# Food of Red-winged Blackbirds, *Agelaius phoeniceus*, in Sunflower Fields and Corn Fields

GEORGE M. LINZ[1], DANIEL L. VAKOCH[1,3], J. FRANK CASSEL[1], and ROBERT B. CARLSON[2]

[1]Zoology Department, North Dakota State University, Fargo, North Dakota 58105
[2]Entomology Department, North Dakota State University, Fargo, North Dakota 58105
[3]Present address: Department of Zoology, Washington State University, Pullman, Washington 99164

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The esophageal contents of 1182 Red-winged Blackbirds (*Agelaius phoeniceus*), collected from late July through early November in southwestern Cass County, North Dakota, showed no differences between after-hatching-year and hatching-year birds in the percentages of various food items consumed. Both males and females contained higher proportions of sunflower in sunflower fields than they did corn in corn fields. Males consumed more sunflower in sunflower fields and more corn in corn fields than did females, and females used more foxtail seeds (*Setaria* spp.) in both habitats than did males. Red-winged Blackbirds probably find sunflower easier to obtain than corn. The differences in percentage of various food items consumed by males and females may be related to body and bill size.

Key Words: Red-winged Blackbirds, *Agelaius phoeniceus*, food, corn fields, sunflower fields, North Dakota

Crop losses due to foraging flocks of Red-winged Blackbirds (*Agelaius phoeniceus*) are often serious and have prompted various, sometimes questionable, management programs (Dyer and Ward 1977; Weatherhead and Bider 1979). Control strategy must be based on knowledge of the diet and feeding behavior of the birds (Dyer and Ward 1977). Variations of food habits and feeding ecology of Red-winged Blackbirds in different areas may suggest different management strategies.

Food habits of Red-winged Blackbirds have been studied in corn production areas of Ohio (Williams 1975), South Dakota (Mott et al. 1972) and Ontario (Hintz and Dyer 1970; McNicol et al. 1982; Gartshore et al. 1982). Red-winged Blackbird food habits also have been studied in the rice-growing regions of Arkansas (Meanley 1971) and California (Crase and DeHaven 1978). To our knowledge, only Bird and Smith (1964) have published data on Red-winged Blackbird food habits in a sunflower production area (Manitoba).

Prior to 1966, sunflower acreage was small in North America (< 80 700 ha) and consisted largely of confectionery (non-oil) varieties grown for human snack foods and birdfeed (Helgeson et al. 1977). In 1983, sunflower acreage will probably exceed 2 million ha, 80 % of which will be oilseed sunflower. Those varieties are used to produce high grade cooking oils and sunflower meal. To the distress of the sunflower growers, Red-winged Blackbirds may prefer oilseed varieties over confectionery varieties (Besser 1978).

In 1982, growers in southern Manitoba planted 200 000 acres of corn and 175 000 acres of sunflower. Monetary losses owing to blackbirds feeding in those crops potentially could exceed $2 000 000 (Harris, A. G. H., unpublished report). Thus, a significant reduction of bird damage would make those crops more attractive to growers. That is especially true for sunflower, which is often grown on marginal land near wetlands known to harbor large flocks of Red-winged Blackbirds during spring and fall migration.

During 1979 and 1980, we studied Red-winged Blackbird food habits in southwestern Cass County, North Dakota, a major oil sunflower production area. Other crops grown in the region included corn, barley, and wheat. All are potential food sources for Red-winged Blackbirds at various times of the year (Bird and Smith 1964; Hintz and Dyer 1970). Our objective was to study feeding patterns of various sex and age groups of Red-winged Blackbirds in an area where sunflower and corn are grown. This information may be used to redesign management programs aimed at reducing blackbird damage in those areas.

## Study Area

Southwestern Cass County is on the east edge of the Drift Prairie physiographic region (Klausing 1968). The numerous wetlands in that agricultural area provide both daytime resting sites and night roosts for blackbirds (Icterinae). A principal roost is located in the Alice Waterfowl Production Area (U. S. Fish and Wildlife Service), which includes an approximately 300 ha cattail (*Typha* spp.) marsh. The surrounding land is intensively farmed, with 90 % under cultivation. In 1980, 39 % of the cultivated land was planted to wheat, 20 % to corn, 17 % to sunflower, 14 % to barley, and only 10 % to other crops (oats, soybeans, edible beans, flax, rye, millet, and sugar beets). On a

county basis, sunflower acreage was 38% higher in 1980 than in 1979 and wheat and barley 27% lower.

