EXPERIMENTS WITH ALPHA-CHLORALOSE TO CONTROL HARMFUL BIRDS

By Janine Cyr

In a bird population study at the Mirabel airport, Quebec, Canada, four species of birds were thought to be hazardous to aircraft because of their abundance and habits (McNeil et al., 1973). These were Starling (*Sturnus vulgaris*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), and Brown-headed Cowbird (*Molothrus ater*). An experimental study on the use of alpha-chloralose, a stupefying substance, on these birds was performed near the airport in 1972 and 1973 to determine if the chemical could be used to control the pest birds without endangering other species.

Due to its physical and physiological properties, alpha-chloralose has proved a reliable substance to control birds. Its properties and effects on some species of animals are described by Giban (1950), Murton et al. (1963), Thearle (1969a), and the authors listed by them. Alpha-chloralose has been widely used in England for local control of harmful birds, such as Rock Doves (*Columba livia*) and House Sparrows (*Passer domesticus*) and for crop protection (Ridpath et al., 1961; Murton et al., 1963; Cornwell, 1966; Thearle, 1968, 1969a, 1969b). The method was also tried in France on Magpies (*Pica pica*), crows and other birds harmful to agriculture (Daude, 1942; Giban, 1947). In Sweden, Borg (1955, cited by Ridpath et al., 1961) successfully captured crows, magpies, pigeons, and gulls with alpha-chloralose. Caithness (1968) has used it to control Great Black-backed Gulls (*Larus dominicanus*) near an airport in New Zealand. The method has also been employed in banding experiments with corvids (Giban, 1950) and Canada Geese (*Branta canadensis*) (Crider and McDaniel, 1966, 1967) or simply as a practical technique for the capture of wildlife (Williams, 1966; Williams et al., 1966).

Our experiments on the Starling, the Red-winged Blackbird, the Common Grackle and the Brown-headed Cowbird took place in two stages: preliminary trials during the post-reproductive flocking period or during fall migration of 1972 and main experiments during the spring migration of 1973. This last period was the most advantageous time to control harmful birds because the method enables capture of breeding individuals, reduces the reproductive rate of the controlled species and thus, reduces the post-reproductive flocks. Furthermore, in the region studied, spring has the advantage that the birds have limited feeding places during this period because most of the ground is covered with snow.

MATERIALS AND METHODS

We selected areas where the species had been seen feeding in migratory flocks. Pre-baiting was required (Ridpath et al., 1961), grains being scattered in quadrats. Bait used was wheat, oats, corn, and turkey pellets. The fields treated with alpha-chloralose

were visited regularly (at least twice a day) in order to collect the stupefied birds and observe their behavior. Less affected individuals were caught in small nets. Most of the authors (Ridpath et al., 1961; Williams, 1966; Caithness, 1968) recommend removing excess bait after a drugging operation to reduce danger to other species. This was impossible in our case because the bait was widely scattered.

The birds were then weighed and banded on the right leg with an aluminum band from the Canadian Wildlife Service and marked on the left leg with a colored band. For each bird, sex, age, and degree of intoxication were determined (for the description of the stages of narcosis, see Ridpath et al., 1961; Giban, 1950). Stupefied birds were kept in large cages until they recovered and could be released. The colored band enabled us to follow the movements of the released birds.

The two known methods for preparing the treated baits were tested: (1) applying a sticky substance (a mineral oil at 14 cc/kg) to the grains, adding the powdered alpha-chloralose slowly and mixing thoroughly (Murton et al., 1963; Williams et al., 1966; Crider et al., 1968); (2) dissolving alpha-chloralose in warm water, adding the grains and heating until the grains absorbed the solution (Giban, 1950, 1966).

Alpha-chloralose was obtained from "Les Etablissements Kuhlman, Paris" for $12.00 per kilo. We used the commercial form called "alpha-chloralose Codex," which only contains traces of para-chloralose (responsible for convulsions during narcosis; Chevalier and Cherbuliez, 1924).

