Taxonomical entities of the Chotoy spinetail *Schoeniophylax phryganophilus*

(Aves: furnariidae) at the Paraná river floodplain, Argentina

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Abstract

The objective of this research was to study the barely known taxonomical entities of passerine Chotoy spinetail —*Schoeniophylax phryganophilus*— at the Paraná River floodplain, with the purpose of giving quantified data about trophic spectrum and diversity, circadian rhythm, habitat selection, niche amplitude, and prey size.

Keywords

Birds, *Schoeniophylax phryganophilus,* feeding ecology, Paraná River.

Resumen

El objetivo de esta investigación fue estudiar las poco conocidas entidades taxonómicas del Chotoy spinetail —Schoeniophylax phryganophilus— *en las planicies inundables del río Paraná, con el objeto de proveer información cuantificable sobre el espectro trófico y su diversidad, el ritmo circadiano, la selección del hábitat, la amplitud de nicho y el tamaño de las presas de esta ave del orden de los paseriformes.*

Palabras clave

Aves, Schoeniophylax phryganophilus*, ecología alimentaria, río Paraná.*

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Chotoy spinetail
Schoeniophylax phryganophilus
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Introduction

The Chotoy Spinetail, *Schoeniophylax phryganophilus* (Vieillot, 1817), lives in the floodplain of the Paraná River, but it also has a wide geographic distribution in Brazil, Paraguay, Bolivia y Uruguay (Baratini, 1945; Narosky e Izurieta, 1988; de la Peña, 1988 a-b, 1991, 1993, 1994, 1997 a-b, 1998, 1999; Canevari et al. a- b, 1991).

Study area

Animal captures and field observations were conducted by INALI at Carabajal Island (Santa Fe, Argentina, 31º 39´S – 60º 42´W), which belongs to the geomorphologic unit called the "banks' plain" (Iriondo and Drago, 1972). Phytographically, it is located in the Amazonian domain, in the province of Paraná, mixed forests district (Morrone, 2001). The island covers an estimated surface of 4000 hectares, where numerous lenitic water bodies stand out, some of them of considerable extension, such as La Cuarentena lagoon (250 Ha.), La Cacerola lagoon (80 Ha.) and Vuelta de Irigoyen lagoon (70 Ha).

These environments take up a reduced extension of Paraná River and its main tributaries because of the magnitude and amplitude of the hydro-sedimentary pulses. Its existence is restricted to prominent low-water periods, which uncover large sandbanks in the course islands, or concentric rings in the flood valley lagoons.

Material and Methods

We show the qualitative and quantitative analysis of eleven (11) stomach contents belonging to individuals captured between 1990 and 1992.

To determine trophic diversity we followed the Huturbia criterion (1973), which consists on calculating trophic diversity (H) for each individual by means of the Brillouin's formula (1965).

$$H = (1/N).(\log_2 N! - \Sigma \log_2 N_i!)$$

where N is the total number of taxonomic entities found in the stomach of each individual and Ni the number of prey of the i species in each stomach.

The estimations reckoned in this way were summed up at random to find out the accumulated trophic diversity (Hk). Then, the rank of the found values of trophic diversity and the average trophic diversity were determined. The stomachs were studied individually, and the organisms were identified and quantified at different taxonomic levels. As regards to the ingestions count in an advanced state of digestion, those which kept structures or key pieces for their identification, such as heads, elytra, jaws, etc. were considered as individuals.

The values of relative importance index (IRI) (Pinkas et al., 1971) were estimated to determine the contribution of each prey species to the diet:

$$IRI = \%FO \cdot (N + \%V)$$

where FO is the frequency of occurrence of a food category, N is the numeric percentage and V the volumetric percentage. To calculate this index, all stomach contents were treated as only one sample.

The niche's trophic scope per season was calculated by means of the Levins index (1968):

$$Nb = (\Sigma P_{ij}^{\ 2})^{-1}$$

where pij is the probability of item i in sample j.

Feeding efficiency was obtained through Acosta Cruz expression (et. al. 1989):

$$1'e = 1— \left[\bar{x}\ Weight\ cont.\ (g) \Big/ x\ \bar{C}orporal\ weight\ (g)\right].100$$

To establish the circadian rhythm of nourishing activity, we calculated the average index of satiety (IF), measured as the volume of stomach contents in milliliters divided by the bird's corporal weight in grams for each time of capture (Maule and Horton, 1984).

$$IF = \left[\bar{x}\ vol.\ cont.\ (ml) \Big/ x\ \bar{C}orporal\ weight\ (g)\right].100$$

To establish the association of the species to the aquatic ecosystems GUVAS (Great Units of Vegetation and Environment: open waters, rooted and floating aquatic vegetation, wood galleries, woodland, pasture ground, tall grass and beach), we applied the index of habitat preference according to Duncan's criterion (1983):

$$Pi = log. \left[Vi \Big/ Ai\right] + 100$$

where Vi is the percentage of individuals registered in each environmental unit (GUVA) and Ai is the percentage of coverage corresponding to each environmental unit. The values obtained above 3% show a visible preference for a determined GUVA, whereas lower values indicate less selectivity.

