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Body temperatures of migrant accipiter hawks just after flight.—Body temperature (T_b) during flight or shortly after flight has been recorded in many studies. Red-tail Tropicbirds (*Phaethon rubri cauda*) captured within 10 sec of returning to land from extended flights had a mean T_b of 40.9°C, almost 2°C higher than the mean for these birds during incubation (Howell and Bartholomew 1962). Platania et al. (1986) measured T_b of 250 seabirds of 23 species within two min after shooting the birds from a boat 30 to 60 km off the coast. The T_b of these birds flying at sea was about 1°C higher than that of individuals studied at nesting sites. Rock Doves (*Columba livia*) shot immediately after landing at air temperatures (T_a) ranging from 13 to 26°C had body temperatures between 41.5–43.8°C (Pearson 1964), and Hart and Roy (1967) measured a T_b of 44.5°C on pigeons during free flights at air temperatures between 4–30°C. The T_b of pigeons flying in a wind tunnel increased 1.5–3.0°C in the first min of flight and remained at this higher level (Hirth et al. 1987) and at T_a above

25°C ranged from 43.3 to 44.1°C (Aulie 1971, Butler et al. 1977). White-necked ravens (*Corvus cryptoleucus*) (Hudson and Bernstein 1981) and Budgerigars (*Melopsittacus undulatus*) (Aulie 1971) flying in wind tunnels had steady-state body temperatures of 43.5–44.8 and 42.1°C, respectively. In all cases during flight, the birds had a body temperature of 1–4°C above resting level.

We are not aware of any literature on the T_b of birds recorded during migratory flight or at the end of a long distance migratory flight. Hoffman's (1985) study of raptor migration along the Goshute Mountains in Nevada provided an opportunity to record body temperatures of migrating accipiters shortly after they were trapped.

Accipiters migrating along the Goshute Mountain Ridge spend much more time soaring or sailing than in active flapping flight. Since energy metabolism during soaring flight is 1/4 to 1/6 of that during flapping flight (Bartholomew 1982), we hypothesized that migrating accipiters would have a body temperature slightly below that observed for birds during continuous active flapping flight in a wind tunnel or in the field.

Methods. — We trapped Sharp-shinned Hawks (*Accipiter striatus*) and Cooper's Hawks (*A. cooperii*) in bownets and mist nets on the ridgetop (elev. 2740 m) at the southern end of the Goshute Mountains, Elko County, Nevada, in September 1983, 1984, and 1985. We measured body temperatures with glass thermometers (Schulthesis and baby rectal thermometers) or a Wescor TC Thermometer (Model TH 50; with a Cu/Con thermocouple). All temperature sensors were calibrated with a precision mercury-in-glass thermometer. We inserted a temperature sensor 1.5 cm into the cloaca; T_b was recorded when temperature reached a steady value (usually within 20 sec). We removed birds from the bownet before inserting the sensor. The T_b of some birds entangled in the mist net was measured before removing them from the net. We removed other birds quickly from the net, and then measured their T_b. The time between trapping a hawk and reading its cloacal temperature averaged 90 sec. When the elapsed time exceeded 4 min, the T_b was not included in this analysis. Data were analyzed with a general linearized model and LSD test using a SAS/STAT program for personal computers.

Results and discussion. — The mean T_b ($\pm$ SD) of Sharp-shinned Hawks (40.6 $\pm$ 1.1°C) was significantly higher ($P = 0.006$) than that of Cooper's Hawks (40.2 $\pm$ 0.9°C) (Table 1). Differences of T_b between the sexes and between adults and immatures were not significant ($P = 0.221$ and 0.769, respectively). The higher T_b of the smaller species might be interpreted in two ways: (1) that an inverse relationship between T_b and body size is real, or (2) that the T_b of the smallest birds increased relatively more during the first 90 sec of capture, generating an apparent but false difference in T_b between large and small birds which did not exist at the time of capture.

In an unpublished study, we recorded rates of metabolism of accipiters 30 to 60 min after capture. The birds were confined inside loosely fitting cans. Typically, rates of metabolism were 1.5 × BMR (BMR was calculated from an allometric equation for Falconiforms [Wasser 1986]), but a few measurements were as high as 5 × BMR. These findings suggest that the metabolic rates during the first 90 sec of captivity are probably elevated in response to the stress of capture. When metabolic heat production is greater than heat loss, the difference is stored in the body, causing an increase in T_b.

We calculated two estimates of the potential increase of T_b by assuming two levels of metabolic heat production ($\dot{H}_m$) during the first 90 sec after capture: (1) 2.0 times BMR and (2) 4 times BMR (Table 2). In both cases we assumed that heat loss ($\dot{H}$) equaled the BMR of an Accipiter perched at rest. Therefore, in these two cases, the ratios of $\dot{H}_m:\dot{H}$ were 2 and 4. When the rate of metabolic heat production is twice the rate of heat loss, the T_b of the smallest and largest Accipiters would increase 0.17°C and 0.10°C, respectively in 90 sec (Table 2). If $\dot{H}_m:\dot{H}$ were 4, these values would increase by three times. The increase in T_b is less in larger birds since weight-specific metabolism decreases with increasing body mass.

