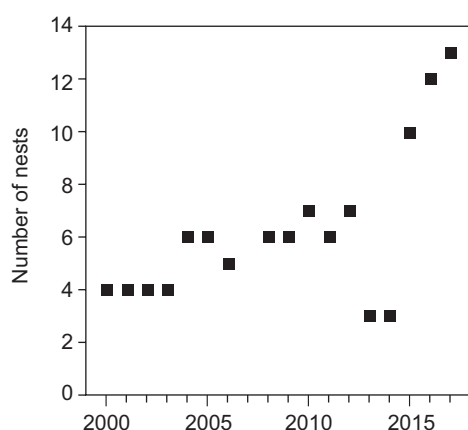


## Status of Peregrine Falcon and Gyrfalcon populations in Northwest Greenland

Recent changes in climate have led to latitudinal range shifts in avian species throughout many areas of the world (Gibbons & Wotton 1996, Thomas & Lennon 1999, Hitch & Leburg 2006). In the Arctic, similar patterns have begun to emerge, with species once occurring only in the Low Arctic now becoming regular visitors or breeders in the High Arctic. Brommer et al. (2012) documented a northern range shift of 0.81 km year<sup>-1</sup> for northern boreal and Arctic nesting species in Finland from 1989 to 2006. In the High Arctic of northwest Greenland, Burnham et al. (2014) suggested that a lengthened breeding window has led to an increase in the number of both new and rare waterfowl species. As a result, species which occupy overlapping niches are now competing for both nesting sites and prey.

For over 650 years Gyrfalcons *Falco rusticolus* have been regular breeders in the High Arctic of northwest Greenland (Burnham et al. 2009). More recently (within the past 75 years), Peregrine Falcons *F. peregrinus tundrius* have extended their breeding range northward into this same area and now breed on an annual basis. Based on research on both falcon species between 1993 and 2005, Burnham et al. (2012) suggested that the recent expansion of Peregrines into northwest Greenland was likely the result of a lengthened breeding window as a result of climate change, and that over the next several decades the population would continue to increase in size.

Here we provide results of continued surveys for both species which took place from 2006 to 2017 over approximately 750 km of coastline in the North Water Polynya near Thule Air Base (77 °N, 68 °W) in northwest Greenland. Results presented in figures are for the period 2000 onward, when the formal survey area was established. For more information on the study area and survey methods see Burnham et al. 2012.



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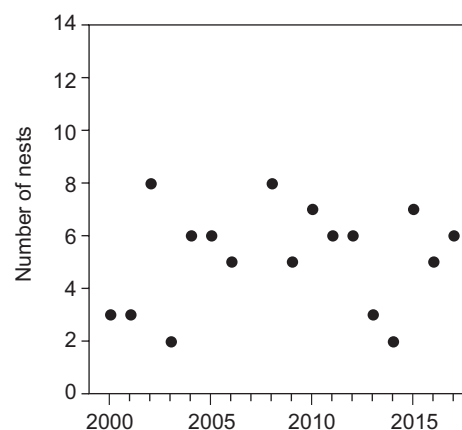
Figure 1. Number of nest sites occupied by Peregrine Falcons from 2000 to 2017 in northwest Greenland. Low numbers in 2013-14 are the result of minimal surveys rather than a lack of birds observed.

From 1993 to 2017 Peregrine Falcons made 118 nesting attempts at 15 different territories. The number of occupied sites varied annually, with the population doubling over the past six years. In particular, the increase has been most dramatic from 2015 onward, with a record high of thirteen occupied sites in 2017 (Fig. 1). Nesting pairs of Peregrines were found only in the northern half of the study area and only lone, non-breeding individuals were observed in the southern half of the study area, where large Little Auk (*Alle alle*) colonies occur. As the number of pairs of Peregrines increased they predominantly colonized vacant cliffs between occupied sites, with the annual inter-nest distance decreasing throughout the study period. Peregrines primarily preyed upon Little Auks, although passerine remains were also commonly found and at some sites as the predominant prey, as reported by Burnham et al. (2012).

Gyrfalcons made 104 nesting attempts at 20 different territories from 1994 to 2017. Although the number of occupied sites varied annually, with a high of 8 in both 2002 and 2008 (Fig. 2), the population appears to be stable. In contrast to Peregrines, Gyrfalcons were found nesting relatively evenly spaced throughout the study area, including nesting in areas with a high abundance of seabirds. However, it appeared that annual movements between territories was much greater for Gyrfalcons than Peregrines. Primary prey species were Little Auks, although Rock Ptarmigan (*Lagopus muta*), Arctic Hares (*Lepus arcticus*), and other seabirds also contributed significantly to their diet, again similar to as reported by Burnham & Burnham (2011).

With both species nesting on similar cliffs and relying heavily on Little Auks for prey, competition between Peregrines and Gyrfalcons in northwest Greenland appears to be frequent. Of the 20 different territories/cliffs where Gyrfalcons have been found nesting, five have recently been used by Peregrines. In the few years when both species have bred at the same cliff, Peregrines have always appeared to be dominant over Gyrfalcons, aggressively stooping the Gyrfalcons whenever they take flight. In one instance a recently fledged Gyrfalcon chick was found with

Figure 2. Number of nest sites occupied by Gyrfalcons from 2000 to 2017 in northwest Greenland. Low numbers in 2013-14 are the result of minimal surveys rather than a lack of birds.



a broken wing in the talus below a nest, possibly a result of being struck and driven into the rocks by the nesting Peregrines at the same cliff. Although both species are heavily dependent upon Little Auks for prey, an estimated 33 million pairs nest in northwest Greenland (Egevang et al. 2003), providing a virtually unlimited food supply and likely limiting the amount of direct competition between falcon species.

Peregrines have generally been shown to be highly adaptable, occurring on all continents except Antarctica, and successfully breeding from the most remote areas to urban city centers. In contrast, Gyrfalcons are unique to the Arctic, and have evolved over millennia to occupy this very specific niche, and thus are most likely less adaptable to a changing climate. As temperatures in the High Arctic continue to ameliorate as a result of climate change, and the breeding window continues to expand, it seems highly probable that the number of Peregrines will not only continue to increase, but that the population will also expand to even more northern areas in Greenland. Should the Peregrine population continue to grow at the current rate there is little doubt that increased interspecific competition for limited nest sites will occur. This increased competition, in addition to the likely inability of Gyrfalcons to adapt to a rapidly changing climate, may well lead to a possible decrease in the Gyrfalcon population in northwest Greenland.

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