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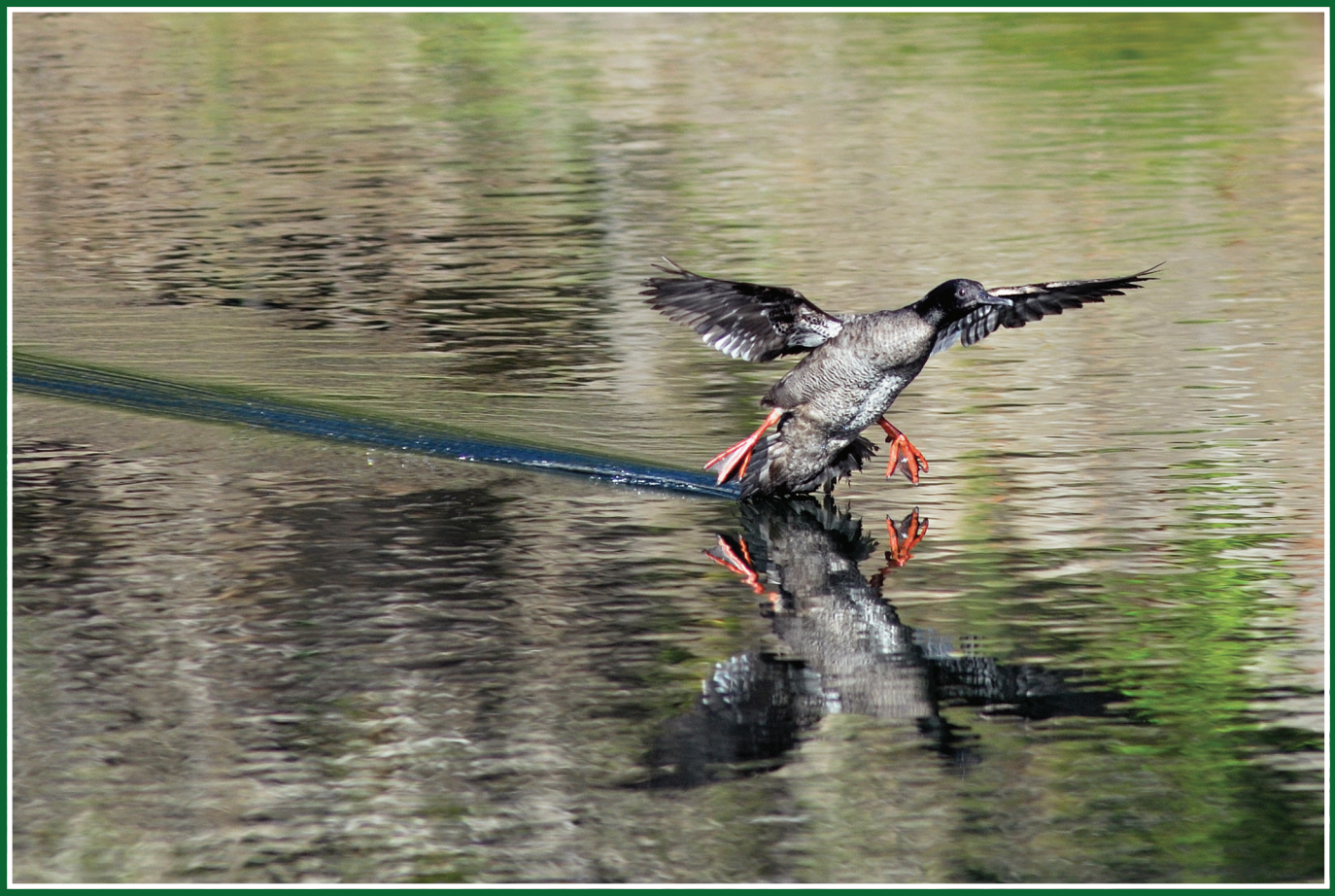

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NOTA

Use of burrows by *Melanopareia torquata,* Collared Crescentchest (Melanopareiidae) in the Cerrado of southeastern Brazil

Mieko F. Kanegae[1] and Matheus G. Reis[2]

1. Laboratório de Vertebrados, Universidade Federal do Rio de Janeiro (UFRJ). Ilha do Fundão, CEP 21941-590, Rio de Janeiro, Brasil. E-mail address: mieko.kanegae@gmail.com
2. Pós-Graduação em Ecologia e Recursos Naturais, Departamento de Ecologia e Biologia Evolutiva, Universidade Federal de São Carlos (UFSCar). Rodovia Washington Luiz, Km 235, Caixa Postal 676, Bairro Monjolinho. CEP 13566-905. São Carlos, SP, Brasil. E-mail address: matheus.reis@gmail.com

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RESUMO: Uso de tocas por *Melanopareia torquata,* (Melanopareidae) no Cerrado do sudeste do Brasil. As tocas no chão são recursos importantes que podem ser utilizados como locais de abrigo para descanso ou dormida, reprodução, termorregulação e até mesmo como refúgio durante a fuga de predadores. O presente trabalho apresenta o primeiro registro de *Melanopareia torquata,* tapaculo-de-colarinho, utilizando tocas no chão. Com o uso de telemetria obtivemos 14 registros da ave utilizando tocas de roedores e de tatus em diferentes horas do dia. Algumas observações mostraram a ave se deslocando nas galerias.