RESULTS AND DISCUSSION

Preliminary trials

Fall trials permitted capture of only one species successfully, the Common Grackle. It was caught in three different field types (Table 1). In the case of the pasture, the results obtained with the dosage 0.35% are of no significance because the grackles were attracted not by the field itself but by bread fed to the cattle. Many individuals (1,500) were observed in the harvested corn field, but the pre-baiting operations postponed the beginning of the trials with alpha-chloralose and then, too small quadrats were used, thus limiting the captures. The flock was afterwards attracted by a recently harvested oat field, but because the flock visited the baiting site irregularly, captures were successful on only a few days.

Success of the operations (the proportion of the number of birds caught at one baiting site during one visit to the total number of birds seen on this occasion) could only be calculated on one day and only in the harvested oat field. On 6 September, 188 of approximately 500 individuals were caught. The efficiency was 37%. Including the birds seen affected but which escaped capture (65), the success amounted to 50%, a satisfying figure considering the limited equipment available and working conditions (Cyr, 1975).

Oats have been less successful than corn in capturing Common Grackles. This should not be attributed to the low visibility of the

TABLE 1.

Details and results of preliminary trials with alpha-chloralose on the Common Grackle during the fall of 1972

Site	Dosage rate[1]	Bait	Quantity bait used (kg)	Technique to prepare treated bait	No. birds caught	No. birds escaping capture	Total
Pasture	.16	corn	5	solution method	3	4	7
Pasture	.25	corn	2	solution method	2	1	3
Pasture	.35	corn	5	solution method	184	24	208
Harvested corn field	.35	corn	6	solution method	64	6	70
Harvested oat field	.30	corn	6	solution method	6	5	11
Harvested oat filed	.30	corn	30	coating method	333	115	448
Harvested oat field	.25	oat	7	solution method	13	22	35

[1]Alpha-chloralose (g/100g grain)

grain, because the birds were feeding in flocks on sheafs of oats before the trials began. Because many individuals fed in the field where oats were offered, we conclude that the quantity of grains was insufficient, although many more individuals were caught in one pasture with about the same quantity of grains (corn).

The use of quadrats to capture an abundant species like the Common Grackle proved inconvenient. Grains should be scattered on a surface as large as possible, preferably on a whole field. Prebaiting was considered unnecessary because the baits used are already part of the species' diet in the fall (McNeil et al., 1973). It postponed the beginning of the trials with alpha-chloralose and thus reduced the number of catches.

The coating method for preparing the treated bait was more convenient than the solution method. It allowed simpler and faster bait preparation and more grains could be prepared at one time with our equipment (Cyr, 1975). Murton et al. (1963) and Thearle (1969b) suggested the use of this technique because the grains need not be digested before the absorption of alpha-chloralose. The inconvenience is that rain can dissolve part of the alpha-chloralose (Thearle, 1969b). But this can be considered a safeguard for other species by preventing effective bait from remaining on fields for long periods when uneaten by the birds (Thearle, 1969b).

No Starling was captured during the fall trials due to its feeding habits. It was not attracted by the types of grain bait offered. Invertebrates make up 65 to 80% of its food during the fall in the Mirabel airport area (McNeil et al., 1973). Plant matter of the bird's diet includes other types of grains than the ones used (McNeil

et al., 1973) and only a small proportion of oats. Turkey pellets should be avoided as bait because they easily dissolve in rain.

Only seven Red-winged Blackbirds were caught during the preliminary trials. The problem with this species was to choose convenient baiting sites. These could not be sites where the species fed because the Red-wings fed in nonharvested fields during our experiments. We tried unsuccessfully to attract the birds to neighboring fields. The Brown-headed Cowbird was more difficult to study because of its smaller numbers compared to the three other species in the area (McNeil et al., 1973). Trials carried out with corn and oats did not lead to any capture, although this species eats oats (McNeil et al., 1973).

Main Spring Experimentation.

(a) Success of the operations.

Spring baiting operations were begun in the middle of March when enough migratory birds were in the Mirabel airport area. The beginning of the operations could vary from year to year, depending on what time migration starts. Oats and corn treated at dosages varying from 0.75 g/100 g to 2.0 g/100 g were used. The different baiting sites studied were pasture, harvested hay field, harvested oat field, and harvested corn field. Grains were scattered on surfaces where snow had melted, making the use of quadrats unnecessary. Pre-baiting was not performed. The technique would be improved if the treated baits were mechanically prepared and scattered on fields.

