

ZOOLOGIA 31 (1): 97–100, February, 2014  
<http://dx.doi.org/10.1590/S1984-46702014000100011>

SHORT COMMUNICATION

## Composition of the diet of *Netta peposaca* (Birds: Anseriformes) in Santa Fe province, Argentina

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**ABSTRACT.** We examined the diet of the Rosy-billed Pochard, *Netta peposaca* (Vieillot, 1816), (n = 59) during the autumn of 2010 in Santa Fe province, Argentina. Were analyzed a total of 59 ducks (n = 37 females and n = 22 males) to assess their gastrointestinal contents. The trophic spectrum was composed of 16 taxa (plant fraction: animal fraction 9 and 7). The contribution of each food category estimated using the IRI was: *Echinochloa* sp. (Poaceae) = 4301, *Polygonum* sp. (Polygonaceae) = 956, and unidentified graminoid species = 53 (females: *Echinochloa* sp. = 4313, *Polygonum* sp. = 1095 and males: *Echinochloa* sp. = 5522, *Polygonum* sp. = 814). No significant differences were found between females and males in diet composition (Fisher's test,  $p < 0.05$ ). Moreover, the diversity index ( $H'$ ) was significantly (Mann-Whitney,  $p < 0.05$ ) different between sexes. The Rosy-billed Pochard showed a predominantly phytophagous feeding habit in autumn. Likewise, this is the first contribution on the sexual differences in the feeding biology of the Rosy-billed Pochard.

**KEY WORDS.** Stomach contents analysis; Rosy-billed Pochard; trophic composition.

An important approach to determining bird community structure is the study of trophic ecology (BELTZER 2003, REALES *et al.* 2009). Knowing how different avian species share and exploit resources helps us to understand of their distribution, abundance and diversity (OLGUÍN *et al.* 2013). The Rosy-billed Pochard, *Netta peposaca* (Vieillot, 1816) is a member of the Anatidae and suffers great pressure from hunting in Argentina (BLANCO *et al.* 2002). This bird nests among reeds in wetlands, mainly in an area that extends from the central provinces of Córdoba, Santa Fe, Entre Ríos, and Buenos Aires, southwards to Río Negro (NAROSKY & RUDA VEGA 2009).

In Argentina the Rosy-billed Pochard migrates to northern provinces and the bordering countries Brazil and Uruguay in autumn, (BELTZER & MOSSO 1992). The present study examined the feeding habits of the Rosy-billed Pochard. Specifically, we asked the following questions: (1) what is the composition of the diet of this bird in the Santa Fe province, Argentina? (2) are there any sex differences with regards to diet composition?

The study area is located in mid-eastern Argentina (Fig. 1), a part of the Espinal ecoregion (BURKART *et al.* 1999). Average annual rainfall in the area is 800 mm and the mean annual temperature is 18°C. The area is dominated by wetlands, remnants of fluvial forests, and intensively managed agricultural lands (cultivated with soybean, maize, wheat and rice) (ARTURI 2006). We selected two sampling sites with similar characteristic within the San Javier department, Santa Fe Province: Cañada de Blanche (30°31'18"S, 60°02'51"W) n = 12 (9 females and 3 males) and La Brava (30°27'19"S, 60°09'28"W) n = 35 (28 females and 19 males) (ARTURI 2006, PELTZER *et al.* 2006).

We surveyed the contents of fifty-nine stomachs obtained from Rosy-billed Pochard individuals (37 females and 22 males). Individuals were donated by tourist hunters during May and June 2010 (autumn period in Argentina). We studied the gastrointestinal contents using a stereomicroscope (Nikon 10x). After that, the contents were stored and preserved in 70% ethanol and were deposited in the collection of the Instituto

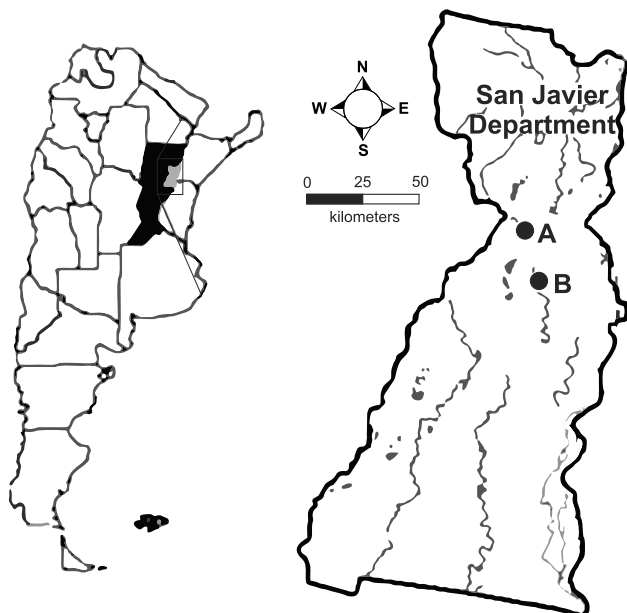


Figure 1. Study area in Santa Fe province, Argentina. Cañada de Blanca (A) and La Brava (B).

