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SHORT COMMUNICATION

Kelp gulls, *Larus dominicanus* (Aves: Laridae), breeding in Keller Peninsula, King George Island, Antarctic Peninsula

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ABSTRACT. We examined the distribution, abundance and density of the Kelp Gull, *Larus dominicanus* (Lichtenstein, 1823), at Keller Peninsula on two occasions during the breeding season of 2007-2008 (once for incubation and once for chick stages) and compared our results with previously published data. We present information on the number of eggs, incubation success, and initial development of *L. dominicanus* chicks in the studied sites. The abundance and density of the species has remained statistically similar in Keller Peninsula over the last 30 years (since 1978-1979). Although the abundance and density were almost unchanged, we recorded alterations in the occupation of the breeding areas by *L. dominicanus*, mainly the abandonment of breeding sites in the eastern portion of Keller Peninsula. The results of the present study compared with similar previous investigations on the abundance of *L. dominicanus* indicate that the populations have been in equilibrium over the years.

KEY WORDS. Abundance; breeding sites; broods development; density; distribution.

About 40 species of sea birds breed in the Antarctic Peninsula, adjacent islands and the Antarctica mainland (Soave *et al*. 2000). The Kelp Gull *Larus dominicanus* (Lichtenstein, 1823) is widespread in the Southern Hemisphere, breeding in South America, southern Africa, Australia, New Zealand, on sub-Antarctic islands and on the Antarctic Peninsula (Harrison 2003). It is a generalist bird that feeds on a variety of prey, using foods of anthropic origin as well as practicing kleptoparasitism (Bertellotti & Yorio 1999). These characteristics have contributed to the expansion of the populations of gulls in the Southern Hemisphere (Silva *et al*. 2001).

Several studies have presented information on population fluctuations of seabird species breeding in Antarctica caused by human presence and climatic alterations (Croxall *et al*. 2002, Sander *et al*. 2005). *Larus dominicanus* would be a good model to use in such studies. However, its breeding biology has received little attention (Quintana & Travaini 2000) and the species is cited almost exclusively in avifaunistic studies of the region.

The main goal of the present study was to gather information on the number of nests, number of eggs, incubation success and initial development of young chicks of *L. dominicanus* at three breeding sites in Keller Peninsula, King George Island, Antarctic during the breeding season of 2007/2008.

Keller Peninsula (62º05'S, 58º24'W) is an ice-free area located between the Martel and Mackellar Inlets in the northern part of Admiralty Bay, King George Island, South Shetland Islands, Antarctic Peninsula (Fig. 1). It has about 500 ha of ice-free area during the austral summer, and is also the location of the Antarctic Brazilian Station "Comandante Ferraz" (EACF). Six seabird species breed in the study area, including the Wilson's Storm-petrel, *Oceanites oceanicus* (Kuhl, 1820); the Black-bellied Storm-petrel, *Fregetta tropica* (Gould, 1844); the South Polar Skua, *Catharacta maccormicki* (Saunders, 1893); the Subantarctic Skua, *C. lonnbergi* (Mathews, 1912); the Kelp Gull, *Larus dominicanus* (Lichtenstein, 1823); and the Antarctic Tern, *Sterna vittata* Gmelin, 1789 (Sander *et al*. 2004). The study was carried out during the 2007-2008 breeding season, from November 24, 2007 to January 22, 2008. We counted the number of individuals of the species around the Keller Peninsula from November 24 to December 17, 2007.

We counted the pairs of Kelp Gulls breeding throughout Keller Peninsula and recorded the number of nests and eggs per nest. The reproductive pairs and the nests were counted directly in the field by JOB. This method was viable because the area sampled was small and without snow cover. We also measured the eggs (length, width and weight) and the chicks (culmen, tarsus and weight) and recorded the date of first chick in each nest hatched. During the incubation period, we visited the area in intervals of three days, for a total of seven visits (November 24 to December 14). The position of the colonies was noted with the aid of a hand-held GPS receiver (Garmin, GPSMAP® 60CSX) and this information was used to map the locations of the colonies (Figs. 1-3).

