BEHAVIOR OF SOME ICTERIDS AND STARLINGS WHEN RELEASED AFTER BANDING

By HAROLD E. BURTT AND MAURICE L. GILTZ

INTRODUCTION

Some banders have observed differences in the behavior of birds when released, for example in the distance and direction of their flight. This behavior was studied systematically with a sample of over 1,400 Common Grackles (*Quiscalus quiscalus*), Red-winged Blackbirds (*Agelaius phoeniceus*), Brown-headed Cowbirds (*Molothrus ater*), and Starlings (*Sturnus vulgaris*), and a small number of two other species.

The decoy trap was 40 X 80 ft with a 15-ft margin of mown grass around its perimeter. Figure 1 is a map of the area.

Following banding, the birds were released from a cage and not from the hand because preliminary work indicated that they thus received directional cues. A "release cage" consisted of a cylinder of ½ inch hardware cloth 15 inches in diameter and 10 inches high. It was mounted at its center on a ½ inch rod which extended through a wire loop at a corner of the banding table and with its lower end resting on the ground. This unit was 13 ft northwest of the northwest corner of the trap. The cage had a masonite lid with a small rod at its center and extending down through the center of the cage so it could be opened from below.

After a bird was taken from the gathering cage and banded, it was put in the release cage with the lid in place. The experimenter sat with his head about one ft below the cage. As far as could be observed his presence had a negligible effect on the bird's orientation. After 15 seconds he opened the cage by pushing up on the small rod thus releasing the bird. The lid rose in a horizontal plane so that all directions of escape became available simultaneously. A large card on the table gave azimuths for every 20° to facilitate estimation of the direction of the bird's flight. A stop watch was used to time the flight.

The experimenter recorded the behavior in as much detail as possible including initial azimuth and height above the ground, azimuth of final perch and its height, location of turns, landmarks along the line of flight, and duration of flight. Some of the birds repeated at the decoy trap and were re-tested on the occasion of subsequent entries.

DISTANCE

From the experimenter's notes the course traversed by a bird was reconstructed on a map of the area and the length of the course determined with a map-measuring device. Some of the data necessarily involved judgments on the part of the experimenter. The final perch might be in a designated tree or merely in the northwest corner of the woods, or 50 ft inside the woods on a particular azimuth. Such points could be located satisfactorily on the map, but

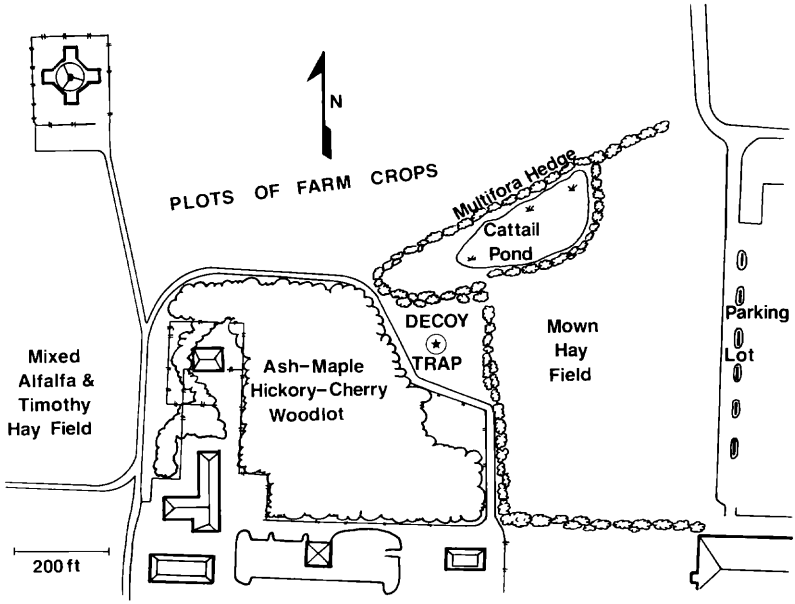

FIGURE 1. Map of the area. Star indicates release point.

the experimenter could err a few feet in his initial judgment. At any rate all the judgments were made by one person.

Table 1 summarizes the results as related to species. Marked variability occurred within a species as indicated by the range of the distances traversed. One Grackle, for example, flew 35 ft whereas another flew 2,000, and the standard deviation was quite large. This would tend to minimize the significance of species differences except for the fact that the samples were fairly large.

