An albino Gray-bellied Flowerpiercer (*Diglossa carbonaria*) in the high Andes of Bolivia

Una diglosa carbonosa albina (*Diglossa carbonaria*) en los altos Andes de Bolivia

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In February 2003 I observed a bird that appeared to be a completely white flowerpiercer (*Diglossa* sp.) foraging on the shrub *Brachiotum microdon* (Melastomataceae) along the edge of a 34.9-ha *Polylepis* forest fragment in Sacha Loma, Cochabamba department (Bolivia). The bird moved normally within the fragment, mostly through the central part containing a 10-ha boulder field. When flying across this area it became camouflaged against the background of grey boulders. I caught the albino, after 4 hrs of effort, with a 12-m mist net placed transversally in the boulder field.

On the basis of culmen morphology (mainly the hooked maxilla) it was apparent that the bird was a *Diglossa* flowerpiercer. However, its albinism condition was total (complete absence of melanin) according to albino reports in the literature (Sage 1962, Dyck 1985, Møller & Mousseau 2001). The skin and feathers lacked pigmentation, the eyes were pinkish red and the culmen was pink, probably presenting this color just from the blood in capillaries as it lacked pigmentation. The legs and feet also were pinkish with no pigmentation. Analyzing the bird's plumage attributes (Ralph *et al.* 1993), no signs of juvenal plumage were found. A skull inspection indicated complete ossification, and I concluded that it was an adult. Morphological measurements are given in Table 1.

Over the course of five years as part of a ringing program (following procedures of Ralph *et al.* 1993) to study forest specialists in 12 *Polylepis* forest fragments (2 – 47 ha) (3,500 – 3,900 m altitude) in Sacha Loma (17° 44´ S, 65° 34´ W) and Cuturi (17° 42´ S, 65° 33´ W) near the city of Cochabamba, we captured 260 Gray-bellied Flowerpiercers (*D. carbonaria)*, the morphometric data of which are given in Table 1. A previous study (Graves 1982) of the same species in Iquico and Caxata in Bolivia's depto. La Paz presented similar results (Table 1). Measurements of the albino flowerpiercer were very similar to those of the Gray-bellied Flowerpiercer (Table 1) and fell well inside the range of values for wing and tarsus length of that species (Fig. 1). The only exception was body mass, which was about 3 g lighter than the average for normally pigmented individuals of the Gray-bellied Flowerpiercer (Table 1). Only 10% of this species captured individuals had a body mass of 10–11 g.

Only one other *Diglossa* species was captured with a very low frequency in Sacha Loma and Cuturi over the 5-year period. Seven individuals of the Rusty Flowerpiercer (*D. sittoides*) captured exclusively during the rainy season (Nov–Mar) had considerably smaller (and mostly non-overlapping) measurements than the Gray-bellied Flowerpiercer and the albino captured in Sacha Loma (Table 1, Fig. 1). Given those notably smaller measurements of the Rusty Flowerpiercer and, based on capture rates, the higher probability of the albino being a Gray-bellied Flowerpiercer (97%

Table 1: Selected measurements of a complete albino Gray-bellied Flowerpiercer (*D. carbonaria*) from Sacha-Loma-Cuturi and normally pigmented from three localities in the Bolivian Andes. Values are means ± SE.

Species	Wing (mm)	Tail (mm)	Tarsus (mm)	Culmen (mm)	Body mass (g)
D. carbonaria albino n=1 (Sacha Loma-Cuturi)	66	62	21.7	8.1	10
D. carbonaria n=260 (Sacha Loma-Cuturi)	67.8 ± 0.2	59.1 ± 0.3	21.4 ± 0.03	8 ± 0.03	13.3 ± 0.1
D. carbonaria n= 5 (Iquico) (Graves 1982)	70.62 ± 0.81	60.6 ± 0.9	20.8 ± 0.3	8.1 ± 0.3	
D. carbonaria n= 8 (Caxata) (Graves 1982)	72.21 ± 0.53	62.2 ± 0.8	20.5 ± 0.3	7.7 ± 0.1	
D. sittoides n= 7 (Sacha Loma-Cuturi)	61.5 ± 0.8	48.7 ± 0.1	17.65 ± 0.6	7.6 ± 0.2	10.0 ± 0.2

of all flowerpiercer captures), I concluded that the albino was assignable to the latter species. Furthermore, the assignation of the albino to other species of flowerpiercers present above 3000 m in Cochabamba (*D. mystacalis* and *D. cyanea*) also was discarded as these species of humid Yungas forest were never caught or reported in the Sacha Loma – Cuturi area.