Statistical significance for all tests was accepted at the $p < 0.05$ level. All statistical tests were performed using the GraphPad InStat program. We used Kruskal Walis to test differences in the abundance and density of the breeding pairs of the species among years. To compare the variations in the size of the chicks we used the "unpaired T test". For analysis of the measurements of the eggs we used Student´s t-test.

We recorded an average of 76.3 (± 13.8) individuals of *L. dominicanus* in the Keller Peninsula in the period from November 24 to December 17, 2007. The average number of adults recorded at the breeding sites "Ldo Ipanema" was 43 (± 12.7) and "Ldo R2" was 51.5 (± 4.9).

We recorded a total of 61 nests of *L. dominicanus* (Ldo) in three breeding sites: Ipanema "Ldo Ipanema" (28), Refúgio 2 "Ldo R2" (32) and Punta Plaza "Ldo Punta Plaza" (01) (Fig. 1). The first observation in Ipanema occurred on November 24 and we recorded 10 nests. The first hatching in this breeding area was recorded on December 14, 2007. For the breeding site Refugio 2, the first visit occurred on December 6, 2007 and we recorded 32 nests. The second visit in this area occurred on December 17, 2007 and the chicks had already hatched in 24 nests.

At the breeding site "Ldo Punta Plaza" we recorded only one breeding pair defending their territory. We saw one chick on the rock shores that did not fledge until January 22.

In table I we present the abundance and density of nests of *L. dominicanus* in Keller Peninsula during five reproductive periods. The maximum number of nests in the study area was recorded in 2002-2003 by Sander *et al.* (2004) and the minimum number by the same authors in 2003-2004 (Tab. I). However, the difference was not significant ($KW = 2.18$, $p > 0.05$) and suggests normal fluctuations in the studied population, which has been in equilibrium over the years (Sander *et al.* 2004, 2006).

Although we did not register significant changes in the number of nests, when we compare our results (Fig. 2) with those of Sander *et al.* (2004, Fig. 3), we observed alterations in the occupation of the breeding sites by *L. dominicanus*. Sander *et al.* (2004) recorded reproduction of the species in five breeding sites (Fig. 3) during the austral summer of 2002-2003. In 2007-2008 we only recorded three breeding sites (Punta Plaza = 4 in figure 3; Ipanema = 5, R2 = 8). For the breeding sites "R2" and "Ipanema" we measured the eggs (Tab. II). We did not recorded significant differences in length ($t = 0.30$; $p > 0.05$), width ($t = 0.64$, $p > 0.05$), or weight ($t = 0.37$, $p > 0.05$) of eggs between the two sites.

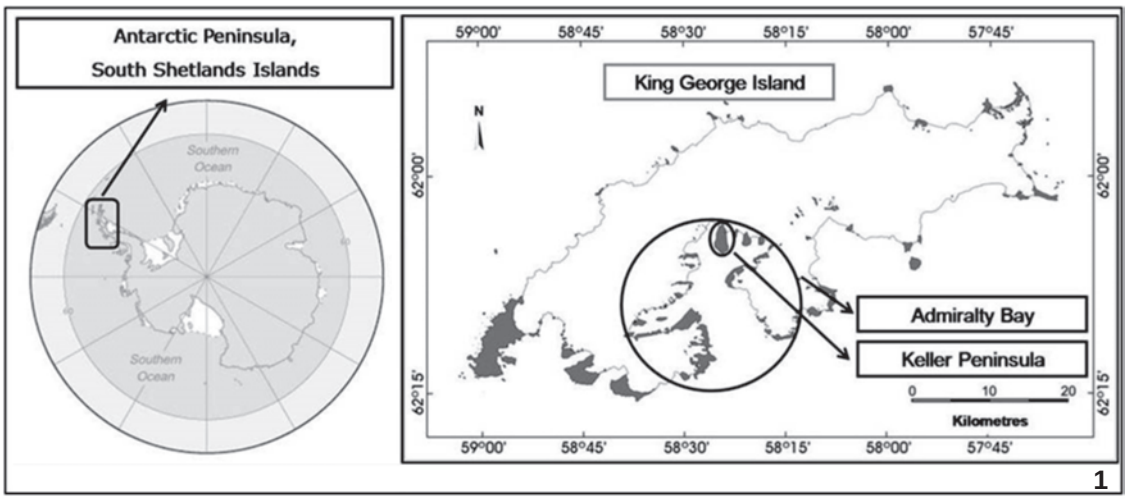
We also measured the chicks from broods of breeding site "Ipanema" twice (Tab. III). The first time (December 13, 2007) we counted 21 chicks in the breeding area. The second time (December 23, 2007) we recorded only 12 live chicks in the same area (one of them was not captured). This indicates a reduction of 43% in the reproductive success of the species from the first to the second evaluation. The variations in the size of the culmen ($F = 2.48$, $p < 0.05$) and the tarsus ($F = 1.152$, $p < 0.05$) were considered significant between the two dates analyzed, but the weight variation was not significant ($F = 1.242$, $p > 0.05$). According to these data, the first growth phase of the Kelp Gull in

