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Nestling Mortality as a Consequence of Interspecific Competition between Secondary Cavity Nesters in the Sub-Antarctic Forests of Chile

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ABSTRACT.—Interspecific competition among secondary cavity nesters can involve physical conflicts between individuals, which may lead to serious injuries or death. Here we report a case of aggression by a pair of Chilean Swallows (*Tachycineta meyeni*) towards a nestling of the Thorn-tailed Rayadito (*Aphrastura spinicauda*) in the sub-Antarctic forests of Chile. This aggression caused the displacement of the breeding rayaditos from an occupied nest box and it appears, nestling mortality. Since levels of aggression among cavity nesters depend on the synchrony of their breeding phenologies, further research is needed to study the prevalence of nest usurpation by Chilean Swallows and its relation to the degree of breeding synchrony with other cavity nesters inhabiting the sub-Antarctic forests. *Received 13 May 2014. Accepted 23 October 2014.*

Key words: *Aphrastura spinicauda*, interspecific aggression, nest box, nest-site competition, nestling mortality, *Tachycineta meyeni*.

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Nest-site availability is a key limiting factor in bird populations, especially for secondary cavity nesters, which cannot excavate their own cavities and therefore must rely on existing holes produced by other birds, insects, or decay (Newton 1994, 1998). Circumstantial evidence shows that bird density often correlates with variations in nest-site availability (van Balen 1982, Raphael and White 1984, Zarnowitz and Manuwal 1985, Snyder et al. 1987). Furthermore, there are numerous experiments that demonstrate how manipulations of nest-site availability can limit breeding densities and/or the proportion of adults able to breed (see table 8.2 in Newton 1998).

Given their dependence on previously existing holes, secondary cavity nesters compete for nesting sites, and these competitive interactions not only occur among conspecific individuals, but also between different species (Slagsvold 1978, Minot and Perrins 1986, Gustafsson 1988). Interspecific competition for nest-sites commonly occurs as pre-emptive competition, e.g., when a bird occupies a hole for nesting and temporally removes that cavity from the available resources

for other individuals (*sensu* Gotelli 2008). It can also occur through interference, which implies a direct social or physical interaction between competitors (Mørla and Wiggins 1995). Pre-emptive competition is perhaps the most common interaction among breeding birds but the least documented (see Newton 1998). Interference competition has been documented through nest usurpation, agonistic encounters and physical conflict (Dhondt and Eyckerman 1980, Rendell and Robertson 1991), and as lethal aggression among adult birds (Mørla and Wiggins 1995). Although egg mortality is commonly observed during nest usurpation (Rendell and Robertson 1991), nestling mortality has rarely been observed during observational studies or long-term monitoring studies of nest boxes (but see Gowaty 1984, Belles-Isles and Picman 1986). Here, we describe a case of nestling mortality presumably caused by interference competition between two secondary cavity nesters that inhabit the sub-Antarctic forests of southern Chile.

During November 2013, as part of a long-term study of the breeding biology of the Thorn-tailed Rayadito (*Aphrastura spinicauda*) at Isla Navarino (55° 56' S, 67° 39' W; see Ippi et al. 2013, Quirici et al. 2014), located in the Magallanes and Chilean Antarctic Region, we observed two Chilean Swallows (*Tachycineta meyeni*) entering an occupied nest box and attacking a 13-day-old nestling rayadito. A pair of breeding rayaditos initially occupied the nest box on 6 October 2013, and five eggs were laid between 10–18 October. All eggs hatched on 8 November 2013, and all nestlings were alive on a subsequent inspection 4 days after hatching. On 21 November 2013, we checked the nest box in order to capture, mark, and measure one breeding adult and all 13-day-old chicks, as part of the monitoring protocol (see Moreno et al. 2005). Before reaching the nest box location on this date, we repeatedly heard a squeaking nestling and loud knocks within the box, and shortly after a swallow flew out of the box and joined another individual that was flying nearby. The adult rayaditos came close to the nest box and emitted alarm calls and loud trills during 11 mins, while the swallows remained close to the nest-site, flying around and calling insistently. This behavior by the swallows continued for more than 1 hr. During two occasions during the incident, the swallows were joined by two conspecifics, allowing them to displace the breeding adults from their nest-site for more than

5 mins and enter the cavity where the rayadito brood was present. In both cases, only one swallow entered the box, while the other remained calling in flight nearby. Although breeding rayaditos are usually very aggressive towards any potential threat (see Ippi et al. 2011, 2013), both adult rayaditos stayed away from the site during these interactions and emitted infrequent and faint alarm calls. This type of 'submission' behavior has never been reported in similar contexts, and its potential causes are difficult to explain.