Chotoy spinetail *Schoeniophylax phryganophilus* Photo courtesy of www.avespampa.com.ar

Results

All stomachs analyzed (n=11) had nourishing material inside them. The values of trophic diversity ranged between 0 and 1.6, being more frequent in those included in the interval of minor diversity (0.5 – 1.00) (Fig.1). The accumulated trophic diversity was of 2.78. By adding 11 samples, the curve tends to stabilize itself. The beginning of the asymptote (p.t. Magurran, 1989) represents the minimum sample (Fig.2). The trophic spectrum, based on the identification of 157 preys, was composed of 13 taxonomic entities, twelve (12) of them corresponding to the animal segment and only one (1) to the vegetal segment represented by non-identified seeds (Table 1). The animal fraction was the most important both qualitatively and quantitatively (92%) and represented the total of ingest, where the majority were insects with forms associated to aquatic vegetation (Hydrophilidae,

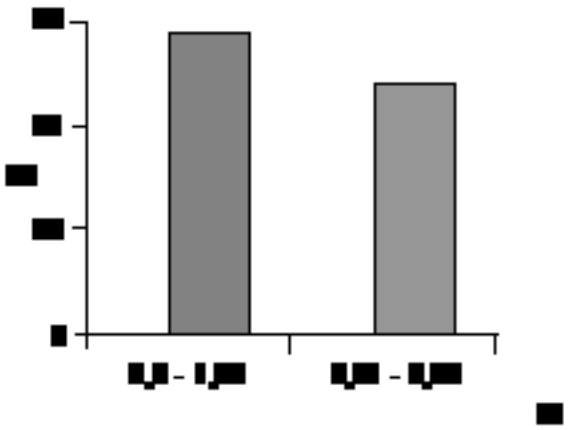

Fig.1. Trophic diversity by stomach of *Schoeniophylax phryganophilus*

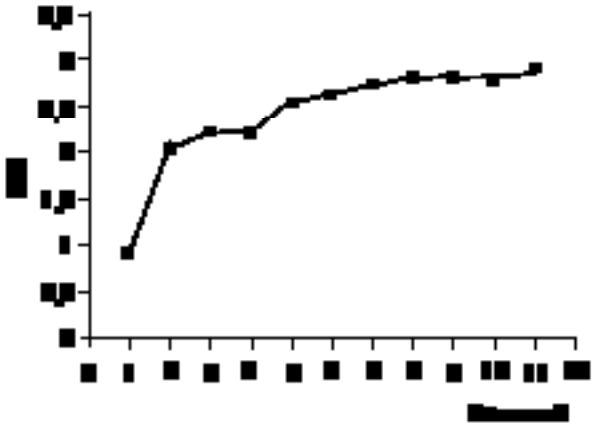

Fig.2. Accumulated trophic diversity curve based on the stomach number.

Table 1. Trophic spectrum of *Schoeniophylax phryganophilus.*

	N	F	%N	H
Animal fraction				
Insecta				
Coleoptera				
Carabidae	6	6	3,8	T
Curculionidae	16	5	10,2	A
Chrysomelidae	8	3	5,1	T
Dytiscidae	9	2	5,7	A
Hydrophilidae	38	7	24,2	A
n.i.	32	5	20,4	?
n.i.	5	1	3,2	?
Orthoptera				
Grillotalpidae	9	2	5,7	T
Paulinidae				
Paulinia sp.	1	1	0,6	A
Hymenoptera				
Formicidae n.i	3	2	1,9	T
Arachnida				
Pysauride	21	4	13,4	T
n.i.	8	3	5,1	?
Plant fraction				
Seeds n.i.	1	1	0,6	?

N = number of organisms; F = capture frequency; % = numeric percentage;
H = habitat (A: aquatic, T: terrestrial); n.i. = no identified.

Curculionidae, Dytiscidae and Paulinidae), and terrestrial environment (Carabidae, Gryllotalpidae y Chrysomelidae). Formicidae, Paulinidae and Arachnida (Pysauridae) were the species that followed in order of importance.

Applying the index of relative importance (IRI), the contribution of each category of nourishing material presented the following values: Coleoptera = 12432; Others (Arachnida, Orthoptera and Formicidae) = 744; Seeds = 2. These values showed an insectivorous diet where the Coleoptera were the main represented category, while the remainders were the secondary categories (Fig.3).

The amplitude for the trophic niche varied between 0.78 (summer) and 0.85 (winter).

Alimentary efficiency (l´e) was 98%. According to the medium index of satiety (IF) for each instance of capture, the type of temporal activity differential model employed by Schoeniophylax phryganophilus (Fig.4) determined that the major unfolding of trophic activity corresponds to the 11:00 – 14:00 time range. Later, it presents minimum activity between 14:00 and 16:00 and continues with an abruptly diminishing nourishing activity from 16:00 onwards. Hence, circadian rhythm of alimentary activity showed a higher activity at mid-day.

