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KLEPTOPARASITISM BY THE CARACARA CHIMANGO (*MILVAGO CHIMANGO*) ON THE AMERICAN OYSTERCATCHER (*HAEMATOPUS PALLIATUS*) AT MAR CHIQUITA LAGOON, ARGENTINA

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Cleptoparasitismo de Chimango (*Milvago chimango*) sobre el Ostrero Común (*Haematopus palliatus*) en la laguna de Mar Chiquita, Argentina.

Key words: *Milvago chimango, Haematopus palliatus,* Kleptoparasitism, foraging strategy, Mar Chiquita Lagoon, Argentina.

INTRODUCTION

Kleptoparasitism is defined as the stealing by one animal of food that has been caught by another (Furness 1987). This behavior is an important strategy to obtain limited or unavailable resources and it has been adopted by a variety of animals (Giraldeau & Caraco 2000). In birds, the likelihood of developing this behavior appears to be associated with certain attributes of the taxa, such as the inclusion of vertebrate prey in the diet, the use of open feeding habitats (Brockmann & Barnard 1979), and the possession of a relatively large brain (i.e., high cognitive abilities, Morrand-Ferron *et al.* 2007).

In Mar Chiquita Lagoon (Argentina), American Oystercatchers (*Haematopus palliatus*) forage on sand-lime beaches where they feed mainly clams and crabs (Bachmann & Martínez 1999). In this area, oystercatchers are frequently kleptoparasitized by Brown-hooded Gull *Chroicocephalus maculipennis* and Grey-headed Gull *Chroicocephalus cirrocephalus*, among others (Khatchikian *et al.* 2002). The Caracara Chimango, *Milvago chimango*, is a generalist and opportunistic raptor bird that feeds on a wide range of vertebrate and invertebrate prey, also showing scavenger habits (Biondi *et al.* 2005). The Caracara Chimango shares the foraging area with the American oystercatchers and is quite abundant in the

area; it can be frequently seen patrolling the shoreline searching for crabs, fishing discards, food scraps and garbage among other items (Biondi *et al.* 2005). Here we report the repeated observation of Caracara Chimangos kleptoparasitizing American Oystercatchers, describing this association qualitatively and quantitatively.

STUDY AREA AND METHODS

Observations were made between March and September 2007 in Mar Chiquita Lagoon (Buenos Aires Province, Argentina, 37°46'S, 57°27'W). This lagoon consists of a body of tidal brackish water of 46 km^2, with mud flats bordered by *Spartina densiflora* grassland and inhabited by a large number of intertidal crabs. Intertidal benthic communities at this lagoon and in other southwestern Atlantic estuaries have very low macroinfaunal diversity, being the Stout Razor clams *Tagelus plebeius* the dominant species (Gutiérrez *et al.* 2000). Among the epibenthic organisms, the dominant species are the Burrowing crab *Neohelice granulata* and the Mud crab *Cyrtograpsus angulatus* (Spivak *et al.* 1994).

Information on kleptoparasitism performed by the Caracara Chimango on American Oystercatchers, was obtained during *ad-libitum* observations conducted throughout daylight hours (09:00–18:00 h local time) over 17 days. Observations were made with the help of binoculars (8x) and telescope (12–60x). During samplings, both the occurrence of kleptoparasitic interactions and its outcome were recorded. An attack was considered successful when the kleptoparasite took the prey from the host. For each attack we also recorded size and type of prey. To reduce biases in the determination and characterization of prey, the same observer made all observations. Two prey were kleptoparasitized: *Tagelus plebeius* and *Cyrtograpsus angulatus*. The size of the main prey kleptoparasitized (i.e., clams, total length TL) was estimated in relation to the oystercatcher's bill length as "very small" (TL ≤ 15 mm), "small" (15 mm < TL ≤ 30 mm), "medium" (30 mm < TL ≤ 45 mm), "large" (45 mm ≤ TL ≤ 60 mm), and "very large" (60 mm < TL ≤ 75 mm).

RESULTS

A total of 29 kleptoparasitic attacks on oystercatchers was observed. There was a difference in the frequency of the stealing-attempts made on clams (N = 26) and those involving crabs (N = 4). Sixty-five percent of the kleptoparasitic events were successful, all of them performed on hosts feeding on clams (N = 17). The size of the clams attempted to steal were "medium" (31.82%) and "large" (68.18%) sized. The size of stolen clams was larger than those registered during the failed attempts (successful: "medium" = 3 events, "large" = 16 events; failed: "medium" = 4 events, "large" = 2 events).