PALAVRAS-CHAVES: Tocas; Proteção; Termorregulação; Descanso.

KEY-WORDS: Hollows; Protection; Thermoregulation; Rest.

Individuals use their habitats for foraging, rest, nesting, shelter during predator escape, perching or other life history traits (Krausman 1999). Thus, the habitat use is related to the way in which an individual or species explores the environment to meet its life history requirements (Block and Brennan 1993).

Many burrowing species provide relevant ecological services as ecosystem engineer and as facilitator of other species due to their physical modification of habitats (Meadows and Meadows 1991, Machicote *et al.* 2004). In the Cerrado, a brazilian savanna, the burrows in the ground are constructed by rodents (10 species) or armadillos (six species) (Reichman and Smith 1990, Vieira and Marinho-Filho 1998). Burrows constitute an important resource that can be used as retreat place, for resting or sleeping, reproduction and even a refuge for escape from predators. In areas with high thermal amplitude and frequent incidence of fire these types of shelters can help to maintain water and thermal balance (Reichman and Smith 1990, Ramos-Neto and Pivello 2000).

The Collared Crescentchest, *Melanopareia torquata* (Wied 1931), Melanopareiidae (CBRO 2010) is an endemic species of the Cerrado (Silva and Bates 2002) that inhabits savannas and grasslands savannas rich in termites (Sick 1997). Its foraging strata comprises terrestrial and understory micro-habitats (Stotz *et al.* 1996) and it feeds on insects, spiders and centipedes (Sick 1997). The species is cryptic moving mainly on the ground, among clumps of grasses, shrubs and trees thus hindering the visual detection *(pers. obs.).* The globular nest is also located at this stratum, on the base clumps of grasses (Gressler and Marini 2007, Kanegae *et al.* 2010). Our study presents some registers of *Melanopareia torquata,* Colared Crescentchest using hollows in the ground of a Cerrado area.

MATERIAL AND METHODS

Study Area

This study was conducted in the Cerrado of *Estação Ecológica de Itirapina* (EEI) (22°15'S; 47°49'W) in the state of São Paulo. The EEI represents one of the last natural areas of grassland and *campo cerrado* remainders in the state (Gianotti 1988), with an area of 2720 ha. Altitudes vary between 705 and 750 m (SEMA 1997) and the climate is Cwa, according to the Köppen's (1948) classification. The mean annual precipitation is 1376 mm, with dry season, between April-September, ranging from 32 to 88 mm monthly, and the rainy season, between October-March, with 117 to 257 mm monthly (DAEE Posto D4-014, Itirapina, SP).

Field Procedure

We used 12 radio transmitters (model LB-2, 0.52 g of weight Holohil Systems Ltd), some of which were used twice due to the detachment on the bird. We used a light radio transmitter, corresponding to 3.3% of *M. torquata* weight. Individuals were captured with a mist-net of 12 × 2 m, in the morning, between 0600 and 1200 hs, and in the afternoon, between 1600 and 1800 hs. We attached a radio transmitter on the back with a ribbon (90% polyester and 5% nylon) as a backpack that weighed 0.1 g (Kenward 2001, Millspaugh and Marzluff 2001). We monitored the birds using a receiver LA 12-Q (AVMA) and a Yagi antenna of three elements during the breeding season, October and November 2007, at intervals of 5 hs, during beginning and late morning, and late afternoon.

We categorized the microhabitat of records into burrows of Bishop's Fossorial Spiny Rat, *Clyomys bishopi,* and burrows of armadillos. Four armadillo species can be found in EEI, Six-banded Armadillo *Euphractus sexcinctus,* Seven-banded Long-nosed Armadillo *Dasypus septemcinctus,* Nine-Banded Armadillo *D. novemcinctus,* and Southern Naked-tailed Armadillo *Cabassous unicinctus* (Bonato 2002). Adult armadillos construct burrows with entrance greater than *C. bishopi.* We use the following measures to identify Spiny Rat's burrows: average 9.7 cm width, and 9.10 cm height (Trovati 2009). Records of young armadillos measurements are almost absent, thus we considered holes larger than ones of Spiny Rat as belonging to armadillos (Carter and Encarnação 1983, Trovati 2009).

From the first visual record of the Collared Crescentchest it was delimited a circle of 5 m radius from the exact point of perched bird (details in Kanegae 2009). The microhabitat variable obtained was density of armadillo and rat burrows, active or not (closed by leaves, brushes or cobweb). We distributed 100 point samplings arranged in a grid of 300 m, of which 35 points were selected at random for comparison with 31 points of bird records.

