

Population Status and Trends of Marine Birds and Mammals in Glacier Bay National Park

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Abstract. By censusing marine birds and mammals at sea it is possible to assess abundance and distribution of entire communities, and monitor population trends of many species simultaneously. We conducted surveys for marine birds and mammals in Glacier Bay, Alaska, during June 1991 and annually from 1999 to 2003. The 1991 surveys were almost exclusively coastal, so only the coastal transects of the more extensive 1999–2003 ship based surveys were used for comparison. To compare data sets, we calculated densities of each species by transect. The mean and standard error were calculated for the most common marine bird and mammal species. Populations of most species showed little change over the past 13 years; however, randomization tests confirmed that there were several exceptions. Kittlitz’s and marbled murrelet populations have declined within the Bay. In contrast, population increases were noted for glaucous-winged gulls, mew gulls, sea otters, and humpback whales. Population changes may be a reflection of ongoing environmental changes in Glacier Bay.

Introduction

Assessing the population status and trends for seabirds and marine mammals can be difficult. Many colonial species can be studied at their rookeries, however, at-sea surveys are required to study non-colonial species, several species concurrently, or the status of juveniles or non-breeders (Tasker and others, 1984). At-sea surveys have the added benefit of providing information about the use of different marine habitats by marine birds and mammals. We conducted surveys of seabirds and marine mammals in Glacier Bay, Alaska, in June 1991 and 1999–2003, with the goal of determining the species composition, population trends, and species distributions within the Bay.

Methods

The 1991 surveys were conducted from a small boat. At the time, transect locations were noted on a 1:24,000 chart. We later digitized these transects to facilitate comparisons with later surveys. The 1999–2003 surveys were collected from both small boats and moderate sized (<100 ft) vessels. Bird and mammal sightings were recorded by entering them directly into a real-time computer data-entry system (DLOG; DLOG; Glann Ford Consulting, Portland, OR, ECI) that plots sighting positions continuously using GPS coordinates. Ground speed for vessels was approximately 15–20 km/hr (8–12 knots). Surveys were conducted, with some modifications, according to protocols established by the U.S. Fish and Wildlife Service for marine birds (Gould and others, 1982; Gould and Forsell, 1989). Observers from the *Pandalus* and

USGS R/V *Alaskan Gyre* counted and identified to species, swimming birds and mammals within 150 m on either side or 300 m forward of the boat. Because of their lower viewing angles in the small boats, we limited the area of counting and identification to 100 m on both sides and 200 m forward. We counted all flying birds that crossed within transects. Due to the considerably greater coverage of offshore areas on the 1999–2003 surveys we only used data from coastal transects to calculate densities. We used a GIS to determine transect lengths. Multiplying transect width by length yielded the area surveyed. Simply dividing the number of each species sighted by each transect’s area yielded a sample. All transects (samples) were then averaged to provide an population index for each species. Although this index could have the effect of underestimating the 1991 populations (due to lower average transect width), we were confident that by looking at the range of species, we would be able to identify any bias.

Results

We observed 65 species of marine birds and 9 species of marine mammals during the surveys. Forty-two of these species were seen in all years. Maps of five common seabirds and the most common marine mammal suggest that some areas of Glacier Bay are important for multiple species, though; some species have distinctly different distributions (fig. 1). Most species showed a coastal pattern of habitat use; however, Kittlitz’s and marbled murrelets were more pelagic in their distribution than the other “common” species. The majority of species had reasonably consistent patterns of habitat use. Among marine birds we noted the increase in the use of the northern part of Glacier Bay by gulls. Among marine mammals, both sea otters and humpback whales expanded their range in the Bay between 1991 and 2003. Conversely, harbor seals appeared to have declined in the East Arm of the Bay over time.

