

## Environmental Studies Program: Ongoing Study

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| Title                      | Spatial and Acoustic Ecology Of Understudied ESA Listed Marine Mammals (NT-21-04)                         |
| Administered by            | Office of Environmental Programs; Alaska Regional Office  |
| BOEM Contact(s)            | Dr. Christina Bonsell <a href="mailto:christina.bonsell@boem.gov">christina.bonsell@boem.gov</a>          |
| Procurement Type(s)        | IDIQ Task Order, IA   |
| Conducting Organization(s) | Blue Water Research Institute, NASA's Center of Excellence for Collaborative Innovation                   |
| Total BOEM Cost            | \$182,000   |
| Performance Period         | FY 2022–2024  |
| Final Report Due           | Dec 2023  |
| Date Revised               | 20 September 2022   |
| PICOC Summary              |   |
| <i><u>Problem</u></i>      | Aerial surveys for marine mammals could potentially be more efficient with the use of emerging technology |
| <i><u>Intervention</u></i> | A machine-learning algorithm that classifies images of Cook Inlet Belugas from survey imagery             |
| <i><u>Comparison</u></i>   | Automated image classification will be compared to traditional techniques                                 |
| <i><u>Outcome</u></i>      | An improved, more efficient method of surveying Cook Inlet Beluga Whales                                  |
| <i><u>Context</u></i>      | Computer programming  |

**BOEM Information Need(s):** BOEM requires robust, current data to: (1) fully analyze and disclose the potential for impacts to protected species from OCS activities at the programmatic and site-specific level; (2) help ensure that a species is not jeopardized by activity or that critical habitat is not adversely modified by that activity pursuant to the ESA; and, (3) minimize incidental take of marine mammals resulting from BOEM-permitted activities, thus meeting not only the small numbers and negligible impact requirement under the MMPA, but also making every effort to maintain the health and stability of marine mammal populations and their ecosystem.

**Background:** Cook Inlet belugas are an endangered population of beluga whales at risk for extinction after years of hunting, and which continue to face threats related to vessel traffic in the busy Cook Inlet waterway. In order to more closely monitor their health and track individual whales, the NOAA Alaska Fishery Science Center conducts an annual photo-identification survey of Cook Inlet belugas. But processing and analyzing new whale images is largely manual,

consuming significant time and resources. New and improved methods are needed to help automate this process and accurately identify matches of the same individual whale across different survey images. However, analysis of this information can consume significant resources. To improve upon this, BOEM looks to leverage artificial intelligence and machine learning to expedite the creation and analysis of large datasets on the endangered Cook Inlet Beluga population.

**Objectives:**

- a) Advise on the development of a machine learning algorithm challenge for the development of a beluga whale photo-identification algorithm challenge.
- b) Provide requirements and assist in evaluation metrics and winner selection for algorithm challenge participants.
- c) Integrate and implement the algorithm challenge winning submission into open-source mark-recapture distributed computing tools.

**Methods:** Using photos from previous surveys, a machine learning algorithm challenge will be held to automate the matching of beluga identification photographs. The winning algorithm will be incorporated into a database platform with a user-friendly interface, from which desired information (e.g., date, location) can be concatenated and downloaded.

**Specific Research Question(s):** Can machine-learning image classification be used to improve survey methods for Cook Inlet Beluga Whales?

**Current Status:** Ongoing

**Websites:**

<https://wildme.org/#/platforms>

<https://belugas.drivendata.org>

<https://drivendata.co/blog/belugas-winners>