

SNAKE'S EXUVIAE AS HABITUAL NESTING MATERIAL OF THE BLACK-CAPPED DONACOBIUS (*DONACOBIUS ATRICAPILLA*) (PASSERIFORMES: DONACOBIIDAE) IN THE PANTANAL WETLANDS

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Resumo. – Exúvias de serpente como material habitual de nidificação do japacanim (*Donacobius atricapilla*) (Passeriformes: Donacobiidae) no Pantanal. – Exúvias de serpentes são ocasionalmente reportadas como material utilizado na composição de ninhos de Passeriformes, tanto em habitats temperados como tropicais. Entre outras explicações, tais artefatos podem funcionar como sinais de alerta e podem dissuadir alguns potenciais predadores de ninhos. Aqui registramos a presença de exúvias da jararacuçu-do-brejo (*Hydrodynastes gigas*) em nove ninhos do japacanim (*Donacobius atricapilla*) encontrados numa região do Pantanal brasileiro, onde ambas as espécies são abundantes. Os ninhos, em forma de cesto alto, foram construídos em habitats sazonalmente alagáveis e apoiados em forquilha de arbustos a uma altura média de $0,66 \pm 0,24$ m acima do nível da água. O artigo chama atenção para as possíveis circunstâncias que envolvem a obtenção de exúvias de serpente por indivíduos de *D. atricapilla* durante a construção do ninho, e também para a potencial eficiência desse tipo de artefato para intimidar o predador.

Abstract. – Snake's exuviae are occasionally reported as nesting material mainly for passerine birds, both in temperate and tropical habitats. Among other explanations, such artifacts might function as warning signals and might deter some potential nest predators. Here we report on the presence of exuviae from the false water cobra (*Hydrodynastes gigas*) in nine nests of the Black-capped Donacobius (*Donacobius atricapilla*) found in the Brazilian Pantanal wetlands, where both species are abundant. Basket-shaped nests were constructed in seasonally flooded habitats, supported on shrub forks, at a mean height of 0.66 m (SD = 0.24) above water level. The article calls attention to the possible circumstances under which snake's exuviae are obtained by individuals of *D. atricapilla* during nest construction, and also for the potential efficiency of this kind of material as a predator deterrent. *Accepted 20 May 2014.*

Key words: Black-capped Donacobius, *Donacobius atricapilla*, Dipsadidae, *Hydrodynastes gigas*, nest, reproductive strategy, snake' sloughs.

INTRODUCTION

Nest characteristics are important life-history attributes of birds and might influence their reproductive success and the persistence of metapopulations (Pianka 1976, Hansell 2000, Suárez-Rodríguez *et al.* 2013). A wide variety of natural materials are used by birds to construct, enhance, or camouflage their nests. The use of exuviae of snakes as nesting material has been considered as an adaptive behavior of birds to avoid nest predation (Strecker 1926, Guthrie 1932, Medlin & Risch 2006, Trnka & Prokop 2011). However, results of experimental approaches on this issue are scarce and controversial, sometimes giving support to the prediction that snake skins would function as predator deterrents (Medlin & Risch 2006), sometimes not (Trnka & Prokop 2011).

Alternatively, exuviae of snakes in birds' nests may serve as a post-pairing signal revealing female parental quality, as observed by Trnka & Prokop (2011) in the Great Reed Warbler *Acrocephalus arundinaceus* (Acrocephalidae). Exuviae may also be collected and used by birds because of its shiny, attractive appearance (Suthard 1927), or because they provide a suitable, soft nest-building material, "in the same manner that birds occasionally use fragments of birch bark, leaves, strings, newspaper, etc." (Whittle 1927: 263).

Although reported worldwide, nests made of snakes' exuviae are more frequently mentioned for passerine species from temperate zones. It seems to be a common habit, for example, among some North American Tyrannidae, Paridae, Cardinalidae, Troglodytidae, and Vireonidae (Strecker 1926, Suthard 1927, Teachenor 1927, Whittle 1927; Bent 1948, 1963; Coppedge 2009), Eurasian Acrocephalidae (Trnka & Prokop 2011), some Indian Sturnidae and Turdidae (Strecker 1926, Dhandhukia & Patel 2012), and North African Muscicapidae (Strecker 1926). In

non-passerines, this behavior has been recorded in the Greater Roadrunner (*Geococcyx californianus*), a cuculid distributed from the southwestern United States to central Mexico (Strecker 1926). Only a few of these reports provide a clear identification of the reptilian species (or even genus), to which the exuviae belonged. Such information seems to be restricted to the experimental studies by Medlin & Risch (2006) and Trnka & Prokop (2011), in which authors used snake sloughs from two species of *Elaphe* (Colubridae).

