North Pacific Fisheries Commission

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Joint Canada-USA International Seamount Survey

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Background and Objectives:

The Joint Canada-USA International Seamount Survey (JCUISS) was designed to study deep-sea coral and sponge communities on seamounts in international waters. Deep sea coral and sponge distributions outside of US and Canada EEZ's are relatively under explored, with the exception of a handful of studies conducted at the Cobb Seamount complex off of southern British Columbia. Historically (1970's – 1990's) many of these offshore seamounts were fished by both domestic (Canadian and USA) and foreign (Russia, Korea and Japan) fishing fleets. Currently, there is limited fishing by the Canadian Sablefish longline trap fleet at seamounts in international waters. The intersection between deep-sea coral and sponge distribution and fisheries is an ongoing concern of the North Pacific Fisheries Commission, the Regional Fisheries Management Organization for international waters of the North Pacific Ocean (www.npfc.int). The NPFC manages fisheries and vulnerable marine ecosystems (VME's) to monitor potential significant and adverse impacts on deep sea corals and sponges.

The main focus of this survey was on benthic invertebrates and fish and the primary objective is to generate spatially explicit data using underwater stereo video cameras that can be used to map the distribution of deep-sea corals and sponges at the seamounts, document their size structure, visible impacts of human activity, and their species associations.

A number of secondary objectives were also addressed, including:

- Collecting eDNA samples from each stereo-camera transect for laboratory analysis
- Collecting observations of marine mammals and birds along the vessel trackline
- Collecting oceanographic data (temperature, salinity, oxygen, etc.) and zooplankton samples at stations during nighttime hours
- Collecting fisheries acoustic data and ADCP data continuously along the vessel trackline at seamounts

Approach:

The survey used a stratified-random sampling design with depth strata on 5 seamounts (Figure 1). Five depth strata (0-200 m, 200 – 400 m, 400 – 600 m, 600 – 800 m and 800 -1100) were defined a total of 100 stations were randomly allocated. The survey was carried out during a 14 day cruise (Sept. 6-20, 2022) aboard the Canadian Coast Guard Vessel *John P. Tully*. Seventy-seven of the allocated stations were occupied across all five seamount at depths ranging from

~100 to 850 m (Figure 2).

The main tool used in this work was the underwater stereo camera system developed during the Alaska Coral and Sponge Initiative in 2012-2015. The stereo-camera survey followed a standard protocol outlined in Rooper et al. (2016), with a target of 15 minutes of on-bottom time for each transect. Images will be processed to determine substrate type, density and size of structure forming invertebrates and density and size of fish species using Sebastes software (Williams et al. 2015). The visual survey was designed in a robust statistically sound method so that inferences about the deep-sea coral and sponge communities on seamounts can be made. In addition distribution models for deep-sea coral and sponge taxa were developed to aid in the selection of depth strata. An estimate of the total abundance of deep-sea coral and sponge (and associated fishes) will be generated using the sampling for each of the seamounts and the seamount chain. Further species distribution modeling will also be conducted to predict hotspots of abundance and diversity in the seamounts that may warrant protection as vulnerable marine ecosystems (FAO 2009).

In addition to the visual survey, we also collected data that can be used to describe the oceanography of the seamounts and can be used for comparisons of the physical conditions experienced by deep-sea coral and sponge communities. We also collected water samples with adjoining images that can contribute to ongoing eDNA studies and taxonomic studies. Acoustic data from scientific echosounders will be also be collected for benthic mapping and estimating zooplankton distribution and abundance. These samples and data are currently being processed in the laboratory.

Significant Results to Date: Preliminary image analysis showed that corals were present at 57% of the transects occupied. Most of the corals occurred at depths below 400 m and corals were present at most transects on all seamounts below this depth (Figure 2). Coral taxa appeared to consist of Primnoidae, Isididae and other Octocorallians and Antipatharians at deeper depths. Hexactinellid sponges had a similar distribution to the corals, although they occurred in only 44% of the transects. Hydrocorals were common at shallow depths on Cobb and Corn seamount, while sea whips and sea pens were not common, but found at most depths. Interestingly, demosponges were found only rarely (~5% of the transects occupied). Figure 3 shows the spatial distribution of samples and dominant taxa on the five seamounts.

