed that, regardless of bird pressure, corn growers could not be assured of effective economical protection with the commercially available 1% 4-AP repellent. Similarily, methiocarb was not effective nor economical for bird control in field corn (Table 3). Lack of alternate feeding areas may have forced foraging blackbirds to feed in repellent-stressed areas; however, environmental factors were also involved.

Table 1. Effect of 4-AP treatment on blackbird damage to corn in Kent (1976) and Simcoe (1977) Counties, Ontario.

Treatment[a]	County[b]	Damaged ears (%)	Damage per ear (%)	Damage per ear (row-cm)
Control		33.1	1.3	4.2
4-AP	Kent	20.7	0.6	1.8
Δ		12.4	0.7	2.4
Control		47.5	9.1	24.8
4-AP	Simcoe	32.6	5.3	14.4
Δ		14.9	3.8	10.4

[a] Treatment means/county/variable are different ($P<0.05$).
[b] Five fields in Kent Co. and 16 fields in Simcoe Co./treatment.

Colour-tag sightings indicated that red-winged blackbirds were selecting foraging sites on the basis of availability and maturity of crops (Table 4). No tagged birds were observed in winter wheat fields totalling 31 ha and comprising all the wheat grown within 7 km of the blackbird roost (16 July - 2 August 1979). Red-winged blackbirds were present in standing wheat on only 5 of the 64 observations in 1979, and in only 2 of the 5 fields. Wheat matures earlier than oats or barley, consequently, wheat may not be a nonpreferred crop (Martin 1977), but the period of susceptibility of wheat to depredation may be out of synchronization with the timing of group foraging by red-winged blackbirds. Sightings of colour-marked after-hatching-year and hatching-year males (Figs. 2, 3) and females (Fig. 4) suggested that all age and sex-classes of red-winged blackbirds were depredators of corn. Monitoring of radio-equipped hatching-year males confirmed the colour-tag sightings (Fig. 5), and further implicated all age-classes as depredators of cereal crops.

Two radio-equipped males in 1979 moved 3.9 and 7.6 km, respectively, to new foraging areas. During a 26-day period 1 adult male red-winged blackbird monitored in 1978 (Table 5) made 8 visits to the same cornfield, and then subsequently established an equally strong preference for cornfields 4.8 km from its original foraging area. These observations of changing site fidelities suggested that considerable turnover of

Table 2. Cost:benefit analysis of 4-AP efficacy, Simcoe County, Ontario, 1977.

Location[c]	Loss (kg/ha)[a]			Benefit analysis ($/ha)[b]		
	NA	A	Δ	Benefit	Cost	Net
1	521	521			10.53	-10.53
2	509	170	339	23.22	10.53	12.69
3	1488	998	490	33.57	10.53	23.04
4	521	502	19	1.30	10.53	-9.23
5	998	1017	-19	-1.30	10.53	-11.83
6	998	1004	-6	-0.41	10.53	-0.94
7	1017	1017			10.53	-10.53
8	44	44			10.53	-10.53
9	170	170			16.59	-16.59
10	1017	38	979	67.06	16.59	50.47
11	170	521	-351	-24.04	22.12	-46.16
12	170	44	126	8.63	16.59	-7.96
13	1563	521	1042	71.38	22.12	49.26
14	521	170	351	24.04	22.12	1.92
15	170	521	-351	-24.04	16.59	-40.63
16	509	170	339	23.22	16.59	6.63

[a] NA = no treatment; A = 4-AP treatment; Δ = difference between treated and untreated values.
[b] Canadian $ and field corn market value of $68.60/tonne.
[c] Locations 1-8 ground treated, 9-16 aerial treated.

Table 3. Damaged ears (%), and cost:benefit analysis of methiocarb efficacy, Simcoe County, Ontario, 1977.

