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ARTIGO

Numbers, timing of breeding, and eggs of Kelp Gulls *Larus dominicanus* (Charadriiformes: Laridae) on Currais Islands in southern Brazil

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RESUMO: Números, período reprodutivo e ovos do gaivotão, *Larus dominicanus* (Charadriiformes: Laridae) no Arquipélago de Currais, sul do Brasil. O gaivotão, *Larus dominicanus,* é uma espécie de hábitos generalistas com ampla distribuição no Hemisfério Sul, inclusive no Brasil. Em algumas regiões onde essa espécie ocorre, como por exemplo, na Argentina, África do Sul e Austrália, suas populações têm crescido por causa do incremento da oferta de alimento. No Brasil informações sobre a reprodução do gaivotão ainda são relativamente escassas e, por isso, o presente estudo apresenta dados sobre uma colônia reprodutiva do gaivotão no Arquipélago de Currais, Paraná, Brasil. Os dados foram coletados durante amostragens mensais entre maio-dezembro de 2006, objetivando-se determinar o início do período reprodutivo, bem como a contagem e mapeamento de ninhos e a biometria de ovos. Os primeiros indícios de reprodução, representados pelo voo de acasalamento e cópula, foram observados entre maio-junho. A construção dos primeiros ninhos e início da postura e chocagem de ovos foram constatados em julho. O pico reprodutivo, caracterizado pelo maior número de ninhos com ovos e filhotes, ocorreu em setembro. Ao longo deste estudo foram encontrados 44 ninhos distribuídos de forma agregada em quatro áreas na periferia da ilha, todas próximas a linha d'água. Um total de 69 ovos foi contado e desses 67 foram pesados e medidos. Os valores médios da massa (g), largura e comprimento (em mm) foram, respectivamente, de 84,42, 49,30 e 70,89. Uma população reprodutora foi estimada em *c.* 122 aves. Em dezembro notou-se que as aves tinham finalizado o período reprodutivo, porque apenas alguns filhotes, já realizando voos, ainda se encontravam na ilha.

PALAVRAS-CHAVE: gaivotão, *Larus dominicanus,* biologia reprodutiva, ovos.

ABSTRACT: Kelp Gull, *Larus dominicanus* is a generalist seabird that is widely distributed in the Southern Hemisphere, including Brazil. In some parts of the species' range, such as Argentine, South Africa and Australia, its populations are increasing in recent decades due to food from fisheries discards. In Brazil, data on the reproduction of Kelp Gulls are relatively scarce, and thus, our study reports on information of a breeding colony of Kelp Gulls in the Archipelago of Currais in southern Brazil. The data were collected monthly between May-December 2006 in order to determine timing of breeding and to count and map nests and measure eggs. The first signs of reproduction, represented by pair flight and courtship, were observed in May-June. Build of first nests, as well as the beginning of laying and hatching, occurred in July. The reproductive peak, when the largest number of nests with eggs and nestlings occurs, was in September. We counted 44 nests distributed in four areas, located on the periphery of the island, near the water. Sixty-nine eggs were counted, 67of which were weighed and measured. Mean values of weight (g), width and length (mm) were, respectively, 84.42, 49.30, and 70.89. The breeding population was estimated to be *c.* 122 birds. Chicks had fledged by December.

KEY-WORDS: *Larus dominicanus,* Kelp Gull, breeding biology, eggs.

Kelp Gull *Larus dominicanus,* a widely distributed seabird in temperate and Antarctic latitudes of the Southern Hemisphere, is also one of the most widespread species in the sea-coast of southern Brazil. In south-western Atlantic, breeding colonies are usually found on inshore islands along the coast of South America, from the State of Rio de Janeiro in Brazil (Sick 1997, Alves *et al.* 2004) to Tierra del Fuego in Argentina (Yorio *et al.* 1998), and it exhibits great plasticity in habitat occupation (García-Borboroglu and Yorio 2004a, b). It is believed that the species chooses breeding sites that have sufficient vegetation cover to protect eggs and chicks, and that are safe from predators and extreme weather conditions (Yorio *et al.* 1998, García-Borboroglu and Yorio 2004b).

