

note I describe aspects of the social behaviour of two *Turdoides* species largely restricted to southern Africa.

The Bare-cheeked Babbler, *T. gymnogynys*, is restricted to Namibia and south-west Angola, being fairly common along dry riverbeds of the northwestern escarpment of Namibia (Simmons 1997). Black-faced Babblers, *T. melanops*, also have a limited range, being restricted to northern Botswana, Namibia and southern Angola (Simmons & Herremans 1997). Although formerly considered conspecific with a similar taxon in east and central Africa, Zimmerman *et al.* (1996) treat the latter as a full species, *T. sharpei*, leaving *T. melanops* with the bulk of its small range in southern Africa.

Brief observations were made on six groups of Black-faced Babblers in the vicinity of Namutoni (18° 50'S, 16° 56'E), Namibia, on 28–30 May 1997. All groups were in dense scrubby thickets consisting mainly of *Combretum*, *Albizia* and *Spirostachys* species. Birds with pale yellow irides and pronounced black lores were classed as adults. One bird, with grey/yellow irides, poorly-defined black lores, and a very slight gape was classed as a juvenile. Those classed as fledglings had dark grey irides, a more obvious cream or pale yellow gape, and dark grey lores.

Mean group size was 4.7 (range 3–7), juveniles and fledglings making up 21% of the sample. During five hours of observation on one group of three adults and one fledgling, at least one adult appeared to act as a sentinel for the rest of the group for much of the time. While the other adults turned over leaf-litter, one bird would perch on the outer branches of a bush above the group, calling quietly (*cull* – *cull*), at intervals of 2–3 sec. The fledgling usually remained perched at about 1 m, spending little time on the ground. Play behaviour, similar to that described in the Arabian Babbler, *T. squamiceps* (Zahavi 1990) was also observed on one occasion. The fledgling and one adult lay on their sides on the ground, wings closed, facing each other, approximately 2–3 cm apart. The adult pushed at the fledgling with its feet, and, after 5–10 sec, it swivelled round and hopped onto the fledgling. After the latter had moved away the adult lay on its back for a few seconds and tugged at a blade of dry grass with its feet. Throughout, there was no suggestion of aggression on the adult's part. In one other group a juvenile was seen feeding a fledgling, confirming that some degree of helping does occur.

Groups of Bare-cheeked Babbler were observed at Halali (19° 02'S, 16° 28'E), Hobatere (19° 20'S, 14° 22'E), and Huab Lodge (19° 58'S, 14° 46'E), Namibia, on 1–13 June, 1997. Age classes, group com-

position and density are described for 47 groups in Shaw & Shewry (2000). As in Black-faced Babbler, adults normally fed in leaf litter, fledglings remained low in nearby bushes, and a single sentinel normally perched at 3–4 m, calling quietly (*lull-lull*) every 2–3 sec. Occasionally an adult would bring food to one of the fledglings, and then take over as sentinel. Alternatively, an adult with food would quiver its wings to attract a fledgling down onto the ground to be fed. On one occasion, when a fledgling had landed in an open area, an adult used this behaviour to lead it back into cover, drooping and quivering its wings in short bouts for 2–3 min. Similar 'leading' behaviour has been reported in the Iraq Babbler, *T. altirostris* (Al-Dabbagh & Bunni 1981, in Cramp *et al.* 1993), and Common Babbler, *T. caudatus* (Gaston 1978a).

Two groups were followed to their roost site on three occasions. They roosted near the centre or tops of trees (*Colophospermum mopane* or *Acacia* sp.), at a height of 3–5 m. All birds would pack tightly together in a line, with young birds in the centre. Zahavi (1990) noted that in Arabian Babblers the outer positions are occupied by dominant individuals, and suggested that this arrangement may provide some protection, or greater insulation, for younger birds. This may have been the result in Bare-cheeked Babblers, although it was noticeable that since young birds would settle down to roost some 5–10 min before the adults it was almost inevitable that they would ultimately occupy the central position.

