

The View from the Tower: 20 Years of Seabird Counts on Great Duck Island

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Abstract

Great Duck Island is located 17 km offshore in the Gulf of Maine, at the boundary of the pelagic and nearshore environments. GDI is an important breeding site for several seabird species. The GDI lighthouse, located within the gull colony on the south end of the island, provides an excellent vantage point for counting both breeding seabirds and offshore visitors in nearby waters. Since 2000, summer field crews have conducted daily 07:00 tower counts throughout June and July. We present some of the trends found in this 22-year dataset. Some of these trends are likely a reflection of sub-colony dynamics on Great Duck, while others may indicate shifts in abundance in the Gulf of Maine. In the rapidly warming and changing Gulf of Maine, long-term datasets like these offer insight into the responses of different seabird species to their changing environment.

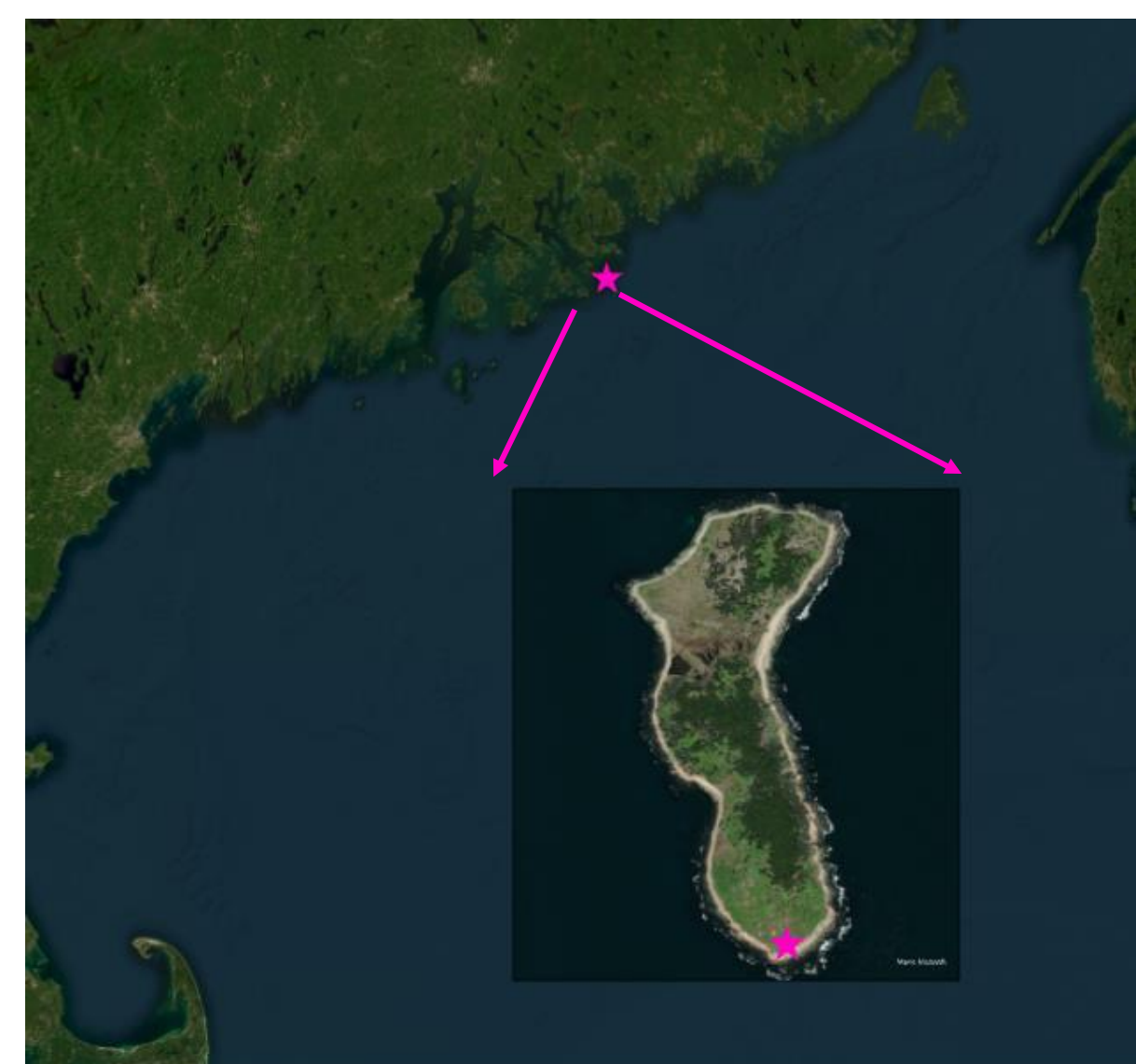


Fig. 1: Great Duck Island in the Gulf of Maine. The location of the tower is starred.