## Methods

The esophageal contents of 1182 Red-winged Blackbirds were analyzed. They were collected by shooting, throughout daylight hours, from late July to early November 1979 and 1980, in sunflower fields and corn fields, with light to heavy weed growth. The specimens examined included: 439 after hatching-year (AHY) males, 238 AHY females, 344 hatching-year (HY) males, and 161 HY females. The birds were placed in plastic bags and packed in ice immediately after collection. Within five hours, the birds were processed or were frozen for later processing. Each bird was weighed, sexed, aged by plumage characteristics and presence or absence of the bursa of Fabricius (Wright and Wright 1944, Payne 1969), and assessed for stage of molt (Linz et al. 1983).

The Red-winged Blackbirds were collected from large feeding flocks (100-10 000). From the birds obtained from any one flock, no more than five of each age-sex class were randomly chosen for analysis of esophageal contents. Esophagi were removed and placed in 95% ethanol. Later, the contents of each esophagus were emptied into a petri dish and examined under a stereomicroscope at 7X magnification. Food items were segregated and stored in 95% ethanol. Animal matter was identified only in 1979. Subsequently, each vial was emptied into preweighed plastic cups; the contents were air-dried to evaporate the ethanol, and oven-dried for 24 h at 70° C. The contents were then cooled to room temperature and weighed. Food items weighing less than 0.01 g were recorded only as "present", and were excluded from further analyses.

Analysis of variance on arcsin-transformed data was used to compare the proportion of various food items consumed by the different age-sex classes. Duncan's multiple range test was used to separate the means; $P < 0.05$ was accepted as significant.

## Results

*Red-winged Blackbirds in Sunflower*

There were no differences ($P > 0.05$) between AHY and HY Red-winged Blackbirds in the percentage of various food items consumed in sunflower fields. Male Red-winged Blackbirds, collected in sunflower fields from 29 July through 4 November 1979 and 1980, contained more sunflower seeds (sunflower) and less foxtail (*Setaria* spp.) than the females ($P < 0.05$) (Table 1). During that period, 93% of the males and 86% of the females contained sunflower, which comprised 69% and 57% of the male and female diets, respectively. Concurrently, foxtail made up 18% of the male and 31% of the female diets and occurred in 65% of the males and 72% of the females. From 23 September to 4 November, the proportion of sunflower in the female diets decreased, and the percentage of foxtail increased, whereas the proportion of those foods in males remained the same compared to previous weeks.

The amount of animal matter consumed by male and female Red-winged Blackbirds in sunflower fields was highest from 12 August to 25 August, making up 25% of the male and 28% of the female diets. During the following ten weeks, animal matter comprised only 4% of the male and 5% of the female diets. In 1979, animal matter found in Red-winged Blackbirds feeding in sunflower fields included 20% beetles (Coleoptera), 16% aphids (Aphididae), 13% leafhoppers (Cicadellidae) and spittlebugs (Cercopidae) and 6% aphidlion larvae (Chrysopidae) (Table 2). Weevil larvae (Curculionidae) were commonly eaten from 23 September to 20 October.

*Red-winged Blackbirds in Corn Fields*

From 12 August to 20 October in 1979 and 1980, Red-winged Blackbirds were collected in corn fields. Males collected in corn fields contained more corn and less foxtail than the females collected there ($P < 0.05$) (Table 3). There were no differences ($P > 0.05$) between AHY and HY birds in the percentage of various food items consumed in corn fields. The proportion of corn in the esophagi of the males collected in corn fields was highest from 26 August to 6 October, when corn was found in 70% of the birds and made up 51% of their diet. During the same period, corn was found in 44% of the females and comprised 18% of their diet. Concurrent with peak corn use, 73% of the males and 90% of the females contained foxtail, which made up 38% and 71% of the male and female diets, respectively.