These observations confirm that Black-faced and Bare-cheeked Babblers share behavioural traits with other *Turdoides* species, in which complex social adaptations to cooperative breeding have been well documented.

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Thermal conductance and basal metabolism of the Orange-cheeked Waxbill (*Estrilda melpoda*)

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Thermal conductance (*C*), the inverse of insulation, is a measure of the ease of heat transfer between an organism and its environment. Many animal species native to hot climates exhibit higher thermal con-

ductance (poorer insulation) than is predicted by body mass, an adaptation that presumably aids in avoiding overheating (Scholander 1950a,b; Calder 1964). However, elevated conductance is advantageous for dissipating excess heat only when ambient temperature (T_a) is less than body temperature (T_b). In envi-

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ronments where T_a regularly exceeds T_b , high conductance could actually be maladaptive by facilitating overheating. Perhaps as a result, tropical passerines that forage in open, sunny habitats, as opposed to forested, shady areas, do not conform to the general pattern of elevated thermal conductance in tropical birds (Weathers 1997). Thermal conductance values of tropical grassland species are generally equal to or below mass-predicted values, with the notable exception of five open-habitat finch species in the family Estrildidae, whose thermal conductances exceed predicted values by 28–50% (Marschall & Prinzinger 1991, Weathers 1997).

The Estrildidae comprise approximately 124 species occupying diverse habitats across Africa, southern Asia and Australasia, with the highest species concentrations occurring in the tropics (Goodwin 1982). The Orange-cheeked Waxbill (*Estrilda melpoda*) is native to savannas and other open habitats of the western and central African tropics (Goodwin 1982). As a starting point for investigating interspecific patterns in the thermal ecology of estrildid finches, we measured thermal conductance and basal metabolism of Orange-cheeked Waxbills.

We used open-circuit respirometry to measure active- and rest-phase basal metabolism (BMR) and active-phase conductance of seven Orange-cheeked Waxbills (sex unknown) obtained from a commercial supplier. Body mass averaged 8.3 g but ranged widely between individuals, from 6.1 to 11.7 g. We maintained the birds individually in 0.73 m³ cages in a temperature-controlled room (27°C) on a 14L:10D photoperiod for one month prior to (and during) study. Birds had *ad libitum* access to commercially available mixed seed for finches, grit and water containing a vitamin supplement.

We conducted all metabolic measurements between November 1997 and March 1998 at the University of California at Davis. Rates of oxygen consumption (VO_2) were determined by open-circuit respirometry with an Applied Electrochemistry model S-3A oxygen analyser, following the protocol of Weathers &

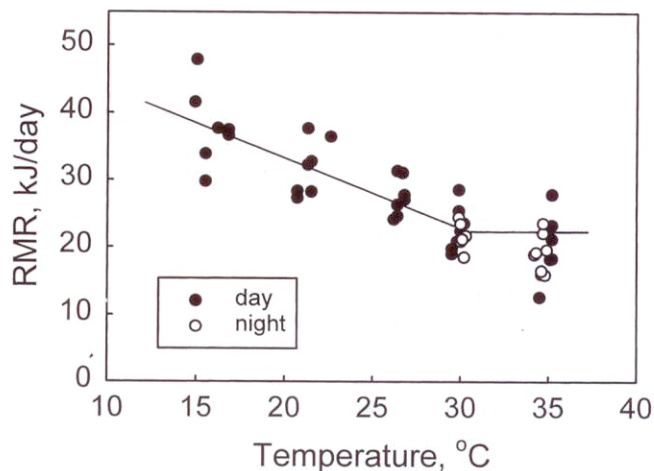


FIG. 1. Relation of resting metabolic rate (RMR) to ambient temperature in Orange-cheeked Waxbills. Closed circles indicate active-phase measurements, open circles denote rest phase measurement.