Site and Methods

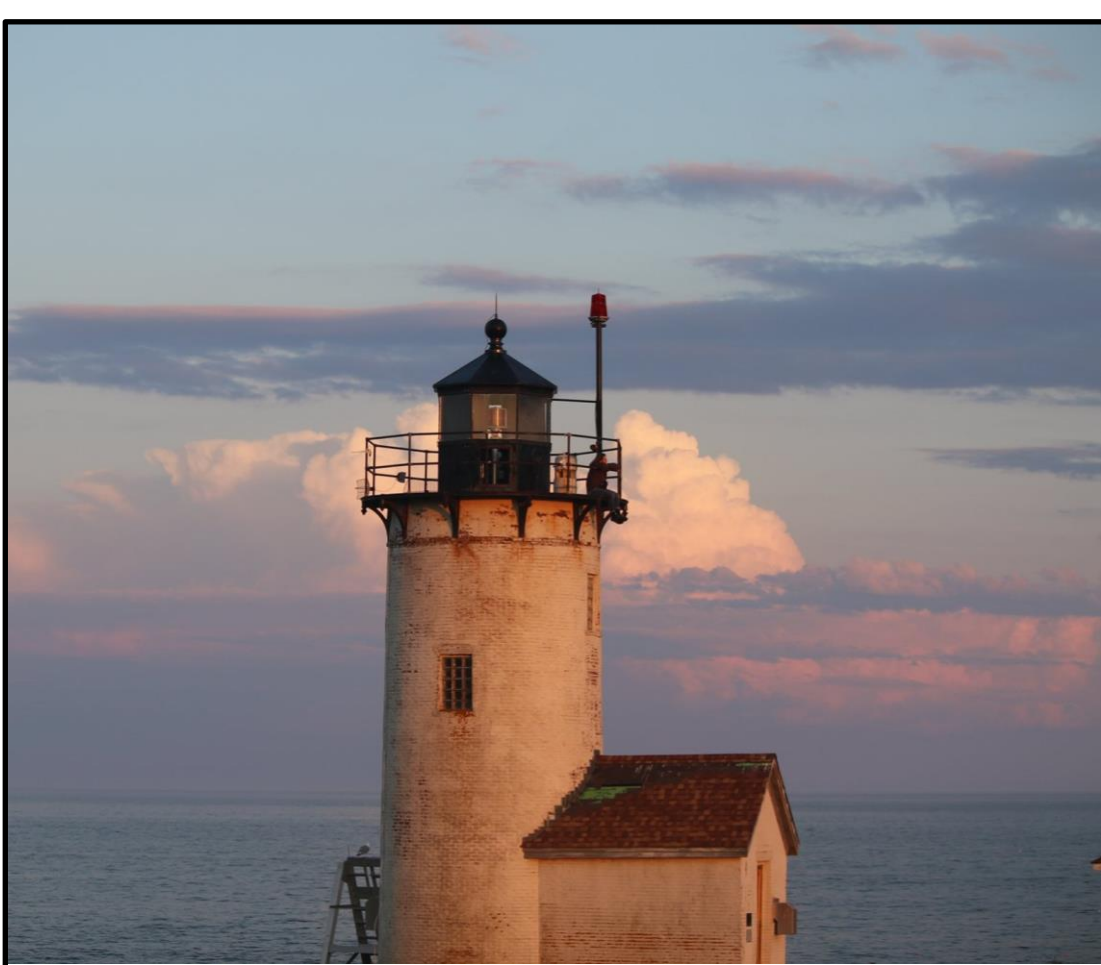


Fig. 2: The Great Duck Light Tower with an observer at the top



Fig. 3: A view of several Herring Gulls and Atlantic Puffins seen from the tower

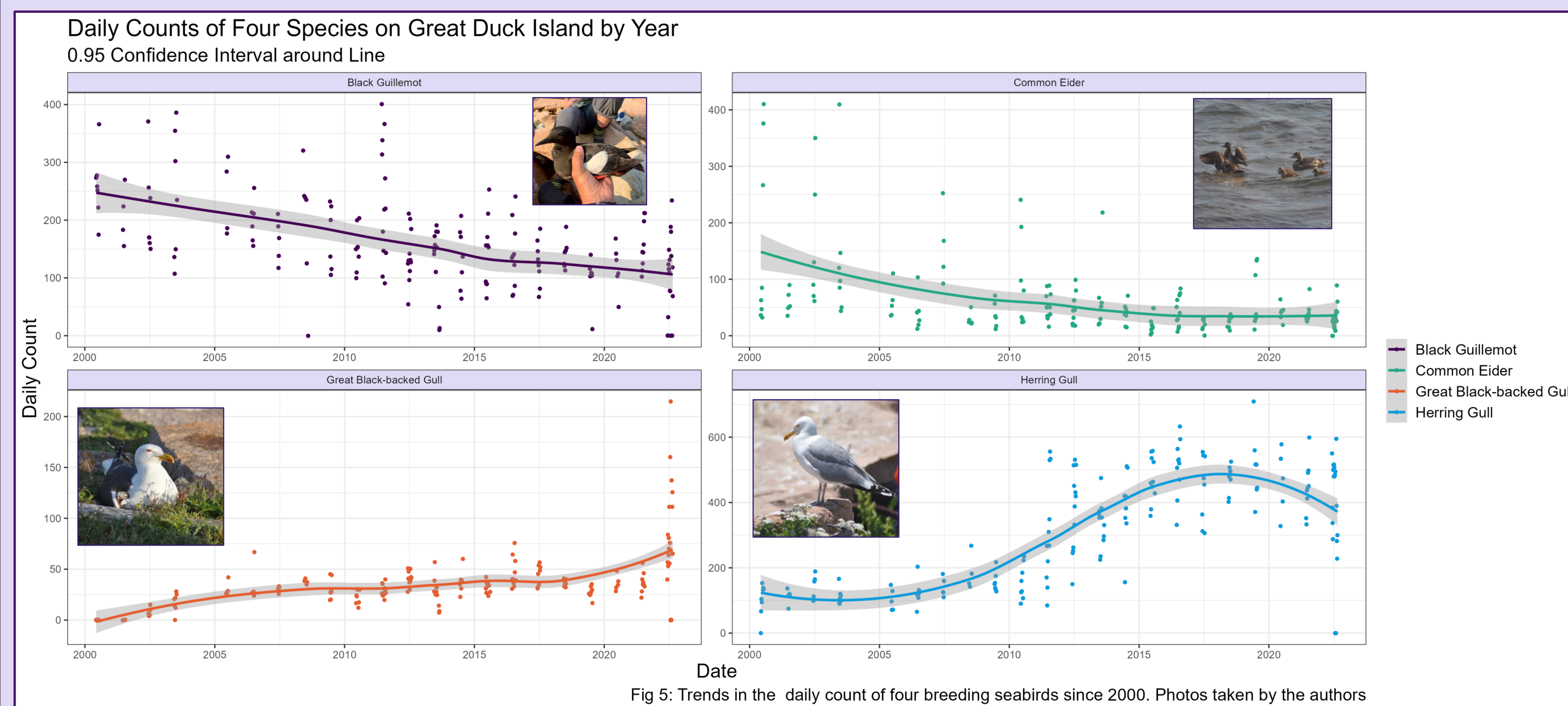


Fig. 4: An observer looking south from the tower towards open ocean.

Great Duck Island is home to breeding colonies of Herring Gull, Black Guillemot, Common Eider, and Great Black-backed Gull. A few Atlantic Puffins also breed on GDI. The island's tower has an open view of the ocean to the south where visiting and feeding seabirds can be seen.

At 07:00 each morning during June and July, teams of 5-8 observers count every bird in sight from the tower. Every bird visible from the tower is recorded. Observers typically use 8x42 or 10x42 binoculars, and may rely on spotting scopes to determine the species of far-off birds. This methodology has been used since 2000.

