

BEHAVIOR OF BROOD-CARING MÁSAFUERA RAYADITOS IN THE PRESENCE OF AVIAN PREDATORS

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ABSTRACT

Observations of brood care of *Aphrastura masafuerae* (Aves: Furnariidae) from Alejandro Selkirk Island, Chile are presented. Adults feed their nestlings about 540 times per day with frequency influenced by hunting Máfafuera Hawks. Brood-caring rayaditos show behavioural adaptations to predator presence: a) foraging inside dense vegetation below the protective cover, b) controlling nest surroundings from inside vegetation and often from a rock before entering, c) leaving vegetation only to reach the nest, e) keeping unsheltered flights to a minimum distance, f) keeping feeding short if hawks frequent nest vicinity, and g) flying mostly directly into shelter after feeding.

KEY WORDS. Alejandro Selkirk Island, *Aphrastura masafuerae*, parental care.

RESUMEN

Se presentan observaciones sobre la crianza del Rayadito de Masafuera (*Aphrastura masafuerae*, Aves: Furnariidae) en la Isla Alejandro Selkirk, Chile. Los adultos alimentan a sus polluelos aproximadamente 540 veces al día, con un importante grado de variabilidad influida por la presencia de aguiluchos. En relación a estos últimos, los rayaditos presentan diversas adaptaciones conductuales: a) forrajean dentro de la vegetación densa, bajo una cubierta protectora, b) vigilan los alrededores del nido desde dentro de la vegetación y comúnmente desde una roca, antes de entrar al nido, c) sólo abandonan la vegetación para alcanzar el nido, e) realizan vuelos cortos, f) reducen la intensidad de la alimentación cuando hay aguiluchos en la cercanía del nido, y g) vuelan directamente hacia la vegetación protectora después de alimentar a los polluelos.

PALABRAS CLAVE. Isla Alejandro Selkirk, *Aphrastura masafuerae*, cuidado parental.

INTRODUCTION

The Máfafuera Rayadito (*Aphrastura masafuerae*) is an endangered little-known Furnarid endemic to the Alejandro Selkirk Island, off continental Chile in the South-east Pacific. The species remained poorly documented since its description (Philippi & Landbeck

1866). After stated as probably extinct (Vaurie 1980), it was rediscovered in 1983 (Bourne 1983). In 1986 the population estimate was about 500 birds (Brooke 1988). It was therefore classified "in danger" (Glade 1993, Schlatter 1987) and "vulnerable" (Stattersfield & Capper 2000). Our own monitoring since 1992 did show significantly lower and declining numbers (Hahn

& Römer 1996). Our 2002 census showed only about 140 individuals. Thus, the red list status presently is about to be updated (BirdLife International in prep.).

Main reasons for the decline seem to be man-made habitat destruction and introduction of alien species. For a broader discussion of factors for decrease refer to Bourne et al. (1992) and Hahn and Römer (2002). Predation by native M^ásafuera Red-backed Hawks *Buteo polyosoma exsul* was not seriously considered before our investigation.

The reproductive period is of high critical importance to a species, in particular for island birds (e.g. Moors 1985). However, no breeding data of the M^ásafuera Rayadito were available. After discovering the first nest sites of this species (Hahn et al. 2004), first observations of brood care behaviour and related use of habitat became possible. In this note we present behavioural observations conducted at four nest sites during the breeding seasons of December 1992 to January 1995, with the aim of contributing with information that may be essential for conservation activities. In particular, we report on the potentially important effect of predation risk by hawks as a factor limiting breeding performance of the species.

METHODS

Field work then was carried out on the island during the austral summers from 25 November 1992 to 1 February 1993, 15 December 1994 to 9 February 1995, and 15 January to 8 February 2002 by IH. RS placed comparative data from southern Chile on disposal. Visual field identification of birds was straightforward, based on the original species description (Philippi & Landbeck 1866). Acoustic identification was possible after learning the bird vocalisations while they were under visual observation (Hahn & Mattes 2000). Statistic evaluations (CHI-Square test) were conducted using the software program CSS-Statistica.