The proportion of animal matter in those Red-winged Blackbirds collected in corn fields was highest in August and tended to decrease as the season progressed (Table 3). Identification of the animal matter found in Red-winged Blackbirds feeding in corn fields in 1979 indicated that aphids, leafhoppers and spittlebugs, aphidlions, and spiders (Arachnida) were most prevalent (decreasing order of frequency) (Table 2).

## Discussion

Studies comparing the food habits of male and female Red-winged Blackbirds have produced conflicting results. Mott et al. (1972), Williams (1975), and McNicol et al. (1982) showed that males consumed proportionally more corn than did females. Gartshore et al. (1982), however, found no differences in the relative amounts of corn consumed by male and female Red-winged Blackbirds.

TABLE 1. Percentage of weight and percentage of occurrence of food items in the esophagi of Red-winged Blackbirds collected in sunflower fields during 1979 and 1980 in southwestern Cass County, North Dakota.

| | Time Period | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 29 July–11 August | | 12 August–25 August | | 26 August–8 September | | 9 September–22 September | | 23 September–6 October | | 7 October–20 October | | 21 October–4 November | | Totals | |
| Sex | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| Number of birds | 16 | 10 | 15 | 2 | 32 | 21 | 79 | 31 | 138 | 61 | 108 | 23 | 89 | 9 | 477 | 157 |
| Mean Food Weight (g) | 0.10 | 0.08 | 0.08 | 0.13 | 0.22 | 0.14 | 0.44 | 0.32 | 0.57 | 0.36 | 0.46 | 0.18 | 0.34 | 0.22 | 2.21 | 1.43 |
| Food Item | Percentage of Weight (Percentage of Occurrence) | | | | | | | | | | | | | | | |
| PLANT | 94(100) | 87(100) | 75(93) | 72(100) | 94(100) | 93(95) | 97(100) | 93(97) | 97(100) | 97(100) | 98(100) | 93(100) | 91(98) | 98(100) | 96(99) | 95(100) |
| Sunflowers | 71(100) | 46( 70) | 52(73) | 40(100) | 72( 87) | 69(86) | 67( 88) | 59(81) | 73( 96) | 56( 90) | 70( 95) | 40( 77) | 60(94) | 40(100) | 69(93) | 57( 86) |
| Corn | | 3( 10) | | | 1( 3) | | 9( 16) | <1( 6) | 2( 4) | 2( 6) | <1( 1) | | <1( 1) | | 3( 4) | 1( 4) |
| Other crops[a] | | 4( 10) | <1( 7) | | | <1( 5) | 7( 20) | 8(20) | 4( 17) | 2( 14) | 3( 9) | 8( 9) | 3(12) | 12( 33) | 4(13) | 5( 16) |
| Foxtail (*Setaria* spp.) | 22( 50) | 34( 60) | 23(40) | 32( 50) | 21( 47) | 22(47) | 13( 52) | 25(78) | 15( 69) | 36( 77) | 22( 68) | 44( 83) | 25(78) | 46( 78) | 18(65) | 31( 72) |
| Incidental and unidentified seeds | 1( 6) | | | | <1( 1) | 2(14) | <1( 7) | <1( 3) | 3( 9) | <1( 10) | 3( 14) | <1( 79) | 3(18) | | 2(11) | 1( 7) |
| ANIMAL | 6( 50) | 13( 60) | 25(73) | 28( 50) | 6( 53) | 7(43) | 3( 48) | 7(61) | 3( 72) | 3( 66) | 2( 68) | 7( 87) | 9(67) | 2( 44) | 4(64) | 5( 63) |
| GRIT[b] | ( 19) | | (21) | | ( 37) | (12) | ( 22) | (32) | ( 47) | ( 34) | ( 54) | ( 26) | (43) | ( 22) | (41) | ( 26) |

[a] Includes Wheat, Barley, Oats, and Proso Millet
[b] Grit not included in food weight

TABLE 2. Percentage of occurrence of animals in esophagi of male and female (combined) Red-winged Blackbirds collected during 1979[a] in sunflower fields and corn fields in southwestern Cass County, North Dakota.

