Revista Brasileira de Ornitologia 26(1): 12–14.
March 2018

SHORT-COMMUNICATION

Several cavity-nesting birds fight for a single tree hollow in an Atlantic Forest fragment: consequence of increasing nest-site limitation?

Alexander V. Christianini[1,2]

[1] Departamento de Ciências Ambientais, Universidade Federal de São Carlos, Campus Sorocaba, Rod. João Leme dos Santos km 110, 18052-780, Itinga, Sorocaba, SP, Brazil.
[2] Corresponding author: avchristianini@yahoo.com.br

Received on 29 September 2017. Accepted on 20 March 2018.

ABSTRACT: Most remnants of Atlantic Forests are found as small and isolated forest fragments. Forest fragmentation and edge effects often lead to structural changes in vegetation that may affect the availability of tree cavities for birds that rely on hollows for reproduction. Here I describe an unusual dispute for a cavity among birds (at least six *Primolius maracana*, two *Pionus maximiliani* (Psittacidae) and two *Pteroglossus aracari* (Ramphastidae)) in the Estação Ecológica dos Catetetus, southeast Brazil. Consequences of Atlantic Forest fragmentation, together with an increase in abundance of cavity users such as Opossums (*Didelphis* spp.) and exotic Honey Bees (*Apis mellifera*) might be decreasing the already small availability of cavities for medium- and large-sized cavity-nesting birds. The conservation of large hardwood trees is probably critical for the persistence of cavity-nesting birds in fragmented Atlantic Forest landscapes. Supply of nest boxes and control of Honey Bees may also be considered.

KEY-WORDS: Africanized honey bees, conservation, habitat fragmentation, hole-nesting bird, parrot, *Primolius maracana*.

The role of nest site availability in limiting the abundance of cavity-nesting birds has been confirmed by several studies from temperate regions (Newton 1994 and references therein). This issue remains relatively poorly investigated in the Neotropics (but see Cockle *et al.* 2010, 2017) where a substantial number of families comprise of obligate cavity-nesting bird species (*e.g.*, Psittacidae, Picidae, Dendrocolaptidae, Ramphastidae, Trogonidae, plus some Falconidae, Strigidae, Tyrannidae, Troglodytidae) (Sick 1997). However, snag (dead tree) availability, a common source of cavities used by birds for roosting or reproduction, is considered less abundant in tropical than in temperate forests (Guibbs *et al.*1993, but see Cockle *et al.* 2010) which suggests an increased role of the low availability of cavities for bird reproduction in tropical forests. Indeed, nest-box supplementation increases the reproduction of several cavity-nest species in the Atlantic Forest (Cockle *et al.* 2010), an evidence that nest site availability limits bird reproduction in these forests.

The Brazilian Atlantic Forest is a global hotspot of biodiversity that holds many endemic birds, several of them obligate cavity-nesters that are threatened or near threatened by extinction (Brooks *et al.* 1999). The Atlantic Forest is today shattered into thousands of forest fragments covering only *c.* 11–16% of its pre-Columbian area (Ribeiro *et al.* 2009). Such drastic habitat loss and fragmentation decreased the abundance and distribution of many bird species through direct effects, but indirect effects such as a reduction in critical resources for reproduction, like cavities, may also be important. In the Amazon, forest fragmentation increases the mortality, damage and turnover rates of trees when compared to continuous forest control plots, and large trees are especially prone (Laurance *et al.* 1998, 2000). These effects are apparently the result of increased windthrow and microclimatic changes due to edge effects (Laurance *et al.* 1998, 2000). Edge effects increase sharply in importance once fragments fall below 100–400 ha in size, depending on fragment shape (Laurance *et al.* 1998). Since most of Atlantic Forest remnants are small, irregularly shaped forest fragments (*e.g.*, more than 80% of fragments are ≤50 ha; Ribeiro *et al.* 2009), edge effects are probably playing an important role in the dynamics of Atlantic Forest tree communities. Indeed, large hardwood long-lived tree species are often replaced by small, softwood and short-lived tree species in Atlantic Forest fragments (Tabarelli *et al.* 2008), which are unlikely to offer adequate opportunities for birds that reproduce in cavities (Cockle *et al.* 2010, 2017, Katayama *et al.* 2017). As the availability of cavities decreases, it is expected an increasing number of disputes among birds over the

available cavities. Indeed, intense disputes over cavities have been reported in some Atlantic Forest fragments (Pizo 1996).

