Cross-platform Ecosystem Assessment Through Characterization of Prey Habitat Suitability and Predator Occurrence off Newport, Oregon

Elizabeth Ferguson[1]
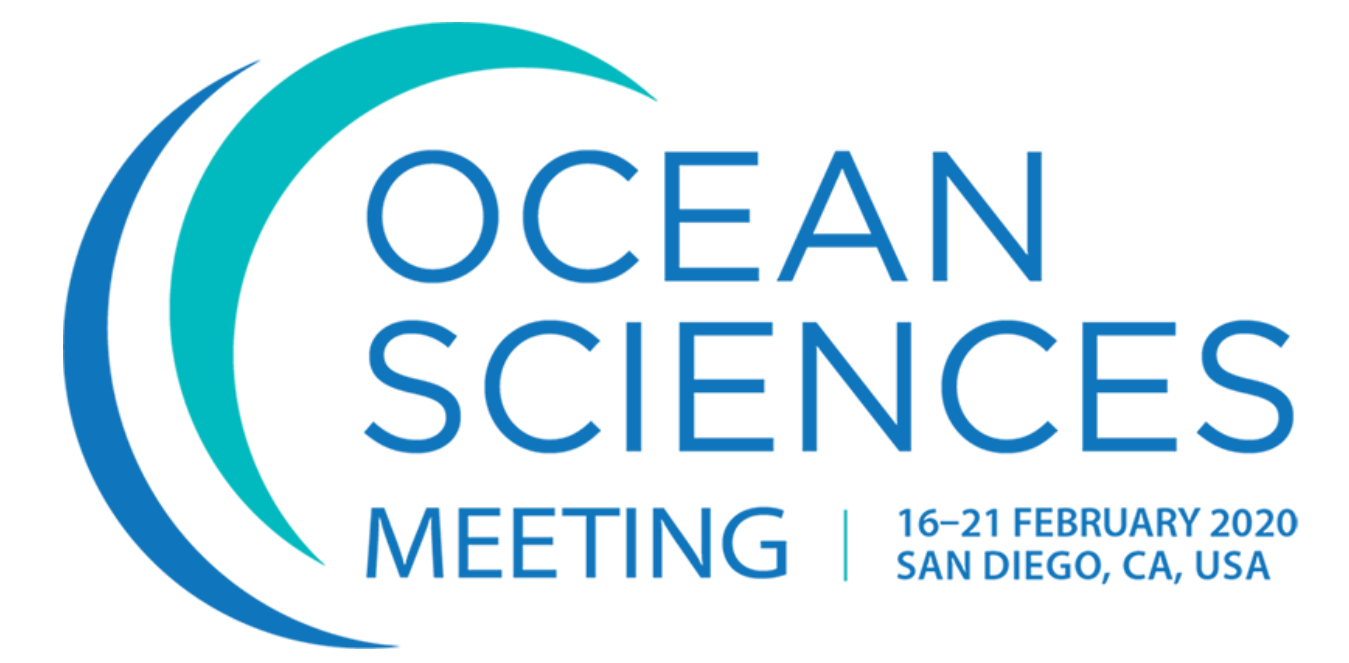
[1]Ocean Science Analytics

