

## **BOBOLINK (*DOLICHONYX ORYZIVORUS*) NUMBERS AND NON BREEDING ECOLOGY IN THE RICE FIELDS OF SAN JAVIER, SANTA FE PROVINCE, ARGENTINA**

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**Resumen.** – **Abundancia y ecología no reproductiva del Charlatán (*Dolichonyx oryzivorus*) en las arrozceras de San Javier, provincia de Santa Fe, Argentina.** – El Charlatán (*Dolichonyx oryzivorus*) se reproduce en áreas templadas de América del Norte y, durante la temporada no reproductiva, migra hacia el sur de América del Sur donde habita pastizales, bañados y arrozceras de Paraguay, Bolivia, Brasil y Argentina. Desde 1960's, su población muestra una tendencia decreciente en especial debido a la modificación del hábitat en el área de cría. Se especula que estos cambios en el hábitat y la asociación al cultivo de arroz podrían tener que ver con su declinación poblacional. Sin embargo, la información sobre su distribución y ecología no reproductiva aún es muy escasa para afirmarlo. El objetivo de este trabajo fue estudiar el valor de las arrozceras de San Javier (provincia de Santa Fe) para el Charlatán. Se presentan datos sobre abundancia y uso de hábitat de la especie. En Noviembre de 2004 y Marzo de 2005, se realizaron censos en arrozceras y observaciones en otros hábitat del área de estudio. Para los censos se utilizaron puntos de conteo. Además se realizaron entrevistas a los arrozceros para investigar su conocimiento sobre la especie. El Charlatán no fue observado en Noviembre pero si en Marzo, donde fue registrado en parejas, grupos pequeños (20-100 ind.), y grandes bandadas (1000 a 10 000 ind.), en arrozceras en estadio de grano lechoso. Se observó un máximo de c. 10 000 individuos en una arrozcera de c. 50 ha. Los resultados del estudio confirman la fuerte asociación del Charlatán con el cultivo de arroz, en el cual éste obtiene alimento y refugio, especialmente durante periodo de formación de la semilla o “estado lechoso”. Las entrevistas confirmaron que la especie es considerada una plaga para el cultivo de arroz por los productores arrozceros, quienes utilizan diversos métodos de control en la zona. Se recomiendan estudios adicionales en las arrozceras de San Javier y en arrozceras en el resto de su distribución no reproductiva, con el fin de evaluar las amenazas potenciales a su población.

**Abstract.** – The Bobolink (*Dolichonyx oryzivorus*) breeds in temperate North America and migrates in winter to southern South America. During the non-breeding season, this species occupies grasslands, marshes, and rice fields in Paraguay, Bolivia, Brazil and Argentina. Since the 1960's, a population decrease has been noted, largely due to modification of the breeding habitat. It is thought that these changes in habitat and the Bobolink's association with rice crops could be related to their population decline, although information concerning their distribution and ecology during the non-breeding season is scarce. The objective of this study was to assess the value of the rice fields near San Javier (Santa Fe Province) as a non-breeding area for migratory Bobolinks. We present data on abundance and habitat use. Fields surveys were carried out in November 2004 and March 2005. We used circular plot sampling and incidental observations to count Bobolinks in rice fields. Besides, we made interviews to rice farmers to assess their knowledge about the species. While in November no Bobolinks were observed, in March the species was recorded in pairs, small groups (20-100 ind.), and large flocks (1000 to 10,000 ind.) in rice fields, when the rice was in the "milky stage". We observed a maximum of approximately 10,000 individuals in a ~50 ha rice field. These results demonstrate this species' strong association with the rice crop, in which it finds food and shelter, especially when the rice comes into the milky stage. Interviews confirmed that the Bobolink is considered a pest in rice crops by farmers, who apply various control methods in the area. We recommend that further studies be conducted in the region of San Javier, as well as in other rice areas throughout its non-breeding season range, in order to investigate potential threats to Bobolink populations. *Accepted 28 April 2007.*

**Key words:** Argentina, Bobolink, *Dolichonyx oryzivorus*, conservation, habitat use, rice fields.

## INTRODUCTION

Bobolinks (*Dolichonyx oryzivorus*) breed in temperate North America, and migrate to the southern Cone of South America during the non-breeding season (December to March) (Bent 1958, Pettingill 1983, Ridgely & Tudor 1989, Martin and Gavin 1995, Paynter 1995a). Although the original non-breeding habitat was the grasslands and marshes in Paraguay, Bolivia, Brazil and the north of Argentina (Ridgely & Tudor 1989, Jaramillo & Burke 1999), they have also been found in rice fields (Bucher & Bedano 1979, Pettingill 1983, Vickery & Casañas 2001, Zaccagnini 2002, Di Giacomo *et al.* 2005, Renfrew & Saavedra 2007).

