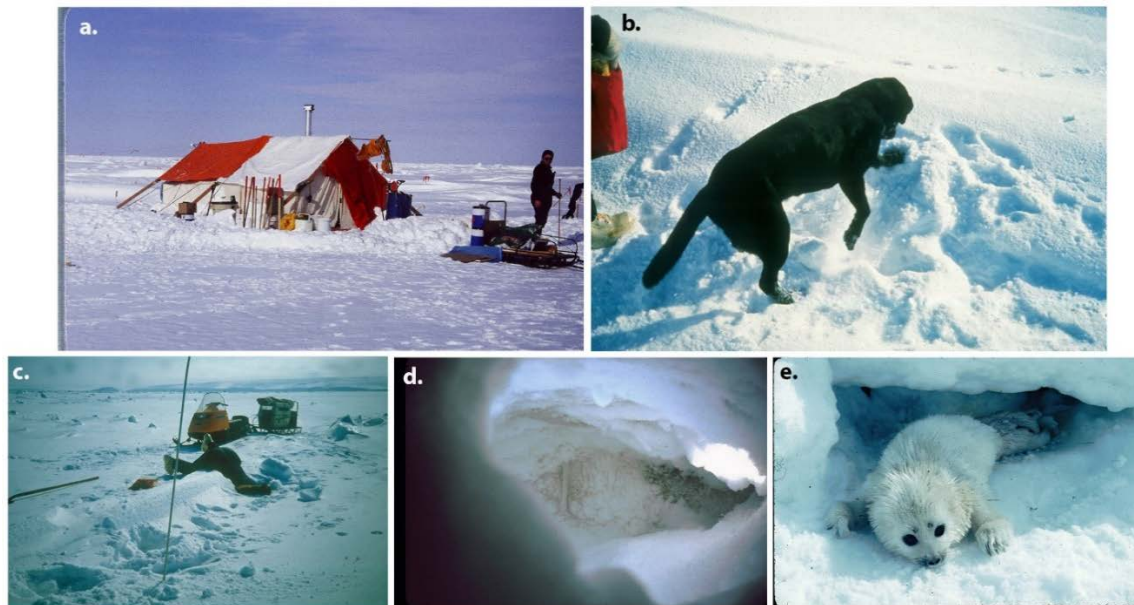


## Ringed seal breeding habitat and predation on the landfast sea ice in northwest Alaska during spring 1983 and 1984

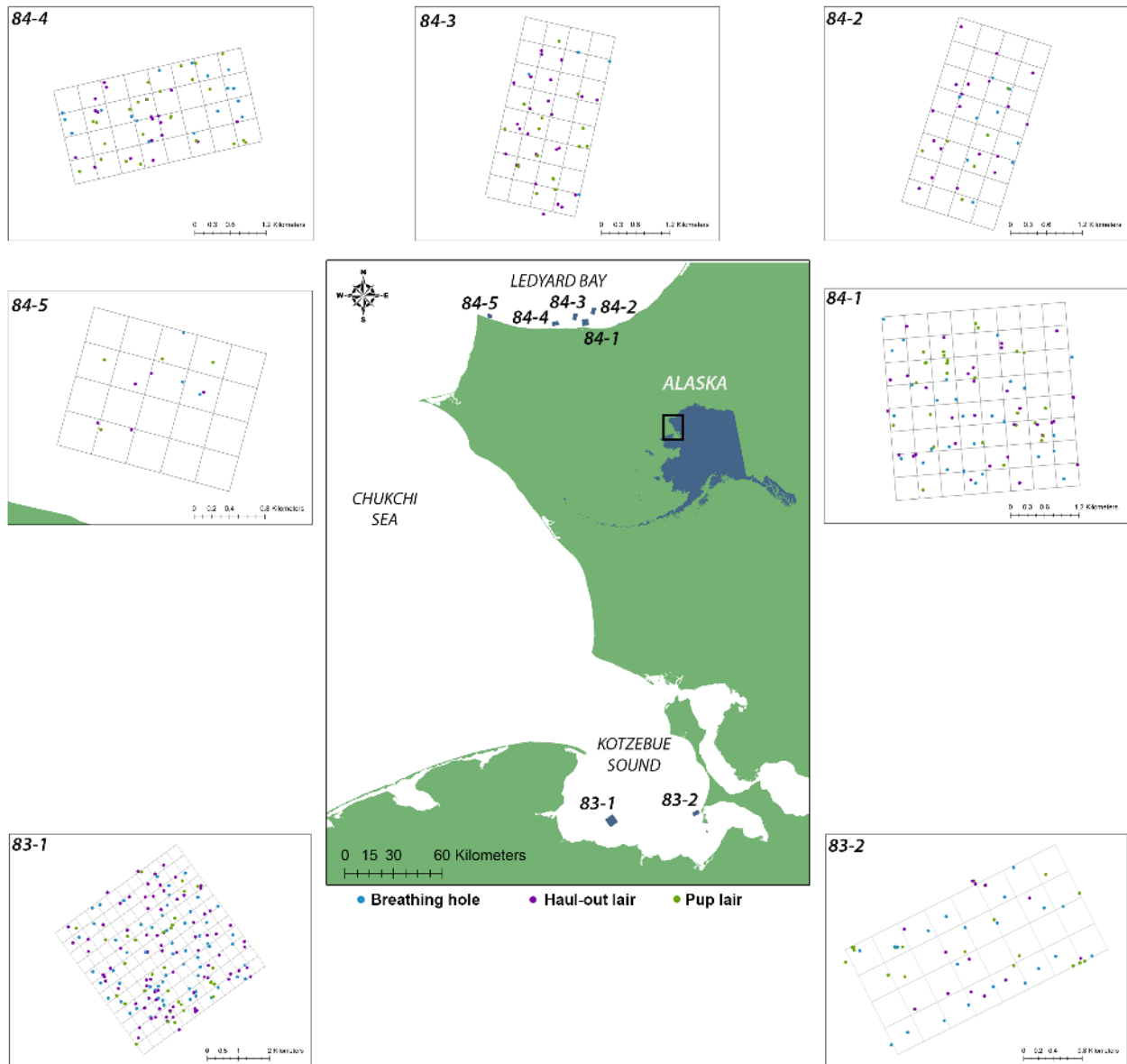
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**Overview:** Climate change has transformed the snow and sea ice habitats that ringed seals call home. We used data collected nearly 40 yr ago, before dramatic changes in the Pacific Arctic, to describe baseline densities, predation pressure, and environmental conditions of ringed seal structures on the landfast ice in northwest Alaska.