November 25, 2022

Abstract

The coastal waters off Newport, Oregon are part of a naturally dynamic ecosystem influenced by the California Current. In additional to highly variable interannual and decadal processes, recent environmental monitoring has indicated instances of persistent warm water masses in the region. One method of assessing long standing shifts in the ecology of this coastal and offshore environment is to associate physical oceanographic variables with the presence of indicator species such as marine mammals. Using cross-platform oceanographic and spatial data sources, we evaluated prey habitat suitability and marine mammal distribution across three years. The Ocean Observatories Initiative (OOI) maintains a series of coastal and offshore monitoring platforms and data systems that include cabled sensors and gliders. Since 2016, this conglomeration of resources has continuously collected information such as temperature, dissolved oxygen, pH, pCO2, chlorophyll and nitrate from the continental shelf near Newport out to the Axial Seamount along the Juan de Fuca Ridge. Gliders travel along five east-west transect lines from a depth of 0-1,000 m, contributing greater spatial resolution of these variables. Approximately 10 species of marine mammals inhabit the waters off Oregon, several of which feed within the region of interest. To obtain marine mammal distribution data within a 1,000 km2 area surrounding the OOI cabled and glider instruments, we queried the Ocean Biogeographic Information System (OBIS) database for observations of killer whales, sperm whales and pacific white-sided dolphins. We used physical oceanographic variables from moorings just below the surface and at depth to characterize the seasonal prey habitat of these three species of marine mammals. Although we did not have data to support an assessment of the region prior to the warm water mass of 2014-2015, the years following this event from 2016-2018 were explored for seasonal ecosystem trends.

Cross-platform Ecosystem Assessment Through Characterization of Prey Habitat Suitability and Predator Occurrence off Newport, Oregon

OCEAN SCIENCES MEETING | 16–21 FEBRUARY 2020 SAN DIEGO, CA, USA

Elizabeth Ferguson,
CEO & Founder
eferguson@oceanscienceanalytics.com
Ocean Science Analytics

INTRODUCTION

- Capabilities in marine ecosystem assessment are expanding given the availability of diverse and extensive oceanographic data. Associations of historical predator observations with current environmental variables can provide insight into likely prey habitat suitability.

- The Ocean Observatories Initiative (OOI) maintains the Coastal Endurance Array, a series of coastal and offshore monitoring platforms off Newport, Oregon that include cabled sensors and gliders.

- This initial step in a larger project explores the feasibility of combining cross-platform data across varying temporal and spatial scales in order to characterize current prey habitat suitability for several northwest Pacific Ocean predators.

METHODS

1. Three predators were identified in this effort along with likely preferred prey in the region. OBIS Seamap (http://seamap.env.duke.edu/) was queried for all observations within the study area (1).

2. After exploration of available data, killer whales and sperm whales were determined as focal species.

3. Sperm whales are known to prefer Humboldt squid, which are documented in the region during low oxygen saturation (hypoxic) conditions.