Discarded longline gear was observed at ~20% of transects and a single furrow believed to be indicative of bottom trawl gear was observed. Most of the fishing gear occurred on Cobb Seamount.

It should be noted that these data are the result of a cursory look at the transect data and will change when detailed image analysis is completed.

Additional Collaborators:

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For more information:
There were a series of blog posts by Paul Hillman (NOAA) during the cruise which can be found here.

Figures:

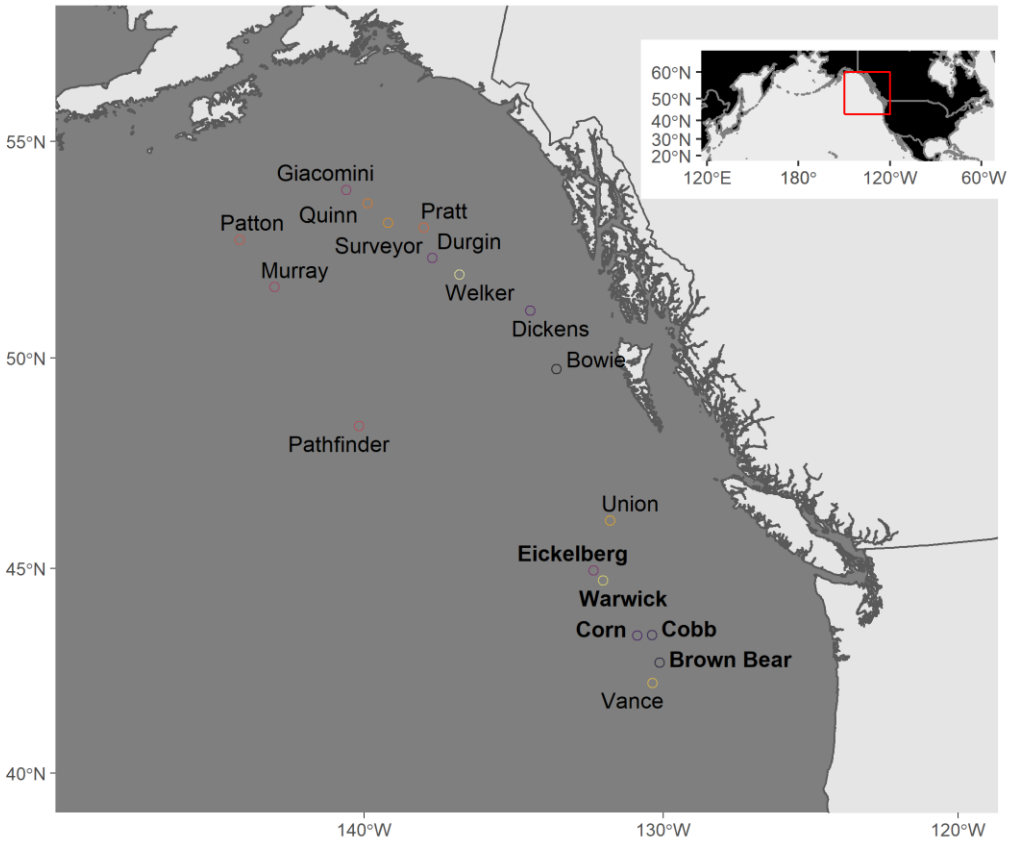

Figure 1. Map of eastern North Pacific Ocean seamounts showing the five seamount complexes surveyed on the cruise in bold text (Eickelberg, Warwick, Corn, Cobb and Brown Bear).