Partial or incomplete albinism has been observed in many species of birds (Gross 1965), including a Giant Conebill (*Oreomanes fraseri*) in *Polylepis* forest in Peru (Servat 2002). However, total or true albinos (Bruckner 1941) such as those registered in Sharp-tailed Sparrow (*Passerherbulus caudacutus*) (Wayne 1921), Mallard (*Anas platyrhynchos*) (Sprunt 1931), Red-winged Blackbird (*Agelaius phoeniceus*) (Nero 1954), Northern Bobwhite (*Colinus virginianus*) (Menzel 1962) and Herring gull (*Larus argentatus*) (Gross 1964) are rare in wild birds (7% of 1847 cases of some type of albinism according to Gross 1965). There are apparently no previous records of total or partial albinism for the Gray-bellied Flowerpiercer or other species in the genus *Diglossa*, although population and speciation studies have examined the plumage colors of many *Diglossa* museum specimens (e.g., Graves 1982, Vuilleumier 1984). In fact, reports of cases of albinism in Neotropical birds seem very scarce (Hosner & Lebbin 2006). According to van Grouw (2006), the reason that adult albinos
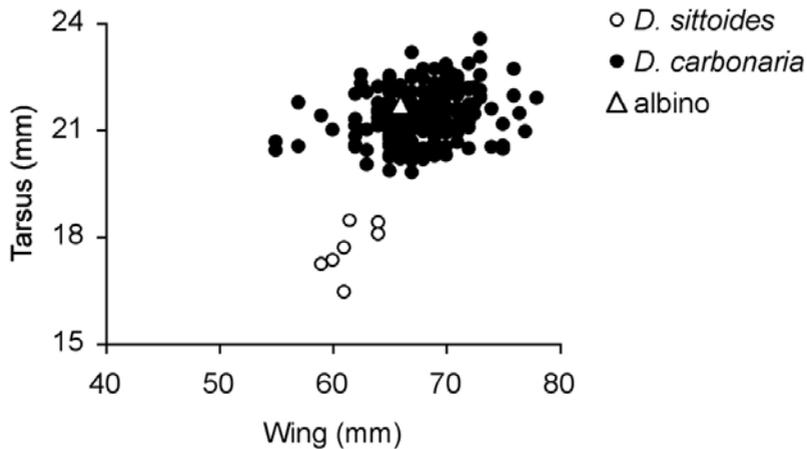
Fig. 1: Wing versus tarsus length of one complete albino Gray-bellied Flowerpiercers (*Diglossa carbonaria*); and seven Rusty Flowerpiercers (*D. sittoides*) captured in *Polylepis* forest in Sacha Loma-Cuturi.

are so rarely observed in the wild is that they have bad eyesight, imperfect flight and are therefore more susceptible to predation early on in life.

Because partial albinism may be due to germline mutations (Møler & Mousseau 2001), diet, senility, shock, disease or injury (Sage 1962), and because complete albinism is most likely a result of inherited genetic factors which condition lack of tyrosinase and, consequently, melanin (Bruckner 1941, Sage 1962, Bensch *et al.* 2000), it is most probable that the albino flowerpiercer in Sacha Loma was homozygous for this condition. With 76% of Gray-bellied Flowerpiercer recaptures in different months and years recorded in the same fragments, it is tempting to propose a link between this unusual plumage condition and inbreeding as a consequence of small isolated *Polylepis* fragments and low dispersal.

It is evident that in very isolated populations a recessive gene may gain a much higher frequency of expression than in a population where gene flow is maintained over a large area (Sage 1962, Gross 1965). From the nectarivorous feeding habits of the Gray-bellied Flowerpiercer

(Ridgely & Tudor 1989, Fjeldså & Krabbe 1990) it could be assumed that the species presents long distance dispersal in response to local and regional flowering seasons. However, Herzog *et al.* (2003) indicated that it is a year-round resident in Sacha Loma *Polylepis* forest fragments, probably shifting to a more insectivorous diet during the dry season when flower nectar is scarce. Naoki (1998) further suggested that morphological and behavioral adaptations of flowerpiercers allow them to use almost any flowers and to be resident on the same territory throughout the year. Therefore, seasonal shifts in feeding habits combined with restricted movements that are largely confined to isolated and patchily distributed *Polylepis* fragments could bring about reduced gene flow and increased homozygosity in the population.

Furthermore, the Gray-bellied Flowerpiercer is a restricted-range species (Stattersfield *et al.* 1998, Hennessey *et al.* 2003) not widely distributed in the high Andes. It is probably endemic to the Andes of Bolivia (Ridgely & Tudor 1989, Fjeldså & Krabbe 1990, Stotz *et al.* 1996), although it also may occur in northwest

Argentina (Moschione & San Cristobal 1993). Such a small geographic distribution could also be explained by a tendency for short distance dispersal. In a study on the zoogeography of Andean birds Vuilleumier (1984) concluded that the Gray-bellied Flowerpiercer presents partially continuous and partially disjunct populations in Bolivia.

This anecdotal record calls attention to the implications of fragmentation and isolation effects on birds dependent on *Polylepis* forests in the high Andes.

Acknowledgments

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