Some authors (Gill *et al.* 2002, Calf *et al.* 2003, Skórka *et al.* 2005, Yorio *et al.* 2005, Kim and Monaghan 2006, Whittington *et al.* 2006) have shown that gulls have a generalist and opportunist feeding behaviour, often taking advantage from anthropogenic food sources such as fishery discards. Recent increases in the population of

many large-sized gulls (*Larus* spp.) around the world has been attributed to their ability to exploit these discards (Furness *et al.* 1992, Garthe *et al.* 1996, Oro 1996, Oro *et al.* 1996, Giaccardi *et al.* 1997, Yorio *et al.* 1998, Arcos *et al.* 2001, Oro and Ruxton 2001, Arcos and Oro 2002, Martínez-Abraín *et al.* 2002, Furness 2003, Garthe and Scherp 2003, Giaccardi and Yorio 2004, Mañosa *et al.* 2004, Whittington *et al.* 2006). However, the influence of discards on the breeding cycle of Kelp Gulls in Brazil and the impact of its population increase on other seabird population has not yet been systematically investigated.

The breeding biology of Kelp Gulls on Brazilian coast has been recently studied (Soares and Schiefler 1995, Branco and Ebert 2002, Branco 2003, Alves *et al.* 2004, Campos *et al.* 2004, Krul 2004, Dantas 2007). The different populations of the species vary in their timing of breeding due to differences in the characteristics of the sites along the Brazilian coast. Therefore, studies carried out in other regions are unlikely to reflect the breeding patterns of the species in Brazil. Moreover, information on the temporal patterns of breeding in the species, such as its habitat requirements and levels of abundance are important for management and conservation purposes. Such information should be obtained at the specific location which is the target of management and cannot easily be extrapolated from studies conducted elsewhere.

In this paper, we present estimates of the breeding population, describe the breeding cycle, present information on egg dimensions, and assess general nesting characteristics of Kelp Gulls on Currais Islands in southern Brazil.

STUDY AREA AND METHODS

A breeding colony of Kelp Gulls were monitored on Currais Islands (25°44'S, 48°22'W; Figure 1), a small archipelago of three islands laying six nautical miles (*c.* 11 km) off the coast of the State of Paraná in southern Brazil. The largest island, Grapirá (Figure 2), reaches a maximum altitude of 55 m and has an area of 54,700 m^2. The hillsides on the north and east parts of the island have a slope of about 28 degrees. Those on the west have a gentler slope (20 degrees), some areas of almost level ground (5-9 degrees), a scree slope and a small pebble beach (Borzone 1994).