RESULTS AND DISCUSSION

M^ásafuera Rayaditos mainly used areas dominated by *Lophosoria* ferns and *Dicksonia* tree-ferns which occur at the high heights of the island. When foraging, rayaditos remained well

protected from M^ásafuera Hawks by staying inside the densest vegetation. However, when they approached the nest with food for the nestlings, they had to leave the protective cover, as nests are located higher up in a small hole within steep rocks. The latter and the phase when birds leave the nest seems to be critical for the adults who are more exposed to attacks by hawks. The effect of the presence of hawks on feeding frequency can be seen at table 1.

Over the day, feeding frequency varied, but not in a regular pattern. During 18% of the time (7.5 out of 43 h) M^ásafuera Hawks were present near the nests, and during these 7.5 h, adult rayaditos entered the nest only 24 times per hour on average versus 43 times during hours without hawk presence ($P < 0.001$).

Sometimes both adults were present in the nest hole at the same time. These double visits were rare (3.0 / h) and short (< 43 s / h) on average and their frequency correlated with their average duration ($r = 0.637$, $P < 0.01$). Double and extended visits may be critical for the rayaditos, as chances to detect an approaching hawk are reduced. This hypothesis seems to be stressed at nest site 2, where no hawks were recorded and double and extended visits were numerous (table 1).

On average, nestlings were fed once every 100s by one of the adults. Sometimes feeding pauses lasted five min or even longer (up to about 15 min when a M^ásafuera Hawk was present in the nest vicinity). The number of calls inside the home range varied between the different pairs/nest sites (table 1). On average, calls were more abundant during early morning and sometimes dusk (compare Hahn & Mattes 2000). The transport of faeces off the nest by adult rayaditos was counted during 11 h: at nest 3, faeces were carried off 4 times per h on average, and at nest 4, only 2.6 times. Thus nest 4 had 65% of the faeces transports of nest 3, but also only 62% of the adult feeding flights.

As hawks massively patrol the rayadito home ranges it is interesting to know if the latter show specific spatial patterns of antagonistic behaviour while flying to and off the nest. For that purpose, at nest sites 2 and 3 we recorded the location of every stopping site of rayaditos flying on their way to the nest. A total of 230 trips were recorded (table 2).

Table 2 shows differences between the behaviour of the two studied pairs. These differences may be related to the structure of the nest surroundings. Nest hole 2 was located in the up-

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Table 1. Brood care data of Másafuera Rayaditos *Aphrastura masafuerae* from four nest sites. Data area presented as average (Standard Error) (sample size = n).

	Nest site 1	Nest site 2	Nest site 3	Nest site 4	Total average
Time range	17:00-19:00	07:00-22:00	11:00-15:00	11:30-20:00	-
Days	16	6 and 11	29 and 30	9,17,18,20,25	-
Month / year	Dec. 1992	Jan. 1993	Dec. 1994	Jan. 1995	
Visits (#)	26.5(1.5) (n=2)	36.6(2.2) (n=15)	53.3(1.9) (n=4)	33.0(1.5) (n=22)	35.8(1.4) (n=43)
Double visits only (#)	1.5(0.5) (n=2)	4.3(0.4) (n=15)	1.3(1.3) (n=3)	1.8(0.3) (n=11.5)	3.0(0.4) (n=31.5)
Duration of all visits (s)	129(11.0) (n=2)	581.2(71.6) (n=15)	89.0(6.4) (n=3)	-	462.2(71.3) (n=20)
Duration of average visit (s)	4.9(0.7) (n=2)	21.0(2.5) (n=9)	1.7(0.1) (n=3)	-	14.6(2.9) (n=14)
Duration of short visits (s)	4.9(0.7) (n=2)	10.3(0.5) (n=15)	1.7(0.1) (n=3)	-	8.5(0.8) (n=20)
Time between two visits (s)	136.0(7.5) (n=2)	105.1(7.8) (n=15)	67.8(2.5) (n=4)	109.1(6.4) (n=22)	100.5(4.9) (n=43)
Calls (#)	-	29.9(2.2) (n=13)	7.8(1.9) (n=4)	12.8(1.8) (n=15.5)	19(2.0) (n=32)
Faeces transports (#)	-	-	4.0(0.0) (n=2)	2.6(0.3) (n=9)	2.8(0.3) (n=11)
Hawk presence (h)	2 (n=2)	0 (n=15)	1 (n=4)	4.5 (n=22)	18 % (n=43)