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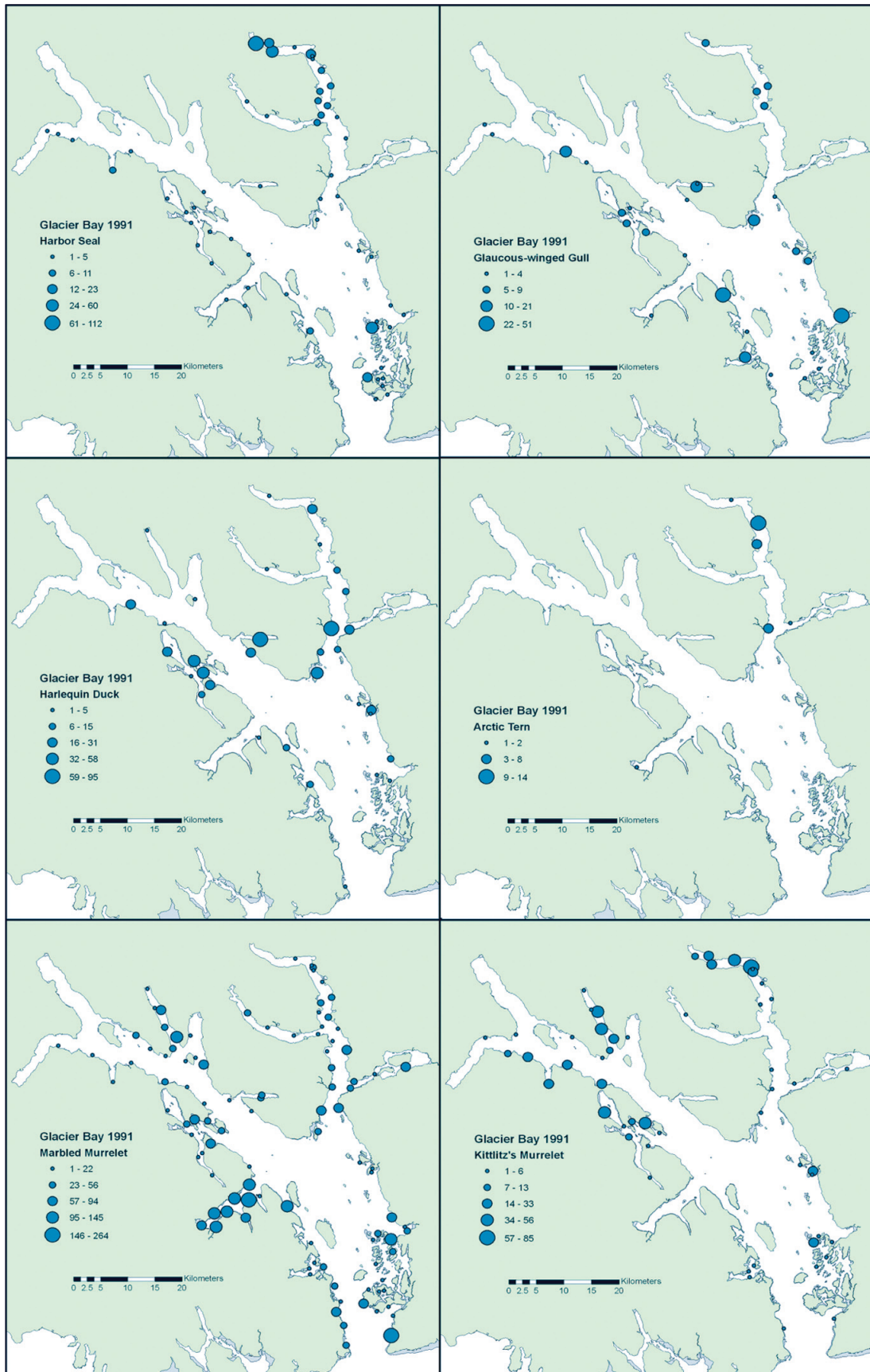


Figure 1. Distributions of five common marine birds and harbor seals from small-boat surveys in Glacier Bay, Alaska, June 1991.

Graphs of species density were examined as an index of population trends (fig. 2). Populations of most species showed little change over the past 13 years; however, Kittlitz's and marbled murrelet populations indicated steep declines. In contrast, population increases were noted for glaucous-winged gulls, mew gulls, sea otters, and humpback whales. Harbor

seal declines that appear to be dramatic were not statistically significant due to high degrees of variation in their sightings. Continued monitoring and coordination with researchers investigating harbor seals may help us reach some conclusion about population trends for this species.

