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FORAGING BEHAVIOR OF THE SNOWY-CROWNED TERN (*STERNA TRUDEAUI*) AT MAR CHIQUITA, BUENOS AIRES PROVINCE, ARGENTINA

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Comportamiento de forrajeo del Gaviotín Lagunero (*Sterna trudeaui*) en Mar Chiquita, Provincia de Buenos Aires, Argentina.

Key words: Snowy-crowned Tern, *Sterna trudeaui*, Foraging behavior, Mar Chiquita Reserve, Argentina.

INTRODUCTION

The Snowy-crowned Tern (*Sterna trudeaui*), an endemic species of southern South America (Escalante 1970, Burger & Gochfeld 1996), can be found throughout the year at Mar Chiquita Reserve showing great affinity to estuarine and freshwater systems (Burger & Gochfeld 1996, Martinez 2001). In spite of the wide distribution of this species, the information of its biology is very scarce. Previous studies carried out in Mar Chiquita, Buenos Aires Province, Argentina, showed that the Snowy-crowned Tern uses estuarine and fresh water areas as well as coastal marine areas next to this coastal lagoon (Martínez 2001, Favero *et al.* 2001). Information from other areas only mentions "small fish" in its diet (Escalante 1970).

Studies conducted on different Sternidae species have shown that the activity patterns of these seabirds can be affected by environmental factors such as weather (e.g., wind and rain) and tidal cycle (Dunn 1975, Frank 1992, Burger & Gochfeld 1996). In this study, we present novel information on the diet of the Snowy-crowned Tern and analyze the effect of environmental variables on its foraging behavior.

STUDY AREA AND METHODS

The study was conducted between December 2003 and May 2004 at Mar Chiquita coastal lagoon (37º46'S, 57º27'W). Throughout the observations, the abundance of terns ranged from 20 to 250 individuals. Behavioral observations were periodically made with binoculars (10 x 50), scope (20–30 x), and a tape recorder. Observations of randomly taken individual birds were made as focal sampling (Martin & Bateson 1993), recording a total of 10 h and 147 samples. The duration of the samples ranged from 1 to 11 min (average 3.2

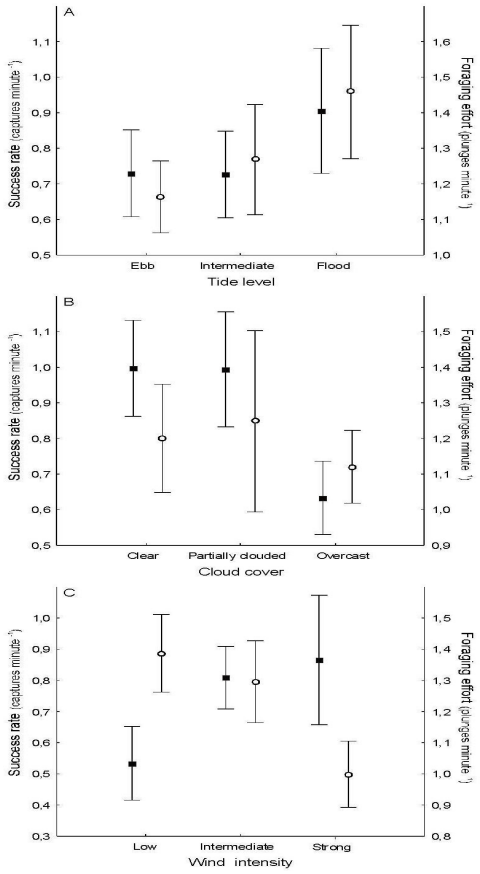

FIG. 1. Effect of tide level (A), cloud cover (B) and wind intensity (C) on the mean (± SD) foraging effort (filled squares) and foraging success rate (open circles) of the Snowy-crowned Tern at Mar Chiquita Reserve, Argentina.