Nacional de Limnología (INALI-CONICET-UNL), Santa Fe, Argentina. Food items were identified to the most detailed taxonomic level possible using a binocular microscope; the number of items per digestive tract was also recorded (BELTZER 2003, OLGUÍN *et al.* 2013). The trophic diversity ( $H$ ) was calculated for each individual according to the method of HURTUBIA (1973) and using the formula of BRILLOUIN (1965):  $H = (I/N) (\log_2 N! - \sum \log_2 N_i!)$ , where  $N$  is the total number of taxonomic entities found in the stomach of each individual and  $N_i$  is the total number of prey species  $i$  in each stomach. Individual estimations were added randomly to obtain the cumulative dietary diversity ( $H_k$ ). Trophic niche breadth was calculated using LEVINS' (1968) index:  $Nb = (\sum P_{ij}^2) - 1$ , where  $P_{ij}$  is the probability of the presence of item  $i$  in sample  $j$ . To represent the contribution of taxonomic categories to the diet, an index of relative importance (IRI) was used, following PINKAS *et al.* (1971):  $IRI = FO\% (N\% + V\%)$ , where  $FO\%$  is the occurrence frequency,  $N\%$  is the numeric percentage and  $V\%$  is the volumetric percentage of each food category. The weight of each bird was recorded with a near balance Pesola® scale Micro-Line. Food differences between sexes were analyzed by comparing the presence or absence of each prey taxon, according to Fisher's probability test (ATTADEMO *et al.* 2007). In addition, the rarefaction method (MAGURRAN 2004) was used to calculate richness ( $S$ ) and the Shannon-Weaver Diversity Index ( $H'$ ) of species consumed by sexes using 1,000 random permutations in the EcoSim program (GOTELLI & ENTSMINGER 2007). Moreover, Mann-Whitney ( $U$ ) tests were used to compare differences between the sexes according to the diversity ( $H'$ ) and richness ( $S$ ) indexes.

The trophic spectrum of the Rosy-billed Pochard diet ( $n = 47$ ) comprised 16 prey items, nine of vegetal origin and seven of animal origin (Table I). The trophic diversity per stomach ranged between 0 and 2.19 and cumulative trophic diversity was 1.23 (Fig. 2), with the curve reaching an asymptote at stomach number 11. The trophic niche breadth was 0.98. The contribution of each food category estimated using the IRI, was: *Echinochloa* sp. (Poaceae) = 4301, *Polygonum* sp. (Polygonaceae) = 956, and unidentified graminoid species = 53. For females, food categories included were: *Echinochloa* sp. = 4313, *Polygonum* sp. = 1095, and unidentified graminoid species = 81, whereas for males, they were: *Echinochloa* sp. = 5522, *Polygonum* sp. = 814, and *Setaria italic* (Beauv, 1812) (Poaceae) = 86. The mean body weight  $\pm$  SD of females and males  $\pm$  was  $1078.93 \pm 90.36$  g, and  $1154.74 \pm 86.59$  g, respectively. The frequency of occurrence of all the prey items did not differ between males and females (Fisher's exact probability test,  $p < 0.05$ ). Moreover, the diversity index ( $H'$ ) was significantly (Mann-Whitney,  $p < 0.05$ ) different between the sexes ( $H' = 0.66 \pm 0.40$  for females and  $H' = 0.11 \pm 0.30$  for males). By contrast, species richness ( $S$ ) was not different (Mann-Whitney,  $p < 0.05$ ) by males and females (were  $S = 0.69 \pm 0.40$  and  $S = 0.79 \pm 0.30$ ).

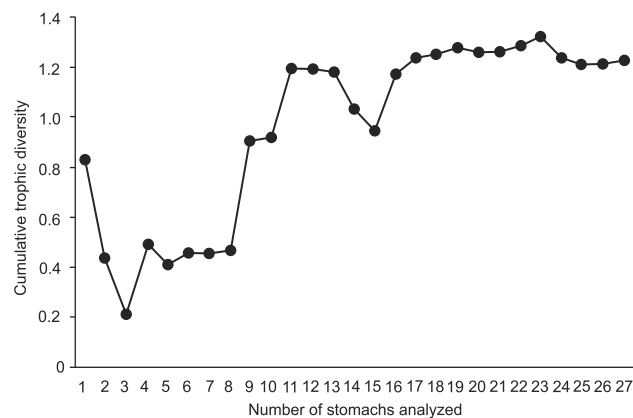


Figure 3. Cumulative trophic diversity of *Netta peposaca* in Santa Fe province, Argentina.

