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USE OF TREE CAVITIES FOR NESTING BY SPECKLED TEAL (*ANAS FLAVIROSTRIS*) IN SOUTHERN CHILE: POTENTIAL COMPETITION WITH SLENDER-BILLED PARAKEETS (*ENICOGNATHUS LEPTORHYNCHUS*)

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Uso de cavidades arbóreas para anidar por el Pato jergón chico (*Anas flavirostris*) en el sur de Chile: competencia potencial con el Choroy (*Enicognathus leptorhynchus*).

Key words: Speckled Teal, *Anas flavirostris*, Slender-billed Parakeet, *Enicognathus leptorhynchus*, *Nothofagus*, nesting, cavities, competition,Chile.

INTRODUCTION

The Speckled Teal (*Anas flavirostris*) is a dabbling duck considered common and locally-abundant throughout western and southern South America (Hellmayr 1932, Jaramillo 2003, Martínez & González 2004). As a group, dabbling ducks (genus *Anas*) are typically ground-nesting species (Johnsgard 1978, Port & McKinney 2001). Although very closely related to the ground-nesting Green-winged Teal (*A. carolinensis*) of North America, the Speckled Teal differs substantially in its breeding biology as the species has apparently made an evolutionary shift from terrestrial to mainly arboreal nesting (Port & McKinney 2001). To date however, most documented accounts of arboreal-nesting by Speckled Teal consist of nests located in debris-filled tree crotches or unoccupied chambers in stick nests of Monk Parakeets (*Myiopsitta monachus*) (Gibson 1920, Port & McKinney 2001). For this reason, Port & McKinney (2001) preferred the term "arboreal-nesting", as opposed to "cavity-nesting", to describe the breeding behavior of Speckled Teal. However, the studies by Port & McKinney (2001) occurred in areas (i.e., Argentinean "pampas") with an inherent scarcity of arboreal cavities. Notwithstanding, Speckled Teal have also been reported to occasionally use terrestrial sites, as well as hollow trees for

nesting (Martínez & González 2004). Use of tree cavities as nest sites can potentially lead to competition with other secondary cavity-nesters (Nilsson 1984, Wiley 1985, McEadie & Gauthier 1985), especially in areas where cavities are naturally limited or being lost to natural attrition or anthropogenic causes (Willson *et al.* 1994, Manning *et al.* 2004, Cockle *et al.* 2010).

In southern Chile, the Slender-billed Parakeet (*Enicognathus leptorhynchus*) is an endemic secondary cavity-nester that is largely dependent on natural cavities in mature southern beech (*Nothofagus* spp.) trees for nesting (Jaramillo 2003, Carneiro 2010). The numbers of such trees have been dramatically reduced throughout southern Chile over the past century due to widespread conversion of native forests to cattle ranching and agricultural uses, with less than 20% of the original forest cover now remaining (Castellon & Sieving 2006, Echeverria *et al.* 2006, Carneiro 2010). As part of a larger study on the biology and natural history of Slender-billed Parakeets (hereafter, SBP) in southern Chile (Carneiro 2010, Jiménez unpubl. data), we conducted an assessment of SBP nest site characteristics as well as the documentation of clutch and brood sizes and associated developmental phenology. While acquiring nesting data on SBP, we also obtained the first documentation of Speckled Teal nesting in *Nothofagus* tree cavities and within active nesting territories of SBP, including use of the same cavities by both Speckled Teal and SBP.

STUDY AREA AND METHODS

We conducted all fieldwork near the city of Osorno in the Lakes Region of southern Chile (40°55' S, 73°35' W). The study area landscape is characterized by widespread agricultural fields and cattle pastures, both containing varying amounts of scattered, mature individuals of mainly *Nothofagus obliqua* trees (locally known as "pellines"), as well as *Laurelia sempervirens* and *Eucryphia cordifolia*. It is primarily within such trees that SBP currently nest in southern Chile (Carneiro 2010, Jiménez unpubl. data).

We inspected tree cavities on several private farms located within approximately 40 km of Osorno, as well as the Remehue research station of the Instituto Nacional de Investigaciones Agropecuarias (INIA), located 7 km north of Osorno. At each site, we visually inspected all known or suspected nesting cavities of SBP during October to mid-January (i.e., SBP nesting season; Carniero 2010) during each year from 2008–2011. Nest inspections were conducted by climbing to the cavity entrance and documenting any contents or occupants therein, either by direct observation or use of a small digital camera. Cavity entrances were accessed using single-rope ascending techniques (Perry 1978, Whitacre 1981). We considered cavities "occupied" if we detected presence of adults, eggs, or nestlings of SBPs or Speckled Teal within the cavity.

