

## WINTER TIME BUDGETS OF BROWN THRASHERS

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Brown Thrashers (*Toxostoma rufum*) are abundant winter residents in dense riparian thickets along the central coast of Texas where they forage by tossing aside leaf litter and other terrestrial debris with their bills (Fischer 1981). This study was undertaken to quantify the daily regimen of activities of winter Brown Thrashers in coastal Texas, and to determine how these activities were influenced by temperature.

### STUDY AREAS AND METHODS

This study was conducted from January through early March 1978 in 8 ha of riparian forest along the Aransas River at the Rob and Bessie Welder Wildlife Foundation, San Patricio Co., Texas. The study area supported a dense overstory cover largely comprised of hackberry (*Celtis laevigata* and *C. reticulata*), elm (*Ulmus crassifolia*), and anacua (*Ehretia anacua*). The understory cover consisted primarily of colima (*Zanthoxylum fagara*) and occasional grasses and forbs.

Thrashers were located by random search and, once found, were observed with binoculars at distances of 8-15 m. An estimated 12 birds were observed during this study. Their activities were recorded at 10 sec intervals for 10-60 min, including at least one complete foraging sequence (forage-loaf-forage). Total observation time was 60 h; 12 in January, 28 in February, and 20 in early March. Observations were limited to late winter because only then were the trees leafless in this relatively warm locality. Before mid-December, or after mid-March, the trees of the area had leaves and the thrashers were difficult to locate and follow.

Data were analyzed using least-square procedures, Duncan's Multiple-Range test, unpaired *t*-tests, and Chi-square contingency tests (Snedecor and Cochran 1976). Probabilities <.05 were considered significant.

The following activities were recorded:

1. *Foraging*—This included all time spent foraging. Thrashers foraged mostly on the ground (95%), and occasionally in clusters of dead leaves in the trees or on the berries of certain trees (hackberry, anacua).
2. *Loafing*—This included inactive periods. Generally, following foraging bouts, the birds perched in a tree from 3-9 m above the ground, or on fallen debris. Also included in this category was the time spent producing whisper song, a very soft rendition of the primary song.
3. *Preening*—This included all time spent preening.
4. *Flying*—This included all time spent flying.
5. *Territorial behavior*—Brown Thrashers maintained winter feeding

TABLE 1. Monthly time-activity budgets of Brown Thrashers in winter.

Activity	Percent of day		
	Jan.	Feb.	Mar.
Foraging	45.4	47.4	48.5
Loafing on ground	4.5	11.4	20.6
Loafing in tree	38.7	31.8	22.6
Preening	3.2	2.5	2.0
Territoriality	0.5	0.8	0.5
Flying	0.5	0.4	0.2
Other	7.2	5.7	4.4
Minutes observed/mo	720	1680	1200

territories as do Long-billed Thrashers (*T. longirostre*) (Fischer 1981) and Mockingbirds (*Mimus polyglottos*) (Hailman 1960). This category included the time spent calling (generally at dawn or dusk), and the time actually spent chasing an intruding conspecific.

6. *Other*—Included all other activities, such as bathing, drinking, scratching, etc.

#### RESULTS AND DISCUSSION

None of the activities (except whisper singing, see below) varied significantly ( $P > .05$ ) in duration during the months of the study (Table 1). Foraging was the dominant activity, followed by loafing (Table 2). Foraging activities occurred in cycles that averaged  $13.9 \pm .71$  min (range = 4.1–49.0 min) followed by  $14.7 \pm .69$  min (range = 4.0–41.1 min) of loafing throughout the day. The mean durations of foraging and loafing bouts were compared by hour of the day and found not to vary significantly ( $P > .05$ ). Other small birds are known to exhibit foraging maxima early in the morning and late in the evening (Gibb 1954,

TABLE 2. Hourly activities of Brown Thrashers.

Activity	Time				
	0530 0800	0800 1000	1000 1200	1200 1400	1400 1730
Foraging	45.1%	49.3%	44.8%	42.6%	51.1%
Loafing on ground	4.9	8.0	18.1	17.8	8.2
Loafing in tree	36.6	33.8	24.6	31.8	32.0
Preening	6.0	2.0	4.5	2.7	0.1
Territoriality	0.9	0.1	0.1	0.1	0.6
Flying	0.4	0.3	0.7	0.2	0.3
Other	6.1	6.5	7.2	4.8	7.7
Minutes observed	381	671	443	1099	1006

TABLE 3. Winter foraging characteristics of Brown Thrashers on cool and warm days.