The Black-capped Donacobius (*Donacobius atricapilla* Linnaeus, 1766) (Passeriformes: Donacobiidae) is an exclusively Neotropical species, widely distributed in lowlands of tropical South America to eastern Panama. In Brazil, it occurs in all states except Rio Grande do Sul, in the southern extreme of the country (Sick 2001, van Perlo 2009). It is a common element of bird assemblages in the Pantanal, a large floodplain located in the mid-west region of the same country (e.g., Nunes *et al.* 2005, Straube *et al.* 2006, Nunes 2011).

Nests of *D. atricapilla* are basket-shaped, usually found high in the vegetation of aquatic habitats such as seasonally flooded fields, marshes, swamps, and margins of lakes (Gwynne *et al.* 2010). Cooperative breeding and other forms of social organization have been described for the species (Ragusa-Netto 1996, 1998; Kiltie & Fitzpatrick 1984). Studies on populations from the Pantanal also include information on juveniles' development and survival (Ragusa-Netto 1996). Here we provide a description of the habitual use of exuviae from a locally abundant snake as nesting material of *D. atricapilla* in the Brazilian Pantanal wetlands.

METHODS

Study area. Considered to be the largest freshwater alluvial floodplain in the world (Junk *et*

al. 2006) and encompassing parts of Brazil, Bolivia, Paraguay and Argentina, the Pantanal can be subdivided in a variable number of subregions, according to distinct patterns of vegetation composition (Adámoli 1982), inundation patterns (Hamilton *et al.* 1996), or geomorphology (Silva & Abdon 1998). Our data were obtained in a sub-region known as “Pantanal de Poconé,” located in the northern part of the floodplain and encompassing ca. 11% of the Brazilian Pantanal (Silva & Abdon 1998). Fieldwork was carried out at “Fazenda Retiro Novo” (16°15’S, 56°22’W), municipality of Poconé, state of Mato Grosso, Brazil. The entire area becomes flooded after the onset of annual regular rains (usually, from December to April), and also due to the overflow of rivers belonging to the Upper Paraguay River Basin (Signor *et al.* 2010). Local vegetation is typical of the savanna-like Cerrado domain. Natural grasslands, seasonally inundated, are the predominant landscape unit, interspersed with a mosaic of other open and forested habitats, as well as seasonal or permanent aquatic habitats (Nunes da Cunha *et al.* 2010). These latter include the study site, “Baía do Coqueiro” (16°22’S, 56°18’W), a fluvial lake connected to the Piraim River, belonging to the Upper Paraguay River Basin. Forested habitats are mainly mono-dominant formations dominated by the trees *Licania parvifolia* (Chrysobalanaceae) and *Vochysia divergens* (Vochysiaceae), and by shrubs of the genus *Combretum* (Combretaceae) (Nunes da Cunha *et al.* 2010, Nunes da Cunha & Junk 2011).

Field sampling. From September 2011 to April 2012, during a study on reproductive aspects of local bird assemblage, we searched for bird nests amidst the vegetation. Searches were conducted both in open and forested habitats, distant and near the margins of “Baía do Coqueiro,” covering an area of around 30 km². Adult birds found transporting nesting

material or food for their young were followed to their nesting sites. Reptilian exuviae found in the nests were collected, brought to the Laboratory of Herpetology of the Universidade Federal de Mato Grosso (Cuiabá, Brazil), examined both visually and under stereoscope, and identified to the species level. Nests were measured to the nearest 1.0 mm with a metallic rule, and described according to Simon & Pacheco (2005). Numerical data are presented as mean \pm standard deviation.

RESULTS

Nine nests of *Donacobius atricapilla* were found during this study, all of them in wet habitats on the margins of “Baía do Coqueiro.” Nests were basket-shaped, supported on forks of shrubs of *Ludwigia* sp. (Onagraceae). They were constructed mainly with thin branches and leaves of *Poa annua* (Poaceae) and *Ludwigia* sp., besides branches of other unidentified herbaceous plants and lianas.

In all nine nests, exuviae of snakes were a conspicuous nesting material (Figs 1A-C). On 1 February 2012, at 08:00 h, we observed a mated pair of *D. atricapilla* carrying pieces of the exuvia of a snake from an old nest to a new one, being constructed 30 cm away. All exuviae were composed of smooth scales in 21 dorsal rows with reduction, each scale with a single apical pit, allowing us to confirm that they belong to the false water cobra (*Hydrodynastes gigas*) (Duméril *et al.* 1854) (Dipsadidae).