Here I report an unusual dispute over a tree hole among three cavity-nesting bird species in the Caetetus Ecological Station (22°24'11''S; 49°42'05''W) (hereafter Caetetus), in southeastern Brazil. Caetetus is an old-growth semideciduous forest fragment (2178 ha) surrounded by pasturelands and field crops. On 15 September 1999, at 09:39 h I observed four Blue-winged Macaws (*Primolius maracana* (Vieillot, 1816)) on a large live tree (Fabaceae) approximately 23 m high. One Macaw was perched vertically and projected its body and head several times towards a 10 cm hole that was located at a height of 9 meters. The latter bird was calling and pecking in an aggressive manner, while other two *P. maracana* alternated calls and short flights around the tree crown and over the individual on the trunk. A few minutes later two Black-necked Aracaris (*Pteroglossus aracari* (Linnaeus, 1758)) chased away all *P. maracana* and flew towards the tree hole. One of the *Pteroglossus* alternated pecks in the hollow with visual inspections of the entrance, while the other one remained perched on the tree crown. Whenever a *P. maracana* tried to return, it was promptly chased away by the *Pteroglossus* which flew directly at it. Each *Pteroglossus* frequently switched position with one another, alternating *c.* 30 s of pecks with 3–5 min of vigilance on a nearby branch. After 1 h, during a short rest taken by the *Pteroglossus*, two adult *P. maracana* left the tree hollow and flew away. At that point, both *Pteroglossus* entered the cavity. They remained inside the hollow and at the entrance until noticing me (30 min), then flew away. At 11:40 h two Scaly-headed Parrots (*Pionus maximiliani* (Kuhl, 1820)) perched on the tree and one of them started to inspect the hole. Suddenly, two *P. maracana* chased away both *Pionus* and occupied the cavity. At 11:58 h they noted me and flew to a nearby tree, and the observation ended. I did not see any signs of egg or nestling predation by the *Pteroglossus* during my observations. All birds involved were probably mated pairs in nest competition based on their aggressive behavior towards other birds, since reproductive cycle starts in September, lasting until January (Sick 1997).

At least 26 species of obligatory cavity-nesting birds occur in Caetetus together with other animals (*e.g.*, Black-lion Tamarin [Mikan, 1823], marsupials, bees) (A. V. Christianini pers. obs.). It is likely that there will be overlap in hollow size used by these species, which are not primary excavators of cavities. Several local cavity-nesting birds are medium sized (233–293 g for *P. maximiliani* and *P. maracana*; Collar 1997) requiring cavities in large trees for reproduction (Carvalho & Carvalho 1992, Cockle *et al.* 2010). Despite habitat fragmentation may increase the scarcity of large cavities, two new elements may be reinforcing the constraints to the reproduction of large cavity-nesting birds in Atlantic Forest fragments: an increase in the abundance of common opossums (*Didelphis* spp.) in response to forest fragmentation (Fonseca & Robinson 1990), and Africanized Honey Bees (*Apis mellifera* Linnaeus, 1758) introduced by European settlers. Both often supplant birds when competing for nest-cavities (Guedes & Harper 1995, Tubelis & Tubelis 2000). Studies with nest-box provisioning in Atlantic Forest fragments often report high rates of boxes occupied by opossums and Honey Bees (Tubelis & Tubelis 2000, A.V. Christianini, unpub. data). The synergistic effect of forest fragmentation and the increasing abundance of opossums and Honey Bees might be increasing the competition for large cavities in Atlantic Forest fragments. However, further research is needed to access the extent of this circumstantial evidence (*e.g.*, Cockle *et al.* 2010) and to confirm the adequacy of management options to keep an adequate availability of hollows for bird reproduction, such as an active management of snag availability, supply of nest boxes and control of honey bees.