When we interrupted the interaction 90 mins after our arrival in order to check the nest box and band the adults and the chicks, we found only one nestling inside. There were no signs of the remaining chicks. The nestling showed recent signs of trauma to the crown and eyes, a broken wing, and a leg immobilized by the nest fibers that were tangled around it. When attempting to mark one of the adult rayaditos with a nest box trap, we incidentally captured both swallows, which did not come back to the box during the rest of the afternoon. Both swallows were identified as adults, having fully ossified skulls and flight feathers with a shape typical for adults of other swallow species (see Pyle 1997). Although there were no clear signs of breeding condition, differences in the measurements of their external rectrices and primaries led us to consider that the swallows could be a breeding pair (see Pyle 1997). The nestling rayadito was found dead the next morning, but neither the rayaditos nor the swallows occupied the vacant box during the rest of the breeding season.

Although we cannot determine what caused the disappearance of the other nestlings, the aggression towards the chick remaining inside the nest box by the swallows suggests that competition for nesting-sites may have instigated this event. We have no evidence to rule out alternative explanations for the observed behavior, but competition for other resources (e.g., food) is less probable given the differences in habitat use patterns and feeding habits between the two species (Remsen 2003, Turner 2004). The fact that the nest box remained unused after the event seems counterintuitive if competition was the cause, but infanticide as a nest-destroying behavior could act to reduce interference from competing birds, even if such aggressions are not followed by a nesting attempt by the aggressors (Belles-Isles and Picman 1986, Botero-Delgado and Páez 2011). The

event could have been motivated by territorial defense in the swallows, since reproductive pairs exhibiting super-territoriality often defend unoccupied cavities (Verner 1977), and such a behavior has been reported in a congener (*T. bicolor*; Leffelaar and Robertson 1985).

Our observations support the notion that competition among secondary cavity nesters for nest-sites can be fierce (see Duckworth 2006) or even lethal (Gowaty 1984, Merilä and Wiggins 1995). Interspecific conflicts have been observed in long-term nest box monitoring between closely related (Löhr 1977, Gowaty 1984) and distantly related species (Rendell and Robertson 1991, Robillard et al. 2013). In North America and Europe, swallows (Family Hirundinidae) are often involved in usurpation or agonistic encounters with other passerine birds, frequently using a mobbing-behavior strategy, where groups (more than two individuals) successfully displace other species (Brawn 1990, Rendell and Robertson 1991, Newton 1998). Although demonstrating a demographic effect between competitors is the most clear-cut evidence for competition (Newton 1998), this is difficult to detect and has been rarely found. Negative individual effects which imply that breeding success or survival of an individual has been compromised are more easily found and reliable indicators of competition (Newton 1998). Most supporting evidence of interspecific competition by interference is based on individual effects, and the degree to which these effects extend to a population still requires further study.

The frequency and level of aggression between competitors are related to the degree of synchrony in their breeding phenologies (Slagsvold 1978, Gowaty 1981). The population of Chilean Swallows at Isla Navarino is composed of migrants that breed during the Austral summer and their arrival coincides with the latter half of the breeding season of Thorn-tailed Rayaditos (Remsen 2003, Turner 2004). At this time of year, most cavities are already occupied by rayaditos and other cavity-nesters. Therefore, a late start to the breeding season of rayaditos or an early arrival by swallows at Isla Navarino could increase the probability of confrontations for cavities or nest boxes. Future studies should consider the relationship between the breeding synchrony among cavity nesters and the prevalence of nest usurping by swallows in sub-Antarctic forests.

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