YOUR NEIGHBOR IS AN ENEMY: THE RELATION BETWEEN CONSUMPTION FREQUENCY AND THE DISTANCE FROM FOOD SOURCE

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Abstract: The Brown skua is a top predator seabird. During the breeding season it feeds mainly on terrestrial resources, where the most recorded are penguins. The presence of Cape petrel in Brown skua chicks regurgitations was evaluated in relation to nesting distance to the Cape petrel colony at Elephant Island. A 45% rate of spontaneous regurgitations of Cape petrels was registered and this frequency was significantly related to nesting distance from the Cape petrel colony. *Pygoscelis* sp. remains were registered in just 15% of samples. Two hypotheses can be accepted, either it indicates that brown skuas are selecting nesting sites that are closer to Cape petrel colonies, or they are just acting opportunistically. An important observation is that penguins were not the most consumed seabird. Food consumption patches were different than expected, reinforcing the importance of more diet investigations.

Keywords: Brown Skua, Diet, Chick, South Shetlands

Introduction

Skuas (Stercorariidae) are known to be pelagic, top predator and opportunistic seabirds, playing an important role in the food web. Brown skua (*Catharacta lonnbergi*) breeds in Southern Ocean islands, from Antarctic Peninsula to New Zealand islands (Watson, 1975). Nests are built in ice-free areas. In the breeding season they feed mainly on terrestrial resources, like seal carrion and placenta, penguin, petrels and opportunistically available eggs and chicks (Watson, 1975; Burton, 1968; Reinhardt *et al.*, 2000). But diet composition varies along the seasons according to availability of resources (Phillips *et al.*, 2004; Anderson *et al.*, 2009). Sometimes adults defend their feeding territory inside a penguin colony (Trivelpiece *et al.*, 1980; Hahn & Peter, 2003; Hahn & Bauer, 2008) in order to ensure sufficient food for the chicks. Skuas predation may pose threats to other seabird populations like the Cape petrel (*Daption capense*), (Weidinger, 1998), Antarctic petrel (*Thalassoica antarctica*) (Varpe & Tveraa, 2005) and burrowing petrels (*Halobaena caerulea* and *Pachytilla belcheri*) (Mougeot *et al.*, 1998). Because skuas reproductive success may vary according to

food availability, populations can be affected by bottom-up effect (Ritz *et al.*, 2005). Predator and prey relations may vary along time and space, so, diet studies play an important role in population monitor. We aim to evaluate if the presence of the Cape petrel on Brown skua chicks' diet is related to nesting distance from the Cape petrel colony.

Materials and Methods

Brown skua chicks spontaneous regurgitation samples were collected at Stinker Point, Elephant Island (61°07'31"S, 55°19'26"W), South Shetlands, during 2010/11 austral summer. Regurgitations were collected opportunistically during routine chick weighing and ringing (Phillips *et al.*, 2004; Barrett *et al.*, 2007). The regurgitations were frozen until identification in laboratory. Just animal items were considered and identified to lowest possible taxon. During incubation, Brown skua nest positions were recorded with a hand-held GPS receiver (60CSx, Garmim), as well as the Cape petrel and Chinstrap penguin (*Pygoscelis antarctica*) colonies. Distances from nests to the Cape petrel colony

were calculated by means of GIS software Arcgis. Data was tested for normality and homogeneity variances. Statistical analyses were performed in SPSS software (Version 18.0). Significance level was assumed as 0.05, and means are presented as $\pm$ SE. Logistic regression (Entered Method) was used in order to evaluate the relationship between Cape petrel presence at regurgitations and the distance from nests to its colony.

Results

A total of 33 Brown skua chicks' spontaneous regurgitations were collected. For two, fish remains were registered, at five *Pygoscelis* sp. and for 15 Cape petrel contents. It was not possible to identify the material taxon of seven samples. Mean distances from nests to Chinstrap penguin colony was 269 ± 187 m and to Cape petrel 244 ± 131 m. It is important to note the relationship between distances from nests to colonies and the presence or absence of both species at chicks' regurgitations (Table 1).

Cape petrel presence in regurgitation samples was significantly related to nesting distance from the Cape petrel colony ($\beta = 0,008$; Wald = 4,261, $R^2 = 0,23$; $p < 0,05$) (Figure 1). It means that the nearer the nests are to a Cape petrel colony, the higher is the probability to register it at chicks' regurgitations.

Discussion

Brown skuas diet described for South Shetlands at breeding season consists less of fish and more on terrestrial resources, mainly penguins, rarely feeding on Cape petrel (Reinhardt, 1997; Malzof & Quintana, 2008). A low fish frequency at regurgitations was expected. On King George Island, in 1993/4 and 1994/5 breeding seasons, Brown skua chicks received 80% penguin components and 12% station garbage (Reinhardt, 1997). A high frequency of penguin at chicks' regurgitation was expected because, Brown skuas' main food source is from penguin colonies (Trivelpiece *et al.*, 1980; Hahn & Peter, 2003; Young, 2005; Hahn & Bauer, 2008). At Elephant Island, the main food source, for this specific breeding season, based on chicks' regurgitation, was from the Cape petrel colony. Brown skua' predation can pose a real threat for Cape petrel colonies, as happened at Nelson Island, where 76% of specie' nesting failure were attributed to Brown skua predation

Table 1. Comparison among distances. Distances from Brown skua nests to Cape petrel and Chinstrap penguin colonies if species had or had not been registered at chicks' regurgitation.

Registered at spontaneous regurgitation	Distance to <i>Pygoscelis</i> sp.(m)	Distance to Cape petrel (m)
Cape petrel	260 ± 147 (n 13)	208 ± 107 (n 13)
<i>Pygoscelis</i> sp	428 ± 273 (n 4)	302 ± 218 (n 4)

Figure 1. Predicted probability (extracted from logistic regression). Cape petrel (*Daption capense*) remains at Brown skua (*Catharacta lonnbergi*) chick's spontaneous regurgitation in relation to the distance (m) from Brown skua nests to the Cape petrel colony at Stinker Point, Elephant Island.

in the 1991/92 breeding season (Weidinger, 1998). Nests where Cape petrel contents were registered were nearer to its colony than to penguin colonies. In this way, two hypothesis can be considered, either skuas are selecting breeding sites so that they are located close to Cape petrel colonies and not near to penguins'; or, as they are known to be an opportunistic species, they are just accessing the nearest resource acting opportunistically. In order to answer those questions, more studies have to be developed, not just diet investigations but to understand deeply inter-specific relations at Elephant Island.

Conclusion

Predator and prey relationship may vary according to breeding site characteristics, which can also vary over time. The well-known relation between skuas and penguins was

different at Elephant Island because the presence of the Cape petrel colony. Food source is one of the factors that dictate reproductive success, consequently population dynamics. It is a crucial factor, not just for predators, but also for prey species' ecology. In this way, we reinforce the importance of dietary investigations, and also the need to continue this investigation in order to enhance quantitative and qualitative data.

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The background of the page is a photograph of an Antarctic landscape. It shows a rocky, uneven terrain with patches of green moss and small, tufted plants. The lighting is bright, suggesting a sunny day. The overall tone is natural and scientific.

Varpe, Ø. & Tveraa, T. (2005). Chick survival in relation to nest site: is the Antarctic petrel hiding from its predator? *Polar Biology*, 28:388-394.

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