The most frequently observed kleptoparasites : host ratio was 1:1 (N = 20), although a maximum of three Caracara Chimangos associated to a single host was observed in three cases. In all observed attacks, kleptoparasitism was performed by only one raptor. The Caracara Chimango stole food from oystercatchers by using two kleptoparasitic tactics, defined as running (from a nearby position) and flying. There was a difference in the use of both stealing-tactics, being the flying one the most frequently performed (95%).

When the kleptoparasite attacked, hosts left the prey with no apparent defense tactics displayed (31.03%, N = 9), or adopted two strategies to avoid the stealing of food: facing the parasite with agonistic vocalizations and peckings (34.48%, N = 10), or running away with the prey in the bill (34.48%, N = 10). Under both defense tactic scenarios, Caracara Chimangos succeed in stealing prey from oystercatchers in 40% of the attacks.

DISCUSSION

Several studies have shown that the American Oystercatcher is kleptoparasitized by seabirds and shorebirds (Martinez & Bachmann 1997, Tuckwell & Nol 1997, Khatchikian *et al.* 2002, Hand *et al.* 2010). However, this is the first study that provides a quali-quantitative des-cription of the kleptoparasitic interaction bet-ween American Oystercatchers and a raptor.

Many bird species act as scavengers on the scraps, feces or parasites of other animals (see Brockmann & Barnard 1979). Such behavior may occasionally result in birds actually stealing from the host while handling prey (Cowan 1968). The Caracara Chimango has frequently been observed consuming the flesh remains of the clams left by oystercatchers, together with the aggressiveness and maneuverability skills characterizing a medium-sized raptor are probably determinant factors leading to the development of kleptoparasitic interactions with American Oystercatchers.

During the field observations we found a higher occurrence of kleptoparasitism on large clams, indicating a possible preference of this prey size by kleptoparasites. Considering that kleptoparasites prefer to steal large or conspicuous prey (García *et al.* 2010), it is very likely that both conspicuousness and extended handling times of larger clams favored the development of such behavior.

The distribution of tactics used by kleptoparasites during the observations showed a greater use of the flying tactic compared to the running one. The predominance of the aerial tactic could be the result of prevailing wind conditions during the observations, facilitating movement and increasing maneuverability to kleptoparasites. In addition, the fact that the Caracara Chimango usually patrols the area through low flights, looking for any feeding opportunity, might increase the likelihood of engaging in kleptoparasitic behaviors using the aerial tactic.

A significant number of precedents have described and analyzed the hosts' behavior to avoid or reduce the theft of food by kleptoparasitism. These types of behaviors may include the flight with prey, aggression to kleptoparasites (Amat & Aguilera 1989), and even reduced handling time (Hockey & Steele 1990, García *et al.* 2008). The two observed avoidance tactics (running away and agonistic behaviors) indicate that kleptoparasitism affected the feeding behavior of oystercatchers and likely their foraging performance.

Previous studies have associated the body size differences between host and kleptoparasite with the occurrence of kleptoparasitism (see Brockmann & Barnard 1979). Larger kleptoparasites might be at an advantage in contexts where they can use threats or actual physical aggression on hosts, but not necessarily in cases where the kleptoparasite attack the host before it can detect or react to that attack (Giraldeau & Caraco 2000). Other studies have found that the residual brain size of kleptoparasites is associated positively with the occurrence of kleptoparasitism in bird taxa (Morand-Ferron *et al.* 2007). Despite the fact that the Caracara Chimango (~ 300 g) is smaller than its host (~ 600 g), this size difference did not prevent the parasite from achieving a high kleptoparasitic success (65%). This claim is consistent with data proceeding from recent studies which allow classifying the Caracara Chimango as a species with a remarkable ecological plasticity and a relatively high residual brain size (Biondi *et al.* 2005, 2008). The social learning ability of the Caracara Chimango, which has recently been demonstrated experimentally (Biondi *et al.* 2010), might speed the transmission of a feeding strategy (i.e., kleptoparasitism) throughout the Caracara Chimango individuals, increasing its effects on the local populations of oystercatchers.

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