Greene (1998). We fasted birds for 3 h prior to measurement in a 1-l metabolism chamber, which we placed in a darkened, thermostatically controlled temperature cabinet. Dry, CO₂-free air was pumped through the chamber at 0.4 l/min. Each bird rested in the chamber for at least one hour before VO_2 measurement. We determined chamber temperature with a 24-gauge Cu–Cn thermocouple calibrated against a National Bureau of Standards certified Hg thermometer. Instrument calibration followed Weathers *et al.* (1980); systematic errors in VO_2 measurements were less than 5%.

We measured each bird's daytime VO_2 (always between 11:00 and 13:00) once at approximately 15, 25 and 35°C and twice at 20 and 30°C. Duplicate values at 20 and 30°C were averaged. Night time VO_2 of each bird (measured between 21:00 and 23:00) was determined at 30 and 35°C. Individual birds rested for approximately seven days between successive measurements.

Metabolic rate of fasted waxbills resting in the dark was a linear function of ambient temperature below 35°C (Fig. 1). Rest-phase metabolic rate was significantly higher at 30°C than at 35°C (paired *t*-test, $t = 3.305$, $P = 0.016$). Similarly, active-phase metabolic rate was nearly significantly higher at 30°C (paired *t*-test, $t = 2.415$, d.f. = 18, $P = 0.051$). Thus, meta-

bolic rate at 30°C falls outside the thermoneutral zone (TNZ) and we calculated basal metabolic rate (BMR) as the average of measurements taken at 35°C. Basal metabolism during the active phase averaged 18.8 ± 5.3 kJ/day (mean \pm SD), 7.0% lower than predicted by mass (Aschoff & Pohl 1970). Unlike most species, in which rest-phase BMR averages *c.* 24% lower than active-phase values (Aschoff & Pohl 1970), waxbill night time heat production within the TNZ averaged 19.4 ± 2.6 kJ/day, statistically indistinguishable from daytime heat production. Apparently, our night time birds were not asleep during the measurements. If so, our rest-phase BMR value over estimates actual BMR. Below the TNZ (lower critical temperature = 30.5°C), active-phase resting metabolic rate (RMR) varied with temperature as follows: RMR (kJ/h) = $54.0 - 1.023 T_a$ ($r^2 = 0.65$, $s_{yx} = 4.12$, $s_b = 0.146$, $n = 28$). Thermal conductance, calculated as the slope of the regression line fitted to measurements below 35°C, equalled 0.245 ml O₂/(g h °C), 25% less than predicted from mass (Aschoff 1981).

Our measurements suggest waxbill thermal conductance conforms to interspecific patterns noted by Weathers (1997). As with several other tropical passerines that may commonly encounter ambient temperatures exceeding body temperature, waxbill *C* is relatively low

TABLE 1. Basal metabolic rate (BMR) and thermal conductance (C) of Orange-cheeked Waxbills, compared with allometrically predicted values and values from a similar study by Marschall & Prinzinger (1991).

Source	BMR (kJ/day)		C (ml O ₂ /g h °C)	
	Active phase	Rest phase	Active phase	Rest phase
Predicted ^a	20.1	13.8	0.322	0.228
This study	19.6	–	0.245	–
Marschall & Prinzinger (1991)	–	11.3	–	0.308

^aPredicted BMR (Aschoff & Pohl 1970) and conductance (Aschoff 1981) based on either a 7.5-g passerine bird (mean mass of birds in Marschall & Prinzinger's study) or an 8.3-g passerine bird (mean mass this study).

compared to tropical birds in general. Additionally, active-phase BMR is 7% lower than predicted for passerines in general, supporting the idea that C and BMR are positively correlated in the Estrildidae (Marschall & Prinzing 1991) and in tropical birds in general (Weathers 1997).