Bobolink populations have declined by 3.1% annually since 1966 (Sauer *et al.* 2004). Authors have attributed these declines to changes and modifications to habitat (Askins 1993, Knopf 1994, Herkert 1997, Vickery *et al.* 1999, Vickery & Herkert 2001), and the association of Bobo-

links with rice cultivation (Pettingill 1983, Vickery & Casañas 2001, Renfrew & Saavedra 2007).

Data on large numbers of Bobolinks in Argentina come from the north east of Santa Fe Province [Hartert & Venturi (1909); > 5000 ind. in a reed bed], rice fields in Corrientes [Pettingill (1983); thousands of individuals], grasslands in the east and north of Formosa [Di Giacomo (2005), Moschione & Casañas (2005), Moschione *et al.* (2005); flocks of up to a thousand], and rice fields at San Joaquín, Santa Fe (MEZ, MS & S. Canavelli unpubl.; several hundreds). However information about its non-breeding distribution is still very scarce and the main areas of concentration in Argentina have not yet been identified.

The objective of this paper is to assess the value of the rice fields of San Javier as a non-breeding area for migratory Bobolinks. We present data on the abundance of the Bobolink in the eastern central sector of the province of Santa Fe, as well as our observations

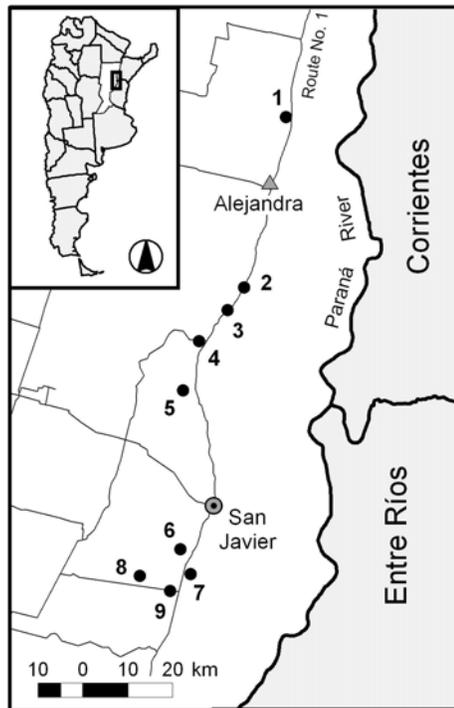


FIG. 1. Geographical location of the sampled farms (black dots) within the rice zone of Santa Fe province, Argentina: 1) Pájaro Blanco, 2) Sina Sina, 3) Cuchinsky, 4) Carlen (where 10,000 Bobolinks were recorded), 5) Gallo, 6) Testa, 7) Sapucay S.R.L., 8) San Roque I, y 9) San Roque II.

about the use of habitat and potential threats to the species in rice crops.

## METHODS

*Study area.* The study area includes the rice zone of Santa Fe province (Argentina), along the provincial route no. 1, encompassing an area of ~350,000 ha. The sampled plots were located in the surroundings of San Javier (30°35'S, 59°57'W; Paynter 1995b), a country district with large areas of secondary "espinal" (dry thorny woodland) (Administración de Parques Nacionales 1999). This rice zone lies between the "espinal" and the San Javier river,

within the floodplains of the Paraná river and in a north-south band, approximately 15-20 km wide and about 100 km long (Fig. 1). The majority of the land is privately owned and there are no protected areas. The main human threats to the local fauna are sport and subsistence hunting, use of agrochemicals to control birds considered as pests, mainly Chestnut-capped Blackbirds (*Agelaius ruficapillus*) and some species of ducks (Canevalli 1994, Serra 1999, MEZ & C. Mathern unpubl.), felling for timber, and deforestation for agricultural expansion.

Rice cultivation has been the main crop and one of the main economic activities in the study area since 1991, with an estimated 17,000 ha sown in 2004. The rice farms are of 1000-5000 ha size (MS pers. observ.). Two different varieties of rice are grown in the area; long-fine and long-wide (Fortuna) grains; the last one restricted to 1.2% of the study area. Rice fields have expanded into previously marshy land and, during the flooding season, they become artificial wetlands.