Grackles and Starlings flew farther before alighting than did the other species. This was shown by both the means and the medians. These two species differed only slightly in median distance although the Grackles' mean was considerably greater than that of the Starlings. However, the means did not differ significantly ($P = .07$ by a t-test). Both the Grackle and the Starling means differed significantly from the means for Red-wings, Cowbirds, and Mourning Doves (*Zenaidura macroura*) ($P < .01$ in all cases). These last three species did not differ significantly from each other (Red-wing *vs* Cowbird, $P = .11$; Red-wing *vs* Mourning Dove, $P = .56$; Cowbird *vs* Mourning Dove, $P = .67$). The sample of American Robins (*Turdus migratorius*) was small but they averaged a significantly shorter distance then any of the other species ($P < .01$).

Female Red-wings flew shorter distances than the males as shown by both means and medians. The means for the two sexes differed significantly ($P < .01$). For Cowbirds, the sex difference was small and not significant.

RELIABILITY

The reliability of these data on distance, or the consistency of the bird's behavior when leaving the trap area, may be determined to some extent from the repeaters that were tested on two occasions. Table 2 gives the correlations (products - moments) between the distances on first and second trials. Practically no Starlings repeated.

TABLE 1. Flight distance (in ft) to first perch from point of release.

	Number of birds	Mean	Median	Range	Standard deviation
Grackle	308	263	210	35–2,000	211
Starling	302	236	200	36–1,400	154
Red-wing	313	178	163	35–1,000	102
Cowbird	318	189	167	14– 820	136
Mourning Dove	170	184	170	40–1,200	115
Robin	42	100	75	10– 265	62
Red-wing, ♂	157	207	183	48–1,000	115
Red-wing, ♀	156	147	138	35– 500	75
Cowbird, ♂	192	195	167	38– 806	140
Cowbird, ♀	126	180	166	14– 820	128

TABLE 2. Reliability of distances of flight in Table 1.

	Number of birds	Correlation of two trials
Grackle	23	.00
Cowbird	50	.76
Red-wing	24	.54
Mourning Dove	13	.34

The distances flown by the Cowbirds had the greatest reliability. One way to interpret a correlation of .76 is the fact that if one were to predict the second trial from the first, using a regression equation, the error of prediction would be 35 percent less than the error if the trials were entirely uncorrelated. The corresponding figure for the Red-wings would be 15 percent. The Mourning Dove distances were considerably less reliable and the Grackle distances completely unreliable in the foregoing sense. This suggests that there may be a variety of causes for some of the behavior described.

POSSIBLE EXPLANATIONS OF SPECIES AND SEX DIFFERENCES

The explanation of the results in Table 1 may involve some basic personality characteristic in which the birds differ. One such characteristic that has been studied empirically (Burtt and Giltz, 1969) is the complacency-agitation continuum. Blackbirds and Starlings were placed individually in an observation cage and their behavior

noted in detail with the aid of a tape recorder. A weighted score, including such variables as time on the walls of the cage or number of 180° turns on the perch, with a split-half reliability of .91, found Cowbirds on the average the most complacent and Starlings the most agitated, with Grackles and Red-wings intermediate. It is possible that the greater agitation on the part of the Starlings leads them to fly farther when released whereas the more complacent Cowbirds do not go as far.

In this same study of complacency the female Red-wings were more complacent than the males but the Cowbird sexes did not differ. Similarly the female Red-wings in Table 1 flew shorter distances than the males whereas the Cowbirds had no sex difference in this respect. Perhaps a high degree of complacency is advantageous to a female bird in incubating eggs and raising young and thus contributes to survival of the nestlings. In the course of evolution this might result in complacent female Red-wings. Female Cowbirds have no nest maintenance responsibilities so that complacency would have no survival value.

Grackles were similar to Red-wings in measured complacency, but in the present study they flew much farther than the Red-wings. This discrepancy may reflect the general unreliability of the distance data for Grackles noted above, or it may involve some other variable. In connection with the latter possibility it may be noted that with a considerable number of birds in the gathering cage the Grackles make much more noise than the other species. It is true that they are quite noisy in other situations such as at a feeder or when foraging. However, in the present case the noise was so pronounced that it must have been partly due to the gathering cage situation. Perhaps the Grackles were more susceptible to confinement so that tension built up and when released they left with more vigorous or compulsive flight which took them farther. But the cause of this susceptibility is obscure.

The partial correspondence of the results of the two studies affords grounds for attributing some of the differences in Table 1 to the underlying complacency-agitation of the species or sexes involved.

