Dive Behavior and Spatial Variability of Bearded, Ribbon and Spotted Seals in the Bering and Chukchi Seas

Josh M. London, Devin Johnson, Peter L. Boveng, and Michael F. Cameron

Polar Ecosystems Program, National Marine Mammal Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA — Seattle, Washington

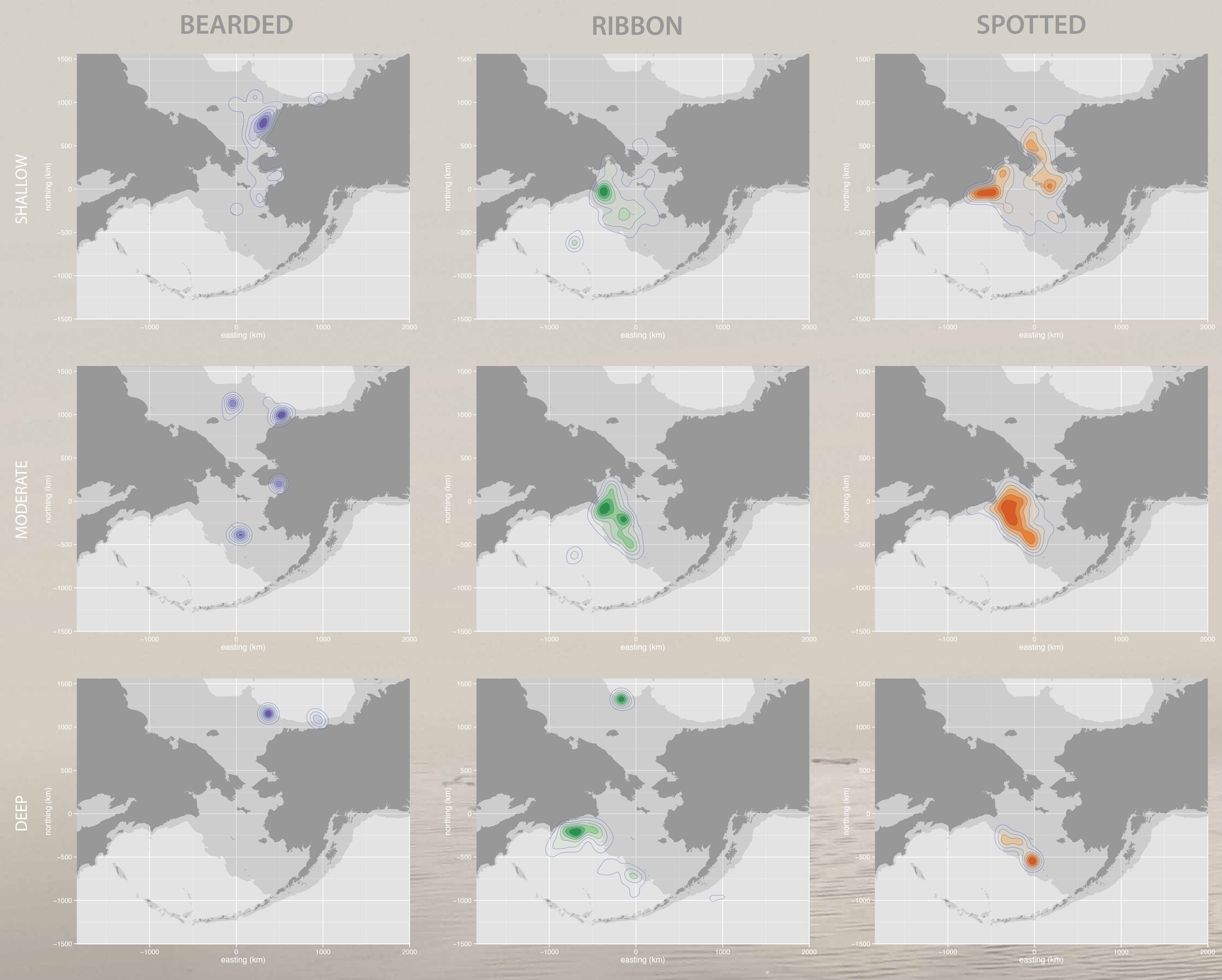
Synopsis

Satellite-linked archival tags (n=68) were deployed on bearded (*Erignathus barbatus*, n=7), ribbon (*Histriophoca fasciata*, n=39), and spotted seals (*Phoca largha*, n=22) in the Bering and Chukchi seas between 2007 and 2012. In addition to location estimates, the tags also record and transmit summarized behavior data on the number of dives, time at depth and dive duration. Previous analyses of the seals' movements documented the different seasonal patterns of geographic spatial use by the three species. We used the dive behavior data to illustrate further differences between the species in their use of 3-dimensional space. Ribbon seals are the deepest diving of the three species with dives often deeper than 200 m and some exceeding 600 m. The deeper dives more commonly occur in the winter season when ribbon seals are off the shelf and associated with the shelf break or more pelagic habitats.

