EFFECTS OF GRASS LENGTH AND MOWING ON FORAGING BEHAVIOR OF THE AMERICAN ROBIN (*TURDUS MIGRATORIUS*)

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ABSTRACT.—In the first of three studies, American Robins (*Turdus migratorius*) spent progressively less time foraging on a suburban lawn as the grass grew longer. The rate of attacks at apparent prey, however, was actually greater in long than in short grass. When, in a second study, the robins were offered a direct choice between short- and long-grassed areas, the birds showed an overwhelming preference for short grass. A third study revealed that the act of mowing itself (i.e. independent of grass length) induced a short-term enhancement in the time the robins spent foraging, implying that the birds were exploiting temporarily vulnerable prey.

THE propensity of the American Robin (*Turdus migratorius*) for foraging on the short-grassed lawns that characterize much of North America is well known to even the most casual of birdwatchers. Indeed, the proliferation of the suburban lawn has contributed greatly to the expanded range and population that robins have achieved since humans cleared away so much of the continent's pre-Columbian forests (Eiserer 1976: 13–25). Despite the clear affinity of robins for lawns, however, little systematic research has been directed at uncovering the details of this particular species-habitat relationship, although related work has been done on other thrushes (Smith 1974a, b, Roth 1979).

The present experiments investigated the effects of grass length and lawn mowing on the foraging behavior of robins. Tyler (in Bent 1949) observed that foraging robins run over short grass but are forced to hop over long grass. Heppner (1965) reported, without quantifying the fact, that robins have greater success in hunting worms where grass is sparse rather than thick. If long grass means an altered locomotor pattern and perhaps decreased hunting success, robins might be expected to spend less time foraging on a given lawn as the grass lengthens.

EXPERIMENT 1

Methods.—The observation area was a suburban backyard in Lancaster, Pennsylvania. The yard (15 × 18 m) contained dandelions (*Taraxacum vulgare*), sourweed (*Oxalis corniculata*), white clover (*Trifolium repens*), crabgrass (*Digitaria sanguinalis*), daisy fleabane (*Erigeron annuus*), and various other forbs and grasses. Data were collected daily (except when it rained) during periods that averaged 90 min and that occurred at different times of day ranging from 0700 to 1800; care was taken that the observations did not occur more frequently at some times of day relative to others. The lawn was mowed to a height of approximately 6.5 cm three separate times during June–July 1979; at least 15 days occurred between mowings. Data were not collected on any subadult robins who may have visited the lawn, because in many cases these birds were noticeably less adept at hunting than the typical adult.

During each observation period, two categories of data were collected: (1) *foraging time,* the number of seconds per hour that a robin was seen foraging on the lawn, and (2) *attack rate,* the number of times per foraging minute that a bird either bill-