TABLE 1

MEAN (±SD) POST-FLIGHT BODY TEMPERATURES OF MIGRATING SHARP-SHINNED AND COOPER'S HAWKS RECORDED 90 SEC (MEAN) AFTER BEING TRAPPED

| | | Body temperature (°C) | | | | | | |
| | | By age | | | | By sex | Mean body mass (g) | By species |
Species	Sex	Immature T_b (N)	Mean body mass (g)	Adult T_b (N)	Mean body mass (g)	T_b (N)		T_b (N)
Sharp-shinned Hawk	M	40.9 ± 1.2 (49)	97	40.0 ± 0.0 (2)	101	40.9 ± 1.1 (51)		40.6 ± 1.1 (160)
	Range	(38.2–43.6)						
	F	40.3 ± 1.0 (86)	164	40.7 ± 1.0 (23)	172	40.4 ± 1.0 (109)		
	Range	(37.6–43.5)		(39.4–42.7)				
Cooper's Hawk	M	40.3 ± 0.9 (24)	270	40.9 ± 1.6 (8)	280	40.4 ± 1.1 (32)		40.2 ± 0.9 (118)
	Range	(38.7–42.8)		(38.0–42.5)				
	F	40.1 ± 0.9 (46)	419	40.1 ± 1.1 (32)	443	40.1 ± 0.8 (86)		
	Range	(38.0–42.6)		(38.7–42.5)				

TABLE 2

PREDICTED BODY TEMPERATURE INCREASE (ΔT_b) OF ACCIPITER HAWKS IN 90 SEC WHEN THE RATIO OF THE RATE OF METABOLIC HEAT PRODUCTION (H_m) TO RATE OF HEAT LOSS (H) IS 2 AND 4

Species	Sex	Avg body mass (g)	H[a] (W)	T_b (°C) when $\dot{H}_m{:}\dot{H}$ equals[b] 2	4
Sharp-shinned Hawk	Male	97	0.6469	0.17	0.52
	Female	164	0.9054	0.14	0.42
Cooper's hawk	Male	270	1.2457	0.12	0.36
	Female	419	1.6502	0.10	0.30

[a] $\dot{H} = \dot{H}_b = m (34.62 \ m^{-0.36})/1000$, $\dot{H}$ is rate of heat loss in W, $\dot{H}_b$ is basal metabolic rate and m is body mass in g (modified from Wasser 1986).
[b] $T_b = 90s \cdot \dot{H}_s/c \cdot m$, where c = specific heat (=3.47 $J \cdot g^{-1} \cdot °C^{-1}$; Bligh and Johnson 1973); $H_s = H_m - H$, where H_s is rate of heat storage in W and $\dot{H}_m$ is rate of metabolic heat production for 90 sec after capture (either 2 or 4 times $\dot{H}_b$).

The difference in mean T_b observed between Sharp-shinned and Cooper's hawks was 0.4°C. It is unlikely, but possible, that this difference could have occurred during the first 90 sec of captivity, since a difference of 0.5°C would result from the most extreme case shown in Table 2 (i.e., when the $\dot{H}_m{:}\dot{H}$ of a male SS is 4 and that of a female CH is 1). Immature male Sharp-shinned Hawks had the highest maximum T_b (43.6°C) and immature female Cooper's Hawks had the lowest maximum T_b (42.6°C). The lowest T_b recorded among immatures in each group was not correlated with the size of the bird. The average body temperature of all sex and age groups among Cooper's and Sharp-shinned hawks was less than 41.0°C. Most of the literature values for the T_b of birds during active flight are greater than 41°C, supporting our original hypothesis of a lower T_b in migrating, soaring Accipiters.

Migrating Accipiters regulated their body temperature within a range of 6°C (between 37.6 and 43.6°C). The difference between the highest and lowest T_b recorded in immatures of each species-sex group was 5.4°C (male SS), 5.9°C (female SS), 4.1°C (male CH), and 4.6°C (female CH).

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Habitats Used by Common Ground-Doves in southern Alabama. — In the United States, Common Ground-Doves (*Columbina passerina*) are distributed from California to North Carolina and sporadically farther north in the East. They are considered local, uncommon to common permanent residents in the lower third of Alabama, are rare farther north (Howell 1928, Imhof 1976), and have recently been designated a Species of Special Concern statewide (Keeler 1986).

Although some authors (Howell 1928, Bent 1932, Johnston 1964, Imhof 1976) have reported on habitats used by ground-doves, they have not quantified characteristics of those habitats. Herein, we describe quantitatively the habitats Common Ground-Doves use in southern Alabama.

Study area and methods. — We studied the lower one-third of Alabama including 24 counties in 1986 and 25 during 1987. All of these counties, with the exception of the northern three-fourths of Lee County, lie in the Coastal Plain. Community type, seral stage, percent overhead cover, percent ground cover, herbaceous vegetation height, and height and diameter breast height (dbh) of the largest tree were recorded for each site where ground-doves were observed or heard while driving 322 km of roads (as per Breeding Bird Survey routes) in each county (Jones 1988). This also was done for each differing adjacent habitat for comparative purposes. Community type and seral stage were determined by species composition and physical measurements of individual plants. Each site was classified by seral stage as forb, grass, low shrub (0.3–1 m in height); high shrub (1–3 m); low tree (3–6 m); young forest (>6 m, and 10–50 cm dbh); or mature forest (>6 m, and >50 cm dbh). For community types, habitats were classified as old field, coastal dune, agricultural field, forest, or young pine plantation. Habitat variables were assessed via the quarter-point method (Brower and Zar 1984) using a 30-m interval where possible. Otherwise, an interval was used that allowed each cardinal point to be sufficiently distant from an ecotone to