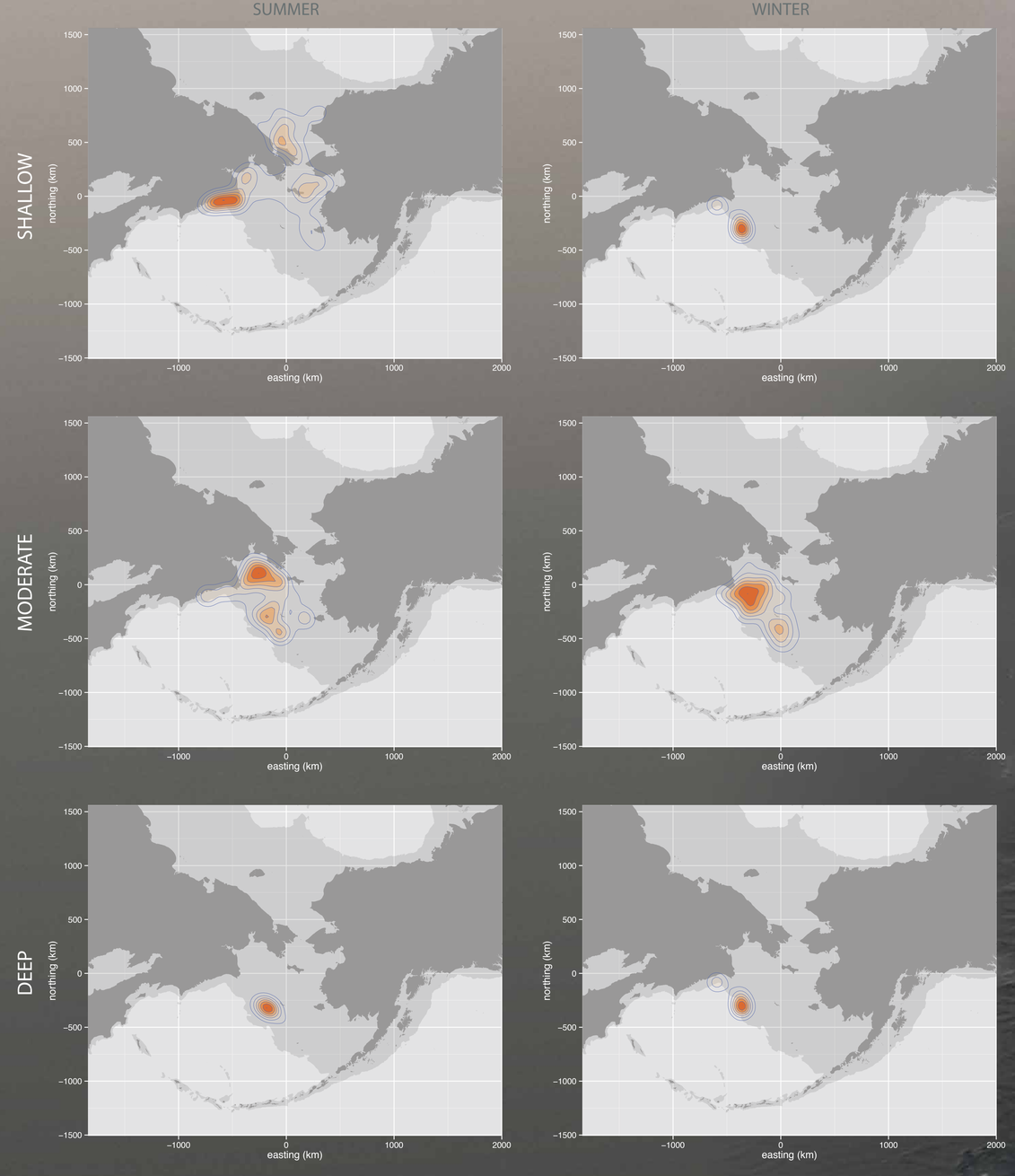
Dive behavior of spotted seals and bearded seals are mostly confined to less than 200 m. These dive depths reflect the close association of bearded and spotted seals to shelf habitats. Most spotted seal dives are less than 70 m with moderate dives (70-200 m) observed mostly in the late winter and spring. Bearded seals distribute dives relatively evenly across shallow and moderate depths in the summer months while the winter months are mostly moderate. This mostly reflects the bathymetry of individual bearded seal winter locations. The spatial variability in dive behavior across all three species is an important component of our ability to understand and predict responses of ice-associated seals to dramatic changes in sea-ice and other elements of their marine ecosystems stemming from global climate change.

Methods

- Locations from all deployments were modeled using the R package crawl to predict regular locations in time with a continuous-time correlated random walk
- Predicted locations were temporally matched with the observed dive behavior (number of dives to specified depth categories)
- Three depth categories were selected: Shallow (11-70 m), Moderate (71-200 m) and Deep (250+ m)
- A quasi-weighted kernel density analysis provided distributions of dive behavior in space. Kernel weights were derived from the observed number of dives for a given depth category
- Spotted seals were further evaluated for seasonal differences (Summer/Fall = June-October, Winter = November - February)



The figures on this poster represent the kernel density of ribbon, spotted and bearded seals weighted by the number of dives to specified dive categories (shallow, moderate, and deep). The kernel densities are a function of both location and dive behavior. The highest kernel densities within each figure are represented by darker color shades. The lightly shaded region represents the 500 meter isobath.



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