4. Killer whales (resident) prefer Chinook salmon that are documented to prefer warm (9-12˚C) waters.
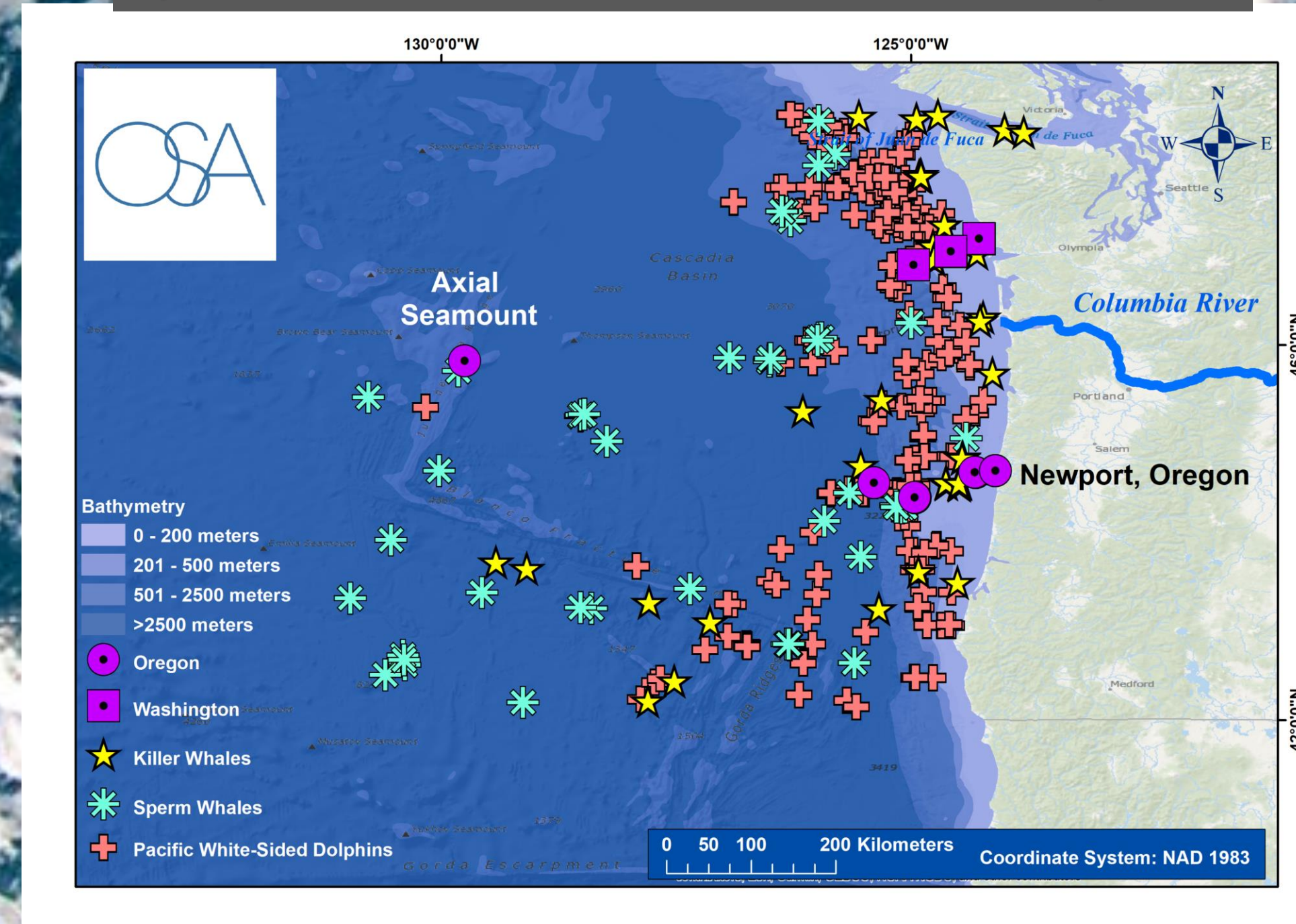
RESULTS

- Glider data determined to be most valuable due to collection depth and spatial resolution.

- Preferred conditions for Humboldt squid (low oxygen saturation) occurred in Spring 2018 (2).

- Ideal temperatures for Chinook salmon at typical depth of 100m were absent in two seasons (3A & 3B).

DISCUSSION

- Greater temporal resolution needed to better characterize prey habitat, but information suggests some indication of suitability can be assessed from the observatory datasets.

The compilation of oceanographic variables from multiple sources can provide useful insights into dynamic environments but require caution when interpreting results.

Next Steps in the Project...

- Expand effort to include larger datasets, explore additional oceanographic variables, and determine better uses of mooring data for this effort.

- Incorporate remotely sensed data products to fill temporal and spatial gaps in data.

- Explore acoustic backscatter and shipboard data collections for direct prey information.

- Utilize the broadband hydrophone data along the Oregon line and Axial Seamount to provide concurrent information regarding the vocal occurrence of marine mammals in the study area

