



Nesting habitat and edges influence reproductive success of Adélie penguins

Annie Schmidt, aschmidt@pointblue.org

Adélie penguins build their pebble nests in colonies of varying size in the relatively few areas of Antarctica that are free of snow and ice. Most colonies are small (<3k pairs) and remain small over time, while only a few colonies are very large (>100k pairs). As climate warms, snowfall is increasing in Antarctica while glaciers are melting. Both can lead to nest failure by increasing the risk of flooding, drowning eggs and chilling chicks, but at the same time new ice-free areas are becoming available for colony expansion.

In this study we investigated the influence of nesting habitat on reproductive success at two nearby colonies of Adélie penguins on Ross Island, one very large (~300k pairs) and one small (~2500 pairs) to address the questions: (1) How do nesting group (“subcolony”) habitat characteristics influence reproductive success? And (2) How do these relationships differ between a small (Cape Royds) and large (Cape Crozier) colony with different terrain characteristics?

We found that the large Cape Crozier colony had consistently higher and less variable reproductive success than the much smaller Cape Royds and that differences in nesting habitat explained more of the variability at Cape Royds.

Penguins at both colonies nesting in subcolonies that had shallower slopes and were higher in elevation were more successful at raising chicks. However, the most important factor at both colonies was the perimeter-area ratio of each subcolony: those with a higher proportion of edge to central nests tended to have lower success.

Nests on the edge are more vulnerable to predation by South Polar skuas and disturbance from other penguins. Cape Royds has a higher total fraction of edge nests as well as a higher density of nesting skuas. Combined with periodic environmental events that cause nesting groups to fragment (such as calving mega-icebergs), these factors may allow nest

predators to limit population growth at small colonies.

Main Points

The larger colony had consistently higher and less variable reproductive success than the smaller one, possibly due to higher quality nesting habitat.

The fraction of edge nests in a subcolony was the most important variable influencing reproductive success at both colonies, but explained more variation at Cape Royds.

Most Adélie penguin colonies are small and those that experience periodic environmental disruptions may be susceptible to becoming trapped by nest predation that limits growth

The majority of penguins nest in larger aggregations, highlighting the importance of large colonies for conservation.

Schmidt, A.E., Ballard, G., Lescroët, A. et al. [The influence of subcolony-scale nesting habitat on the reproductive success of Adélie penguins](#). *Sci Rep* 11, 15380 (2021).