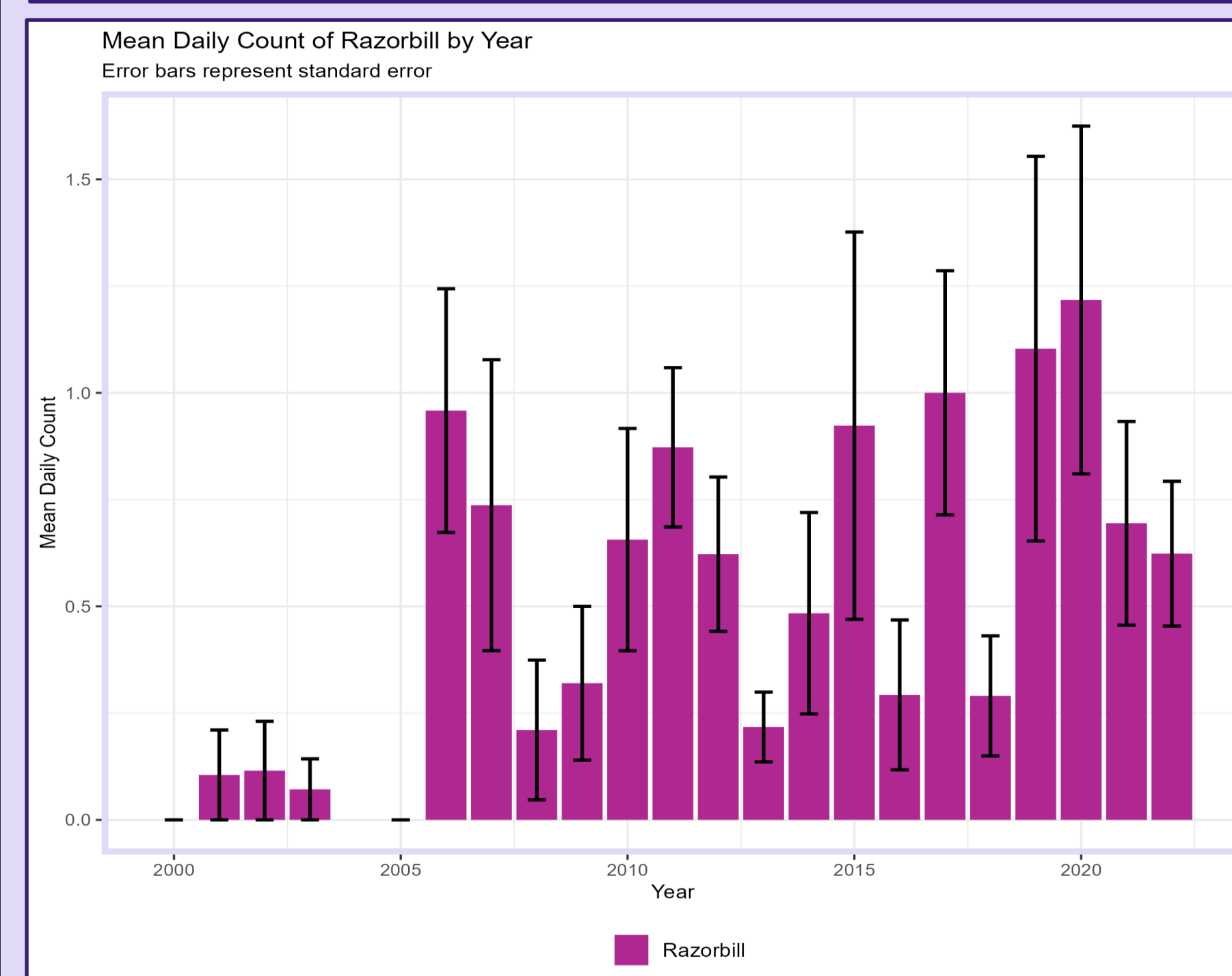
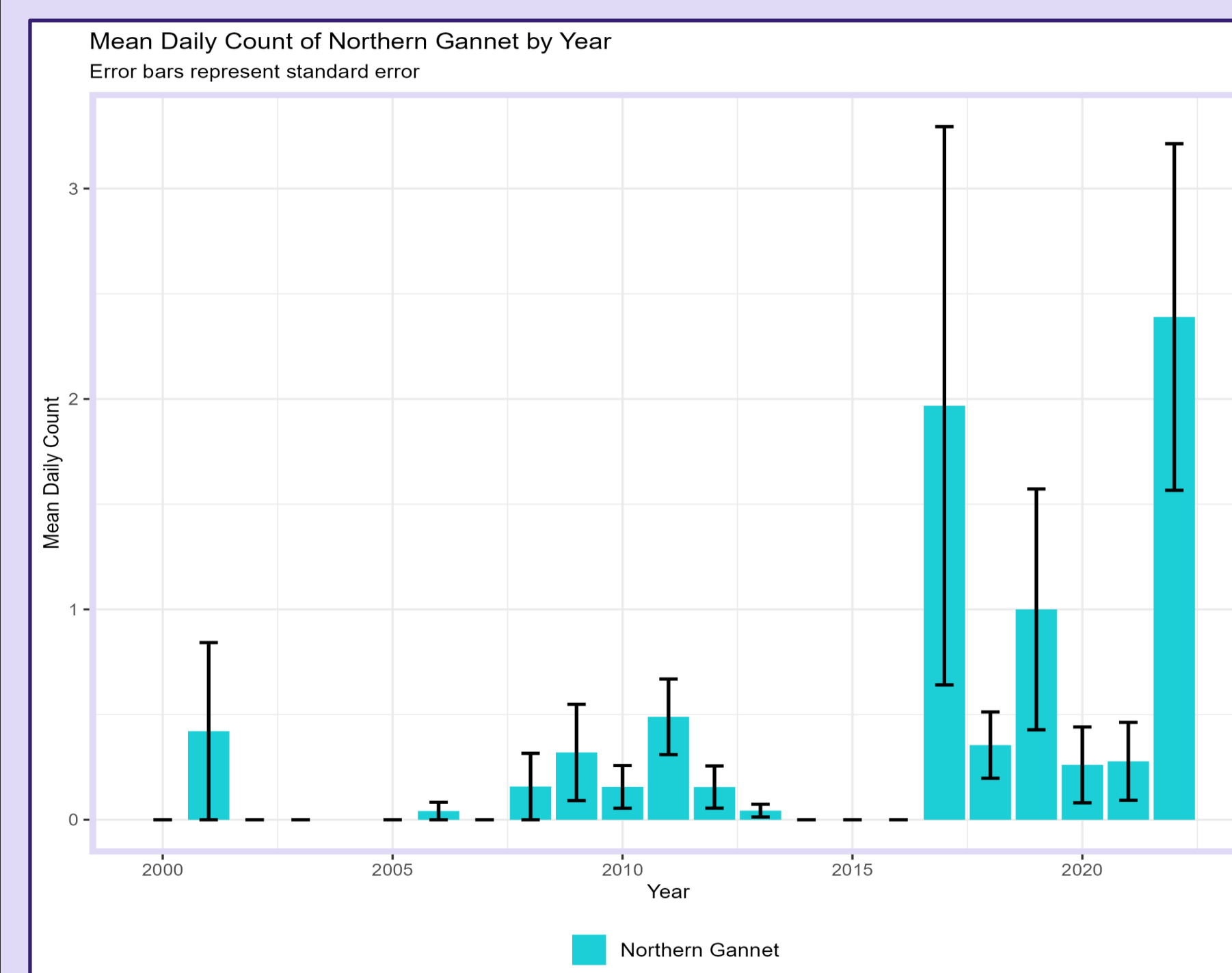
Results