Visit our website for future project and training updates! OSA develops online training opportunities related to our research and we envision offering training using OOI data in the future.
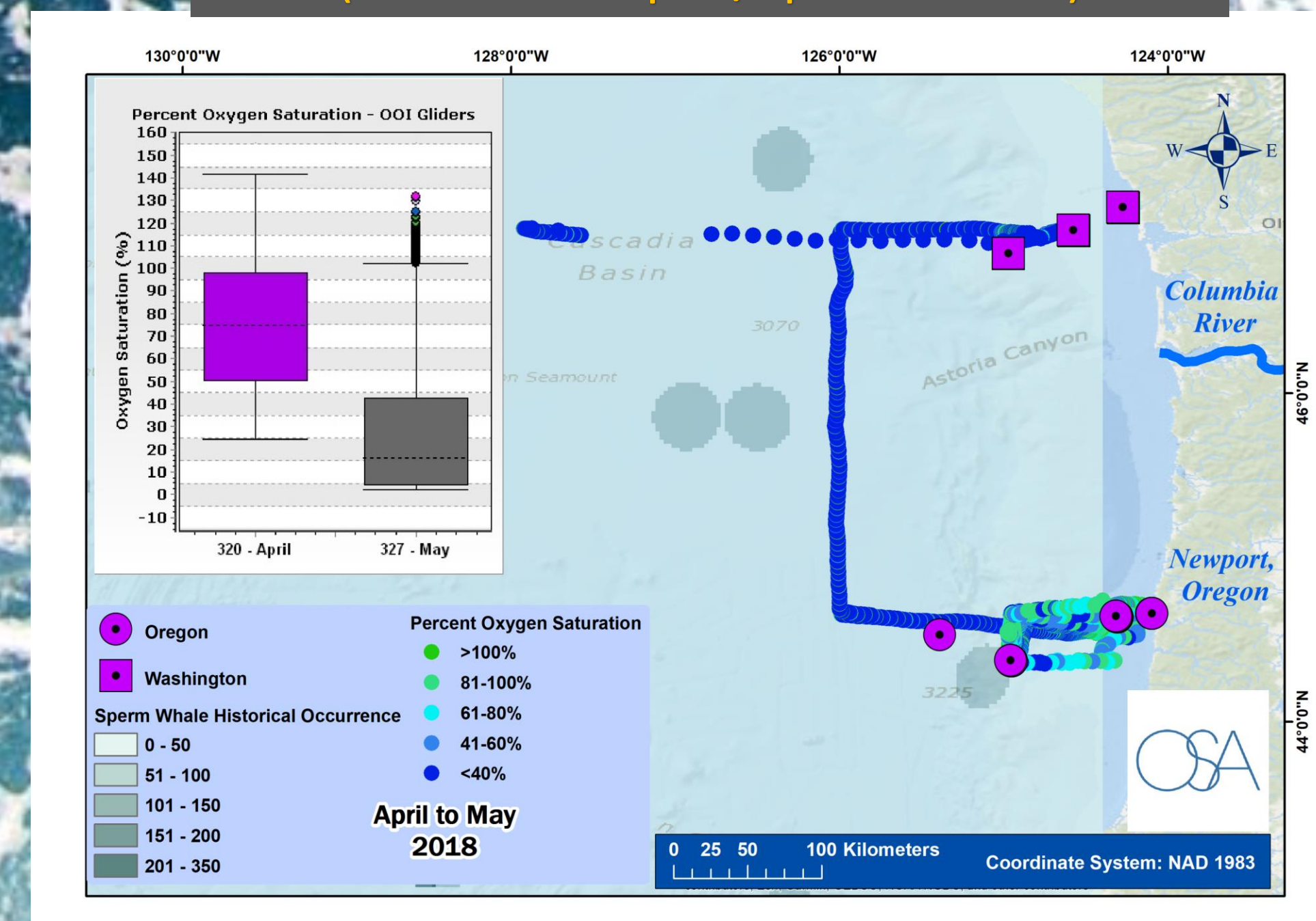
SCAN ME