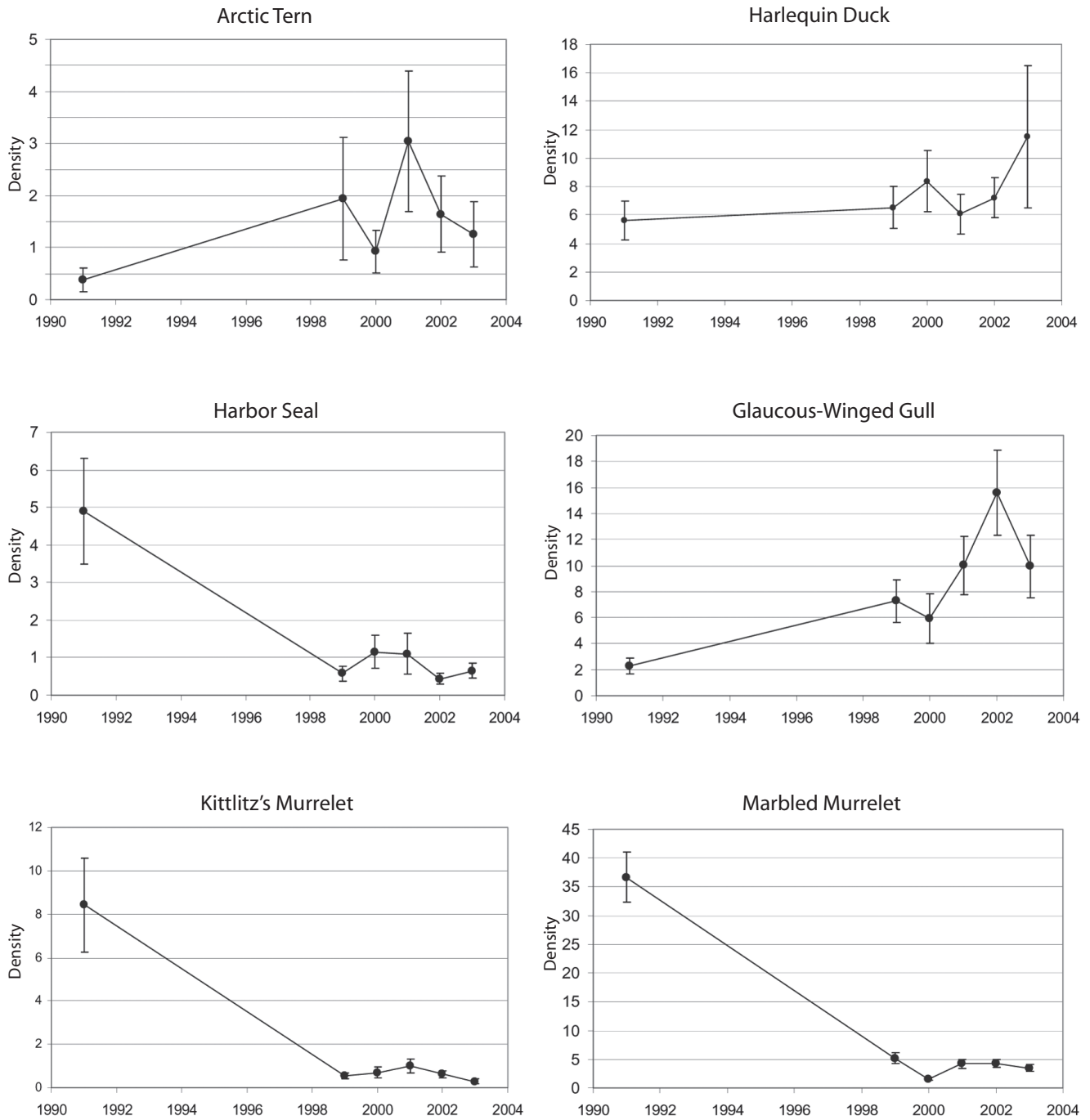


Figure 2. Trends in numbers of each of six common marine bird and mammal species observed on marine surveys in Glacier Bay, Alaska. Numbers reflect relative density expressed as the average number of each species seen per kilometer of survey transect.

Discussion and Conclusions

Glacier Bay is home to an abundant and variable set of marine species. The variable marine environments in Glacier Bay appear to be highly productive and provide quality habitats for many species. However, Glacier Bay also is an ecosystem undergoing rapid change. Despite the dramatic pace of habitat change it is difficult to determine species numerical responses particularly for long lived marine species. Our ability to look at marine populations over a 13-year period provided us the data required to detect increases in gulls and decreases in both Kittlitz's and marbled murrelets. The cause of these population changes may vary among species; however, we suspect that the dramatic changes in Glacier Bay's glacial-marine habitats and alterations in terrestrial nesting habitats are playing a major role.

Management Implications

The results of our at-sea surveys provided managers with information about population trends for most marine bird and mammal species in the Park. The ability of this annual "snapshot" to identify population trends for a wide diversity of marine birds and mammals at once makes it an efficient tool for monitoring these populations. This is particularly true of the species that cannot be monitored in any other way. At-sea survey methodology is a useful tool for monitoring marine bird and mammal populations, however, continued refinement of survey techniques is necessary to reduce variation and increase power to detect change. Marine bird and mammal populations are undergoing considerable change in Glacier Bay and therefore further research is needed to identify the causes of this change.

Acknowledgments

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