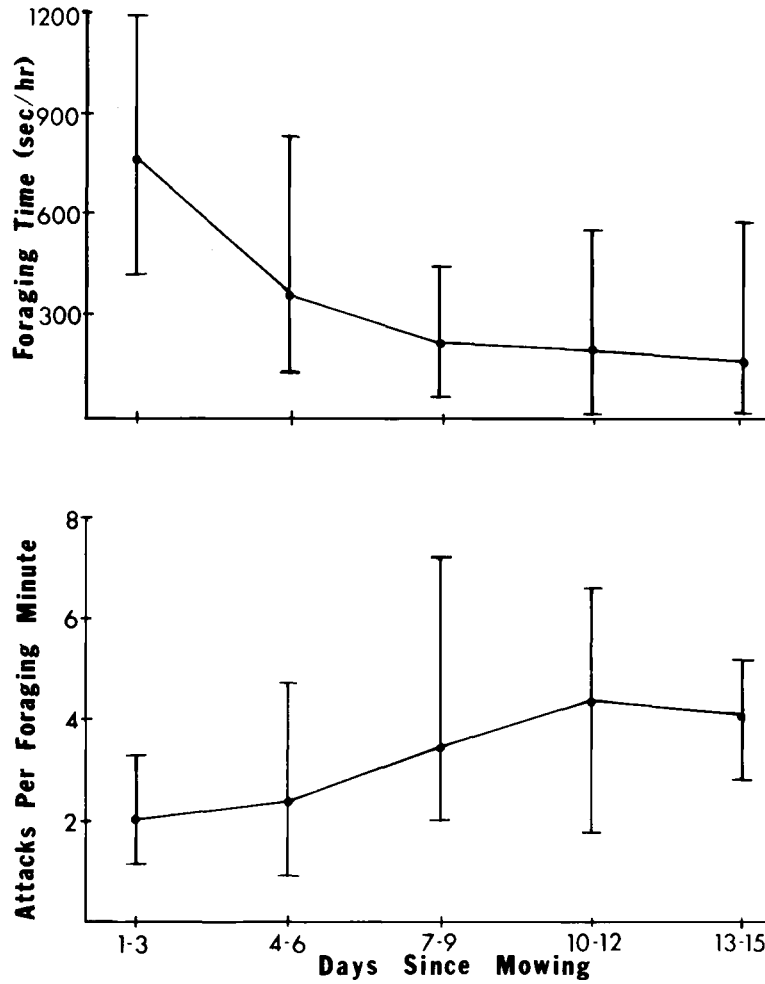

Fig. 1. Top: seconds of foraging per hour as a function of days since the lawn was last mowed. Each data point represents the average for a 3-day block. Vertical lines depict ranges. Bottom: number of attacks per foraging minute as a function of days since mowing.

pounced (Heppner 1965) or snapped at apparent prey in the grass. In calculating the attack rate, the time that a bird spent thrashing a captured worm, slug, or caterpillar was subtracted from the total foraging time; this behavior, thought to remove slime and setae while stunning the prey (MacDonald et al. 1962, Morton 1968), occasionally entailed as much as 2 min for an individual prey animal. Prey handling time was not subtracted when calculating foraging time because prey handling constitutes part of the total foraging behavior; on the other hand, because a bird that was thrashing a given prey could not simultaneously attack another one, it seemed appropriate to consider handling time in calculating attack rate.

Results.—It appeared that, with little exception, only a single pair of robins ever visited the yard. These birds frequently carried food away from the lawn to a nearby nest; often they did not, however, and instead swallowed prey as it was captured.

The amount of time that robins foraged on the lawn decreased greatly over the

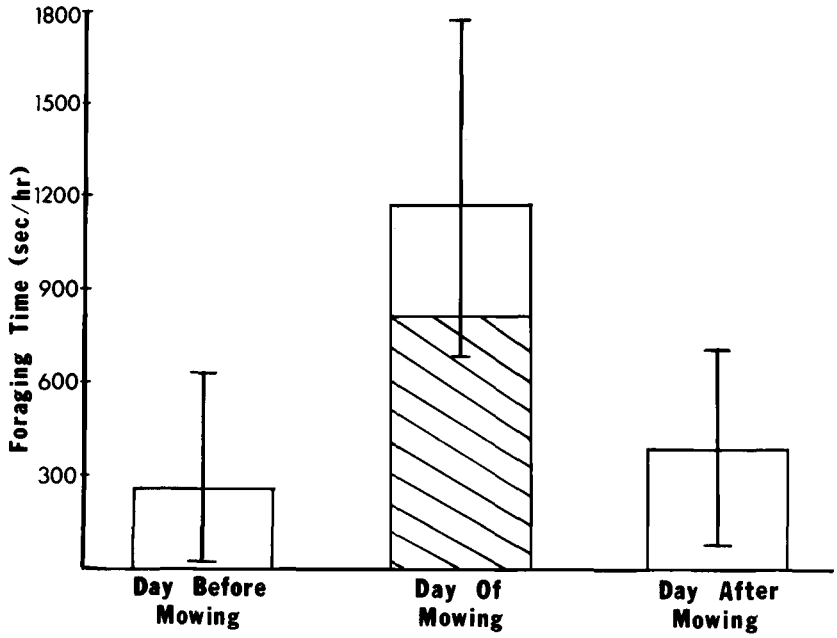

Fig. 2. Seconds of foraging during the hour immediately following mowing (Day of Mowing) and during the same hour on the previous (Day Before) and subsequent (Day After) day. Striped area represents the amount of foraging during the first 30 min immediately following mowing. Vertical lines depict ranges.

