EXPLORING NOVEL TECHNOLOGIES TO ASSESS THE TERRESTRIAL ECOLOGY OF SPOTTED SEALS

Graduate student: Maeghan Connor, UAF, mrconnor@alaska.edu

Project leads: Donna Hauser, UAF, dhauser2@alaska.edu; Andrew Von Duyke, NSB, andrew.vonduyke@north-slope.org

Project partners*:* University of Alaska Fairbanks, North Slope Borough, Ice Seal Committee, and Alaska Arctic Observatory and Knowledge Hub

Project Goals and Objectives: The overarching goal of this study is to improve our understanding of spotted seal (*Phoca largha*) ecology during the summer-fall open water period by employing two novel and noninvasive technologies; time-lapse cameras (e.g. commonly known as 'game cameras') and small quad-copter style Uncrewed Aircraft Systems (sUAS, or commonly known as 'drones'). This study is a continuation and expansion of the time-lapse camera work conducted by Donna Hauser and Andy Von Duyke from 2020-2022. Specifically, we plan to (1) process previously collected time-lapse data for substrate availability, spotted seal counts, and spotted seal presence/absence at known haul-out sites by applying Artificial Intelligence (commonly known as 'AI') approaches; (2) quantify the effects of environmental conditions on spotted seal summer-fall haul-out behavior; (3) quantify disturbance effects of sUAS on hauled out spotted seals; (4) determine feasibility of using sUAS to assess spotted seal relative abundance, age distribution, and body condition at coastal haul-outs; (5) improve and broaden understanding of spotted seal haul out behavior by putting results into context with local environmental observations from Indigenous Knowledge holders; (6) conduct outreach activities with the community of Utqiaġvik, including offering opportunities for drone and data analysis training, regular consultation with project partners regarding study design, and effective dissemination of project updates and results.

Methods*:* We plan to use previously collected time-lapse camera imagery (described below) and sUAS to evaluate coastal haul-out behavior, presence, and counts of spotted seals at study sites along the Chukchi and Beaufort Sea coasts, including Dease Inlet, Smith Bay, and Peard Bay. These sites are used for hauling out by ice seals across the region and occur across representative substrates, thereby contributing to the broad applicability of these study sites.

- *Time-lapse Camera Data Collection & Analysis*

From 2020-2022, two high-resolution time-lapse cameras equipped with acoustic recorders were placed at each study site during the open water season (~mid-July to mid-October). The sites were monitored for a total of 330 days, resulting in a total of ~300,000 photos over the three study years. Additional environmental and weather variables were collected from three local weather stations and the National Weather Service in Utqiaġvik to complement concurrent weather and environmental observations collected by Iñupiat observers who are part of the Alaska Arctic Observatory and Knowledge Hub (AAOKH). Images will be reviewed manually and via machine learning (or 'AI') techniques for presence, counts, and behavior of seals. Sound and environmental data will be summarized and synced to camera seal count and presence/absence data for analysis.

- *sUAS Data Collection & Analysis*

During July-September 2024 and 2025, we propose to expand on this project by surveying haul-out sites using small quadcopter sUAS deployed from either land or a research vessel, depending on site accessibility. We plan to identify additional study sites for sUAS-based data collection by consulting

with community partners, including AAOKH observers, NSB-DWM wildlife biologist Andy Von Duyke, the Ice Seal Committee, and subsistence hunters. Compared to time-lapse cameras, sUAS provide a birds-eye view of an area, allowing for further analyses (see Figure 1). Multiple altitudes, flight paths, and drone models with associated sound levels will be tested to determine which flying techniques cause minimal disturbance to seals while simultaneously providing the necessary image resolution for data analyses. To quantify the effect of sUAS surveys, we will post hoc examine still and video imagery using a ranked categorical scale of increasing severity for potential behavioral responses. Collected imagery will be analyzed to determine feasibility of using sUAS to assess spotted seal relative abundance, age distribution, and body condition at coastal haul-outs.

Figure 1: Spotted seals at haulout in time-lapse camera imagery (left) vs. sUAS imagery (right). This demonstrates how the angle for time-lapse cameras can block individual seals, whereas sUAS footage gives an unobstructed birds-eye view. Photo credit time-lapse camera image: Donna Hauser, Andy Von Duyke. Photo credit sUAS image: Josh Jones.

Expected Outcomes:

1. Electronic data files and imagery.
2. Workforce development and inclusion in research by two Alaskan Native hunters as field technicians, hired by the NSB-DWM.
3. Incorporation of Indigenous perspectives and knowledge by partnering with two AAOKH Iñupiaq observers and regular communication of project goals and activities with the Ice Seal Committee.
4. Training opportunities for Utqiaġvik community members and youth in sUAS operation and data interpretation, including at the BARC 2024 science fair.
5. At least one peer-reviewed scientific publication (e.g., Connor, Hauser, Von Duyke, Adams, Leavitt, Brinkman, et al. Environmental factors affecting spotted seal coastal haulout behavior in Arctic Alaska).
6. We propose to present final project results at AMSS and interim updates to the Ice Seal Committee at biannual meetings.
7. Outreach will include feature stories about project updates and results in the biannual *AAOKH News* and the NSB-DWM newsletter in both 2024 and 2025 and sent to all mailbox holders in North Slope communities. Websites for both the NSB-DWM and the Ice Seal Committee will also serve as venues to communicate the progress of this work.
8. Enhanced understanding of how camera traps and sUAS can be applied in future ice seal projects.

Funding Status: This project will be funded by a grant from the Alaska Sea Grant College Program. Expected award dates are May 2024 – April 2026.