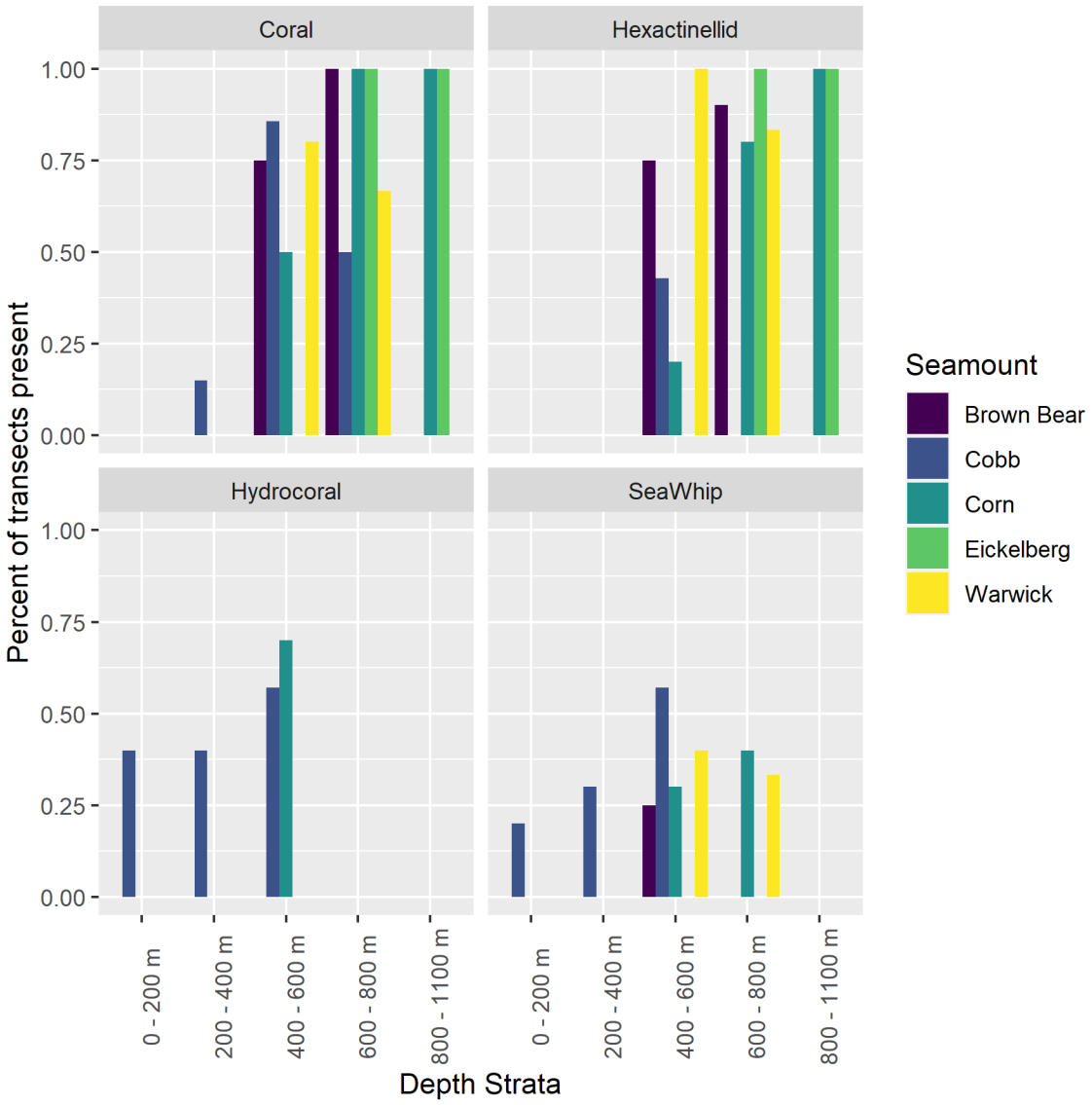

Figure 2. Percentages present for the four most common structure forming invertebrates at the five seamounts surveyed during the Joint Canada USA International Seamounts cruise.