first 15 days that followed a given mowing (Fig. 1), and an analysis of variance for independent measures confirmed the reliability of this decline ($F = 4.35$; df = 4,27; $P < 0.05$). Moreover, as the grass grew longer, the birds showed qualitative and quantitative shifts in their attack behavior. Instead of pouncing bill-first on worms and other potential prey, as they did when the grass was short, most of their attacks in long grass could best be described as the plucking of small insects off stalks of grass. Whereas the bill-pounce was almost always preceded by the familiar head-cocking posture, the plucking attacks very often were not. Heppner (1965) also noted that robins sometimes catch insects on lawns without the head-cock that accompanies the hunting of worms, although he did not relate this difference to grass length. As can be seen in Fig. 1, attack rate increased as the grass grew longer, a trend that was marginally significant ($F = 2.53$; df = 4,27; $P < 0.07$).

EXPERIMENT 2

The decline in foraging time as grass lengthened suggests that robins prefer to hunt on short grass and that as the observation lawn went unmowed the birds made more visits to neighboring, better trimmed lawns. Experiment 2 provided a test of this notion by mowing different portions of the observation lawn to different heights, thereby offering a direct choice for the robins.

Methods.—On 8 August 1979, the left half of the lawn was mowed to approximately 6.5 cm while the right half was mowed to approximately 11.5 cm. On each of the next 4 days, I recorded the number of seconds (out of a total foraging time

of approximately 1,000 s/day) that robins spent on the left and right halves, respectively, during daily observation periods that averaged 90 min. The lawn was mowed a second time on 18 August, but now the left half was mowed to 11.5 cm while the right half was mowed to 6.5 cm. Foraging times spent on the left and right halves were again recorded during observation periods on each of the next 4 days.

Results and discussion.—Time spent foraging averaged 880 s/day for the short grass and 76 s/day for the long grass, a difference that was reliable ($t = 5.58$; df = 7; $P < 0.05$). Factors that could underlie this overwhelming preference include (1) greater ease of locomotion in short grass and (2) greater hunting efficiency (food obtained relative to energy expended) in short grass. Although I did not specifically record the number of large prey (worms, slugs, caterpillars) that were caught, it appeared as though more of such prey were taken in short grass than in long. Because, in terms of bulk, a single worm or slug might equal dozens of the tiny insects that robins plucked from long grass, hunting efficiency could easily be greater in short grass even if the birds caught twice as many prey in long grass (Fig. 1). Additional research, collecting more detailed data over a broader population and environmental sample, is needed to examine these possibilities. Nevertheless, the present results seem comparable to the finding by Roth (1979) that mockingbirds abandon territories characterized by "too much grass," apparently because the birds are forced to feed in alternate, less energy-efficient styles. The present data also have relevance for theoretical models of feeding strategies (MacArthur and Pianka 1966, Schoener 1971, Marten 1973).

Experiment 3

Apart from the effects of grass length, it seemed possible that the act of mowing *per se* could affect the foraging behavior of robins. Casual observation suggested that robins frequently arrived to forage on the lawn very soon after it had been mowed. In Experiment 3, I attempted to document this phenomenon quantitatively.

Methods.—The work involved a smaller lawn (8 × 18 m) that was mowed to approximately 6.5 cm at 1100 on four separate occasions during June–July 1979. The amount of time that robins spent foraging was recorded during the hour immediately following completion of mowing (1130–1230), as well as during the same hour on both the day before and the day after mowing. As was the case in the first two studies, it appeared that a single, mated pair of robins (different from those in the earlier studies) were virtually the only visitors to the observation lawn. These two birds also frequently foraged on two other lawns immediately adjacent to the observation site.

