Seasonal movements and high-use areas of spotted seals (Phoca largha) in the Pacific Arctic

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BACKGROUND

Spotted seals (Phoca largha) are pelagic foragers that use Bering Sea pack ice for pupping, nursing, and resting when ice is present and rest on shore during the open-water season. Warming of Pacific Arctic waters associated with climate change may affect fish and invertebrate prey of spotted seals, and therefore affect their foraging behavior. Decreases in the extent of sea ice and lengthening of the open-water season have eased access to the Arctic for development and shipping, prioritizing the need to identify areas important to seals. Our understanding of movements, high-use areas, and foraging habitats of spotted seals is limited. Therefore, we worked with Alaska Native hunter-taggers along the Beaufort and Bering sea coasts to deploy satellite-linked transmitters on spotted seals from July through October 2016–2018 to describe movements and identify high-use areas.

METHODS

- We worked with seal hunters to capture spotted seals in entanglement nets and instrument them with satellite-linked transmitters.
  - SPLASH (Wildlife Computers, USA) or CTD tags (Sea Mammal Research Unit, Scotland) were glued to the hair on their mid-dorsum.
  - SPOT tags (Wildlife Computers, USA) were attached to a rear flipper.

- MOVEMENTS:
  - We used location data collected by all SPLASH, CTD, and SPOT tags.
  - We estimated daily locations for all tagged seals using a continuous-time Correlated Random Walk (CRW) model (package crw in R).
  - We evaluated movements of seals based on:
    - Season: Open-water (May–November) and Ice (December–April).
    - Tagging area: Beaufort and Bering seas.

- HIGH-USE AREAS:
  - We identified high-use (core) areas based on the density of daily estimated locations within 50×50 km square cells across our study area. The volume rasters calculated are utilization distributions (UD).
  - UD volumes were calculated for:
    - Season,
    - Tagging area, and
    - Distance from shore:
      - Offshore (>5 km): associated with foraging
      - Nearshore (<5 km): associated with resting and foraging
    - Haul-out data collected by tags informed identification of resting areas.
  - We considered core areas to be cells with UD volumes of <50% volume.

RESULTS

- We deployed satellite-linked transmitters on 24 spotted seals from 2016–2018 (4 SPLASH, 20 CTD, and 24 SPOT tags).
- Seals were tracked 137–443 days.

SUMMARY

- Spotted seals in the Chukchi and Bering seas made frequent east-west foraging movements, rested on shore, and rarely moved between seas during the open-water season.
- Movement patterns we identified highlight the importance of tagging seals in multiple regions annually to understand movements and habitat use throughout their range.
- Continued studies of seal movements will be necessary to monitor for changes in behavior with changes in climate and development activities.

FUTURE WORK

- Examine how seal high-use areas are influenced by oceanographic characteristics and sea ice.

ACKNOWLEDGEMENTS

Seal tagging projects were funded by the Bureau of Ocean Energy Management, USA and Office of Naval Research, USA. We appreciate the support of the IUCN Seal Committee and assistance from the hunter-tagger crews; Morgan Simon, River Simon, Al Smith, Wybon Rivers, Vernon Long, and Richard Tukle. We also thank Ryan Adam, Isaac Leavitt, Aaron Morris, Justin Olnes, and Joe Skin and for tagging assistance. The National Oceanic and Atmospheric Administration, Marine Mammal Laboratory provided 8 flipper (SPOT) tags. Research on ice seals was conducted under permits 15234 and 20466 issued to ADGF by the National Marine Fisheries Service and under an approved ADGF Animal Care and Use Committee Protocol: 2016-23, 0027-2017-27, 0027-2018-29.