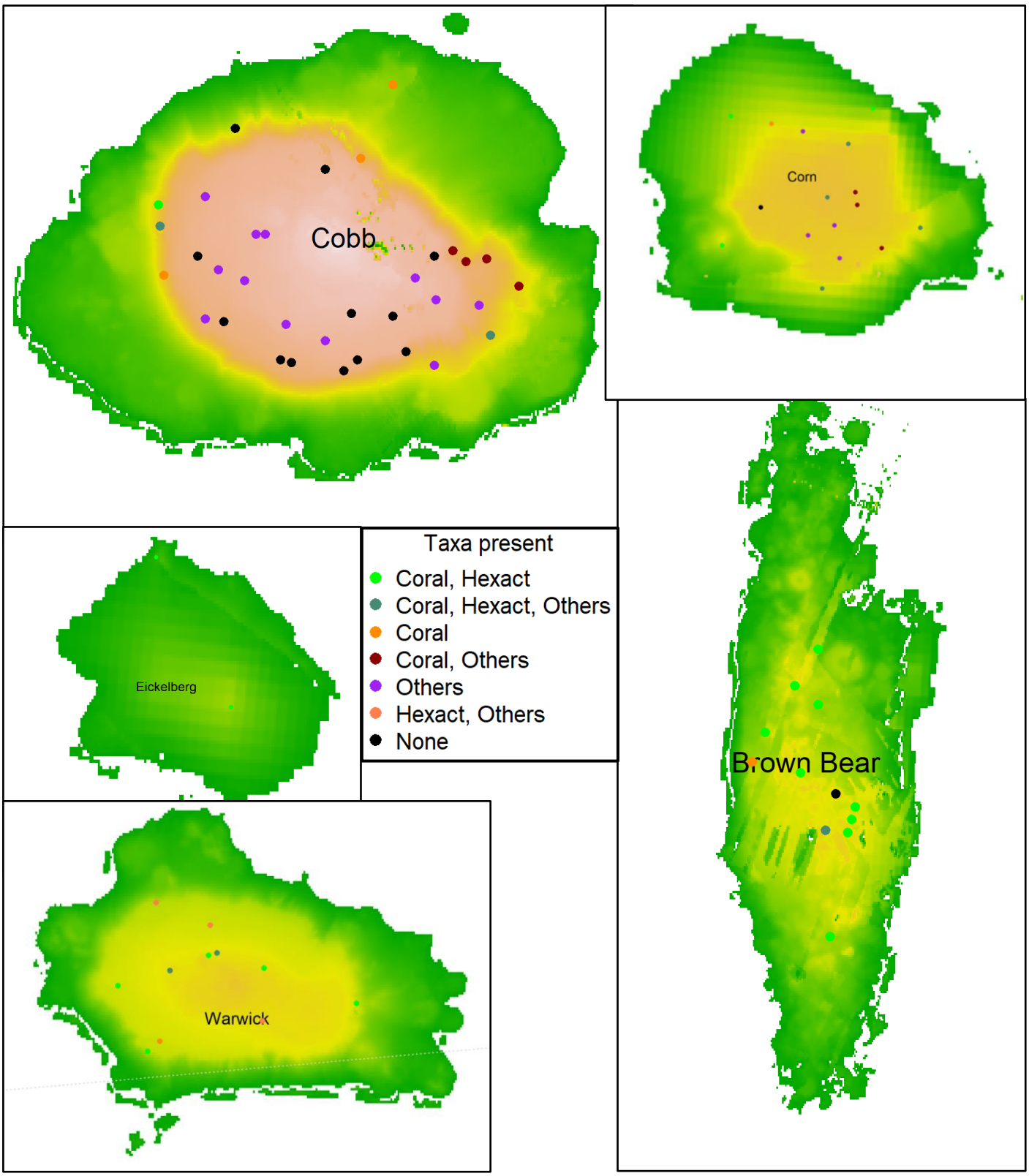

Figure 3. Locations of transects (n = 77) and the most common structure forming invertebrates occurring at the five seamounts surveyed during the Joint Canada USA International Seamounts cruise.

Figure 4. Example images of corals and sponges collected at seamounts in international waters.