± 1.8 min). In each observation, date, starting time, tide level (ebb, intermediate and flood), cloud cover (clear, partially clouded and overcast), water surface condition (smooth, lightly rippled, heavily rippled), and wind intensity (low, intermediate and strong) were recorded. The observations on foraging effort were split in three periods: morning (before 11:00 h local time, N = 59), noon (11:00–15:00 h, N = 39) and afternoon (after 15:00 h, N= 49). Foraging effort (i.e., number of plunges/min was estimated for all samples (N = 147) and the success rate (i.e., number of prey captured per minute) was estimated excluding the samples where there was uncertainty about prey capture (N = 42). Prey length was estimated by comparing the fish length with the bill length [average: 40.8 mm (Escalante 1970, Shealer 1998)]. The effect of environmental factors and time of day on the foraging behavior was tested with one-way ANOVA (Zar 1999). Post-hoc Tukey's comparisons were performed to identify differences in individual comparisons (Zar 1999). Data are presented as means ± one SD. Degrees of freedom are given as subindex.

RESULTS AND DISCUSSION

Our results are in agreement with previous studies describing Snowy-crowned Tern eating small fish (Escalante 1970, Martínez 2001, Favero *et al.* 2001). From the 84 fish prey observed, 24% were identified as silversides (*Odontesthes* sp.), 5% as flatfishes (*Paralichthys* sp.), while the rest remained undetermined. Most of the fish prey (55.7%) were smaller than 35 mm, 25.7% were between 35 and 50 mm in length, and the remaining 18.6% exceeded 50 mm.

The average foraging effort was 1.26 ± 0.93 plunges min^{-1}, and the average success rate was 0.76 ± 0.52 captures min^{-1}. Foraging efforts differed significantly among daytime periods (ANOVA, $F_{2\text{-}144}$ = 18.82, $P < 0.001$), being significantly higher during the morning (1.77 ± 1.15 plunges min^{-1}) compared to noon (1.01 ± 0.64 plunges min^{-1}) and afternoon (0.84 ± 0.38 plunges min^{-1}) (Tuckey post-hoc comparisons, $P < 0.05$).

Effect of environmental factors. Both, foraging effort and success rates tended to increase when tide level increased (ANOVA, $F_{2\text{-}144}$ =

0.4, $P = 0.67$ and $F_{2\text{-}39} = 0.903$, $P = 0.41$, respectively) (Fig. 1A). This trend can be, at least partially, related to variations in fish availability through the tidal cycle due to differences in their behavior (Frank 1992). It has been shown that, during the ebb tide, fish's spatial distribution is affected (Rozas 1995, Martinetto 2001), thus affecting the availability of potential prey to piscivorous birds. A negative trend was observed in the foraging effort under different cloud cover conditions (ANOVA, $F_{2\text{-}144} = 2.63$, $P = 0.07$) (Fig. 1B). This trend was less evident when the capture rates were analyzed, but a slight decrease in the foraging success was also observed under overcast conditions (ANOVA, $F_{2\text{-}39} = 0.18$, $P = 0.83$) (Fig. 1B). Previous studies on foraging ecology of other piscivorous bird species addressing the effects of cloud cover showed that in birds targeting fish from the air an increase in cloud cover could affect visibility (Grubb 1978).

While the foraging effort tended to increase with increasing wind intensity, the success rate tended to decrease. Nevertheless, no significant differences were observed (ANOVA, $F_{2\text{-}39} = 1.6$, $P = 0.21$ and $F_{2\text{-}144} = 1.23$, $P = 0.3$, respectively) (Fig. 1C). As wind intensity was highly correlated with water surface roughness ($r^2 = 0.88$, $P < 0.05$), the decrease in the foraging success rate could be associated with lower prey visibility beneath a rippled water surface (Grubb 1978, Bovino & Burtt 1979).

Although some particular references about the Snowy-crowned Tern actually exist for estuaries in Argentina, this information is anecdotical. The information given in this paper contributes to the basic knowledge of this species, emphasizing the need for further studies. The preference of this tern for estuarine and inland freshwater bodies as foraging areas during breeding and non-breeding seasons shows the importance of the wetlands conservation for the species.

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