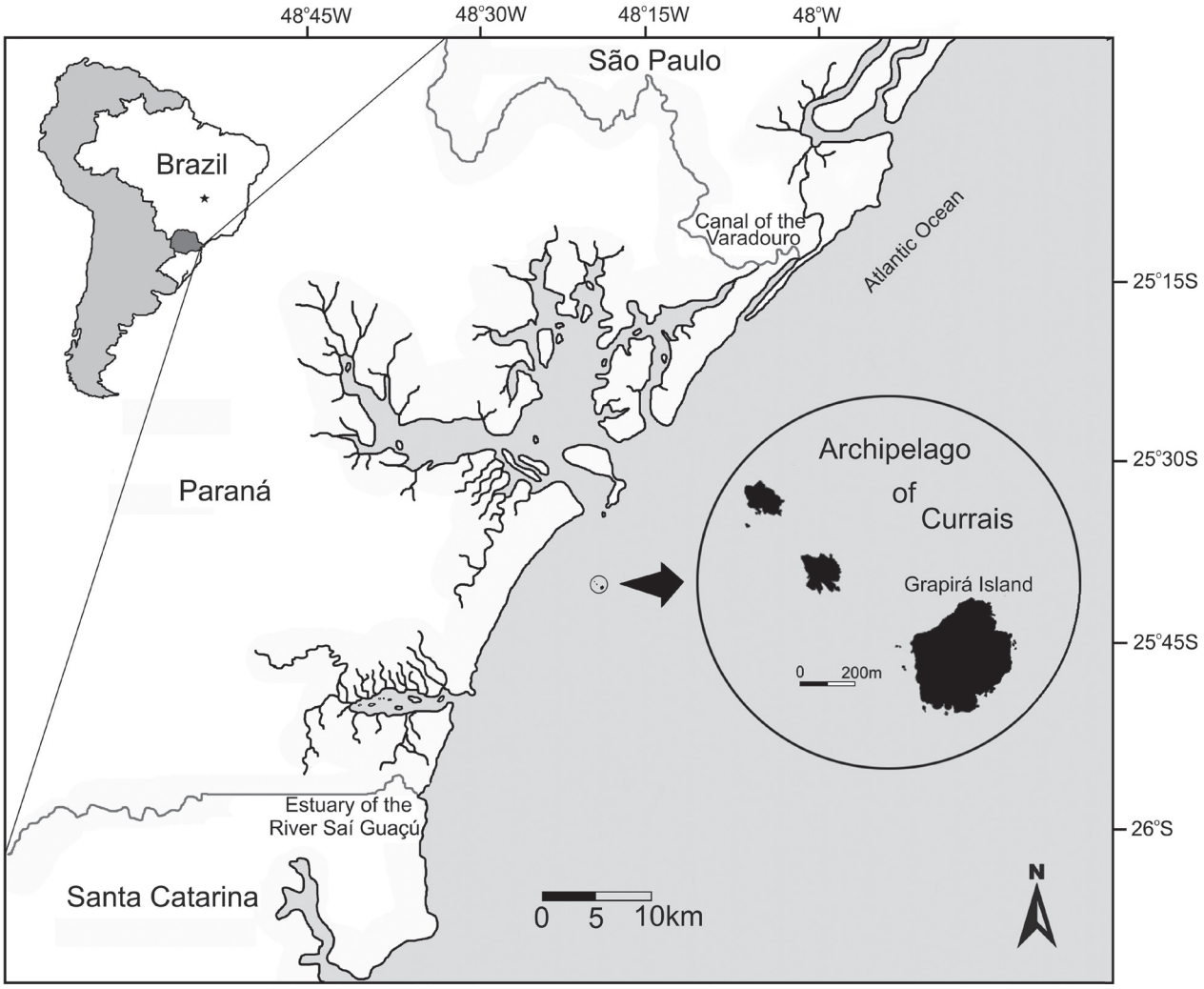

FIGURE 1: Map of the location of Currais Islands, State of Paraná, southern Brazil.

FIGURE 2: A view of Grapirá Island (Currais Is.), State of Paraná, southern Brazil (Photo: V. L. C.).

The colony of Kelp Gulls on Currais Islands was monitored in May-December 2006. Numbers of individuals were obtained during pre-breeding and post-breeding periods, while nests and eggs were counted during the breeding season. Monthly trips were made to Grapirá Island when weather conditions were good, to count and map nests and eggs. Nests were marked with an individual numbered flag. Eggs were weighed (to the nearest 1 g) and measured (to the nearest 0.1 mm) with spring scales and vernier calipers. Egg volume was obtained using the following formula (after Coulson 1963): 0.04866 * length * $(width)^2$. Measurements were taken when eggs were found for the first time in nests.

We divided Grapirá Island into sections to record the distribution and abundance of nests along the west, north, south and east slopes. Only active nests (*i.e.,* those containing at least one egg) were mapped.

RESULTS

Kelp Gulls were observed on Currais Islands throughout the study period. During the breeding season, the population in this area comprised *c.* 122 breeding individuals, but the highest number was recorded in June (Table 1).

