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Notes on the Behavior of the Masked Saltator in Southern Ecuador

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The Masked Saltator (*Saltator cinctus*) is a near-threatened species (Collar et al. 1994) that is locally distributed in Andean cloud forest from central Colombia to central Peru (Renjifo 1991). Contrary to assumptions that it is a shy inhabitant of impenetrable undergrowth (O'Neill and Schulenberg 1979, Ridgely and Tudor 1989), it has been recorded in Colombia joining large mixed-species flocks in the canopy (Renjifo 1991). Additionally, its association with *Chusquea* bamboo in Peru (O'Neill and Schulenberg 1979) is not apparent in Colombia (Renjifo 1991). We confirm Renjifo's findings in a population of *S. cinctus* in Ecuador, and present data suggesting that the species, unlike most cloud-forest passerines, undertakes non-seasonal movements. This behavior possibly derives from a dependence on the cone crop of podocarps (Podocarpaceae).

On two separate visits in 1990 and 1991, we surveyed birds on the Cordillera de Sabanilla, above the town of Amaluza, Loja Province, southern Ecuador (4°21'S, 79°45'W). Our main site was Angashcola, a valley on the western slope of the main Andean cordillera that retained ca. 300 ha of montane cloud forest contiguous to large areas of similar vegetation in adjacent valleys (Williams and Tobias 1994). This habitat extended northward to the extensive forests within Podocarpus National Park and southward into Peru. Podocarps, primarily *Podocarpus oleifolius*, were exceptionally common in the area. All forest below 2,450 m had been removed, and the upper tree line extended little beyond 3,000 m because of clearance at the páramo edge (Williams and Tobias 1994). Meteorological conditions were very similar during both of our visits.

From 1 to 17 August 1990, *S. cinctus* was seen almost daily at Angashcola (21 sightings of 1 to 3 birds together; 33 individuals total). Although the species often was conspicuous and confiding, it was only located at the lower fringe of forest, between 2,450 and 2,550 m. It also was never recorded in bamboo despite our spending ca. 90 h surveying this habitat and an additional 35 h running 24 m of mist nets where

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bamboo was most dense. Most encounters were in the lower canopy ($\bar{x}$ = 6.1 m above ground, range 2–11 m, n = 21; mean canopy height ca. 10 m). Twice we saw single individuals foraging <2 m above ground, even hopping briefly on the leaf litter, or drinking at streams. The saltators were silent except for a quiet, metallic "tsik" note that was given fairly frequently, often disclosing the species' presence.

The areas where we tended to encounter *S. cinctus* were characterized by an abundance of podocarps. Along with several other species (e.g. Lacrimose Mountain-Tanager [*Anisognathus lacrymosus*], Fawn-breasted Tanager [*Pipraeidea melanonota*], Chestnut-breasted Chlorophonia [*Chlorophonia pyrrhophrys*]), *S. cinctus* commonly consumed fruits of *P. oleifolius* (see also Fjeldså and Krabbe 1990, Renjifo 1991). In 62% of sightings (13 of 21), we observed *S. cinctus* foraging on podocarp cones, often lingering for long periods in the canopies of podocarps as a component of mixed-species flocks. No other food item was recorded.

Attendance by *S. cinctus* in mixed-species flocks and an association with *P. oleifolius* have both been noted previously (Renjifo 1991), but not to the extent that we recorded in southern Ecuador. In Colombia, 11% of sightings derived from mixed-species flocks, compared with 76% of sightings (16 of 21) in the present study. A mixed-species flock was considered an aggregation of more than five individuals comprising more than one species of bird, and sightings were considered independent if more than 12 h had elapsed since the previous observation in a given section of forest. Because flocks retained a certain degree of cohesion over periods of days (Williams and Tobias 1994), the possibility of re-encountering them made it difficult to ascertain numbers of *S. cinctus*. Based on simultaneous sightings and flock distributions, we are certain that we encountered at least 10 different individuals along 700 m of trail.

Although *S. cinctus* was easily detected in early to mid-August 1990, we did not record it during 55 h of intensive searching at Angashcola between 22 and 28 July 1991. In both years, mixed-species flocks often contained 40–70 individuals of 10–20 species. We compared the species composition of these flocks using data collected below 2,600 m (i.e. within the elevation zone where *S. cinctus* occurs) and considering only flocks that contained more than 25 individuals identified to species (31 flocks in 1990 and 17 in 1991). For the commonest 25 species (discounting *S. cinctus*), the proportion of flocks in which they were present varied between years by a mean of only 7.5% (range 0–16%). Flock composition at this season thus remained largely stable in 1990 and 1991. The attendance rate of *S. cinctus*, however, underwent by far the largest shift, from 52% of flocks in 1990 to none in 1991.