REPEATERS

Birds that re-enter the trap one or more times may differ in some basic characteristic from birds that never repeat. Table 3 shows the average distances traveled by repeaters and non-repeaters, together with the significance of the difference for each species (*t*-test). For birds that were tested twice only the first trial is used in Table 3. In every species the repeaters flew the shorter average distance but the results were significant only for Grackles, Starlings, and Cowbirds. In a study of species differences in tendency to repeat at the decoy trap (Burtt and Giltz, 1970a), it was suggested that some personality aspect might be involved. Possibly the characteristic that led them to return to the trap area might cause them to fly shorter distances when released in the area. This characteristic could

TABLE 3. Distance of flight (ft) for repeaters and non-repeaters.

	Repeaters			Non-repeaters			
	No. of Birds	Mean	Standard deviation	No. of birds	Mean	Standard deviation	Significance of difference
Grackle	36	213	118	272	269	208	$.05 > P > .01$
Starling	8	172	68	294	237	145	$.05 > P > .01$
Red-wing	31	165	67	282	180	103	$P > .05$
Cowbird	83	155	32	235	192	143	$P < .05$
Mourning Dove	32	171	100	138	177	117	$P > .05$

be topophilia (Burtt and Giltz, 1970b), namely the attachment to or orientation toward a particular place.

Another possible instance of topophilia is the pattern of the Grackles' flight in contrast to that of the Starlings. Both species flew considerable distances (Table 1) but the Grackles circled about without getting very far from the starting point. The Starlings departed in a straight line and kept going, suggesting an escape mechanism. Perhaps the Grackle pattern is topophilic. In the study just cited, Grackles, on the basis of repeats, returns, and local recoveries were more topophilic than Starlings, Red-wings, or Cowbirds.

TIME IN THE AIR

The times from release to final perch were analyzed in detail. In general they corresponded to the species differences in distance traveled (Table 1) and provided little additional information. The mean times ranged from 9.7 seconds for Grackles to 6.7 for Mourning Doves. It is possible to approximate the speed of flight for a species by dividing the mean distance by the mean time. On this basis the Starlings showed the greatest speed (20.5 miles per hour) and Red-wings the slowest speed (16.2 mph). This higher speed for Starlings corresponds to Meinertzhagen's (1921) report of the speed of Starlings in migration as 38-49 mph in contrast to 20-37 for small passerines.

Unfortunately, the literature on flight speed cites figures for families or genera rather than species and gives ranges rather than averages. This does not facilitate comparison with the present data. At least the comparatively high speed of the Starlings in the present study is of some interest and it may reflect their agitated personality and their escape tendency.

SEASONAL FACTORS

It is well, at this point, to consider some other variables that may be related to distance. These could influence some of the foregoing

conclusions. The first of these variables is the season at which the bird was released.

The experiment was not designed with reference to the season. The birds were tested when they were available and the number of birds of a given species trapped varied through the year. However, the data on distance were re-tabulated for subsamples of each species tested in spring migration, breeding season, summer residence, fall migration, and winter.

Actually only two subsamples for each species were sufficiently large to warrant consideration. The mean distances for these subsamples appear in Table 4. The breeding season is taken as 1 April-31 July; summer, 1 August-15 October; fall migration, 16 October-30 November. For the Cowbirds the difference between means was negligible. Otherwise the difference between the means in each row was significant ($P < .01$).

The effect of the breeding season is equivocal. The Grackles at

TABLE 4. Mean flight distance at various seasons.

	Breeding season	Summer	Fall migration
Grackle	266	192	
Starling	192	253	
Red-wing	148		218
Cowbird		184	187

that season flew a greater distance when released whereas the Starlings and Red-wings flew shorter distances. One might expect birds at that season to remain in the vicinity and be somewhat less active like the Starlings and Red-wings, but the Grackles did not follow that pattern. The greater distance for Red-wings in the fall might be understandable in terms of migratory restlessness (Zugunruhe). However, it did not characterize the Cowbirds. The effect of season on distance flown does not appear consistent enough to constitute a serious variable.

TIME OF DAY

Whereas the distance flown might conceivably vary with the time of day, no data are available to check this possibility. All the experiments were conducted in the early afternoon.