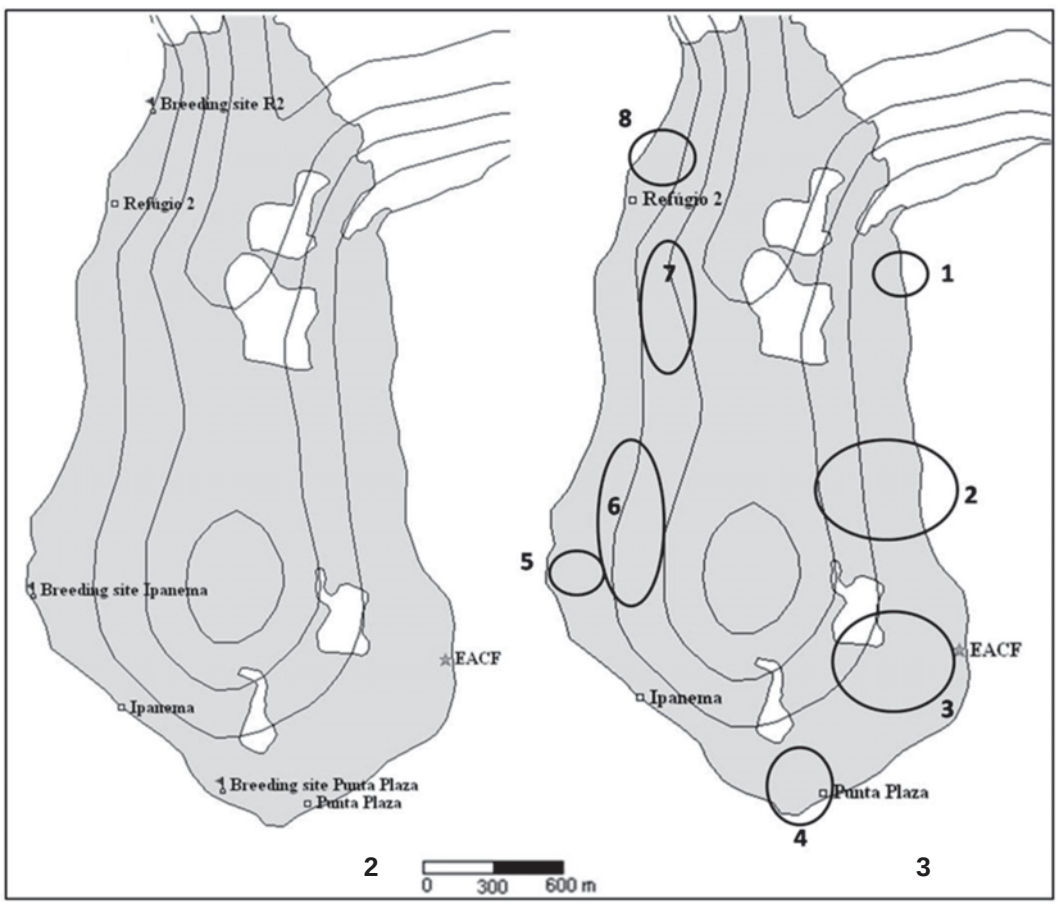
Table I. Abundance and density (nests per km²) of the nests of Kelp Gull *Larus dominicanus* in Keller Peninsula, King George Island, Antarctic Peninsula. ([1] Jablonski 1986, [2] Sander *et al.* 2004, [3] Present study).