The number of captures of each species (Table 2) more accurately reflects the success of the operations on each one than the abundance of the species in the area. The Starling is 9 to 10 times more abundant in the area than the Red-winged Blackbird, 15 times more

TABLE 2.

Results of the spring trials with alpha-chloralose on the four species studied in 1973.

Species	No. birds caught	No. birds escaping capture	Total
Starling	382	88	470
Red-winged Blackbird	724	153	877
Common Grackle	571	163	734
Brown-headed Cowbird	165	59	224

abundant than the Common Grackle, and 25 times more abundant than the Brown-headed Cowbird (McNeil et al., 1973), but fewer Starlings were caught than were Red-winged Blackbirds or Common Grackles.

An accurate assessment of the success for each operation is impossible because the number of individuals that fed in the experi-

mental fields could not be determined for each visit. Furthermore, usually the four species fed together, and it was practically impossible to evaluate the relative proportion of each species without disturbing the birds and affecting the captures. I decided to estimate the success for each species according to a mean proportion of each species in mixed flocks. This mean proportion was based on data collected by the ornithological team of EZAIM (Ecologie de la zone du nouvel aéroport international de Montréal; see McNeil et al., 1973) in the spring of 1972 on the number of birds of each species in mixed flocks. This proportion was 17% for the Starling, 25% for the Red-winged Blackbird, 20% for the Common Grackle, and 38% for the Brown-headed Cowbird. The values calculated in the case of the mixed flocks (Table 3, data from 30 March on) are certainly not completely accurate, but at least they represent approximations.

The success of the trials on the Starling was always low (0.3, 2, 4%) in the case of large flocks (300, 150, 200 individuals, respectively) and increased slightly with the reduction of the flock's size or when only few individuals are feeding. Never were high values reached. The Starling is a very "nervous" species. It never stays for a long time at one feeding site and readily flies away at any disturbance (McNeil et al., 1973 and personal observations; Cyr, 1975). The method would therefore be inappropriate for controlling large flocks of Starlings.

The main reason for the trials' failure, however, is the feeding habits of the Starling. A study by F. Patenaude-Pilote (pers. comm.) on the feeding habits of the four species in the airport area has proved that the diet of the Starling already consists of 50% insects in March and of 75% in April. The Starling is thus poorly attracted by grain in spring, even if food is scarce.

The results for the Red-winged Blackbird and the Common Grackle show much variation. We believe, however, that the lower percentages do not correspond to a reduced success of the method, but are due either to short feeding times, to a low visibility of the grain on the feeding sites, or to small surfaces covered by the bait. Because most captures occurred in one field where visibility of the grain was good and which was largely covered by bait, we conclude that the low percentages should be attributed to the first cause. The 44% and 55% values (Table 3) for the Red-winged Blackbird, 51% and 59% for the Common Grackle, although not completely accurate, are acceptable and satisfying considering that all of the work was done by only two persons and with limited equipment. The 83% and 95% values are apparently high, but under optimal conditions, it sholud be possible to attain such results.

For the Brown-headed Cowbird, success does not exceed 20%. Results are difficult to explain. Assessment of the success was based on the mean proportion of the species in mixed flocks. This mean proportion (38%) is higher than the one calculated for the three other species. According to my observations, however, the Brown-headed Cowbird was apparently less abundant in flocks than the other three, but unfortunately this can not be confirmed. F. Patenaude-Pilote (pers. comm.) believes that the Brown-headed Cow-

TABLE 3.

Results on the success of the method on the four species studied during the spring trials of 1973.

