EFFECTS OF INTERSPECIFIC COMPETITION ON RESOURCE ACCESS AND NESTING SAFETY IN SYMPATRICALLY BREEDING SKUA SPP. (*CATHARACTA*)

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INTRODUCTION

When a resource, such as food, is limiting, sympatric species with similar requirement will often compete with each other for their share of available resources. One common method of interference competition is territoriality, where an individual or species will control a territory so that it has sole access to all of the resources contained in that area. In addition to access to limited resources, the occupation of territories also provides the added benefit of protection from predation while raising young. Due to these advantages, territoriality is a common behavior found across a diverse range of animal taxa, and helps to structure and define communities (Maher and Lot 2000). While territoriality is most common found in terrestrial vertebrates, it also occurs in seabirds as most species defend nesting sites against potential predators. However, territorially as a method of the competition for food resources is unknown in seabirds except in those that also feed on terrestrial resources such as the skuas (*Stercorariidae*; Furness 1987).

Two members of the family *Stercorariidae* can be found breeding in the Antarctic: the South Polar Skua (*Catharacta maccormicki*) and the Brown Skua (*C. lonnbergi*). Both of these species are circum-Antarctic in distribution; however each species differs in their respective ranges (Furness 1987).

In the Antarctica Peninsula, the ranges of South Polar Skua (SPSK) and Brown Skua (BRSK) overlap and they can be found breeding at the same locations. It is at such locations that these two species have been found to form mixed pairs (MXSK) leading to viable hybrid (HYSK) offspring that often recruit back into the population (Parmalee 1988).When both species are found breeding in proximity to penguin colonies, the larger BRSK tend to dominate over SPSK and monopolize prey items associated with penguin colonies (Pietz 1987), while SPSK are more dependent on fish and other marine prey items.

The aim of this study is to examine the spatial distribution of skua territories in relation to variables which correspond to access to resources: distance to nearest penguin colony and to coastline, and variables which reflect nesting safety: nesting density, nearest neighbor, and solar indices.

MATERIAL AND METHODS

During 2004-05 we surveyed the abundance and spatial distribution of sympatrically breeding skuas pairs within Admiralty Bay, King George Island, South Shetland Islands, Antarctica.

Penguin colony perimeters and skua nest positions were entered into a GIS database along with spatial data detailing the area (km^2) and coastlines of the all ice-free areas within the bay. We used this data to obtain two different measures: 1) nest density; 2) and the nearest neighbor index (NNI) for each nest, defined as the mean distance to the three closest nests. We also calculated the distance from each skua nest to the nearest penguin colony and to the coastline.

An index of incident solar radiation for each nest was calculated. Moreover, we also sampled the mean incident solar radiation of ice free areas using 50 m equidistant control points. To determine if incident solar radiation at skua nests differed from control points we used the Kruskal-Wallis One-Way ANOVA on Ranks (*KW*), with the Kruskal-Wallis Z-Test to determine where significant differences among groups lied.

RESULTS AND DISCUSSION

SPSK pairs were the most abundant, followed by BRSK, MXSK and HYSK pairs. During the 2004-05 there were an estimated 12,000 breeding pairs of penguins within Admiralty Bay, with all colonies found within three ice free areas.

Only BRSK pairs actively defend and control feeding territories within the penguin colonies, and we found no areas within the penguin colonies that were not defended by a skua pair. However, during surveys we did find boluses containing penguin remains within territories of all pair types, in both areas with penguin colonies and without.

Skua pairs nested in Admiralty Bay at a density of 15.34 breeding pairs $(km^2)^{-1}$. Mean NNI, distance to the nearest penguin colonies, and index of incident solar radiation varied significantly between nests of different pair types, while no significant variation between pair types in the distance from the coastline was observed. Significant differences in NNI were due to comparisons including BRSK, with BRSK pairs nesting the farthest away from other nests, as would be expected in relation to differences in territory sizes between skuas (Pietz 1987). In contrast, BRSK pairs nested closest to penguin colonies. HYSK and MXSK pairs nested the next closest to penguin colonies, and SPSK pairs nested the farthest away from penguin colonies on average.

SPSK pair nests had the highest incident solar radiation levels, followed by HYSK, MXSK and BRSK pairs, with only SPSK pairs differing significantly from BRSK pairs in post-hoc analysis. Moreover, SPSK pairs selected nests with higher incident solar radiation than control points (*KW*, $P < 0.001$), while nest of BRSK, HYSK and MXSK pairs did not differ from control points. By nesting in areas of high incident solar radiation, which are likely to be snow free early in the breeding season, pairs could initiate clutches earlier and facilitate higher chick growth rates and overall reproductive success (Pezzo et al. 2001, Ritz et al. 2005), since they don't have access to penguin colonies as a resource of food.

As predicted BRSK pairs in Admiralty Bay out-competed with other pair types and selected territories that had greater access to penguin resources. In doing so, BRSK pairs displaced other pair types from the areas directly around penguin colonies, likely limiting their access to penguin resources to opportunistic predation or scavenging. In addition, we observed a 260 % increase in skua populations in Admiralty bay since 1978/79 (Jablonski 1986).

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