**Research results:** There is limited baseline information on the snow and ice habitat, distribution, density, and configuration of ringed seal structures (breathing holes, simple haulout lairs, and pup lairs) in Alaska. We rescued data from field notebooks of retired biologists (Kathy Frost and John Burns) that used trained dogs to locate seal structures on the landfast ice in two regions of the eastern Chukchi Sea during spring 1983 and 1984 (Figure 1). Dogs searched along survey gridlines that were established in Kotzebue Sound and Ledyard Bay. Each seal structure detected was opened, measured, and classified. Snow depth, ice relief, and extent of ice deformation was also measured at each structure. Surveys predated GPS, so we mapped the distribution of ringed seal structures using modern geospatial tools (Figure 2).



**Figure 1. Photos illustrating field activities during spring 1983 and 1984.** Photos include: (a) field camp associated with Kotzebue Sound grid 83-1. Stakes used to mark locations within a grid are shown along the side of the tent; (b) “Charlie”, a Labrador retriever, indicates the location of a seal structure (photo by K.F.); (c) K.F. measuring dimensions of a structure in a linear ridge feature (photo by Sue Hills); (d) the inside of a seal lair (photo by Ann Adams); (e) ringed seal pup at a partially collapsed lair (photo by Lloyd Lowry). From Hauser et al. (2021).



**Figure 2. Study areas in Kotzebue Sound (1983) and Ledyard Bay (1984).** Maps of survey grids include all ringed seal structures located by dogs. From Hauser et al. 2021.

Of 490 structures located by trained dogs, 29% were pup lairs. Ledyard Bay grids had greater overall density of seal structures than Kotzebue Sound grids (8.6 structures/km<sup>2</sup> and 7.1 structures/km<sup>2</sup>), but those in Kotzebue Sound were larger. Pup lairs were located in closer proximity to other structures and characterized by deeper snow and greater ice deformation than haulout lairs or simple breathing holes. We describe evidence of arctic fox and polar bear predators at seal structures. Our results are summarized in the context of similar studies conducted elsewhere in the geographic range of ringed seal as well as in consideration of recent environmental changes.

**Research publications:**

Hauser, Donna D.W., Kathryn J. Frost, and John J. Burns. 2021. Ringed seal (*Pusa hispida*) breeding habitat on the landfast ice in northwest Alaska during spring 1983 and 1984. PLoS ONE 16: e0260644. <https://doi.org/10.1371/journal.pone.0260644>

Hauser, Donna D.W., Kathryn J. Frost, and John J. Burns. In preparation. Predation on ringed seals in subnivean lairs in northwest Alaska during spring 1983 and 1984. (To be submitted spring 2022)

**Outreach:** Supplementary funding from the North Pacific Research Board (Grant No. 1811-90) was secured to develop a children’s book, focused on weaving scientific research on ringed seals with Iñupiaq perspectives. The book *Natchiq Grows Up: The story of a ringed seal pup and her changing home* is being written by Donna Hauser, Kathy Frost, and Alex Whiting, with contributions from John and Pearl Goodwin and Cyrus Harris, and illustrations by Heather McFarland. It tells the story of Natchiq, a ringed seal pup born in a lair on the landfast ice in Kotzebue Sound (Figure 3), with sidebar and focused sections on Indigenous Knowledge (based on contributions from representatives with the Native Village of Kotzebue) as well as scientific studies of ringed seals. The book will be published by University Press Colorado later in 2022.



**Figure 3. Example draft illustrations** to be included in a forthcoming children’s book, showing a ringed seal pup in a lair on the landfast ice (left) and a young seal pup in late spring (right).