

## HYACINTH MACAWS (*ANODORHYNCHUS HYACINTHINUS*, PSITTACIDAE) FEEDING ON TERMITES

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**Abstract** · Hyacinth Macaws (*Anodorhynchus hyacinthinus*) feed largely on palm seeds and fruits. Here, we report a pair of Hyacinth Macaws feeding on termites. We visited the nesting tree of a pair of Hyacinth Macaws at the southern border of the Brazilian Pantanal on a monthly basis during one year. Macaws were present during four of these visits, and we recorded them foraging on arboreal termites in their nesting tree during one of the visits. Using their beaks, both macaw individuals repeatedly broke away bark pieces from decaying branches, and handled them with beak and feet to ingest termites found on the inner side of the bark. Nesting in decaying trees likely increases opportunities for Hyacinth Macaws to find termites, and the feeding behavior of these macaws indicates that they are familiar with and able to consume termites. This is the first report of termite consumption by this species.

### Resumo · Arara-azul-grande (*Anodorhynchus hyacinthinus*, Psittacidae) comendo cupins

Indivíduos de Arara-azul-grande (*Anodorhynchus hyacinthinus*) consomem principalmente sementes de palmeiras e frutos. Reportamos aqui um casal de Araras-azuis-grandes consumindo cupins. Visitamos uma árvore de nidificação na borda sul do Pantanal brasileiro mensalmente durante um ano. As araras estavam presentes em quatro visitas, e registramos consumo de cupins presentes na árvore de nidificação em uma visita. As araras repetidamente retiravam com o bico pedaços de casca de ramos podres, e manuseavam os pedaços com o bico e os pés para ingerir cupins presentes na parte interna da casca. Nidificar em árvores senescentes provavelmente aumenta a oportunidade dessas araras encontrarem cupins, e o comportamento alimentar delas indica familiaridade e habilidade em consumi-los. Esse é o primeiro registro de consumo de cupins por esta espécie.

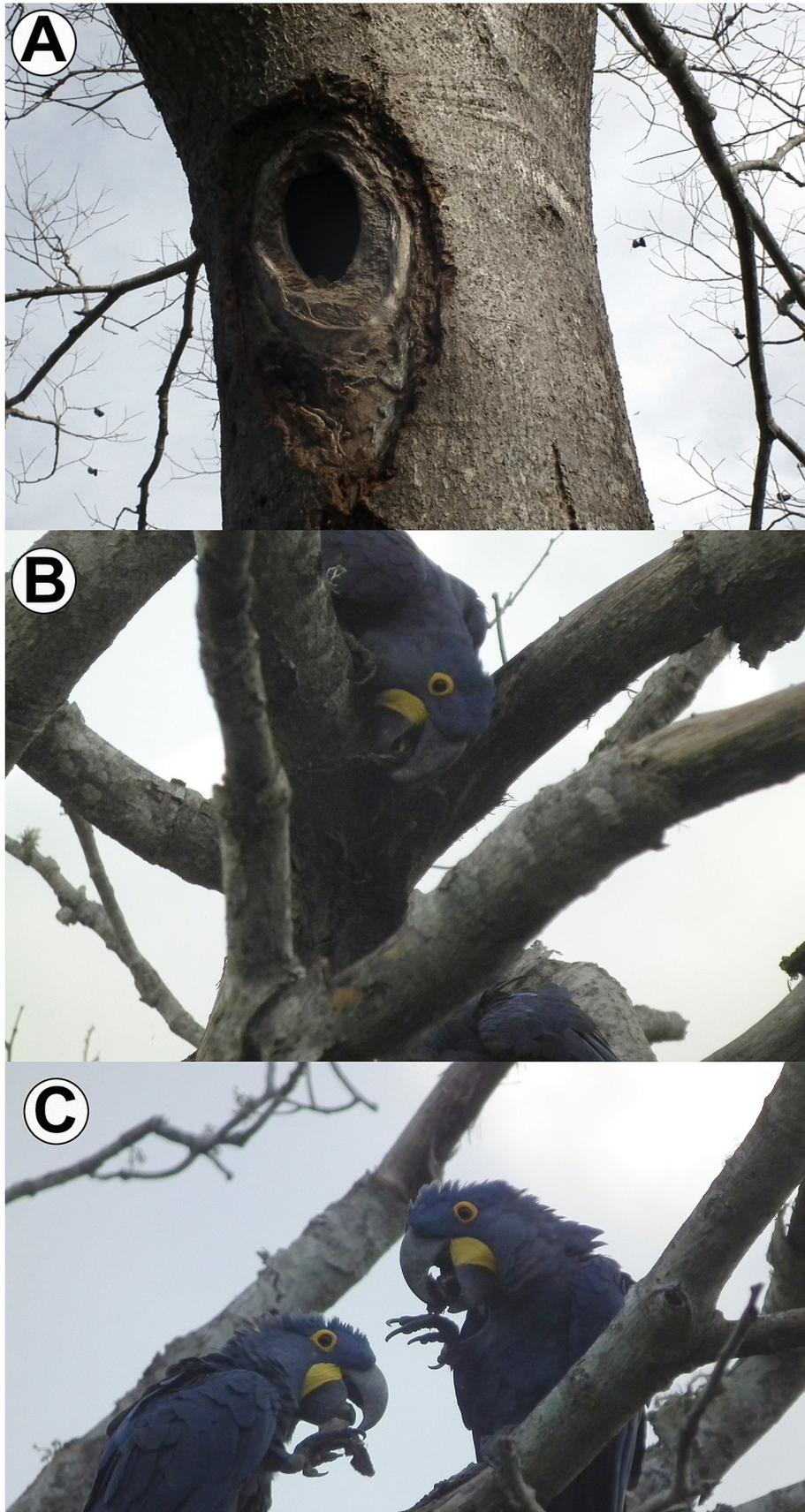
**Key words:** *Anodorhynchus hyacinthinus* · Decaying trees · Feeding behavior · Food habit · *Nasutitermes* · Pantanal