RESULTS AND DISCUSSION

We made a total of 346 inspections of 112 different tree cavities during the study, of which 109 cavities (97.3%) were in *Nothofagus obliqua* trees; with 2 occurring in *Laurelia sempervirens* and 1 in *Eucryphia cordifolia* trees. We documented 76 nesting events by SBP, with inspected cavity occupancy rates of 27/79 (34.2%) during 2008–09, 30/70 (42.9%) during 2009–10 and 19/23 (82.6%) during the 2010–11 nesting seasons (Table 1). Apparent cavity occupancy rates were higher during the 2010–11 season because we mainly inspected previously used (i.e., known) SBP nest sites, due to resource and logistical constraints. We found Speckled Teal either actively nesting, or evidence thereof (e.g., dead ducklings, egg shells), in 6 (8.6%) of such cavities during the

TABLE 1. Number of tree cavities inspected during each of three nesting seasons (2008–2010) near Osorno, southern Chile and observed occupancy rates by Slender-billed Parakeets (SBP) and Speckled Teal (ST). [1]Only previously used (i.e., known) cavities were inspected during the 2010–11 season due to resource limitations.

Nesting season	Total cavities inspected	Occupied by SBP	Occupied by ST
2008–2009	79	27 (34.2%)	0
2009–2010	70	30 (42.9%)	6 (8.6%)
2010–2011	23[1]	19 (82.6%)	2 (8.7%)

2009–10 nesting season, and 2 (8.7%) of the cavities inspected during the 2010–11 season (Table 1). No cavity nests of Speckled Teal were found during the 2008–09 season. All Speckled Teal cavity nests were in *Nothofagus* trees; in 1 instance SBP and Speckled Teal were found nesting simultaneously in the same tree, albeit in different cavities. There were also eight events of alternating use of the same tree cavities by SBP and Speckled Teal. The first three consisted of a cavity used by SBP during the 2008–09 nesting season, but which was later found occupied by Speckled Teal during the subsequent (2009–10) nesting season (Fig. 1), and again by SBP during 2010–11. Three additional events consisted of a cavity used by SBP during 2009–10, which then was used for nesting by Speckled Teal early in the 2010–11 nesting season, and then again used by nesting SBP later that same season following fledging of the ducklings. The remaining events consisted of a cavity used by Speckled Teal during the 2009–10 nesting season, and subsequently used by SBP during the 2010–11 nesting season. In each case of alternating cavity use, occupants - regardless of species - successfully fledged young.

To our knowledge, these findings constitute the first reported use of *Nothofagus* tree cavities for nesting by Speckled Teal. Moreover, the observed temporal overlap of the Speckled Teal and SBP nesting seasons, combined with ever-decreasing numbers of mature *Nothofagus* trees in southern Chile (Willson *et al.* 1994), may promote interspecific competition for such cavities between SBP and Speckled Teal. In fact, our results provide some evidence of potential interspecific competition arising from the alternating inter-annual use of some cavities by both species; particularly the use of the same cavity by both species during the same nesting season. In this instance, use of the cavity for nesting by SBP during 2010 was effectively preempted and thereby delayed by the earlier occupancy of the cavity by Speckled Teal. Psittacines, such as SBP, typically exhibit high inter-annual nest site fidelity, and occupancy of traditional nest cavities by other species early in their nesting season can lead to direct competitive interactions, delayed breeding, or failed nesting attempts (Wiley 1985, Snyder *et al.* 1986, Pell & Tidemann 1997, Guix *et al.* 1999, Renton 2004). However, Speckled Teal also exhibit high nest site fidelity, and - like parakeets - vigorously defend occupied nest sites (Port & McKinney 2001). In such case, individuals of either species which first occupy a given cavity gain a competitive advantage. In southern Chile, where the numbers of large, arboreal nesting cavities are rapidly decreasing (Willson *et al.* 1994, Echeverria *et al.* 2006), increased future competition is therefore likely between SBP and Speckled Teal for the remaining suitable nest sites (Port & McKinney 2001, Cockle *et al.* 2010). Additional research into species-specific factors

FIG. 1. Interior of a tree cavity in a southern beech (*Nothofagus obliqua*) near Osorno, Chile. Upper photograph depicts Slender-billed Parakeet (*Enicognathus leptorhynchus*) nestlings on 25 January 2009. Lower photograph depicts Speckled Teal (*Anas flavirostris*) nesting in the same cavity on 20 December 2009.

influencing nest site selection by SBP and Speckled Teal may yield information leading to beneficial management actions for both species.

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