In our study area the rice cultivation cycle starts in mid September-October with the sowing. The rice plant grows during the non-breeding season months, reaching the milky-stage by early February. The harvest is carried out in March, when the rice reaches the mature stage. The Fortuna variety has a longer cycle, with the milky-stage occurring in March and the harvest in April.

*Survey methods.* We conducted Bobolink surveys as part of a project for evaluating the use of rice fields by migrating shorebirds. Two campaigns took place in the austral spring of 2004 (23-30 November) and the austral summer of 2005 (8-12 March). The spring surveys coincided with early growth stages in the rice cycle (germinated rice not yet flooded to rice of around 30-40 cm high), whereas summer surveys took place during more advanced growth stages of the crop (green rice in

TABLE 1. Bobolink sightings ordered from North to South during variable circular plot sampling in the rice fields of Santa Fe, Argentina, in March 2005.

Map No.	Locality <sup>1</sup>	Coordinates	Date	Survey points <sup>2</sup>	Survey points with Bobolinks	Number on points <sup>3</sup>	Number at nearby sites <sup>4</sup>
1	Pájaro Blanco	29°46'S, 59°49'W	8 March	10	3	5	Isolated birds
2	Sina Sina	30°07'S, 59°55'W	12 March	1	1	20	
3	Cuchinsky	30°10'S, 59°55'W	12 March	8	8	863	Hundreds
4	Carlen	30°14'S, 59°59'W	10 March	8	5	25	1000–10,000
5	Gallo	30°20'S, 60°02'W	10 March	5	2	2	
6	Testa	30°40'S, 60°00'W	9 March	4	–	–	
7	Sapucay S.R.L.	30°44'S, 59°59'W	9 March	4	–	–	
8	San Roque I	30°43'S, 60°05'W	11 March	14	1	1	
9	San Roque II	30°45'S, 60°01'W	9 March	6	–	–	Isolated birds
	Total			60	20	916	

<sup>1</sup>Rice farm; <sup>2</sup>Number of survey points per locality; <sup>3</sup>Number of Bobolinks detected within 150 m of survey points; <sup>4</sup>Number of Bobolinks detected while walking to and from points.

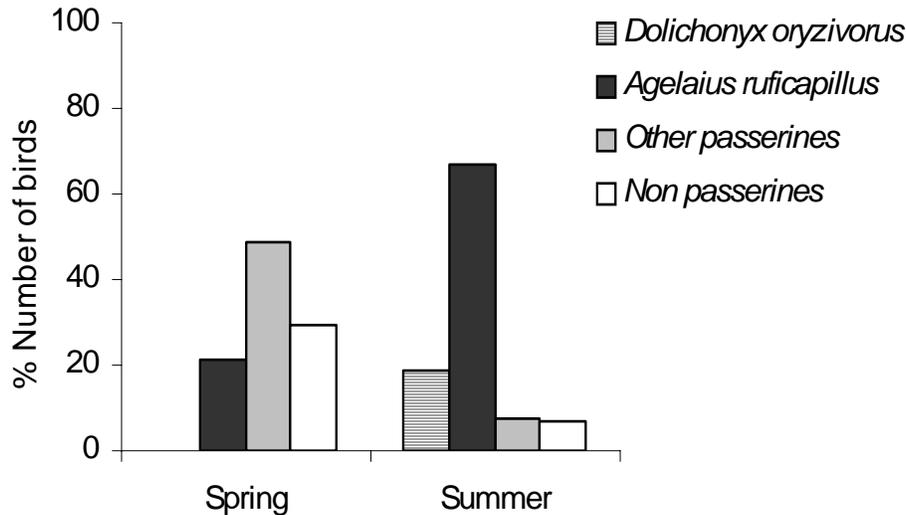


FIG. 2. Numerical frequencies of Bobolinks and other non-waterbird species counted in rice fields of Santa Fe during variable circular plot sampling, in the austral spring 2004 (N = 331) and the summer 2005 (N = 4845).

“milky stage” and mature rice) and during the harvest (stubbles). Rice at the “milky stage” refers to the period of seed formation.

We surveyed Bobolinks in rice fields and searched the species in other crops like wheat and maize fields (both visually and audibly), as well as in native habitats such as grasslands and marshes.

We used variable circular plot sampling (Reynolds *et al.* 1980, Buckland *et al.* 1993) to count Bobolinks in nine rice farms. Count points (N = 60) were located along roads and also along secondary paths inside the rice fields. Count points were spaced approximately 500 m apart (between 1 and 14 per rice farm; Table 1) to ensure observations were independent. Two observers per point recorded the number of birds within 150 m of each point, at both sides of the road when possible. We collected data during 10 min using binoculars (8 x 40, 10 x 56) and a scope.

