

KELP GULL *LARUS DOMINICANUS* PREDATION ON AN IMPERIAL CORMORANT *PHALACROCORAX ATRICEPS* COLONY IN PATAGONIA

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Gulls breeding in mixed-species assemblages can adversely affect many species through egg or chick predation, kleptoparasitism and breeding site competition (e.g. Thomas 1972, Bourget 1973, Becker 1984, Furness 1987, Furness & Monaghan 1987). At the Punta León seabird colony, Chubut, Argentina, Kelp Gulls *Larus dominicanus* breed adjacent to a large colony (2669 and 2658 pairs for 1989 and 1990, respectively) of Imperial Cormorants *Phalacrocorax atriceps* (both *atriceps* and *albiventer* colour morphs, *sensu* Rasmussen 1991). At this mixed-species colony, the Kelp Gull is the most abundant breeding species, has increased in numbers during the last 10 years from 3664 in 1982 to 6500 breeding pairs in 1995 (Malacalza 1987, Yorio *et al.* 1998), and has been previously reported to prey upon cormorant eggs and young (Malacalza 1987). As part of a broader study of the ecological interactions between Kelp Gulls and other seabirds at Punta León, we evaluated the impact of gull predation on the cormorant colony. In this paper we present information on predation attempts and predator and antipredator behaviour obtained during the 1989 and 1990 breeding seasons.

To obtain information about predator-prey interactions between Kelp Gulls and Imperial Cormorants we made observations with $\times 20$ –45 telescopes from an observation point located on a cliff 50–70 m from the cormorant colony. During each observation hour ($n = 122$), we quantified predation attempts, success rates, number of potential predators and prey availability, prey type (eggs or chicks), and prey nest location (central or peripheral), and recorded predator and antipredator behaviours. We considered as potential predators all 'peripheral' Kelp Gulls, defined as gulls with nests or territories located at distances of 0–3 m from the cormorant colony. We identified peripheral gulls from a distance by the location of their territories and, in some cases, by plumage marks. We assumed that any gull pair within an identified territory was always the same. Any other gull flying over the colony was followed until leaving the cormorant colony boundaries. We defined a 'peripheral nest' as any cormorant nest that was not completely surrounded by other cormorant nests. Thus, to prey upon a 'central nest', a gull had to pass at least one peripheral cormorant territory. During both seasons, more than 90% of the cormorant colony was visible from the observation point.

All predation attempts observed during both seasons were by Kelp Gulls. Predation on Imperial Cormorants in the 1989 breeding season was relatively low. Of a total of 35 observation hours from 28 October 1989 to 2 January 1990, covering both the incubation and chick stages, we observed only one chick preyed upon out of five predation attempts. The one-week old chick was stolen from a peripheral nest.

From 23 October to 20 December 1990 we conducted a total of 87 observation hours, 60 during the egg stage and 27 during

the chick stage. During the egg stage we recorded eight predation attempts, seven of which were successful, whereas during the chick stage we recorded 17 predation attempts, 14 of which were successful. Chicks stolen by gulls were between one and two weeks of age. Except for one failed attempt when a peripheral gull walked up to a central nest, all successful and unsuccessful attempts were on peripheral nests. During 1990, the numbers of Imperial Cormorant peripheral nests adjacent to the gull colony that were visible from the cliff varied throughout the season between 206 and 245. The relative high nest density of Imperial Cormorants at Punta León (average nest density for 1989 was 1.8 nests/m²; Yorio *et al.* 1994) may be one of the factors restricting predation attempts to the periphery of the colony. Greater predation on peripheral nests has been showed for several species (see reviews in Burger 1981 and Wittenberger & Hunt 1985).

Kelp Gulls preyed almost exclusively from the ground by walking up to cormorant nests. On only one occasion did a gull approach a cormorant nest from the air. When preying from the ground, Kelp Gulls stole eggs or chicks individually, without the participation of a second gull, as has been observed when preying upon Royal *Sterna maxima* and Cayenne Terns *S. eurygnatha* (Yorio & Quintana 1997). Kelp Gulls harassed cormorants until they left their nest contents exposed or stole the nest contents from under the bird. When approached by a gull, Imperial Cormorants remained at the nest. The most common displays used by Imperial Cormorants in defence of their nests were 'Snaking' and 'Thrusting' (after Siegel-Causey 1986).

All observed predation attempts were by adult Kelp Gulls which either had a nest near the cormorant colony edge or defended territories around this colony. During 1990, the number of Kelp Gulls nesting at the periphery of the cormorant colony that were visible from the cliff varied between eight and 17. These gulls often chased other gulls that approached the cormorants. Of the total eggs and chicks preyed upon ($n = 21$), 24% were taken by the same gull pair.

Predation by Kelp Gulls on Imperial Cormorant eggs and chicks at Punta León was relatively low during both study seasons. Predation by gulls on peripheral nests which were not visible from the observation point seems unlikely, as the seaward cormorant colony edge is more than 0.5 m above the adjacent beach, making it difficult for gulls to prey from the ground. Kelp Gulls approaching cormorant nests from the air would have been detected by observers. Kelp Gulls have been reported to prey upon eggs and young of several Patagonian seabirds and shorebirds (Conway 1971, Rodriguez 1983, Scolaro 1985, Malacalza 1987, Frere *et al.* 1992, Yorio & Boersma 1994) and can have an important effect on some species (Punta *et al.* 1995, Yorio & Quintana 1997). However,

Kelp Gulls do not appear to have a significant impact through predation on the breeding success of Imperial Cormorants at Punta León. Predatory behaviour was restricted to relatively few gulls nesting at the periphery of the cormorant colony, suggesting that an expansion of the Kelp Gull population at Punta León might not necessarily result in a proportional increase in predation rate. Moreover, because gulls nesting at the periphery of the cormorant colony might prevent through their territorial behaviour access to the cormorant colony by other predators, Imperial Cormorants might be gaining a protective advantage by nesting among Kelp Gulls.

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