Site[a]	Damaged ears (%)	Loss (kg/ha)[b]		Value in dollars[c]		
		NT	M	Benefit	Cost	Net
1	82.2	1,996	1,996		113.85	-113.85
2	97.2	3070	3070		113.85	-113.85
3	93.5	2028	1500	36.17	185.14	-148.97
4	94.2	2078	2624	-37.40	185.14	-222.54
5	28.0	521	521		37.95	-37.95
6	55.0	998	1017		37.95	-39.25

[a] Sites 1, 2, single application @ 2.81 kg A.I./ha; Sites 3, 4, 2.81 kg A.I./ha and 2nd application @ 1.68 kg A.I./ha; Sites 5, 6, single application @ 2.81 A.I./ha to ½ of field area.
[b] NT = no treatment; M = methiocarb.
[c] Canadian $, and field corn market value of $68.50/tonne.

Table 4. Temporal utilization of habitat types by colour-tagged redwinged blackbirds, Coldwater, Simcoe County, Ontario, 1978 and 1979. Values in parentheses are percents.

Week of	N[a]	Corn	Oats	Wheat[b]	Old Field	Pasture Hay	Other[c]
July							
16	13	1(8)	3(23)	-(0)	1(8)	4(31)	4(31)
24	33	1(3)	12(36)	3(9)	-(0)	12(36)	5(15)
31	43	6(14)	25(58)	-(0)	1(2)	8(19)	3 (7)
Aug.							
7	61	17(28)	23(38)	8(13)	-(0)	3(5)	10(16)
14	44	17(39)	15(34)	-(0)	7(16)	-(0)	5(11)
21	50	43(86)	3(6)	-(0)	-(0)	1(2)	3(6)
28	37	36(92)	-(0)	-(0)	-(0)	-(0)	1(3)
Sept.							
4	53	53(100)	-(0)	-(0)	-(0)	-(0)	-(0)
Total	334	174(52)	81(24)	11(3)	9(3)	28(8)	31(9)

[a] N = 334 total sightings; 1978 N = 208; 1979 N = 126.
[b] Wheat stubble, not standing or swathed crop.
[c] Other = trees, ditches, fences, gardens.

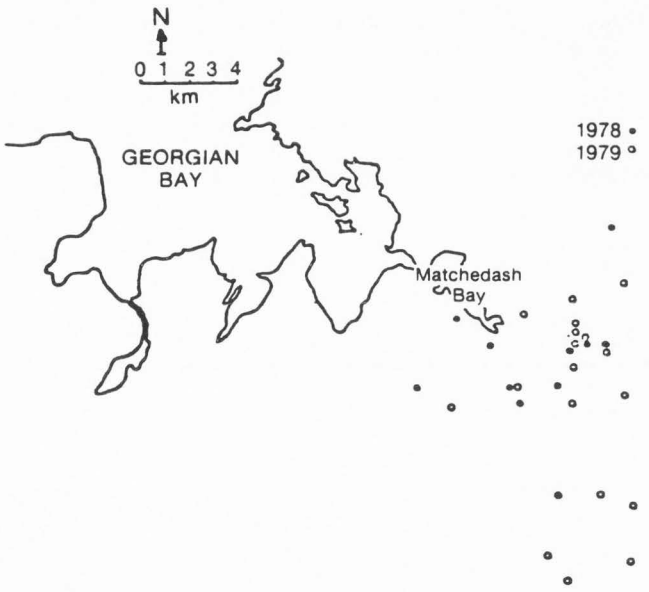

Figure 2. Distribution of colour-tagged after-hatching-year male red-winged blackbird sightings, Coldwater, Simcoe County, Ontario, 1978 (•) and 1979 (0).

individuals may be occurring during the term of a crop's susceptibility to depredation. Dyer (1976) proposed that without alternate foraging areas repellents would not be effective. Martin (1977) suggested that control will not be efficacious if a rapid learning process has to occur each time new individual birds enter a field. Thus, the turnover suggested by the current telemetric study when considered with the proposals of Dyer (1976) and Martin (1977) may partially explain the reduced efficacy of chemical repellents in Simcoe County (Joyner et al. 1980; Somers et al. 1981a).