The Rosy-billed Pochard showed a predominantly phytophagous feeding habit in autumn, with *Echinochloa* sp. and *Polygonum* sp. being the main food items. These results are consistent with findings reported by BELTZER & MOSSO (1992), who studied the diet of this species in a natural area of the Middle Paraná River. The dominant consumption of seeds in autumn is a behavior associated with the need to obtain carbohydrate-rich food, which is essential for meeting thermophysiological requirements in that season. Seeds readily provide a high energy supply, which is essential for alleviating temperature stress during that season (JORDE & OWEN 1988). Although the Rosy-

Table I. Trophic spectrum of *Netta peposaca*. Total number of organisms (N), Absolute frequency (F), Percentage of each prey category in the diet (%), Frequency of occurrence (FO), Index of relative importance (IRI), and without value (\*).

Prey category	N	F	%	FO	IRI
Vegetal components (seeds)					
Poaceae					
<i>Oryza sativa</i>	368	1	1.05	0.73	1
<i>Setaria italic</i>	1165	17	3.31	12.41	46
<i>Sporobolus</i> sp.	287	10	0.82	7.30	12
<i>Echinochloa</i> sp.	28429	40	80.88	29.20	4301
Graminae					
<i>Paspalum repens</i>	7	2	0.01	2.19	*
Unidentified species	1379	10	3.92	7.30	53
Polygonaceae					
<i>Polygonum</i> sp.	3488	34	9.92	24.82	956
<i>Muehlenbeckia sagittifolia</i>	8	1	0.02	0.73	*
Leguminosae					
	6	3	0.02	2.19	*
Animal fraction					
Insecta					
Coleoptera					
Dytiscidae	2	1	0.01	0.73	*
Unidentified adult	1	1	*	0.73	*
Diptera					
	9	1	0.03	0.73	*
Hymenoptera					
Formicidae					
<i>Acromyrmex</i> sp.	1	1	*	0.73	*
Unidentified adult	1	1	*	0.73	*
Arachnida					
Araneae					
Lycosidae	2	1	0.01	0.73	*
Mollusca					
	1	1	*	0.73	*
Cumulative trophic diversity	1.23				
Total of prey	35143				

billed Pochard has been indicated as a pest in rice fields (BUCHER 1984), no seeds of this crop were found in stomach contents in the present work. The absence of rice seeds may be related to the sampling period, which does not encompass the time of rice heading. The asymptote reached by the curve of cumulative trophic diversity indicates that the sample size was enough to identify the prey items consumed by the species during the study period. Niche breadth value was lower than the reported by ROZZATTI *et al.* (1994) because the items consumed were homogeneous and *Echinochloa* sp. was a numerically high item. Although that study was conducted in rice fields, the difference in the presence of rice reveals the species plasticity relative to the offer of other food resources. ROZZATTI *et al.* (1994) identified only eight items, whereas in the present study, the spectrum comprised 16 taxonomic entities. Furthermore, no significant differences in the frequency of occurrence of prey items between males and females were observed, suggesting

that the prey items are equally available to both sexes in the environment. However, using rarefaction to control for the differences in the number of prey showed higher diversity of prey-items for females than for males. This finding may be attributed to the fact that females were more affected than males and needed to use other sources to complement their diet, but the information obtained is not enough to formulate a hypothesis. Further studies encompassing the entire annual cycle are necessary to complement the present data. The variety of food consumed in autumn reflects the plasticity in the Rosy-billed Pochard to exploit diverse food items according to habitat conditions and resource offer. Finally, the results of our study enhance the knowledge on the composition of the diet of *Netta peposaca*, which is important to conservation management to ensure stable and continuous population levels. Likewise, this is the first contribution to the feeding biology of the Rosy-billed Pochard discriminated by sex.

## ACKNOWLEDGMENTS

We thank Walter Boeger for critical reading of the manuscript as well his helpful observations. We thank the hunters, who operated under the Argentine national decree ratified by Law 4830 in Article 4, subsection a, Resolution 036, for donating the samples of the species studied. Our research was conducted according to the guidelines for use of wild animals in accordance with the established by the law "Protection and Conservation of Wild Fauna" (Argentina National Law 22421) and with authorization of the Ministerio de Aguas, Servicios Públicos y Medio Ambiente, from Santa Fe province, Argentina.

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Submitted: 03.V.2013; Accepted: 26.IX.2013.

Editorial responsibility: Diego Astúa de Moraes