Results and discussion.—Foraging time was much greater during the hour following mowing than during the same hour on either the previous or subsequent day (Fig. 2). After an analysis of variance yielded a significant overall effect ($F = 7.31$; df = 2,9; $P < 0.05$), a Newman-Keul's multiple range test indicated that foraging time was significantly greater on the day of mowing than on either the day before or the day after mowing ($P < 0.05$, in both cases). The slight increase in foraging on the day after mowing relative to the day before mowing was not significant ($P > 0.05$) and thus failed to support the previous finding (Fig. 1) that foraging time is greater in short grass than in long. This discrepancy could stem from the different time-sampling procedure of the third study (e.g. the particular time-of-day that observations were made), the different birds that were involved, or the possibility

that the present observation lawn (as opposed to the lawn monitored in the first two studies) constituted a different proportion of the total territory of the robins who foraged there.

Because only a negligible amount of grass growth would be expected to occur within a 24-h period, the large difference between the day of mowing and the day after mowing could not have been due to grass length. Indeed, the rapid decline of foraging from the first half hour to the second half hour after mowing (see Fig. 2) implies the operation of a short-lived process. One possibility is that prey are more active and hence more exposed to avian predation immediately after mowing; alternatively, many prey may be immobilized or otherwise injured during mowing and for that reason may be more vulnerable.

There are many recorded cases of predators exploiting the temporary exposure of prey caused by other agents. Coyotes snap up rodents that are flushed from their burrows by badgers; foxes associate with caribou to feed on voles and lemmings disturbed by the passing herd; small bass trail larger ones to feed off minnows that the latter frighten up; cattle egrets and bee-eaters perch on rhinoceri and camels to prey upon insects that the large mammals stir; gulls follow farm plows to collect upturned invertebrates; and hawks perch near harvesting activities to catch mice flushed in the process (Storer 1953, Rue 1969, Costello 1971, Lang 1972).

Concerning robins specifically, Butts (1927) noted that the birds sometimes flock onto newly burnt fields to hunt exposed invertebrate prey; Eckstorm (1901) suggested that robins are especially attracted to lawn sprinklers that bring worms to the surface; and Heppner (1965) stated that the birds hunt on lawns just after a rain for the same reason. The present data on the effects of mowing may provide yet another example of the same prey-exploitation phenomenon.

LITERATURE CITED

BENT, A. C. 1949. Life histories of North American thrushes, kinglets, and their allies. U.S. Natl. Mus. Bull. 196.

BUTTS, W. K. 1927. The feeding range of certain birds. Auk 44: 329–350.

COSTELLO, D. F. 1971. The world of the gull. New York, J. B. Lippincott Co.

ECKSTORM, F. H. 1901. The bird book. Boston, D. C. Heath & Co.

EISERER, L. A. 1976. The American Robin: A backyard institution. Chicago, Nelson Hall Co.

HEPPNER, F. 1965. Sensory mechanisms and environmental clues used by the American Robin in locating earthworms. Condor 67: 247–256.

LANG, E. M. 1972. Present day rhinoceros. Pp. 36–48 *in* Animal life encyclopedia, vol. 13 (B. Grzimek, Ed.). New York, Van Nostrand Reinhold Co.

MACARTHUR, R. H., & E. R. PIANKA. 1966. On optimal use of a patchy environment. Amer. Natur. 100: 603–609.

MACDONALD, J. D., D. GOODWIN, & H. E. ADLER. 1962. Bird behavior. New York, Sterling Publishing Co., Inc.

MARTEN, G. G. 1973. An optimization equation for predation. Ecology 54: 92–101.

MORTON, E. S. 1968. Robins feeding on hairy caterpillars. Auk 85: 696.

ROTH, R. R. 1979. Foraging behavior of mockingbirds: The effect of too much grass. Auk 96: 421–422.

RUE, L. L. 1969. The world of the red fox. New York, J. B. Lippincott Co.

SCHOENER, T. W. 1971. Theory of feeding strategies. Ann. Rev. Ecol. Syst. 2: 369–404.

SMITH, J. N. 1974a. The food searching behavior of two European thrushes: I. Description and analysis of search paths. Behaviour 48: 276–302.

———. 1974b. The food searching behaviour of two European thrushes: II. The adaptiveness of the search patterns. Behaviour 49: 1–61.

STORER, J. W. 1953. The web of life. New York, New American Library, Inc.