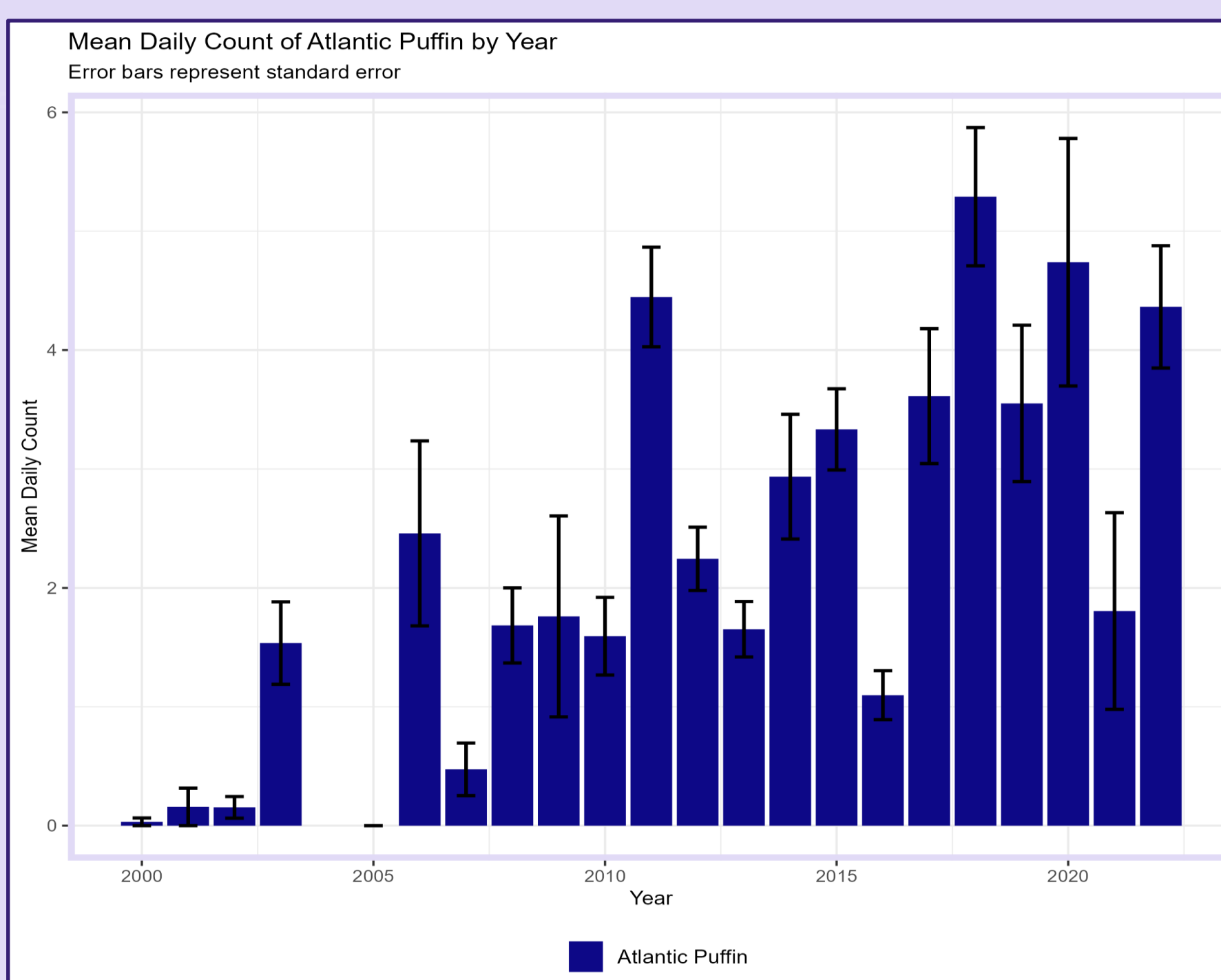
Herring Gulls (*Larus argentatus*), Great Black-backed Gulls (*Larus marinus*), Black Guillemots (*Cepphus grylle*) and Common Eiders (*Somateria mollissima*) breed on GDI and are visible from the tower every day. To analyze changes in their populations, we grouped the survey years into “early” years (2000-2008), “middle” years (2009 -2016) and “late” years (2017 – 2022) and performed ANOVAS on the counts of each species across the three time periods. All four species differed significantly across time periods (Table 1). For all four species, we performed Tukey Honest Significance tests and found that all time periods differed significantly from each other. time periods differed significantly from each other ($P < 0.01$).