Concurrently, this apparent turnover of individuals suggested that flocks removed by lethal control at corn fields may be replaced by new foraging groups. Thus, treatment of corn fields with lethal compounds instead of repellents may be a viable option for bird control in some areas in Ontario. Pilot studies using Starlicide® and α-chloralose were completed to evaluate this hypothesis.

Application of Starlicide® at foraging sites did not reduce depredation (Table 6); however, altering the carrier (cf. 4-AP) may have potential. Although the trial was limited in size, application of α-chloralose

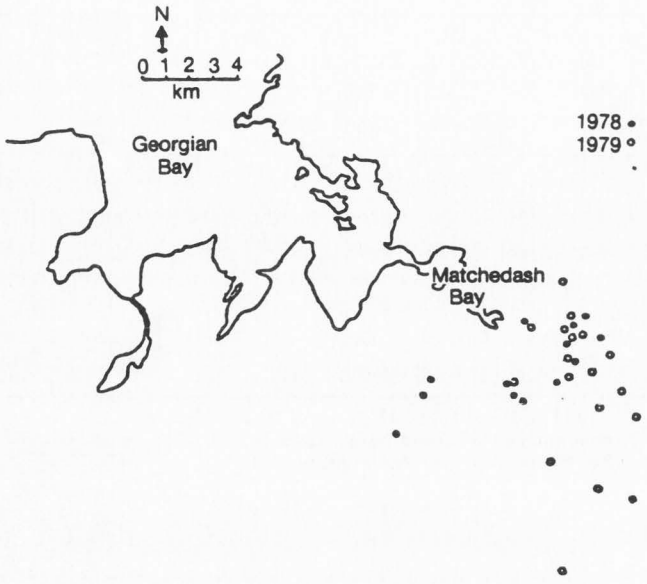

Figure 3. Distribution of colour-tagged hatching-year male red-winged blackbird sightings, Coldwater, Simcoe County, Ontario, 1978 (•) and 1979 (0).

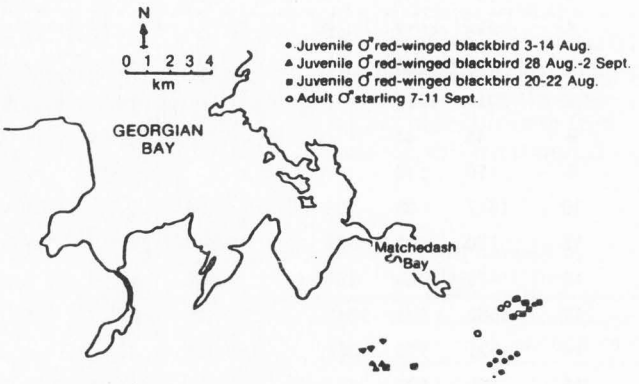

Figure 5. Movements of three radio-equipped hatching-year male red-winged blackbirds (•, 3-14 August: ▲, 28 August - 2 September, ■, 20-22- August) and one radio-equipped adult male starling (0, 7-11 September), Coldwater, Simcoe County, Ontario, 1979. Overlaps in position indicate sightings in same grid area.