ACKNOWLEDGEMENTS

I thank Sérgio H. Borges, Emilio Bruna, Pedro F. Develey, Mauro Galetti, Milene M. Martins, and Marco A. Pizo for criticism on previous versions. I thank also the Instituto Florestal de São Paulo for research license, CNPq for research grants and two anonymous referees for suggestions.

REFERENCES

Brooks T., Tobias J. & Balmford A. 1999. Deforestation and bird extinctions in the Atlantic Forest. *Animal Conservation* 2: 211–222.

Carvalho C.T. & Carvalho J. 1992. A nidificação de *Pionus maximiliani* (Kuhl) e *Ara maracana* (Vieillot) em Gália São Paulo, Brasil (Aves, Psittacidae). *Revista Brasileira de Zoologia* 9: 363–365.

Cockle K.L., Martin K. & Drever M.C. 2010. Supply of tree-holes limits nest density of cavity-nesting birds in primary and logged subtropical Atlantic Forest. *Biological Conservation* 143: 2851–2857.

Cockle K.L., Martin K. & Bodrati A. 2017. Persistence and loss of tree cavities used by birds in subtropical Atlantic Forest. *Forest Ecology and Management* 384: 200–207.

Collar N.J. 1997. Family Psittacidae (parrots), p. 280–477. In: del Hoyo J., Elliot A. & Sargatal J. (eds.). *Handbook of the birds of the world, v. 4 (sandrouse to cuckoos)*. Barcelona: Lynx Editions.

Fonseca G.A.B. & Robinson J.G. 1990. Forest size and structure: competitive and predatory effects on small mammal communities. *Biological Conservation* 53: 265–294.

Guedes N.M.R. & Harper L.H. 1995. Hyacinth Macaws in the Pantanal: conservation and management, p. 395–421. In: Abramson J., Speer B.L. & Thomsen J.B. (eds.). *The large macaws: their care, breeding and conservation*. Fort Bragg: Raintree Publications.

Guibbs J.P., Hunter-Jr. M.L. & Melvin S.M. 1993. Snag availability and communities of cavity nesting birds in tropical versus temperate forests. *Biotropica* 25: 236–241.

Katayama M.V., Zima P.V.Q., Perrella D.F. & Francisco M.R. 2017. Successional stage effect on the availability of tree cavities for cavity-nesting birds in an Atlantic Forest park from the state of São Paulo, Brazil. *Biota Neotropica* 17: e20170391.

Laurance W.F., Delamônica P., Laurance S.G., Vasconcelos H.L. & Lovejoy T.E. 2000. Rainforest fragmentation kills big trees. *Nature* 404: 836.

Laurance W.F., Ferreira L.V., Rankin-de-Merona J.M. & Laurance S.G. 1998. Rain forest fragmentation and the dynamics of Amazonian tree communities. *Ecology* 79: 2032–2040.

Newton I. 1994. The role of nest sites in limiting the numbers of hole-nesting birds: a review. *Biological Conservation* 70: 265–276.

Pizo M.A. 1996. Interspecific aggression in the hole-nesting Long-tailed Tyrant, *Colonia colonus* (Aves, Tyrannidae). *Ciência e Cultura* 48: 278–281.

Ribeiro M.C., Metzger J.P., Martensen A.C., Ponzoni F.J. & Hirota M.M. 2009. Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141–1153.

Sick H. 1997. *Ornitologia brasileira*. Rio de Janeiro: Editora Nova Fronteira.

Tabarelli M., Lopes A.V. & Peres C.A. 2008. Edge-effects drive tropical forest fragments towards an early-successional system. *Biotropica* 40: 657–661.

Tubelis D.P. & Tubelis A. 2000. Ocupação de caixas de nidificação em uma mata secundária crescendo em uma plantação de eucalipto abandonada, no estado de São Paulo. *Papéis Avulsos de Zoologia* 41: 187–196.

Associate Editor: Cristiano S. Azevedo.