## INTRODUCTION

Macaws are primarily herbivores that feed on seeds, fruits, flowers, and leaves (Vaughan et al. 2006, Contreras-Gonzalez et al. 2009), but consumption of leaf-gall homopteran larvae was reported once for the Scarlet Macaw (*Ara macao*) (Renton 2006). Twigs and tree bark have also been reported to be handled or ingested by macaws, but the role of such items for their diet is unclear (Renton 2006, Vaughan et al. 2006). The Hyacinth Macaw (*Anodorhynchus hyacinthinus*) is the largest Neotropical parrot (130 cm wingspan). Its wide historical range in South America has been fragmented into three smaller regions, the Pantanal, the central Cerrado, and eastern Amazon basin (Miyaki et al. 1998). In the Pantanal region, seeds of palms (*Attalea phalerata* and *Acrocomia aculeate*) are the primary food items of these macaws (Munn et al. 1989, Presti et al. 2009, Antas et al. 2010). Although palm nuts present high nutritional value, they may provide insufficient protein for macaws (Contreras-Gonzalez et al. 2009, Cornejo et al. 2011). Enhanced protein intake by Hyacinth Macaws may happen through consumption of bruchid larvae inside nuts. This macaw species frequently drops fruits from palms, thus increasing chances of nuts being attacked by bruchids, and feeds on nuts on the ground that may contain bruchid larvae (Borsari & Ottoni 2005, Schneider et al. 2006). In addition, macaws can enlarge tree cavities for nest building and dig exposed wood after fallen branches (Pinho & Nogueira 2003, Antas et al. 2010), so they likely frequently encounter invertebrates living in decaying wood, like termites, which represent a source of protein. We report

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**Figure 1.** A) Nest entrance in a pacara earpod tree (*Enterolobium contortisiliquum*) used for nesting by a Hyacinth Macaws (*Anodorhynchus hyacinthinus*) pair in Bonito, southern Pantanal, Mato Grosso do Sul, Brazil; B) Hyacinth Macaw picking up a bark piece from the nesting tree; C) Hyacinth Macaws feeding on termites on the internal bark pieces. Photographs by Gabriel Arvelino de Paula.

here, for the first time, Hyacinth Macaws feeding on wood termites, and describe their foraging behavior while consuming termites in the Pantanal region.