| Species | Degrees of Freedom | F value | P value |
|---------|--------------------|---------|---------|
| BLGU | 2, 714 | 80.83 | <.0001 |
| HERG | 2, 714 | 325.5 | <.0001 |
| GBBG | 2, 714 | 76.4 | <.0001 |
| COEI | 2, 714 | 17.67 | <.0001 |

Table 1: Results from one-way ANOVAs conducted on changes in population



Figs. 6 - 8: Changes in mean daily counts of three less abundant species since 2000. Counts are shown for Atlantic Puffins, Northern Gannets, and Razorbills.



We have seen a general increase in the abundance of several non-breeding species in the waters around GDI, although no such trend can be identified for species that are seen only rarely (e.g scoters or murres). Since 2011, 3-5 pairs of Atlantic Puffin have bred on GDI each year. The diversity of seabird species seen from the tower has increased from a mean of 11.4 species seen per year in the “early” years (2000-2008) to a mean of 17.7 species seen per year in the “late” years (2017-2022). These grouped time periods differed significantly (one-way ANOVA, $df = 2$, $P < 0.005$), however, some of the increase in the number of species seen is likely the result of increased observer effort rather than a reflection of biological change.

Discussion

These data emphasize the importance of long-term monitoring to conservation. The steady decline of species such as Black Guillemots and Common Eiders may not be observed on a year-to-year basis. However, when looked at over the long term, we notice significant declines, especially for Black Guillemots. We also note the importance of context when interpreting these results; the increase in Herring Gulls may not reflect an increase in the total number of gulls nesting on GDI, but rather of shifting distributions between sub-colonies on the island (fig. 9). The spike in Great Black-Backed Gulls in 2022 does not reflect an increase in nesting pairs; unusual large groups of non-breeders frequented the intertidal during the 2022 season. In the Gulf of Maine (and around the world), Herring and Great Black-Backed Gulls are facing serious declines (Mittelhauser et al 2016, Lopez et al 2022). These declines are documented; however, the causes of decline are unknown. Little is known population dynamics of Black Guillemots in the Gulf of Maine. Long term monitoring is essential to understanding the changing dynamics of seabird populations in this rapidly changing environment.