Nests/breeding station	1978-79 [1]	2002-03 [2]	2003-04 [2]	2004-05 [2]	2007-08 [3]
Abundance	51	57	43	49	61
Density	12.5	13.9	10.5	12.0	14.9

Table II. Egg measurements of the of Kelp Gull *Larus dominicanus* in Keller Peninsula, King George Island, Antarctic Peninsula. We present the minimum, maximum and average measures (± Standard Deviation) of length, width and weight of the eggs at two breeding sites. Ipanema and R2 (Refuge 2) are two refuges from the Brazilian Station – Estação Antártica Comandante Ferraz (EACF).

Breeding site/measurements	Length (cm)		Width (cm)		Weight (g)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Ipanema, n = 27	7.0	7.6	4.9	5.6	70.0	100.0
Average ± SD	7.2 ± 0.18		5.1 ± 0.15		86.8 ± 8.22	
R2, n = 28	7.0	7.6	4.9	5.3	70.0	100.0
Average ± SD	7.2 ± 0.20		5.1 ± 0.10		87.6 ± 7.85	





Figures 1-3. (1) Location of Keller Peninsula, Admiralty Bay, King George Island, South Shetlands Islands, Antarctic Peninsula. The gray colors in the map of King George Island represent the ice-free areas. (2) Breeding sites of Kelp Gull *L. dominicanus* in Keller Peninsula (R2, Ipanema and Punta Plaza = red flags), Admiralty Bay, King George Island, South Shetlands Islands, Antarctic Peninsula (EACF indicate the Brazilian Station Comandante Ferraz). (3) Main breeding sites of birds in Keller Peninsula, Admiralty Bay, King George Island, South Shetlands Islands, Antarctic Peninsula (according to Sander *et al.* 2004). In breeding season of 2002-2003 Sander *et al.* 2004 recorded nests of *L. dominicanus* in areas 1, 2, 4, 5 and 8.

Table III. Measurements of chicks of the Kelp Gull *Larus dominicanus* in Keller Peninsula, King George Island, Antarctic Peninsula. We present the minimum, maximum and average measures (± Standard Deviation) of culmen, tarsus and weight for two dates, December 13 and December 23 2007, at breeding site Ipanema.

Date/Measures	Culmen (cm)		Tarsus (cm)		Weight (g)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
13/XII/2007, n = 21	1.3	3.1	2.6	4.9	73	415
Average ± SD	2.0 ± 0.52		2.3 ± 0.73		174.8 ± 112.90	
23/XII/2007, n = 11	2.1	3.1	3.1	4.8	91	415
Average ± SD	2.5 ± 0.33		3.8 ± 0.68		242.8 ± 125.81	

the Antarctic Peninsula is in the general size of the bird, not in weight. Probably the second phase is weight gain, an essential condition for winter migration in Antarctic regions. In other regions, such as Argentina, growth can occur in the opposite order or in equilibrium between weight gain and growth in size (Yorio & Borboroglu 2002). These differences in the development of the Kelp Gull can be explained by the necessity of migration by individuals breeding in Antarctic. It is not necessary for birds in other regions, because they do not need to migrate. We recommend more analyses involving this species in different regions that require different biological and ecological necessities.

In all situations, when the chicks were manipulated, they regurgitated amphipods, krill and the soft parts of the clam *Nacella concinna*. Those food items were considered by several authors as the main constituents of the diet of the species (Favero *et al.* 1997, Bertellotti & Yorio 1999).

An increasing population trend, with an increase in abundance of about 37%, was recorded for *L. dominicanus* in Admiralty Bay by Sander *et al*. (2006). The abundance of the species had increased in some areas of the Bay while other areas had been abandoned (Sander *et al.* 2006). In the present study, we report that the population of *L. dominicanus* has remained constant in Keller Peninsula during the last 30 years (since 1979-1978). Although the present study reports data from two occasions during the 2007-2008 breeding season (one during incubation and another one with chicks), we relate only alterations in the position of breeding sites. The main change was the abandonment of the breeding sites in the eastern portion of the Keller Peninsula. Long-term field studies with annual, biennial or tri-annual intervals are necessary to provide better evaluation of the occupation of breeding sites and their relation to other environmental variables (such as climatic changes). This type of study would help to determine cause and effect and would facilitate a better comprehension of the system as a whole.

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