We also estimated Bobolink numbers observed incidentally in grasslands, marshes,

the edges of native bush and other crops at nearby sites throughout the survey locality and in its surroundings, totaling around 13 days of search. Some of these observations were at the point counts but beyond the radius of the count circle. Besides, observations of Bobolink flocks were done during the sunset and until the night to locate roosting sites. We used handheld GPS (Garmin 12) to determine geographical coordinates for each survey point within the rice fields.

In November 2004, we interviewed rice farmers and rice workers (N = 18) found during field work in order to obtain information about the presence and abundance of the species in the study area. A sheet of drawings of the common icterids of the area (mainly *Agelaius* spp.), including the Bobolink, was used for these interviews. We recorded the data of each rice farm, as well as the names, ages and occupations of the people interviewed. In the case of positive identification of Bobolinks, the following data were requested: 1) local

name, 2) approximate abundance (tens, hundreds, thousands), 3) approximate dates of arrival and departure, 4) use of the rice fields and natural history, and 5) methods of control.

## RESULTS

In November 2004, we did not observe any Bobolinks but its presence in the study area was confirmed by the locals. Ten out of the 18 people who were interviewed recognized the species as the “Charlatán” or “Chupador”, and agreed on its great abundance, mentioning sightings of hundreds to thousands of individuals “which form flocks like clouds and darken the sky” seen in previous years. It is noteworthy that some of the people interviewed were able to recognize the different phases of plumage of the males shown on the sheets.

According to interviewees, Bobolinks feed on the rice at the “milky stage” and were more abundant in the north of our study area, with repeated sightings in the “Pájaro Blanco” farm (Site 1; Fig. 1), where rice cycle starts before due to the northern position. Two people mentioned that it also feeds in fields of sunflower, wheat, maize and sorghum. All interviewees that recognized Bobolinks considered the species as a local pest, as well as Chestnut-capped Blackbirds and some species of duck (Anatidae), which are controlled locally by different methods (e.g, aerial fumigation, use of adhesives and different methods of bird scaring).

In March, we recorded Bobolinks mainly in the central part of the study area (Fig. 1 and Table 1), where they accounted for 19% of the total non-waterbirds recorded on points, the second most abundant species following the Chestnut-capped Blackbird (Fig. 2). Preliminary observations done in February 2005 by one of the authors accounted for thousands of Bobolinks in the rice fields of Pájaro

Blanco (MS pers. observ.) where, in March, abundances decreased due to the fact that most of the rice was at the mature stage or harvested.

In March, Bobolinks were recorded in 20 of the 60 survey points in rice fields, with a total count of 916 ind. (Table 1). Our records on points varied from individuals and pairs to a maximum of 863 birds at Cuchinsky farm (abundance = 30.52 ind./ha), with some large flocks of various thousands birds also observed incidentally (out of the point counts), at nearby sites (Table 1). The largest numbers recorded during incidental observations were in the localities of Cuchinsky and Carlen (sites 3 and 4, Fig. 1, Table 1), with a maximum estimate on 10 March 2005 of 10,000 birds roosting in one field of “Fortuna” rice (~50 ha) to the north of Carlen farm. A second roost of 1500 Bobolinks was found on 8 March 2005 in a field of “long-fine” mature rice, also in Carlen farm.

Bobolinks were normally observed together with Chestnut-capped Blackbirds, a much more abundant species (Fig. 2), feeding exclusively in fields of headed rice (“milky stage”). Around 85% of Bobolinks were recorded in the “Fortuna” rice variety. In spite of search efforts, the species was not recorded in grasslands and marshes in the surroundings of rice fields, but numerous flocks were found resting in “Espinillo” trees and bushes along the edges of rice fields, where the males sang complex songs and/or preened themselves.

Bobolink flock size was variable. They were often seen in small groups or in flocks of about 100 to 5000 ind., normally flying low over the rice fields, then disappearing into the crop. Many of the Bobolink males seen were in nuptial plumage. There was no marked variation of the species behavior throughout the daytime. However, sightings of isolated individuals or groups in flight apparently increased towards evening.

## DISCUSSION

Bobolinks had previously been observed in rice fields of San Javier between 1992 and 1995 (Zaccagnini 2002; MEZ, MS, S. Canavelli, E. L. Gill, C. J. Feare, & R. L. Bruggers unpubl.), with maximum counts of 900 individuals (MEZ & MS unpubl.).