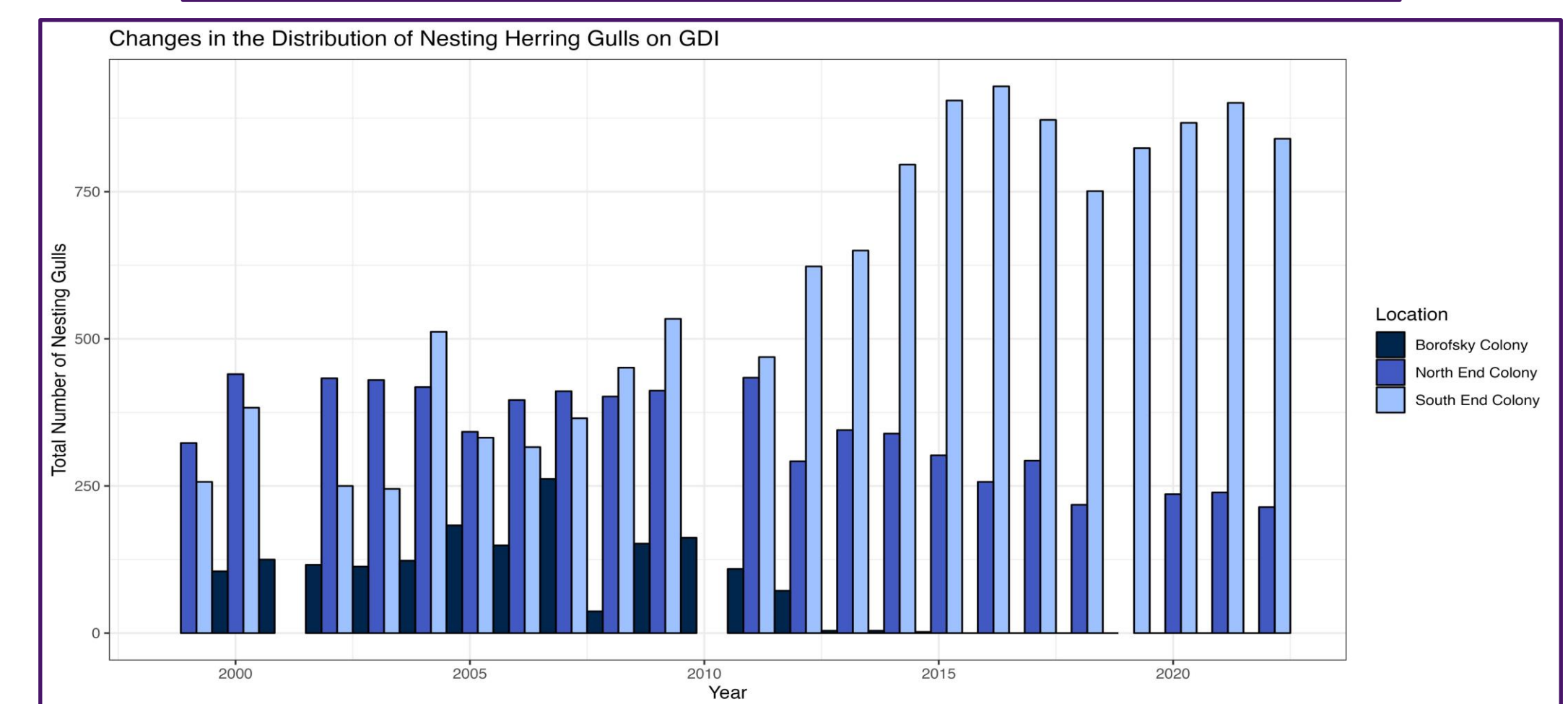
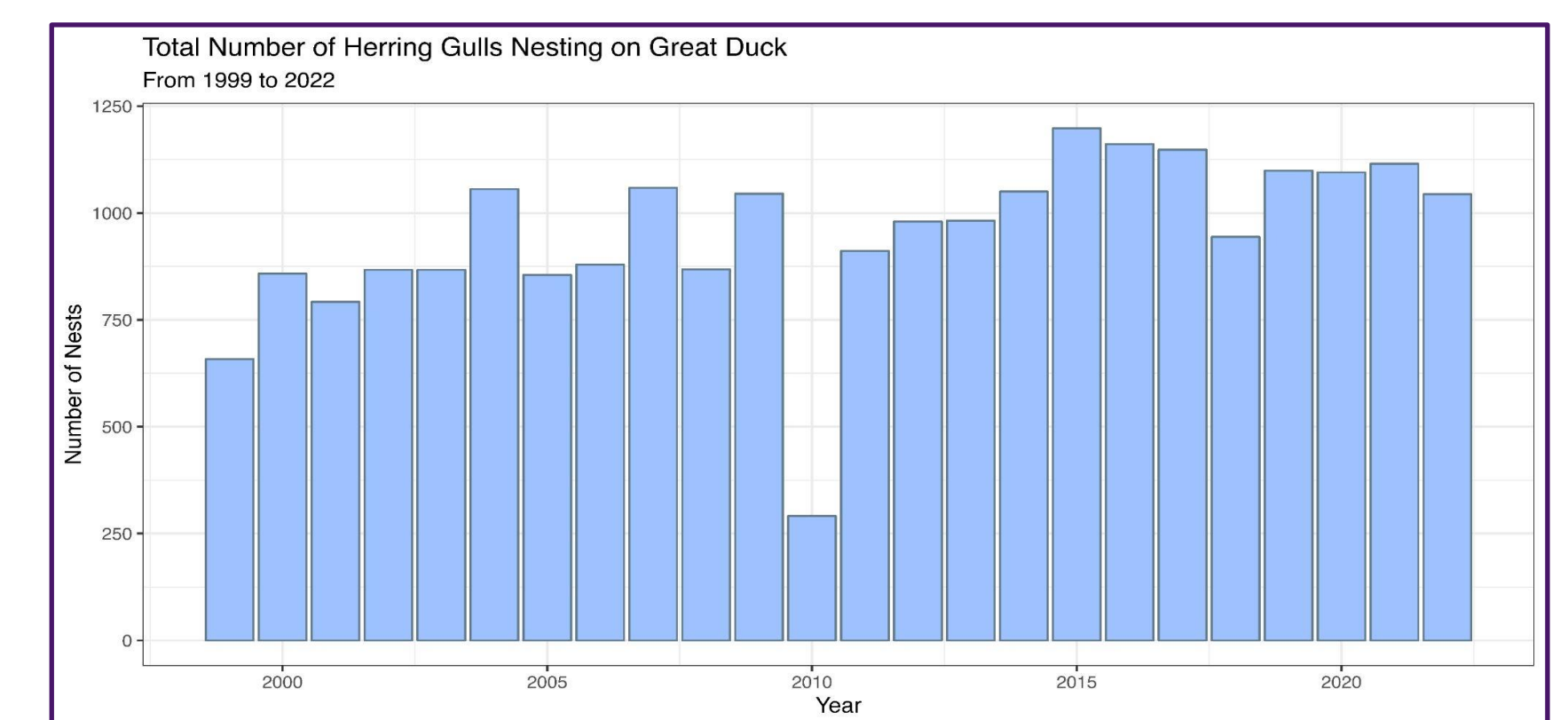


Fig. 9 & 10: Changes in the total number and distribution of nesting gulls on GDI.

Literature Cited

Mittelhauser, G. H., Allen, R. B., Chalfant, J., Schaffler, R. P., & Welch, L. J. (2016). Trends in the Nesting Populations of Herring Gulls (*Larus argentatus*) and Great Black-backed Gulls (*Larus marinus*) in Maine, USA, 1977-2013. *Waterbirds: The International Journal of Waterbird Biology*, 39, 57–67. <http://www.jstor.org/stable/26428195>

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