Table 2. Nest approaching flights and stations of Másafuera Rayaditos *Aphrastura masafuerae*. Listed habitat structures are the first stopping station on the way to the nest hole.

	nest site 2 9 Jan. 1993		nest site 3 29 Dec. 1994	
	abs.	%	abs.	%
Flight to a fern stand more than 5 m from the nest hole	6	5	0	0
Flight to a projecting rock in 1-5 m distance to the nest hole	74	57	27	27
Flight close to the nest opening of less than 1 m distance	29	22	0	0
Flight directly to the nest opening without pre-stopping	21	16	73	73
Total (n = 230)	130	100	100	100

per third of a big rock while nest hole 3 was located at medium height of a smooth rock wall. Therefore, hawks could not take advantage of potential hiding places, but, in return rayaditos could not control the surroundings of the nest hole. However, behavioral tendencies were the same: before approaching the nest both pairs controlled the surrounding area from under the fern cover. Then they controlled again from a projecting rock or flew directly to the nest vicinity. Only in six of 230 observed cases (3%) an individual already exposed itself on top of a fern stand more than five m away from the nest. Thus they normally long remained in vegetation shelter before quickly entering the nest, reducing predation risk.

Nest departure flights were investigated at the same two nests. At nest site 3 we registered to which habitat structures flights were directed ($n = 100$): 86% to a fern stand (inside or on top), and 14% to a rock projecting out of the ferns. Although mosses and lichens covering these rocks contained arthropod prey (Hahn, personal observation), rayaditos stopped there only for seconds. The same was observed on top of ferns: they always quickly left and disappeared inside the vegetation. At a different nest site (no. 4) exclusively flights to fern stands were taken into account ($n = 25$): 84% directly led into the vegetation, 16% first to the top of ferns before continuing inside. Thus, in all cases (nest sites 2 – 4) rayaditos mostly flew directly into a fern stand under the cover. However, if they first landed on top of a rock or fern frond, they always remained there for a very short time. This behavior did not seem to be related to lack of food sources, but might be adaptation to predation pressure.

Although interactions between the rayaditos and hawks are a natural phenomenon, some hints suggest higher predation pressure compared to former times. Probably hawk numbers have increased during the last centuries related to introduction of numerous prey species. Originally they had to feed on native birds and sea-shore carrion only. Now goats, cats, rats, mice, and domestic fowl are additionally available throughout the year. Our own censuses show an increase of the M \acute{a} safuera Hawk population from about 150 individuals in 1994 to around 250 in 2002 (own unpubl. data). The recent increase may have resulted from the stop of illegal hunting on hawks. Thus, after predation pressure on M \acute{a} safuera Rayaditos has increased by introduced predators, pressure by native M \acute{a} safuera Hawks may also have grown.

Management for the conservation of the species must be aimed at the total eradication of introduced mammals, namely of goats, cattle, cats, mice, and rats (Bourne *et al.* 1992; Hahn & Römer 2002). However, no direct population culling program for M \acute{a} safuera Hawks seems to be justified, because reduction of introduced prey species would probably have the same impact. The need for more detailed studies of the breeding ecology of the species, especially regarding reproduction success, is evident.

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