CLOUD COVER

Cloud cover had a negligible effect on our results. The data on distance were tabulated separately for days that were overcast-cloudy and those that were sunny-hazy. For Grackles, Red-wings, and Cowbirds the average distance was greater on overcast days by approximately 15 percent, but the differences were not statistically significant ($P > .05$). For Starlings and Mourning Doves the distances were greater on sunny-hazy days but the differences were very slight.

AMBIENT TEMPERATURE

Table 5 gives the mean distances as related to temperature. Readings were taken from a thermometer resting on the table beside

TABLE 5. Mean distance of flight (in ft) at various temperatures.

	Grackle	Cowbird	Red-wing	Starling
40°-49°	(4)369[1]	(45)175	(11)205	
50°-59°	(5)265	(61)182	(24)183	
60°-69°	(16)282	(106)206	(16)193	(42)204
70°-79°	(52)273	(89)189	(101)202	87)260
80°-89°	(72)328	(14)194	(81)169	124)237
90°-99°	(53)220		(43)138	(27)188
100°-109°	(76)209		(6)119	(9)218
110°-119°	(28)219		(14)103	(5)397

[1](sample size) and mean.

the release cage. In the summer sun some readings were quite high. The birds may have encountered other temperatures during flight especially if they entered the woods. No Cowbirds were available at the highest temperatures and no Starlings at the lowest.

The first step is to test the hypothesis that the distance is the same at all temperatures. Chi-square was computed for each species. For the Cowbirds the hypothesis is confirmed. For the other species it is rejected.

The temperature at which the mean distance of flight was the greatest will be called, for purposes of discussion, the "most effective." For Grackles this most effective temperature was 80°-89° with a distance of 328 ft. The mean distance for the next higher temperature was significantly smaller than this ($P < .01$) whereas the mean distance for the next lower temperature was not significantly smaller ($P > .05$) and the results for successive catagories were not very consistent.

The tendency for the Red-wings was similar, with the most effective temperature being 70°-79°. For Starlings the trend was reversed with a significant decrease in distance for the temperature category below the most effective but not for the category above the most effective.

On the whole the results on temperature are not impressive. Although there probably is some relationship between temperature and distance, it is not very consistent.

PRESENCE OF OTHER BIRDS

Although the birds were released one at a time, possibly their subsequent behavior was influenced by the presence of other birds. A mate, or even another bird of the same species, perched nearby might cause the released bird to join it. Or the presence of birds in the trap might induce the released birds to re-join them. It was obviously impossible to map all the birds in the area prior to each release. All that can be said is that unusual behaviors due to the

presence of other birds were not noticed by the experimenter, probably because they were infrequent. Through the years an occasional bird returned into the trap immediately upon release from the hand. Actually no bird in the present samples did this although in two or three instances one flew immediately to a perch on top of the trap. There were also three instances in which a released bird joined another that was flying by. Apparently other birds in the vicinity had a minimal effect on the results.

DIRECTION OF PERCH

The azimuths of the points where the birds finally perched are analyzed in Figure 2. They are grouped by 20° sectors around the point of release, 0°-19°, 20°-39° etc., where 0° is due north, 90° east, 270° west. A vector is drawn at the middle of each sector (10°, 30°) proportional to the frequency of perches in that sector. For example of the 298 Starlings, 41 perched in the 270°-289° sector, i.e., 13 percent of the Starlings. The long vector to the west is 13 units to a convenient scale. The numbers involved in the other diagrams are: Grackles 306, Red-wings 304, Cowbirds 316, and Mourning Doves 168.

Although the vectors are considerably scattered it may be of interest to average them for each species. This is done by taking the Cartesian coordinates of the tip of each vector, totalling the x's and the y's and using the ratio of these totals as the tangent or cotangent of the desired azimuth. These average azimuths are indicated by heavy vectors of uniform length.

The most striking species difference was in the figure between Starlings and Red-wings. For the former the trend was toward the west and southwest with an average azimuth of 266°. For the Red-wings the trend was northeast with an average azimuth of 35°. This difference might be due to habitat preference. A woodlot extends from approximately 170° to 290°, whereas the other directions include open territory and with a cat-tail marsh to the north just beyond a multi-flora hedge. Table 6 shows the percent of each species with azimuths in the direction of the woods (the initial azimuths will be discussed later). Only 21 percent of the final azimuths of Red-wings were in the direction of the woods in contrast to 55 percent for the Starlings. Red-wings are primarily birds of marshes, fields, and open areas.

Grackles and Mourning Doves also showed a trend toward the woods (49 percent) and average azimuths of 295° near the northern edge of the woods. Cowbirds had one long vector in the wooded area but more activity somewhat north of the woods with an average azimuth of 304°. Their pattern was not clear cut but tended more toward the open.