## METHODS

The study was conducted in Bonito (21°18'S, 56°30'W; 417 m a.s.l.), southern Pantanal border, state of Mato Grosso do Sul, Brazil. The climate in Bonito is characterized by dry winters and wet summers (category Aw in the classification by Köppen 1936). Annual rainfall varies from 1300 to 1700 mm and annual mean temperature, between 20 and 22°C. Vegetation comprises deciduous and semideciduous forests interspersed with shrubby savannas, pastures and plantations. Each month from June 2015 to May 2016, we monitored the use of a 12 m tall pacara earpod tree (*Enterolobium contortisiliquum*, Fabaceae), which contained a nest cavity of a pair of Hyacinth Macaws. The tree produced fruits in July 2015, but it was senescent with few leaves and infested by termites. The macaw nest was in the main trunk (Figure 1A), with a 20 cm diameter entrance at 5 m from the ground. We made opportunistic observations in the mornings and late afternoons (after 16:00 h EST) during 1–2 days per month to record the presence and behavior of the macaws while in the nest tree or nearby. Data collection was carried out with binoculars (10x42) and a digital video camera, maintaining a minimal distance of 20 m between the observers and macaws. When the macaws had left the immediate area, we inspected the bark pieces dropped by them, confirmed the presence of termites in the nest tree, and collected termites for identification.

## RESULTS AND DISCUSSION

We found the Hyacinth Macaw pair in the nesting tree in four out of the 12 months; in October and November 2015, and in January and May 2016. We presumed they were the same individuals in all occasions. In November 2015, the female was inside the nest, but we did not observe offspring. In the other three occasions when macaws were present, we observed grooming, vocalizations and feeding on termites. In May 2016, we saw both individuals foraging on termites found in the nesting tree during the evening (17:30 h). To access the termites inside the branches, the birds picked up multiple (> 40) pieces of bark (3–6 cm long x 2–3 cm wide) with their beaks (Figure 1B), and handled these pieces, one at a time, to pick off and consume termites present on the internal side of the bark. They handled smaller bark pieces with the beak alone, and used one foot to hold larger pieces in position while consuming termites (Figure 1C). The macaws rotated the bark pieces in the beak or feet and took termites with the tongue. After ingesting most of the termites on a given piece, the macaws discarded the bark and reinitiated the process to search for and feed upon additional termites. Based on inspection of termite-infested

branches and of bark pieces handled and dropped by macaws, Hyacinth Macaw fed on nymphs, soldiers, and workers of *Nasutitermes* sp. (Termitidae).

Our records are the first of macaws feeding on termites, and the first we know of parrots picking up termites, like *Nasutitermes* sp. (Constantino 1999), under tree bark. Other parrots have been noted feeding on larvae and adult termites by scraping termitaria or capturing flying termites (Sazima 1989, Sick 1997, Faria 2007). They also consume the material of arboreal termitaria as nutrient supplement (Costa-Pereira et al. 2015). Hyacinth Macaws nest trees are always large and often old (Johnson et al. 1997), thus increasing the chance of nesting on termite-infested trees, like the pacara earpod tree at our study site. The adept handling of bark pieces while feeding on termites suggests that they are familiar with this type of food and foraging method. This suggests that Hyacinth Macaws regularly feed on wood termites.

Macaw diet has rarely been studied in a systematic way, in part because they are very difficult to observe (Stotz et al. 1996). Consumption of palm nuts is easily observable; however, feeding on wood-dwelling invertebrates is not so obvious. Although the significance of invertebrates in macaws' diets still needs to be addressed, our findings indicate that some previous records of twigs and tree bark handling reported for Scarlet Macaw (Renton 2006, Vaughan et al. 2006) might also be related to feeding on wood invertebrates. In addition, Schneider et al. (2006) reported manipulation of bark pieces by Hyacinth Macaws in a similar way, but they interpreted this as a beak sharpening. Despite the fact that macaws can use objects to sharpen their beaks, part of such observations might have been misinterpreted as the presence of wood invertebrates is difficult to assess. Therefore, consumption of wood-dwelling invertebrates by Hyacinth and other macaws may have been underestimated.

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