Sixty-one nests were found, 44 of which were active with only eggs and other 17 with nestlings (Table 1). Sixty-nine eggs were counted, 67 of which were weighed and measured. Mean values and standard deviation of weight (g), width, length (mm) and volume (cm^3) were, respectively, 84.42 ± 8.83, 49.30 ± 1.78, 70.89 ± 3.20, and 83.92 ± 8.17. The first nests were built in July. Egg laying commenced in the same month. The breeding peak, when largest number of nests with eggs where noted, was in September. By December, the population concluded the breeding season, with only a few fledglings remaining on the island (Table 1).

TABLE 1: Number of nests (without or with eggs and with nestlings), number of individuals, eggs and nestlings on Grapirá Island (Currais Is.), southern Brazil.

Months	Nests			Individuals	Eggs	Nestlings
	Without eggs	With eggs	With nestlings			
May	0	0	0	131	0	0
June	0	0	0	221	0	0
July	45	2	0	(*)	4	0
September	0	42	17	(*)	76	29
Deccember	0	0	0	33	0	0

* Individuals not counted.

Nests were built with plant material (*Mariscus pohlii,* Cyperaceae) in open areas (north face of the island), on pebbles beaches (west side of the island) or on scarps with (south face of the island) or without vegetation (east side of the island). Most nests were on the south face of Grapirá Island (Table 2). The egg coloration was predominantly light-brown, with dark-brown patches irregularly distributed (Figure 3).

TABLE 2: Absolute numbers of Kelp Gull *Larus dominicanus* nests along the west, north, south and east faces of Grapirá Island (Currais Is.), southern Brazil.

Nests	West Face	North Face	South Face	East Face
Number of Nests	8	1	25	10
Contribution (%)	18.2	2.3	56.8	22.7

Nestling Kelp Gulls are nidifugous (*i.e.,* leaving the nest soon after hatching; Lawrence 1999) and have a cryptic coloration. They are all grey with black markings on the head, the bill is black with a lighter tip, and feet are light-grey (Figure 4). Nestlings were usually observed close to their parents during the initial phases of life. Other adults tried to attack intruding nestlings when they became more adventurous.

FIGURE 3: Eggs of Kelp Gull, *Larus dominicanus,* Grapirá Island (Currais Is.), State of Paraná, southern Brazil (Photo: V. L. C.).

FIGURE 4: Nestling of Kelp Gull *Larus dominicanus,* Grapirá Island (Currais Is.), State of Paraná, southern Brazil (Photo: V. L. C.).

DISCUSSION

Seabirds usually breed on inaccessible areas such as islands or cliffs, where disturbance and risk of predation by mammals is minimized (Buckley and Buckley 1980 *in* García-Borboroglu and Yorio 2004a, Pontier *et al.* 2008). The Currais Islands can be considered to be important breeding site for Kelp Gulls because have a variety of nesting habitats and are in close proximity to fishing areas (Oro 1996, Oro *et al.* 1996, Quintana and Travaini 2000, Bertellotti *et al.* 2001, García-Borboroglu and Yorio 2004a, b, Yorio *et al.* 2005).

The breeding season of Kelp Gull on Currais Islands was in May-December, with peak in September. This is in agreement with other studies in southern Brazil (Soares and Schiefler 1995, Krul 1999, Branco 2003, Branco *et al.* 2006). The differences between our results and those of other authors working on southern South America are maybe due climatic characteristics of each breeding site. For example, in southern Argentina, where the climate is harsher, Yorio *et al.* (2005) observed that the breeding season occurred in September-January (spring-summer), with the onset of egg laying in October.