Although Mourning Doves and Starlings often flew into the woods the former did so at lower levels (average height of perch, 17 ft) whereas the Starlings often flew above the treetops and then dropped down to an average perch of 27 ft. This behavior might reflect the agitated personality of the Starlings. They headed for the open sky above the woods but sometimes the agitation decreased and they dropped down.

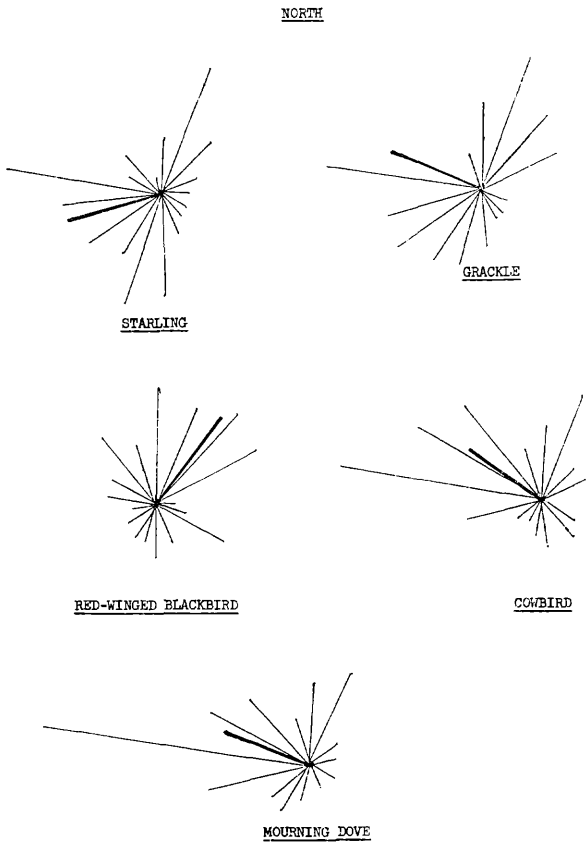

FIGURE 2. Azimuths of flight direction to final perch. Darkest vector is average azimuth.

The sample of American Robins was too small to warrant inclusion in Figure 2. The final azimuths tended to be toward the west with an average of 277° and with 48 percent of them toward the woods.

TABLE 6. Percent of initial orientations of flight and final perches in direction of woods.

	Initial azimuth	Final azimuth
Grackle	45	49
Starling	53	55
Red-wing	40	21
Cowbird	45	39
Mourning Dove	49	49

If there is a tendency for birds in general to fly to a perch in a tree, either in the woods or in isolation, this tendency might bias some of the present results. However this bias appears minimal. Actually 14 percent of the Cowbirds and 35 percent of the Red-wings perched on the ground and many other birds perched in bushes.

In connection with habitat preference it might be well to revert to the discussion of distance to see if habitat could have biased those results. If the habitat preferred by a particular species was at a considerable distance from the point of release then the birds might fly the necessary distance to reach that habitat. However, if our Starlings prefer woods they can find them 50 ft from the release point. Similarly Red-wings can find fields or open areas at about this same distance. It appears doubtful that habitat biases the distance data.

CONSISTENCY IN FINAL AZIMUTHS

It is well to consider whether the individual bird is consistent in its orientation. This can be checked with birds that repeated and were tested a second time. Table 7 shows the percent of each species, which on the second trial perches in the same 20° sector as in the first trial or in an adjacent sector. If perching is random this percent should be 17 (3 sectors divided by 18 sectors). Cowbirds and Mourning Doves had the greatest consistency and the figure for all 110 birds was 57 percent. This is more than three times the chance expectation and suggests that some confidence may be attached to Figure 2.

INITIAL AZIMUTHS

Diagrams similar to Figure 2 were plotted for the initial azimuths. No clear patterns energed and it is not worthwhile to present the

TABLE 7. Consistency in final azimuth of flight.

	Number of birds	Percent with second trial in same or adjacent sector
Grackle	23	48
Cowbird	49	63
Red-wing	24	46
Mourning Dove	14	64
All Birds	110	57

diagrams here. Moreover the initial azimuths were less consistent. If a table exactly like Table 7 is made up for the initial rather than the final azimuths the bottom figure in the last column is 35 percent rather than the 57 percent for final azimuths.