Characteristic	Cool days (0–5°C)	Warm days (20–25°C)	Significance
	$\bar{x} \pm SE$	$\bar{x} \pm SE$	
Bill sweeps/sec	0.78 ± 0.05	0.68 ± 0.05	NS
Foraging bout length (min)	13.75 ± 1.31	14.40 ± 1.92	NS
Loafing bout length (min)	10.03 ± 1.47	15.26 ± 1.39	$P < .05$
Number of complete bouts (forage and loaf)	28	30	
Minutes observed	360	389	

1956; Morton 1967), or in the afternoon (Verner 1965, Verbeek 1972). A uniform foraging rate perhaps may be related to the thrasher's diet, one composed of nocturnal invertebrates that remain hidden, inactive, and about equally accessible throughout the day under leaf litter or other debris on the ground's surface.

On cold days, foraging may increase to meet additional maintenance-energy requirements (Kendeigh 1969). Such an increase may result by extending the length of foraging bouts, by decreasing the length of loafing periods, or by increasing search rates for prey (as measured indirectly by the rate of bill sweeps/sec). The only foraging characteristic that differed significantly between cool days (0–5°C) and warm days (20–25°C) was the length of the loafing bout, which was reduced on cool days (Table 3). In addition, the bill-sweep rate was more rapid on cool days. These results concur with Verbeek (1964) who found that foraging rates of passerines were generally inversely related to temperature. In contrast, Grubb (1978) reported that foraging rates of passerines were directly related to temperature, and inversely related to wind velocity. Grubb found that in Ohio the energetic costs of rapid movement by birds during cold weather apparently exceeded any additional energy income to be attained by more rapid processing of the habitat. Thrashers in coastal Texas were not subjected to the temperature extremes experienced in Grubb's study, and they could increase their foraging rates even at the coldest temperatures.

Although the amount of loafing time was similar among months, the site of this activity inexplicably varied (Table 1). In January, virtually all loafing (89.6%) was restricted to perches in trees. In March, the site shifted so that about 47.7% of this activity was spent on the ground. In addition, the incidence of whisper singing while loafing increased significantly ( $P < .01$ ) with a maximum of 59.2% of the loafing time devoted to this activity in March.

Territorial activity was virtually confined to dawn or dusk calling bouts, with chases of intruding birds rarely observed (Table 2). This

behavior was highly ritualized with apparently all of the thrashers perching in trees and calling vigorously for about 10–15 min during these time periods (Fischer 1981). Few conflicts were seen, possibly because thrashers established territories soon after their arrival in September and October; thus stable boundaries were established by the time this study was initiated. Earlier in September and October, chases between thrashers were observed commonly throughout the day (Fischer 1981). Lederer (1977) and Salomonson and Balda (1977) found that Townsend's Solitaires (*Myadestes townsendi*) spent proportionately more time in territorial activities during territorial establishment than later in the winter.

#### SUMMARY

The activity patterns of Brown Thrashers in coastal Texas were cyclic with an average of 14 min of foraging followed by an inactive bout of about 15 min. Foraging accounted for 47% of the daily activities, and loafing 43%. During cold weather, Brown Thrashers reduced the length of the loafing bout, so that a greater percentage of the day was spent foraging. Early in the season most of the loafing time was spent perched in trees, but as the season progressed, thrashers spent more time loafing and whisper singing from the ground. Territorial activity formed a limited percentage of the daily regimen and was essentially confined to dawn or dusk calling bouts.

#### ACKNOWLEDGMENTS

I thank K. A. Arnold and E. G. Bolen for their advice and encouragement during the study. The manuscript was read by T. C. Grubb, Jr. and an anonymous reviewer, and I appreciate their suggestions. Financial assistance was provided by the Rob and Bessie Welder Wildlife Foundation, Sinton, Texas. This is Welder Wildlife Foundation Contribution Number 267.

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