1: OBIS Seamap observations of killer whales, sperm whales and Pacific white-sided dolphins
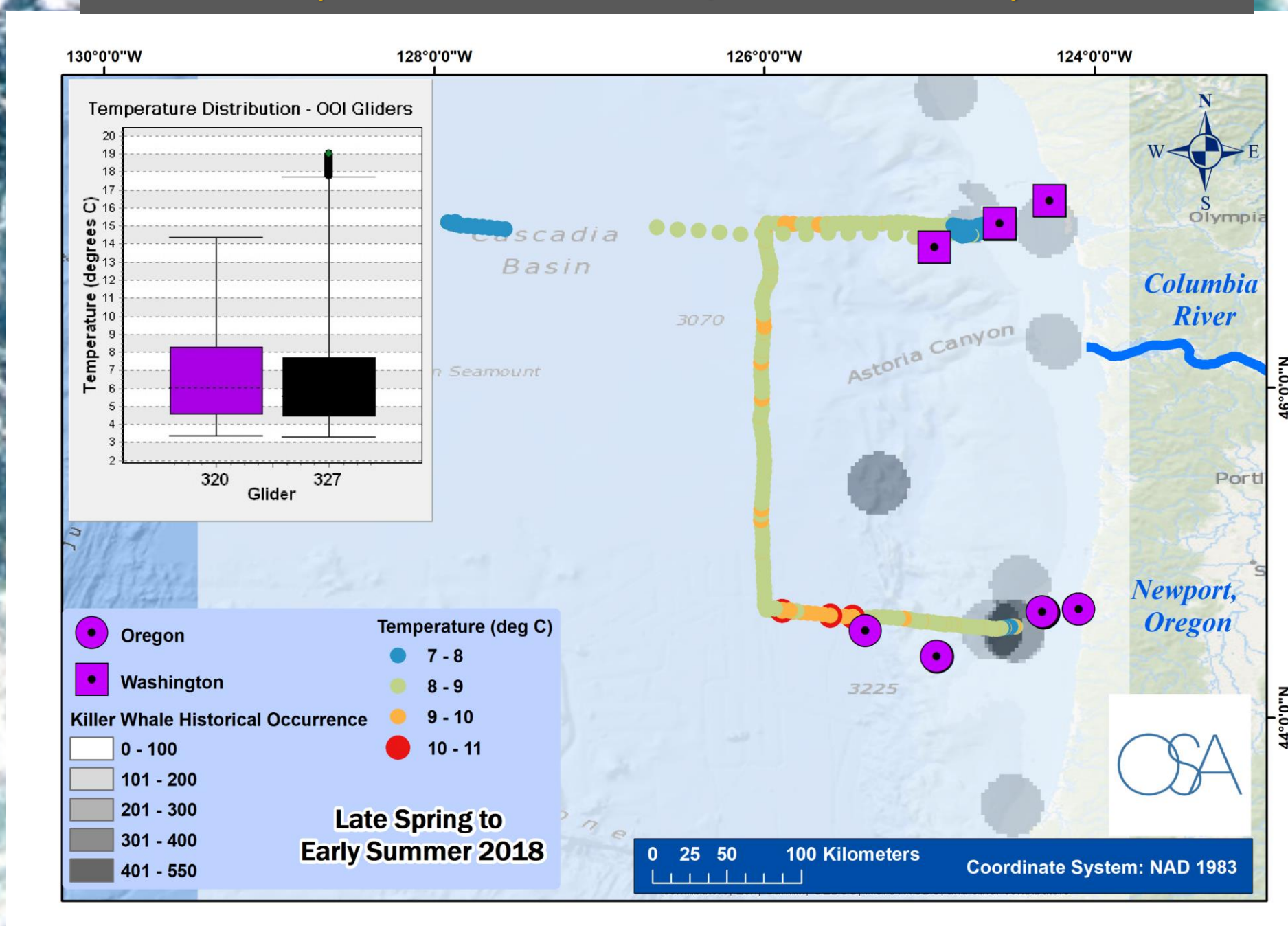
3A: Glider temperature in Summer-Fall 2017 (Chinook salmon/Killer whale)