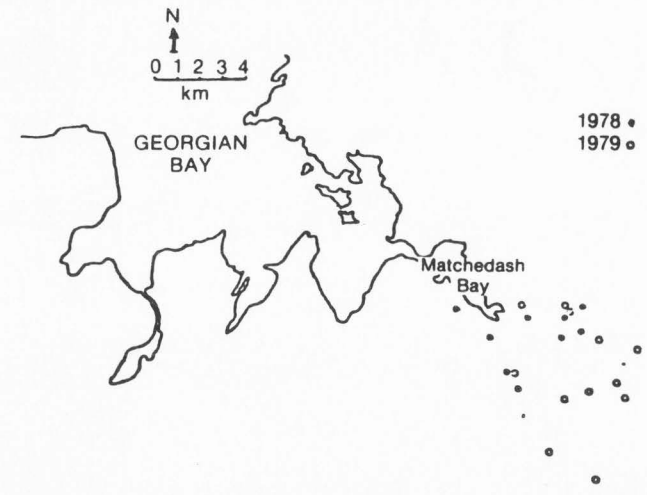

Figure 4. Distribution of colour-tagged female red-winged blackbird sightings, Coldwater, Simcoe County, Ontario, 1978 (•) and 1979 (0).

reduced ($p < 0.05$) bird damage in field corn (Table 6) indicating potential for lethal bird control, and a need for further study. Recovery of 18 starlings from the α-chloralose treated field, observation of foraging starlings, and telemetric monitoring (Table 5) indicated that starlings were depredators of corn.

The 18 adult starlings recovered represented 27.3% of all stupified birds, with the majority (61.1%) males. Forty-seven red-winged blackbirds and 1 grackle *(Quiscalus quiscula)* were recovered from the treated field. Only 27 (40.9%) of the 66 birds recovered were dead or subsequently died. The radio-equipped starling visited 5 different cornfields 11 times in 5 days (Table 5), and returned to the capture site 6 times. The number found was small, however, previous definitive evidence of starlings foraging in standing corn crops had been lacking. Affected birds could have left the study field prior to being stupified or dying, and the pilot study was small, thus the results must be treated with caution. Regardless, the hand-on evidence of starling depredation raises concern about the nature and impact of blackbird control efforts that are attempted without an evaluation of the potential role of other species. Simplistic management plans may even increase the severity of a depredation problem (Dolbeer et al. 1978).

We concluded that management strategies must (1) be integrated and not be age or sex specific, (2) may require growers to alter cultural practices, (3) may focus upon the roosts and/or foraging sites, (4) should consider the impact and efficacy of repellent or lethal chemicals at these control centers, and (5) be aware of the potential ecological consequences (e.g., replace-

Table 5. Distance moved from the roost and frequency of visitation of habitat types by three radio-tagged male red-winged blackbirds and by one male starling, Simcoe County, Coldwater, Ontario.

Species-age[ab]	Year (date)	No. of areas visited[c]	Mean distance (km)	Crop	Times visited	Days visited
RWB-AHY	1978	6	3.9	*Corn*	26	14
	(4 Aug. – 5 Sept.)	2	3.9	*Oats*	10	10
		6	4.1	*Trees, ditch, field, hay*	9	6
RWB-HY	1979	3	4.0	*Corn*	7	5
	(3-4 Aug.)	2	4.4	*Oats*	4	3
		7	4.3	*Trees, ditch, field, hay*	9	5
RWB-HY	1979	5	4.4	*Corn*	12	5
	(28 Aug. – 2 Sept.)	1	3.2	*Trees*	2	2
St-AHW	1979	5	3.2	*Corn*	11	5
	(7–11 Sept.)	2	3.1	*Trees, hay, field*	3	2

[a] RWB = red-winged blackbird; ST = starling.
[b] AHY = after hatching year; HY = hatching year.
[c] Each area = 6.25 ha.

Table 6. Efficacy of Starlicide® and α- chloralose treatments as measured by % damaged ears, row-cm damage, and % damage per ear.

Treatment[a]	Damaged ears (%)	Damaged (row-cm)	Damage (%)
Starlicide[b]	85.7	69.2	25.3
None	67.0	43.7	16.1
α-chloralose[c]	50.0	35.9	11.7
None	63.0	62.9	19.3

[a] Respective treatments cf. no treatment are different ($p < 0.05$).
[b] Mean of 2 fields/treatment.
[c] One 1.6 ha field was treated with α-chloralose.

ment of red-winged blackbirds by other depredating avian species, and impact of roost control on nontarget species).

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