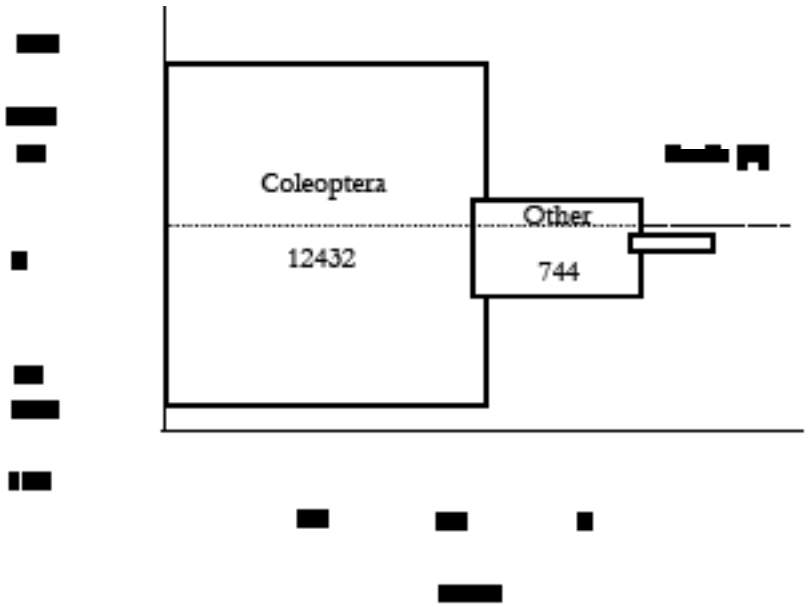

Fig.3. Index of relative importance (IRI)
N = numeric percentage V = volume percentage
FO = frequency of occurrence percentage

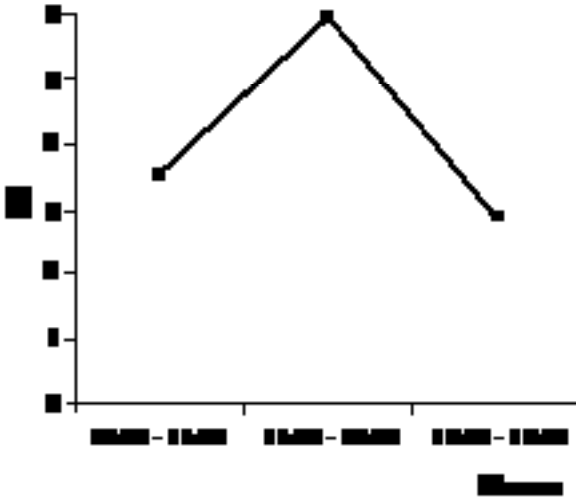

Fig.4. Circadian rhythm of Schoeniophylax phryganophilus.
IF = Average index of satiety

Chotoy spinetail
Schoeniophylax phryganophilus
Photo courtesy of www.avespampa.com.ar

The size of preys ranged between 2 and 10 mm, being more frequent those included in the interval of 4.5 - >8 mm class, which corresponded to Curculionidae, Hydrophilidae, Dytiscidae, Carabidae, Gryllotalpidae y Pysauridae. The minor sizes were represented by Formicidae, some Carabidae and non-identified Arachnida (Fig.5).

The values of habitat preference (Pi) for Schoeniophylax phryganophilus showed a preference for forest (0.28) and gallery forest (0.3), GUVA in which it was registered.

Discussion

Previous studies about the Schoeniophylax phryganophilus mainly refer to population statistics: census, registers and description (Canevari, et al., 1991-b); behavior and geographic distribution (Baratini, 1945; Narosky e Izuieta, 1988; de la Peña, 1988, 1989; Canevari et al, 1991); and timing for habitat preference (Klimatis y Moschione, 1987).

All antecedents make a qualitative reference of the diet but seldom lead to a good taxonomic resolution of the organisms that compose the trophic spectrum. Information about the diet has been gathered by Harrison (1978), who included these species in the insectivorous bird's guild that consume a large variety of insects of different environments.

Conclusions

The large variety of organisms observed in its trophic spectrum show the plasticity these species have in their nourishment as a consequence of the abundance of trophic resources existing in an area as that of the Paraná River floodplain valley, where the offer of habitats (GUVAS) not only offers them food, but also a place for refuge, protection and reproduction.

Following the criterion of Beltzer (2003), this study incorporates the Schoeniophylax phryganophilus taxonomical entities in the guilds of the basically insectivorous bird, picking and gleaning in foliage.

This work constitutes the first contribution to qualitative and quantitative information for this area of the Schoeniophylax phryganophilus taxonomical entities. It deals with basic knowledge about the handling of any specie with the purpose of establishing interactions between its populations and the environment.

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