Many of the birds changed their direction during flight. A bird in the air would suddenly turn abruptly and fly directly to a particular tree at what seemed to be increased speed. Frequently, however, initial and final azimuths were about the same. Table 8 shows that

in 55 percent of the cases the final azimuth was in the same sector as the initial azimuth or in an adjacent sector. This tendency was most pronounced for the Starlings (65 percent). Perhaps these birds, being especially concerned with escape, tended to get ready and to select an objective while still in the release cage so that when released they started off immediately on their final azimuth.

In Table 6 the initial and final azimuths have about the same percent directed toward the woods except for the Red-wings. Forty percent of their initial azimuths were in that direction and only 21 percent of their final azimuths. Their initial orientation was much like that of the other species but quickly they corrected it toward their preferred habitat in marsh or fields.

HEIGHT OF PERCH

Heights above ground (in ft) of the final perches appear in Table 9, the heights being based on estimates by the same experimenter. Various known items were used as a scale whenever possible such as the height of a car, a conspicuous branch on a particular tree, a utility pole, a small building.

TABLE 8. Similarity in initial and final azimuths of flight.

	Number of birds	Percent with final azimuth in sector the same as, or adjacent to, initial azimuth
Grackle	309	47
Starling	299	65
Red-wing	310	49
Cowbird	315	59
Mourning Dove	167	60
All birds	1,400	55

TABLE 9. Height of final perch.

	Number of birds	Mean height in feet	Standard deviation
Grackle	301	21	15
Starling	289	27	13
Red-wing	308	10	11
Cowbird	309	17	13
Mourning Dove	165	17	13

All the differences between means in the table are significant ($P < .01$) except that for Cowbirds vs. Mourning Doves. The

Starlings are at one extreme and the Red-wings at the other. As mentioned earlier, 35 percent of the Red-wings perched on the ground. The Starlings' orientation toward the woods (Table 6) may contribute to their perching at the greatest height. However, some birds may like to perch at a high level regardless of woods. Grackles frequently perched in a high tree elsewhere in the trap area.

WIND DIRECTION

The azimuths of the final perches were analyzed with reference to wind direction on days when the wind was estimated to be 2 units or more on the Beaufort scale. This point on the scale indicates wind felt on the face, leaves rustling, or a measured velocity of 4-7 mph. The direction was noted in 8 categories: E, NE, N, NW, etc., and the final azimuths were grouped by 20° sectors. The sample of Mourning Doves was too small to warrant a detailed breakdown.

Table 10 shows the numbers flying approximately with or against the wind together with the numbers to be expected if the direction of flight was random. Obviously the number of birds observed in the hypothesized direction differs little from chance expectation. A Chi-square test on the observed and expected values did not confirm the hypothesis at the 5 percent level. In fact the largest Chi-square was at about the 30 percent level.

The present data give no indication that the birds when released tend to fly against the wind or with the wind. The flights in the

TABLE 10. Flight direction and wind direction.

	Number of birds	Flying against the wind	Flying with the wind	Chance expectation
Grackle	265	24	18	20.8
Cowbird	201	18	10	15.9
Red-wing	184	11	14	14.7
Starling	220	18	21	18.8

present case were only a few hundred feet, so generalizations regarding longer flights are not warranted.

SUMMARY

When Common Grackles, Red-winged Blackbirds, Brown-headed Cowbirds, Starlings, American Robins, and Mourning Doves are released after banding, Grackles and Starlings fly the greatest distances and American Robins the least, with the other species being intermediate. Female Red-wings fly shorter distances than males. These results correspond somewhat to previous measurements of complacency-agitation for those species and sexes. Grackles, Starlings, and Cowbirds that repeat at a decoy trap fly shorter distances than non-repeaters. Topophilia may be involved.

Starlings, in the present study, fly at a faster rate than do the other species. This may be related to their agitated personality and their escape tendency.

Some possibly influencing variables were shown to have a negligible effect on the results. These included season of the year, time of day, cloud cover, temperature, and presence of other birds in the vicinity.

The point to which the bird flies after release appears to reflect habitat preference - Starlings toward the woods and Red-wings toward the open. Frequently the bird starts in one direction and then changes direction in mid-flight. This is especially true for Red-wings. No tendency to fly with or against the wind was apparent. Starlings and Grackles perch at greater heights than do the other species and Red-wings frequently perch on the ground.

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Departments of Psychology and Zoology, Ohio State University, Columbus, Ohio 43210.

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