RESULTS

From telemetry method we obtained 14 records of Collared Crescentchest using the burrows. This indicates a rate of 4.8% of all records obtained from 12 individuals tagged with a radio transmitter. Eight of this records occurred in armadillo burrows and six in *C. bishopi* burrows. Eleven burrows (78.6%) were located close to the base of *Attalea geraensis,* a palm tree. Two observations for the use of burrows were obtained one day after tagging the radio-transmitter in individuals. There was a death record of *M. torquata* in an armadillo burrow with signals of short movements underground that continue during a period of one month. It is possible that an armadillo (that might be a predator of small vertebrates) was moving inside galleries, or just digging underground, what could cause the records of short movements.

Clyomys bishopi is the only fossorial rodent species found in EEI. It is a colonial species that build extensive galleries which vary in depth, reaching up to 158 cm, and in number of entrance holes from three to 12 (Cunha and Belentani 2000). Three of the six records inside *C. bishop* burrows indicated individuals of *M. torquata* moving through underground galleries. The records of armadillo burrow use were probably from *C. unicinctus* and *E. sexcinctus,* the most common armadillos in EEI (Bonato 2002). Moreover their burrows are easy to distinguish from others due to the horizontal arrangement.

We evaluated a total of 66 point samplings in "campo sujo" and "campo cerrado", area of 78.5 m^2 each (radius of 5 m) had 158 burrows of *C. bishopi* and armadillos, which is equivalent to one hole every 32.8 m^2. Of these total only 35.2% were active, while most of them were old and inactive, blocked by leaves, shrubs or cobwebs and 21 holes (13.3%) were located close to the base of the palm *(Attalea geraensis).* Each point sampling have an average density of 3.66 (± 1.94 SD, N = 158) holes and the records ranged from 0 (N = three point samplings) to 8 (N = one point sampling).

DISCUSSION

In the studied area the density of burrows in "campo sujo" is high, ranging from 176 to 334 burrows per hectare, which 143 burrows/ha were constructed by *C. bishopi* and 99 burrows/ha by armadillos *(E. sexcinctus* e *C. unicinctus).* These burrows diggers are consider key species due to the construction of potential microhabitats for invertebrates and vertebrates (frogs, lizards and small mammals; total of 12 families and 26 species) (Trovati 2009).

Burrows from armadillos and rodents present several entrances to reduce predation risk (Reichman and Smith 1990). The potential predators in the EEI are snakes, hawks, falcons, jays and armadillos (Bonato 2002, Granzinolli 2009, Kanegae 2009, Sawaya 2004). Nest predation rates are high in Cerrado biome (Borges and Marini 2010, França and Marini 2009), but rates of adult predation are poorly known.

A possible relationship between using burrows and their location near the base of *Attalea geraensis* may represent a factor of safety against predation, and/or thermal regulation. In the Cerrado, this palm is abundant and represents a valuable resource for wildlife, especially for *C. bishopi* (Vidal 2007, Trovati 2009). *A. geraensis* is a no stem palm occupying a considerable area, due to its large

size. It can reach up to 1 m high and contain from five to six leaves around 1.4 m of length (Lorenzi 1991).

There are few records of burrows used by bird as shelters, probably due to the difficulty in perform this type of observation. In Brazil the Burrowing Owl, *Athene cunicularia,* is the most known species with a wide range distribution among open habitats that uses burrows. It uses mainly cavities of armadillos and other mammals for shelter, nesting and to escape from predators. Some Tinamids of Cerrado, as *Nothura minor* and *N. maculosa,* also use burrows in the ground when they are hunt down by natural predators or human hunters (Sick 1997, Nacinovic, J. B. *pers. comm.*).

Inside the holes in the ground, the temperature range is always lower during a day cycle and humidity is often higher than outside (Hudson and Rummel 1966, Morhardt and Gates 1974). During the studied months the mean daily temperatures ranged from 18.1 ± 2.4°C to 31.1 ± 4.3°C (ADEE Tour D4-014, Itirapina, SP). Daily variations are around 13°C in average, reaching up to 20°C. This type of shelter can reduce these fluctuations maintaining temperatures constant and mild. Besides, the species is small and the low ratio of surface/volume makes it a candidate for dehydration. Ambrose (1984) recorded inside the same burrow in the ground three bird species (11 individuals) sheltering together, protected from extreme temperatures (49.6°C and 21.0-22.0% humidity at 30 cm above the ground in a shaded area; and 41.8°C and 39.8% humidity at the bottom of the underground hollow).

In fire-prone ecosystems of Cerrado biome the burrows also play an important role as safe refuge during a burning event not only for digger animals, but also for other species (Vieira and Marinho-Filho 1998). During these occasions, only a few centimeters below soil surface the temperatures rarely reach lethal levels (Coutinho 1978). Thus we can expect burrows as stable microhabitats if we compare to outside habitats directly exposed to daily and seasonal weather variations (Morhardt and Gates 1974, McNab 1979, Machicote 2004, Platt *et al.* 2004). Other potential use is related to foraging behavior, as Collared Crescentchest feeds ants (unpublished data), spiders and centipedes (Sick 1997) so its search for this resource can also occur in the burrows.

Considering the historic association of fire in the Cerrado and the use of burrows by some animals as protection, we expect that more bird species could use these holes during different activities. However to detect this behavior expensive studies with cameras or telemetry are necessary.

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