During the two years of our visits, this population of *S. cinctus* clearly was prone to nonseasonal fluctuations in behavior and/or density, whereas numbers and detectability of other flocking species remained relatively constant. Although this result might be explained by behavioral changes (e.g. foraging quietly and solitarily in undergrowth), this scenario is unlikely. We spent many fruitless hours searching for *S. cinctus* in the understory, and mist-netting effort was increased in 1991 (40 m running for ca. 40 h) without success. The result suggests that *S. cinctus* undertakes nonseasonal movements in southern Ecuador, either periodically or nomadically, perhaps in response to changes in the availability of podocarp cones. Reasons underlying these potential movements are unclear. If podocarps produce a spatially or temporally variable cone crop in the region, organisms dependent on this resource might undertake periodical or irregular movements in order to harvest it effectively. This would be analogous to periodic mass movements of crossbills (*Loxia* spp.) in temperate coniferous woodlands (Senar et al. 1993).

By contrast, *S. cinctus* was recorded for over a year in the same localities of the Cordillera Central of Colombia, giving rise to speculation that it maintains permanent territories (Renjifo 1991). This clearly was not the case on the Cordillera de Sabanilla. Such inconsistencies are perhaps explained by localized cone crop stability, which can lead to residence in otherwise mobile populations of bird species (Senar et al. 1993).

Numbers of frugivores often fluctuate at given sites, but such fluctuations normally follow a seasonal pattern (Loiselle and Blake 1991). The fact that frugivores exploit patchy resources in expansive forest tracts renders them vulnerable to habitat fragmentation, which tends to disrupt fruiting patterns and to reduce food availability (Collar et al. 1992). The Golden-plumed Parakeet (*Leptosittaca branickii*) is an example of a threatened nomadic podocarp specialist (Collar et al. 1992), and it is possible that *S. cinctus* is subject to some of the same constraints that have made *L. branickii* rare. However, observations in Colombia suggest that *S. cinctus* relies to some extent on fruit from other trees and vines (P. Salaman pers. comm.), although podocarp fruit appears to be consumed at all stages of development (Renjifo 1991). Clearly, the ecology of the species remains to be fully investigated.

Having now been recorded as neither shy nor inconspicuous in two widely separated areas, the overall paucity of records of *S. cinctus* can no longer be attributed solely to difficulties in detectability. The pattern of records probably reflects low population densities, a highly localized distribution, and perhaps nonseasonal movements. Despite being scarce, *S. cinctus* has an extensive range and, thus, is unlikely to be severely threatened.

Podocarpus oleifolius is disappearing rapidly from many areas because of its timber value (Renjifo 1991). The tree is now uncommon in Colombia, and its Ecuadorian range is centered primarily in the southernmost provinces. Important areas appear to be Po-

docarpus National Park in southern Ecuador (ca. 100 km north of Angashcola), where recent records of *S. cinctus* derive (Bloch et al. 1991), and the Reserva del Alto Quindío Acaime/Los Nevados National Park/ Ucumarí Regional Park complex in Colombia. Other potentially viable populations of *S. cinctus* in Ecuador probably occur within Sangay National Park (Chimborazo/Morona-Santiago) and the Cayambe/Coca Ecological Reserve (R. S. Ridgely pers. comm.). Stringent protection of these areas should be strongly supported.

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Habitat Barriers to Movement of Understory Birds in Fragmented South-Temperate Rainforest

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The temperate rainforests in South America are restricted to southern Chile and adjacent southwestern Argentina (Vuilleumier 1985). Home to a number of endemic bird species, some that are listed as endangered or threatened (Glade 1988, Collar et al. 1992), this forest biome is rapidly being harvested for timber and fragmented by agricultural expansion. Habitat fragmentation has detrimental effects on forest bird populations (Wilcove et al. 1984, Lovejoy et al. 1986, Hagan and Johnston 1992, Donovan et al. 1995, Robinson et al. 1995). Among forest bird species, terrestrial or understory insectivores repeatedly have been identified as highly sensitive to forest fragmentation, particularly in the tropics (Leck 1979, Willis 1979, Karr 1982, Lovejoy et al. 1986, Sieving and Karr 1997)

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