Date	Site	No. birds observed feeding	No. birds caught	Success (%)
		Starling		
16 March	Pasture	150	3	2
17 March	H. oat field	10	1	10
18 March	H. hay field	60	2	3
18 March	H. hay field	11	1	9
18 March	H. oat field	10	1	10
19 March	H. hay field	30	1	3
19 March	H. hay field	65	3	5
19 March	H. oat field	60	1	2
20 March	Pasture	300	1	0.3
20 March	H. hay field	40	4	10
20 March	H. oat field	70	0	0
22 March	Pasture	40	4	10
22 March	H. hay field	6	1	17
22 March	H. oat field	50	6	12
27 March	H. hay field	7	1	14
30 March	H. corn field	30	3	10
31 March	H. corn field	17	1	6
1 April	H. oat field	200	8	4
2 April	H. corn field	8	1	13
3 April	H. oat field	34	1	3
7 April	H. corn field	34	9	26
8 April	H. corn field	31	0	0
		Red-winged Blackbird		
17 March	H. oat field	60	3	5
30 March	H. corn field	44	24	55
31 March	H. corn field	25	0	0
2 April	H. corn field	12	0	0
3 April	H. oat field	50	2	4
7 April	H. corn field	50	22	44
8 April	H. corn field	46	38	83
		Common Grackle		
30 March	H. corn field	35	18	51
31 March	H. corn field	20	6	30
2 April	H. corn field	10	0	0
3 April	H. oat field	40	1	3
7 April	H. corn field	40	38	95
8 April	H. corn field	37	22	59
		Brown-headed Cowbird		
30 March	H. corn field	66	13	20
31 March	H. corn field	38	3	8
2 April	H. corn field	19	0	0
3 April	H. oat field	76	3	4
7 April	H. corn field	76	11	14
8 April	H. corn field	70	11	16

bird does not eat corn in the spring in the airport area, but eats oats. Unfortunately time did not allow us to make enough observations to obtain satisfactory results with oats. More trials should be conducted on this species to confirm, or deny, the failure of the method.

Another way of assessing the method's efficiency on a species is to consider the number of captures in males and females. The two sexes were caught in nearly equal numbers for the Starling and the Common Grackle. Because the technique is efficient on the Common Grackle and because the females can be caught in sufficient numbers, it would be possible to reduce the hazard of this species on airfields. Female captures of the Red-wing represented only 10% of the total catches of the species. This could be due either to an unbalanced sex ratio or to the migratory habits of the females. According to McIlhenny (1940) and Burtt and Giltz (1970), males would be more numerous than females. But Bent (1958) and Holcomb and Twiest (1971) believe that females outnumber males on the breeding grounds. We could then explain our results by the fact that the females, which make their appearance later in spring (Bent, 1958), would disperse quickly to join the males on their territories. If this were the case, the use of alpha-chloralose would be inefficient in controlling the females. Males of the Brown-headed Cowbird were also caught in greater number than females, reflecting an unbalanced sex ratio, determined by Darly (1971) as 1:5.

(b) Preferred sites and bait.

Most birds were captured in an harvested corn field (Table 4a). Non-collected ears had already attracted the species before the trials began; then the presence of corn as bait and the good

TABLE 4.

(a) Number of birds caught in the different types of experimental sites and (b) quantity of bait used during the spring trials of 1973.

(a) Species	Pasture (3)[1]	Harvested hay field (4)[1]	Harvested oat field (3)[1]	Harvested corn field (1)[1]	Roadside	Mixed pasture/ harvested oat field (1)[1]
Starling	39	72	50	136	26	59
Red-winged Blackbird		14	10	659	1	40
Common Grackle		47	5	511	1	7
Brown-headed Cowbird	1	6	5	150		3
(b) Quantity of bait used (kg)	67	105	55	54	34	29

[1]Numbers in parenthesis represent the number of fields of each type used.

visibility of the scattered grains contributed to the success of the operations. The ground in the harvested corn field had the advantage of being rather bare because grass was sparse. With this single field, more birds were captured at least in the case of three species, than with all the other fields put together. This is particularly significant if we consider the quantity of bait scattered in the treated fields (Table 4b). In one pasture and one harvested hay field, where respectively 55 and 60 kg of bait were scattered, fewer individuals were caught than in the harvested corn field. Pastures and harvested hay fields are good food sites for the Starling, the Red-winged Blackbird, and the Brown-headed Cowbird (McNeil et al., 1973), but few birds were captured at these sites probably due to low visibility of the grains.

Preference of bait could be better determined in the harvested corn field, but because two types of bait were scattered there, results were obtained from the stomach contents of the captured birds that died. These showed that oats and corn were well accepted by the Red-winged Blackbird and the Common Grackle, even if oats were used in less quantity. Too few stomach contents of the Brown-headed Cowbird were examined, so that results are incomplete for this species.