Nests of *Donacobius atricapilla* were found in the beginning (October 2011; n = 1) and in the middle of the rainy season (January and February 2012; four nests per month), at a mean height of 0.66 ± 0.24 m above water level (0.81 ± 0.01 m above soil level). Five of the nests were active (under construction or with eggs and/or nestlings), while the other four had probably been used in former reproductive seasons. Active nests lined with exu-



FIG. 1. Nests of the Black-capped Donacobius (*Donacobius atricapilla*) found at Fazenda Retiro Novo, Poconé, Mato Grosso, Brazil, lined with exuviae from *Hydrodynastes gigas*. (A) A nest constructed mainly with exuviae; B) a nest with three eggs, found in January 2012; C) a nest constructed with plant material, mainly grass strips, and lined with pieces of exuviae.

viae had a 60% success rate. Remaining active nests were predated.

DISCUSSION

Type of nest and nesting site of *Donacobius atricapilla* in the northern Pantanal are consistent with previous reports for the species in other parts of its range, in southeastern Brazil (Euler 1900, Ragusa-Netto 1996), northern Venezuela (Skutch 1968), and southeastern

Peru (Kiltie & Fitzpatrick 1984). All nine nests found during the present study were located at the margins of a fluvial lake, in aquatic-terrestrial transition habitats also frequently occupied by the snake *Hydrodynastes gigas*.

Diurnal, semiaquatic, and widely distributed in South America, *Hydrodynastes gigas* is one of the most abundant snake species in the Pantanal (Strüssmann & Sazima 1993). Wet, marshy habitats seem to be preferred by this

snake, although it was observed to use other habitats in the floodplain extensively, even during the dry season (Strüssmann & Sazima 1990, 1993). In addition to being an abundant species in the Pantanal, *H. gigas* exhibits year-round activity, which possibly results in a high availability of exuviae of this snake in the environment. Indeed, several exuviae were found by one of us (S.M.A.) during the field study, amidst vegetation near the margins of "Baía do Coqueiro".

The diet of *Hydrodynastes gigas* is highly variable, including both aquatic invertebrates and representatives of most classes of vertebrates (Strüssmann & Sazima 1993, Lopez & Giraudo 2004, Weiler & Wood 2010), but birds have not yet been mentioned as prey for this snake, under natural conditions. This is surprising since individuals of *H. gigas* frequently forage amidst aquatic vegetation along the shoreline of shallow aquatic habitats in the Pantanal (Strüssmann & Sazima 1990), where dense aggregations of different types of waterbirds might occur, especially, in the beginning of the dry season. In the same hydrological period and habitats, yellow anacondas *Eunectes notaeus* are also abundant (Strüssmann & Sazima 1993). However, although readily available, exuviae of such boid snakes have not yet been reported as nesting material for *D. atricapilla* or any other bird species, which may be linked to the fact that they are usually too large or too wet for this purpose. Whittle (1927) argued that exuviae of snakes are possibly investigated as potential nesting material by many bird species, but only the larger birds would be able to carry and manipulate exuviae of larger snake species.

All nine nests of *Donacobius atricapilla* found in the Pantanal were lined with exuviae of *H. gigas* and were composed of plant fibers. In other Brazilian sites, nests of *D. atricapilla* have been found usually wrapped with spider webs (Sick 2001), but unidentified snake's and

lizard' sloughs had been mentioned as nesting materials for the species in Peru (Kiltie & Fitzpatrick 1984) and Venezuela (Skutch 1968). Usually, the use of exuviae in nesting construction seems to be incidental in other bird species, although in the Nearctic Western House Wren (*Troglodytes aedon parkmani*, Troglodytidae) 63% of 30 nests contained exuviae (Teachenor 1927).

Complimentary studies on reproductive traits of *D. atricapilla* in the Pantanal should ideally include both field observations and experimental approaches, in order to address questions regarding individual and populational benefits of using snake's exuviae as nesting material, such as: 1) Is there a pattern in the selection of animal and plant items as nesting materials in this species?; 2) Are exuviae found by chance or actively searched for amidst vegetation in preferred habitats of *H. gigas*?; 3) Are exuviae of venomous snakes, when available, also used or even preferred over those of the rear-fanged false water cobra?; and 4) Does differential reproductive success occur in nests with and without this material?

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