| | Time Period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 12 August–8 September | | 9 September–22 September | | 23 September–6 October | | 7 October–20 October | | Totals | |
| Habitat | Corn | Sunflower | Corn | Sunflower | Corn | Sunflower | Corn | Sunflower | Corn | Sunflower |
| Number of Birds | 16 | 24 | 48 | 60 | 66 | 138 | 62 | 99 | 192 | 321 |
| Taxon | Percentage of Occurrence | | | | | | | | | |
| Hemiptera | | | | | | | | | | |
| (Miscellaneous) | 25 | 4 | 13 | 6 | 6 | 7 | 9 | 9 | 10 | 8 |
| Miridae | | 9 | 19 | 7 | 6 | 5 | 8 | 2 | 9 | 5 |
| Nabidae[b] | | | 2 | 3 | 6 | 2 | 8 | 3 | 5 | 2 |
| Homoptera | | | | | | | | | | |
| (Miscellaneous) | | 8 | 23 | 8 | 18 | 13 | 6 | 12 | 14 | 11 |
| Aphididae | 56 | 9 | 20 | 8 | 24 | 15 | 23 | 24 | 26 | 16 |
| Cicadellidae and Cercopidae | 6 | 8 | 23 | 10 | 29 | 14 | 17 | 13 | 22 | 13 |
| Neuroptera | | | | | | | | | | |
| Chrysopidae[b] | 25 | 12 | 33 | 10 | 15 | 4 | 13 | 4 | 20 | 6 |
| Lepidoptera | | 9 | 15 | 8 | 9 | 11 | 6 | 10 | 9 | 10 |
| Diptera | 18 | 4 | 11 | 3 | 9 | 4 | 8 | 3 | 10 | 4 |
| Coleoptera | | | | | | | | | | |
| (Miscellaneous) | 12 | 21 | 21 | 20 | 5 | 22 | 18 | 16 | 14 | 20 |
| Curculionidae Larvae | | 4 | 2 | 5 | 5 | 27 | 3 | 19 | 3 | 18 |
| Hymenoptera[b] | | 8 | 2 | 5 | 14 | 1 | 2 | 1 | 5 | 2 |
| Arachnida[b] | 12 | 4 | 23 | 23 | 15 | 9 | 16 | 9 | 17 | 7 |
| Miscellaneous and Unidentified | 12 | | 2 | | 5 | | 3 | 3 | 4 | 1 |

[a] Major taxonomic categories were only identified in 1979
[b] Beneficial insects

TABLE 3. Percentage of weight and percentage of occurrence of food items in the esophagi of Red-winged Blackbirds collected in corn fields during 1979 and 1980 in southwestern Cass County, North Dakota.

| | Time Period | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12 August–26 August | | 26 August–8 September | | 9 September–22 September | | 23 September–6 October | | 7 October–20 October | | Totals | |
| Sex | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| Number of birds | 15 | 21 | 25 | 16 | 95 | 54 | 87 | 90 | 84 | 61 | 306 | 242 |
| Mean Food Weight (g) | 0.17 | 0.14 | 0.32 | 0.41 | 0.45 | 0.20 | 0.44 | 0.35 | 0.33 | 0.29 | 1.71 | 1.39 |
| Food Item | Percentage of Weight (Percentage of Occurrence) | | | | | | | | | | | |
| PLANT | 82(100) | 82(95) | 87(96) | 94(100) | 96(100) | 92(100) | 98(100) | 98(100) | 98(100) | 95(98) | 96(99) | 95(99) |
| Corn | 15( 27) | 3( 5) | 52(64) | 7( 38) | 54( 84) | 20( 41) | 47( 67) | 20( 47) | 21( 40) | 10(33) | 45(62) | 16(38) |
| Sunflower | 7( 20) | <1( 9) | 1(12) | 1( 6) | 3( 6) | 12( 20) | 12( 20) | 3( 11) | 21( 38) | 9(18) | 8(20) | 6(15) |
| Other crops[a] | | 7(14) | 1( 4) | | <1( 1) | <1( 2) | <1( 2) | 1( 2) | 8( 20) | 8(18) | 2( 8) | 3(14) |
| Foxtail (*Setaria* spp.) | 60( 73) | 71(86) | 33(56) | 86( 94) | 38( 75) | 58( 89) | 38( 74) | 72( 89) | 46( 79) | 66(87) | 40(81) | 69(89) |
| Incidental and unidentified seeds | | | <1( 4) | | 1( 15) | 2( 13) | 1( 5) | 2( 7) | 2( 14) | 2(11) | 1(13) | 1( 9) |
| ANIMAL | 18( 43) | 18(76) | 13(56) | 6( 81) | 4( 68) | 8( 64) | 2( 61) | 2( 56) | 2( 44) | 5(56) | 4(57) | 5(62) |
| GRIT[b] | ( 7) | (23) | (12) | ( 6) | ( 22) | ( 13) | ( 32) | ( 18) | ( 21) | (10) | (23) | (14) |