Our values for Orange-cheeked Waxbill BMR and C differ markedly from measurements of the same species made by Marschall & Prinzing (1991; Table 1). Marschall & Prinzing's measurements were made during the birds' rest phase, whereas our measurements were made during the active phase. Furthermore, their birds weighed less than ours (7.5 vs 8.3 g). Thus directly comparing data from the two studies is inappropriate and comparisons must be based on values predicted from body mass (Table 1). BMR was lower than predicted in both studies, but much more so in Marschall & Prinzing's study (-18% vs -7%). Several factors may explain the inter-study difference in BMR, including seasonal variation in metabolism (Weathers & Caccamise 1978) or length of the pre-measurement fast. Marschall & Prinzing (1991) did not report the length of their birds' pre-measurement fast, but extended fasting can cause substantial reductions in avian BMR (Ketterson & King 1977; Shapiro & Weathers 1981; Bucher & Worthington 1982; Weathers *et al.* 1983).

The thermal conductance of our finches differed dramatically from values obtained by Marschall & Prinzing; our active-phase value being 25% lower than predicted, whereas their rest-phase value is 35% higher than predicted. Marschall and Prinzing's higher C indicates that their bird's plumage was less dense than ours. Plumage density and insulation vary seasonally and this may account for the difference in values between the two studies. Our birds were not moulting and were in excellent plumage and the value of C we measured may be near the species' minimum.

Differences of the magnitude presented here between studies could seriously confound cross-species comparisons and obscure relationships between phylogeny or ecological variables and energy metabolism. Clearly, intra-specific variation in avian metabolism needs further study.

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Longevity record of a Great White Pelican, *Pelecanus onocrotalus*, from Lake Shala, Ethiopia

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In 1972, 1973 and 1974 we and our colleagues placed coloured streamers and British Trust for Ornithology rings on the legs of 420 young, nearly ready-to-fly Great White Pelicans, *Pelecanus onocrotalus*, at Lake Shala, Ethiopia (07° 30'N, 38° 30'E). Seven of these marked birds were either recovered or sighted in 1972-1974 in Ethiopia's Danakil Desert, Rift Valley and Western Highlands and in Kenya's Rift Valley (Kwetu, Lake Nakuru), the latter some 1000 km away (Urban & Jefford 1977) and one recovered in 1978 or 1979 in Sudan's Dinder National Park, some 680 km away (Ash 1984).

Recently, on 17 September 1997, one of these ringed birds was caught alive in a gill net at Lake Zwai (c. 8° 00'N, 38° 50'E), Ethiopia (Anon. 1997). The bird was kept alive in a village for a few weeks before being released (Yilma Dellelegn, pers. comm.). It was captured some 60 km northeast of Shala where we had ringed it as a fully feathered pullus (70-80 days old) on 1 June 1974. Thus, when captured, this pelican was 23 years and 5, possibly 6, months old.

Information on how long pelicans live is poorly documented and not well known in Africa. There are two unpublished recoveries of Great White Pelicans from southern Africa, both ringed at Walvis Bay Guano Platform (22° 52'S, 14° 32'E) (SAFRING database: D. Oschadleus, T. Oatley, pers. comm.). A bird, ringed on 12 January 1971, was recovered

12 km away on 15 January 1988; it was 17 years old. The other bird, ringed on 20 December 1972, was captured 53 km away at Wlotzbaken, 40 km N of Swakopmund (22° 24'S, 14° 27'E) on 3 January 1989; it was 16 years old. In addition, an unmarked Great White Pelican was present at Keiskamma estuary (33° 27'S), Eastern Cape, South Africa from 1969 to 1997; if it was, as thought, the same bird, it would have been at least 28 years old (Tree 1997).

The oldest known documented ages of wild pelicans elsewhere in the world include American White Pelican, *P. erythrorhynchus*, 26 years 5 months (Clapp *et al.* 1982; Klimkiewicz 1997), and three Eastern Brown Pelicans, *P. occidentalis*, 31, 37 and 43 years (Schreiber & Mock 1988). The oldest known captured pelicans include three Dalmatian Pelicans, *P. crispus*, acquired at an unknown age in the wild, that lived 31, 31, and 34 years (S. Elbin, pers. comm.) and an unidentified pelican, reported to have reached an age of 54 years (del Hoyo *et al.* 1992).

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