(c) Dosage of alpha-chloralose.

Table 5 shows the number of captures and the mortality rates obtained with different dosages of alpha-chloralose. Higher dosages did not result in more captures. Ridpath et al. (1961) showed that the concentration does not influence the efficiency of the operations. Results with low dosages (0.25, 0.3, 0.35%) obtained with the Common Grackle in the fall do not appear to be comparable with the spring results. If the first ones are not taken into account, the mortality rate tends to increase as the dosage of alpha-chloralose increases. A dosage of 1.5% therefore appears to be too high and should be avoided. A dosage of 1.0 to 1.25% is reasonable. Because we obtained a good capture rate with low dosages (see text), in the case of the Common Grackle during the fall, it is possible that a dosage of about 0.3% is sufficient. This probably depends on the time of the year, on weather conditions, and possibly on the physiological state of the birds. Because the data are incomplete, we suggest the use of dosage between 0.5 and 1.25% for the control of Red-winged Blackbirds and Common Grackles.

(d) Mortality.

The total number of birds of each species dying during the experimentation was high. Alpha-chloralose apparently was the main cause of mortality. Table 6 shows, however, that most of the birds, which died from an over-dosage of alpha-chloralose, died before capture. In the spring, exposure to wind, rain and cold certainly intensified the effect of the drug and accelerated the death of the birds. Giban et al. (1966) showed that cold increases the effects of alpha-chloralose.

TABLE 5.

Number of birds caught at different dosages of alpha-chloralose and mortality rates.

Dosage of alpha-chloralose (g/100g bait)	No. birds caught	Over-dosage mortality	Mortality rate
	Starling		
0.75	11	0	0
1.0	241	21	9
1.25	34	8	24
1.5	76	27	36
2.0	17	2	12
	Red-winged Blackbird		
0.75	8	2	25
1.0	344	35	10
1.25	270	31	11
1.5	95	23	24
2.0	7	0	0
	Common Grackle		
0.25	28	1	4
0.30	326	26	8
0.35	248	34	14
0.75	31	0	0
1.0	141	5	4
1.25	268	41	15
1.5	120	58	48
2.0	11	1	9
	Brown-headed Cowbird		
0.75	5	0	0
1.0	102	10	10
1.25	23	3	13
1.5	34	2	6
2.0	1	0	0

Drowned birds that had eaten treated bait were found in drainage channels near the fields. Predation occurred by Common Crows (*Corvus brachyrhynchos*). To reduce mortality, fields should be visited more frequently.

(e) Effects of alpha-chloralose.

The stages of narcosis observed on the four species were the same as those described by Giban (1950), Ridpath et al. (1961), Williams et al. (1966), and Crider and McDaniel (1966).

Alpha-chloralose showed no repellent effect on the species studied. The affected birds emitted no distress call that could have warned their congeners and did not avoid the experimental sites after a first narcosis. The first signs of narcosis occurred from 10 to 20 minutes after feeding began. This observation was made only with the Common Grackle and at a dosage of 0.35%. The data do not lend themselves to calculation of lethal dosage rates. Narcosis

TABLE 6.

Frequency of mortality causes during the spring trials of 1973.

	Starling	Red-winged Blackbird	Common Grackle	Brown-headed Cowbird
No. birds caught	382	724	571	165
Over-dosage mortality				
Number before capture	55	83	99	14
Number after capture	8	9	6	1
Total	63	92	105	15
Percent	16.5	12.7	18.4	9.1
Drowning				
Number	25	15	21	8
Percent	6.5	2.1	3.6	4.9
Predation				
Number	6	44	46	5
Percent	1.6	6.5	8.1	3.0
Other causes				
Number	13	3	3	2
Percent	3.4	0.4	0.5	1.2
Total mortality				
Number	107	157	175	30
Percent	28.0	21.7	30.6	18.2

lasted between 0.5 hour to 8 hours for the Starling, between 1 to 10 hours for the Red-winged Blackbird, between 1 to 27 hours for the Common Grackle and between 1 to 9.5 hours for the Brown-headed Cowbird. Intraspecific variation in the duration of intoxication reflected the quantity of grains eaten. The longer duration interval of narcosis in the case of the Common Grackle compared to the other three species probably reflected a higher sensitivity.