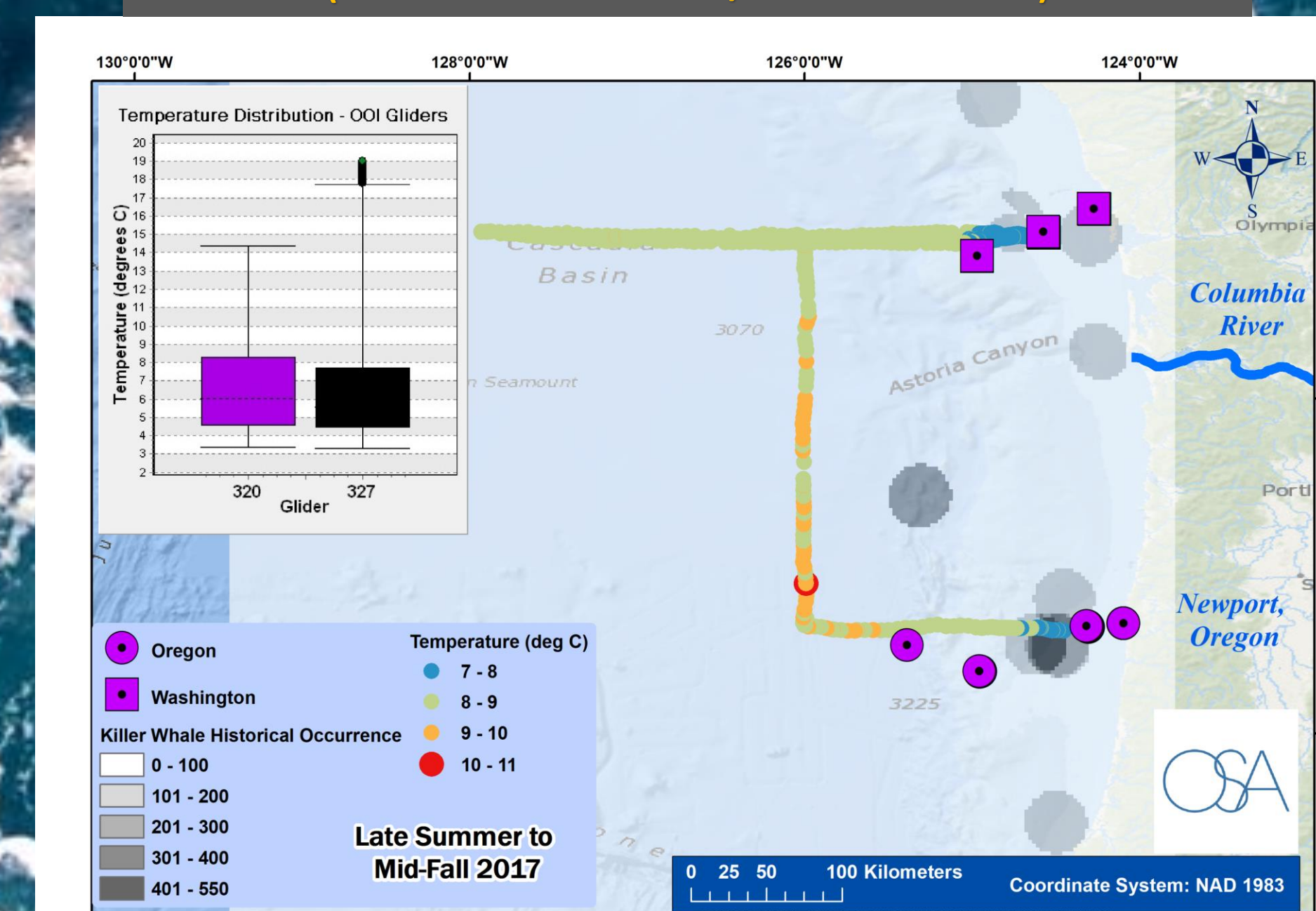
2: Glider oxygen saturation in Spring 2018 (Humboldt squid/Sperm whale)

3B: Glider temperature in Spring-Summer 2018 (Chinook salmon/Killer whale)

Ocean Science Analytics