

## Assessing the Availability of Glacial Ice as Habitat for Harbor Seals in a Tidewater Glacial Fjord

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Tidewater glaciers are a prominent landscape feature along the southeastern and south-central coasts of Alaska and play an important role in landscape and ecosystem processes. Many tidewater glaciers calve icebergs into the marine environment and serve as critical substrate for harbor seals for resting, pupping, nursing young, molting, and avoiding predators. Although tidewater glaciers are naturally dynamic, advancing and retreating in response to local climatic and fjord conditions, most of the ice sheets that feed tidewater glaciers in Alaska are thinning and, as a result, many of the tidewater glaciers are retreating. The rapid thinning and retreat of tidewater glaciers may directly impact harbor seals which rely heavily upon glacial ice; however, the potential impacts of changes in ice coverage and characteristics and the relationship with harbor seal distribution and abundance are unknown. Our primary objectives are (1) to develop a semi-automated method for estimating ice cover and characteristics of glacial ice used by harbor seals from digital photographs and (2) to assess the relationship between the availability of glacial ice and harbor seal spatial distribution and abundance. From 2007 to 2012, we conducted aerial photographic surveys (n = 43) of seals and glacial ice in Johns Hopkins Inlet, Glacier Bay National Park, Alaska, during the pupping (June) and molting (August) periods. Surveys were flown along a grid of 12 transects at an altitude of 1,000 ft. Non-overlapping digital photos were taken directly under the plane using a vertically-aimed camera. Preliminary estimates of seal (non-pups) abundance were consistently higher in June (range: 1,325 - 2,647) than in August (range: 1,041 - 1,928). The spatial distribution of seals was also much more extensive during June and corresponded to more extensive glacial ice coverage in the fjord. Future efforts will include developing quantitative estimates of ice cover, ice density, and seal density for inputs into habitat and geospatial models. Ultimately, understanding relationships between glacial ice availability and harbor seal distribution and abundance may provide novel perspectives on the spatial and temporal variation of harbor seals in tidewater glacial fjords.