(f) Risks to other species.

During the spring trials 12 other species, nine of them protected ones, were caught. (Table 7). The number of captures appears to be relatively low, but if we consider that 75% of them were obtained in only one field, the harvested corn field, the results gain in significance. As a matter of fact, a treatment of many harvested corn fields could lead to a proportionately high number of captures of the protected species. This applies to the Mourning Dove (*Zenaida macroura*), Rusty Blackbird (*Euphagus carolinus*) and Tree Sparrow (*Spizella arborea*), which were caught almost exclusively in the corn field.

TABLE 7.

Number of individuals of other species that were caught and those that escaped capture during the spring trials of 1973.

Species	No. birds caught and recovered	No. birds caught and died[1]	Total	No. birds that escaped capture
	Nonprotected			
Rock Dove	3	(2)	5	2
Common Crow	6	2(1)	8	2
House Sparrow	2	10(7)	12	1
	Protected			
Killdeer	1		1	
Mourning Dove	7	6(5)	13	4
Horned Lark	2	3(2)	5	
Eastern Meadowlark	9	5(4)	14	8
Rusty Blackbird	4	1	5	2
Savannah Sparrow	2	1	3	
Vesper Sparrow		1	1	
Tree Sparrow	2	9(1)	11	1
Song Sparrow	1	4	5	1

[1]The number in parenthesis represents individuals that died accidentally.

But, in any case, the results cannot be properly interpreted, because the total number of individuals of each species that fed at the sites has not been determined. Risks appear possible at least in the case of the Mourning Dove and the Eastern Meadowlark (*Sturnella magna*). The Mourning Dove feeds in open areas and cultivated fields (Godfrey, 1967) and apparently prefers corn. The meadowlark was observed at 8 experimental sites, i.e. most of the fields. Risks to the species would therefore increase proportionately if the method were used in a larger area.

Numbers of Killdeer (*Charadrius vociferus*), Horned Lark (*Eremophila alpestris*), Vesper (*Pooecetes gramineus*), Savannah (*Passerculus sandwichensis*) and Song sparrows (*Melospiza melodia*) captured are low enough to presume that alpha-chloralose would not endanger those species.

Even if the technique could represent a risk to a few protected species, its use could be maintained if certain preventive measures were applied. These include the use of a reasonable dosage of alpha-chloralose, repeated visits to the fields to limit mortality due to predation, drowning and other accidental causes, the use of corn as bait to reduce the risk to small protected species, which can hardly swallow the large grains (Guillaume, 1944; Ridpath et al., 1961), and, for the heavily narcotized birds, irrigation or removal of the stomach contents or keeping the birds in a warm place to prevent chilling.

(g) Population control.

The use of alpha-chloralose has brought positive results in the case of the Red-winged Blackbird and the Common Grackle, but would it be successful in controlling such common species on a whole airport area? The trials using alpha-chloralose to control the Rock Dove in England from 1961 to 1968 had no significant effect on the resident population, although more than 69,000 individuals were caught (Thearle, 1969b). Thearle (1969b) asserts that a population control (meaning a general reduction of the whole population of the species) is practically impossible: too great a proportion of the population must be killed to achieve a long-term reduction. Local control, like crop protection, however, is possible. Further tests on local populations might prove useful.

SUMMARY

This study reports the experimentation of alpha-chloralose, a stupefying substance, on four species (Starling, Red-winged Blackbird, Common Grackle, Brown-headed Cowbird) considered to be dangerous to aircraft in the Mirabel airport area, Quebec, Canada, to determine the reliability of the method in controlling the harmful birds. Common Grackles and Red-winged Blackbirds were caught in sufficient numbers with oats and corn and preferably in a corn field. Dosages varying from 0.5 to 1.25% gave best results. The unsuccessful trials on the Starling were due to the feeding habits and behavior of the species. Data on the Brown-headed Cowbird have proved incomplete. Alpha-chloralose would not represent a risk to protected species, as long as the method is applied in certain limits of security.

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