In our study we suggest that a minimum of 10,000 Bobolinks reach the rice zone of Santa Fe province annually, where they forage in rice fields. The species' habit of feeding on rice grains has been well documented (McAtee 1919, Meanley & Neff 1953, Pettingill 1983, Martin & Gavin 1995, Renfrew & Saavedra 2007).

We only recorded the species at the end of the non-breeding season, during the last steps of the rice cycle and specially in association to those fields where the rice was at the milky stage, consistent with the observations of Pettingill (1983) and Martin & Gavin (1995). Although we did not see the species feeding on any other habitat, it has been previously observed feeding on maize (Pettingill 1983), sorghum (Di Giacomo 2005, Di Giacomo et al. 2005, Renfrew & Saavedra 2007), soybean (Renfrew & Saavedra 2007) and in native grasslands or marshes, where it is known to feed on grasses or sedges (Pereyra 1938, Martin & Gavin 1995, Di Giacomo 2005, Di Giacomo et al. 2005, Renfrew & Saavedra 2007).

Apparently, the association of the Bobolinks to the "Fortuna" rice – a variety that occupies only 1.2% of our study area – and the high concentrations of birds in these fields in the month of March, is due to this rice longer cycle, providing milky-stage grains when the majority of the rice fields have reached the mature-stage. However information available is not enough and future studies are needed to investigate this relation.

Because rice has been cultivated in the San Javier area for more than three decades, it is

possible that the Bobolinks appeared in the area at the same time. Bobolinks probably carry out regional movements to visit rice fields in large flocks as a function of the rice cycle in other rice areas of Argentina. Future studies should focus on standardizing evening night roost flight counts to better estimate Bobolink populations at local level, as well as on to study the species distribution on a regional scale in function of variations in rice cultivation cycle.

This study suggests the relative importance of the rice zone of Santa Fe province as a key Bobolink's non-breeding quarter in northeast Argentina. The sighting of at least 10,000 Bobolinks just in a ~50 ha rice field, and recent unpublished data from the authors, suggest that the region could host more than 100,000 birds, what have resulted in its designation as an Important Bird Area SF07 "San Javier" (López-Lanús & Blanco 2005).

*Implications for conservation.* The Bobolink has been included in the Migratory Bird Treaty Act of the USA and Canada and, since 1966, its annual rate of population decline has been approximately 3.1% (Sauer *et al.* 2004). The species has also been named as a "Species of Special Concern" (Martin & Gavin 1995) in some states of the USA, and included as a "Bird of Conservation Concern" (USFWS 2002) in three regions. On the other hand, the Bobolink is considered as a pest by local farmers within some areas of its non-breeding range in South America. According to Pettingill (1983), the species is considered a pest in the rice fields of Corrientes province, together with other blackbirds such as *Agelaius* spp. Bucher & Bedano (1979) and Bucher (1983) mentioned sporadic complaints from farmers about damage done in the rice fields by the species.

In our study, local farmers who were interviewed indicated that it was easy to rec-

ognize whether Bobolinks had occupied a rice field because the damage to rice ears was conspicuous. However it is not clear if they could distinguish the species from other blackbirds foraging in the rice. This perception was used to justify aerial applications of pesticides.

Our results suggest that in the northeast of Argentina, the Bobolink is threatened by the use of agrochemicals in rice, where it is considered a pest along with the Chestnut-capped Blackbird, the Shiny Cowbird (*Molothrus bonariensis*) and some species of ducks (Bucher 1983, Pettingill 1983, Bruggers & Zaccagnini 1994, Zaccagnini 2002). In spite of the fact that no Bobolink deaths were recorded during our survey, deaths of the species have been previously recorded in the area due to application of the organophosphate pesticide Chlorpyrifos, which produced mortality of more than 20 species of birds, and at least two species of fishes and mammals (MS & MEZ pers. observ., MEZ & C. Mathern unpubl.). Zaccagnini (2002) and MEZ & J. J. Venturino (unpubl.) stated that rice producers used to make aerial applications with very toxic active ingredients to control birds (i.e., Malathion, Monocrotophos). Although it appears that these practices have decreased in some areas, in others they are still performed to control Chestnut-capped Blackbird, indirectly affecting Bobolinks (G. Perusini pers. com.).

We suggest that this control pressure on Bobolinks, which might be practiced in other areas of its non-breeding distribution, may be one of the causes of the decline observed during the last decades in the North America (Renfrew & Saavedra (2007).

We recommend more comprehensive studies in the San Javier region, as well as in the rest of the southern distribution of the Bobolink, to evaluate its interactions with the rice crop and the possible consequences of its management at the population level.

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