A relatively small breeding population of Kelp Gulls, comprising *c.* 122 individuals, was present on Currais Islands in 2006. Ten years ago (1996) the population-size on Grapirá Island was estimated to be 100 adults (Krul 1999). Our data reinforce the idea that Kelp Gulls are generalists with respect to which nest sites they use, as also observed in Argentina (García-Borboroglu and Yorio 2004a, b), Antarctica (Quintana and Travaini 2000) and Chile (Simeone and Bernal 2000). The plasticity of habitat use in Kelp Gulls is demonstrated not only by their ability to use almost all habitats available on Grapirá Island, but also by the increase of nest sites observed in our study, when compared with data of Krul (1999). Nests were located along all slopes of Grapirá Island, confirming that the gulls have expanded their distribution since the 1990s. Krul (1999) found nests only in the west and south faces of the island.

Vegetation cover is an important component of Kelp Gull nesting habitat on Grapirá Island. Nests were placed predominantly in vegetated areas (56.8%), as also reported in Argentina (Quintana and Travaini 2000, Bertellotti *et al.* 2001, García-Borboroglu and Yorio 2004b). Vegetation cover appears to assist both offspring and adult survival (Burger and Gochfeld 1981) since it reduces the predation risk (Parsons 1982, Parsons and Chao 1983 *in* Bertellotti *et al.* 2001).

In our study, smaller mean values for egg weight (84.42 mm) and width (49.30 mm) were observed, when compared to that obtained by Krul (1999). Krul (1999) recorded mean values of egg weight and width of, respectively, 91.08 mm and 49.86 mm. This may suggests that feeding conditions have deteriorated with respect to the small increased population-size recorded in 2006, as gulls tend to produce smaller eggs when food is scarce (Bolton *et al.* 1992). In 2006, for the first time, the trawl fishing moratorium coincided partially with the breeding season of gulls, and may have reduced food availability. During the moratorium, fewer discards were produced, thus reducing the amount of food available to seabirds. This could explain smaller size of eggs. A similar situation was observed in colonies of the Lesser Black-backed Gull *Larus fuscus* in Spain (Oro 1996). On Currais Ilsands, Krul (1999) observed differences in egg weight of another seabird, the Brown Bobby *Sula leucogaster,* in periods with and without a trawling moratorium.

In seabirds like Kelp Gulls, that have a relatively large clutch-size, the consumption of fish waste is advantageous in energetic and nutritional terms. Discards, consisting mainly of fish, provide a source of energy that is important for egg formation and can lead to a better reproductive success and survival rates (Pierotti and Bellrose 1986, Oro 1996, Oro *et al.* 1996, 1999, Bertellotti *et al.* 2001). Increase in food availability trough fish discards is considered to be the main reason for the expansion of many gull populations worldwide (Calf *et al.* 2003, Yorio *et al.* 2005, Skórka *et al.* 2005, Kim and Monaghan 2006, Whittington *et al.* 2006).

An increase in Kelp Gull populations can negatively affect other seabirds through predation, competition for reproductive space and kleptoparasitism (Furness and Tasker 2000, Oro and Pradel 2000, Furness 2002, Valeiras 2003, Krul 2004, Yorio *et al.* 2005). In the same way, a reduction in fishery discards could seriously affect communities of seabirds, as large scavenging species may switch to killing smaller ones when discards are scarce (Furness 2003). The Kelp Gull population on Currais Islands is currently too small to affect other seabirds detrimentally. Nevertheless, this population should be monitored to prevent it reaching levels that might impact other species, such as Magnificent Frigatebirds *Fregata magnificens* and Brown Boobies, which use the same areas to feed and breed (Krul 2004).

Other authors (Branco 2003, Krul 2004) have considered Kelp Gull nestlings to be nidifugous and cryptically colored. During the censuses, adults were seen behaving aggressively towards intruding nestlings when the latter were moving away from their nests. This movement was probably a result of the disturbance generated by the visit to the colony, as suggested by Krul (1999). Krul (1999) stated that adults frequently attack intruding nestlings in the colony. It is important to stress that scientists working on islands should be careful to reduce impacts on breeding colonies.

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