[a]Includes Wheat, Barley, Oats, and Proso Millet
[b]Grit not included in food weight

This study indicated that both sexes consumed higher proportions of sunflower in sunflower fields than they did corn in corn fields. Males used 12% more sunflower and 29% more corn than did females. The percentage of sunflower in the male diets remained about the same throughout the sample period, whereas the percentage of sunflower in the female diets decreased as the sunflower seeds matured. In comparison, the proportion of corn in both the male and female diets decreased as the corn hardened.

Those differences may be related to the relative availability of sunflower and corn and to morphological and behavioral differences between the males and females. Corn is protected by husks, and after the seeds mature becomes difficult to remove and consume (Dolbeer 1980). In contrast, sunflower seeds are unprotected, easy to remove from the head, and as they mature become only slightly more difficult for the birds to shell and obtain the kernel. Unlike corn, sunflower heads are susceptible to seed loss due to wind and bird activity, particularly after some seeds are removed. Hence, a large number of sunflower seeds fall to the ground.

We observed Red-winged Blackbird feeding behavior in sunflower fields and in enclosed sunflower plots. Males appeared to spend more time removing seeds from the heads and less time foraging on the ground than the females. Similar differences in feeding behavior might occur in corn fields, but the females would not encounter corn on the ground as often as they do sunflower seeds.

The males' larger size and larger bill (Orians 1961) may enable them to slit the husks of the corn and handle the dry kernels more effectively than can the females. Larger size may be less advantage with sunflowers, where females have relatively easy access to the seeds in the head and on the ground and may be able to shell the seeds almost as readily as do the males.

We concluded that males were largely responsible for damage in sunflower fields and corn fields, although females had the potential to cause a significant amount of damage to sunflower. We do not know, however, what portion of the sunflower in female diets was waste grain taken on the ground. Further studies are needed to assess the depredation potential of females in sunflower fields.

In August and early September insects made up approximately 14% of the diet of Red-winged Blackbirds in both sunflower fields and corn fields, but their importance in the birds' diets decreased as the season progressed. The possible economic benefits of Red-winged Blackbirds preying on noxious insects has intrigued many authors (Hintz and Dyer 1970; McNicol et al. 1982; Bendell and Weatherhead 1982). A high percentage of noxious insects in the birds' diets (Robertson et al. 1978; McNicol et al. 1982) and a reported population reduction of European Corn Borers (*Ostrinia nubilalis*) due to predation by Red-winged Blackbirds (Bendell and Weatherhead 1982) lend credence to this idea. On the other hand, insects may attract the birds to the fields before they begin feeding on the crop itself (Dolbeer 1980; Woronecki et al. 1981), thus offsetting any initial economic benefits with increased crop damage later in the year.

In our study, noxious insects occurred more often in the Red-winged Blackbirds' diets than did beneficial insects (predators) (Table 2). As prey species (noxious insects) usually outnumber predatory species (beneficial insects) (Krebs 1978), we would expect that, given equal availability, the birds would take more of the noxious insects than of their predators. That occurred with the aphidlions and aphids, where a predator-prey relationship may have existed (Borror et al. 1976). Similar relationships may exist with other beneficial and noxious insects. We suggest that predator-prey interactions among the insects should be considered when the economic benefits of insect feeding by Red-winged Blackbirds are investigated.

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