Effect of ferry vessel activity on Brandt's Cormorant foraging behavior

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BACKGROUND

Brandt's Cormorants (*Urile penicillatus)* are coastal pursuit-diving seabirds which primarily breed along the California Current system where seasonal upwelling is strongest.[1]

When upwelling diminishes during the winter, Brandt's Cormorants redistribute along the west coast to overwintering areas with suitable foraging conditions.[1]

Overwintering cormorants have been observed to roost near the Tsawwassen ferry terminal, an area characterized by frequent vessel disturbance.

METHODS

Pre-existing Brandt's Cormorant GPS and Automatic Identification System (AIS) datasets will be used to examine cormorant movement and behaviour in relation to vessel activity.

Brandt's Cormorant GPS Data

- 30 adult cormorants were tagged between October 11-26, 2023 at the Tsawwassen Breakwater by Lindsay Lalach (former MSc student) and Environment and Climate Change Canada.
- Tags recorded GPS locations and dive events.
- Preliminary analysis focused on daytime tracks of 3 cormorants between November 1-30, 2023, selected as representative examples of general movement patterns.

AIS Vessel Data

- Provided by Ocean Networks Canada for vessels operating in the ferry terminal area.
- Final analysis will use daytime records of passenger vessels.

PRELIMINARY RESULTS

- A large proportion **(44.7%)** of Brandt's Cormorant dives occurred within the Tsawwassen ferry terminal area during November 2023, indicating that this area is an important foraging hotspot.

- Dive distribution aligned closely with the continental shelf boundary, highlighting the influence of ocean depth on foraging patterns.

The Tsawwassen ferry terminal area is **one of two important foraging sites** for Brandt's Cormorants in BC.

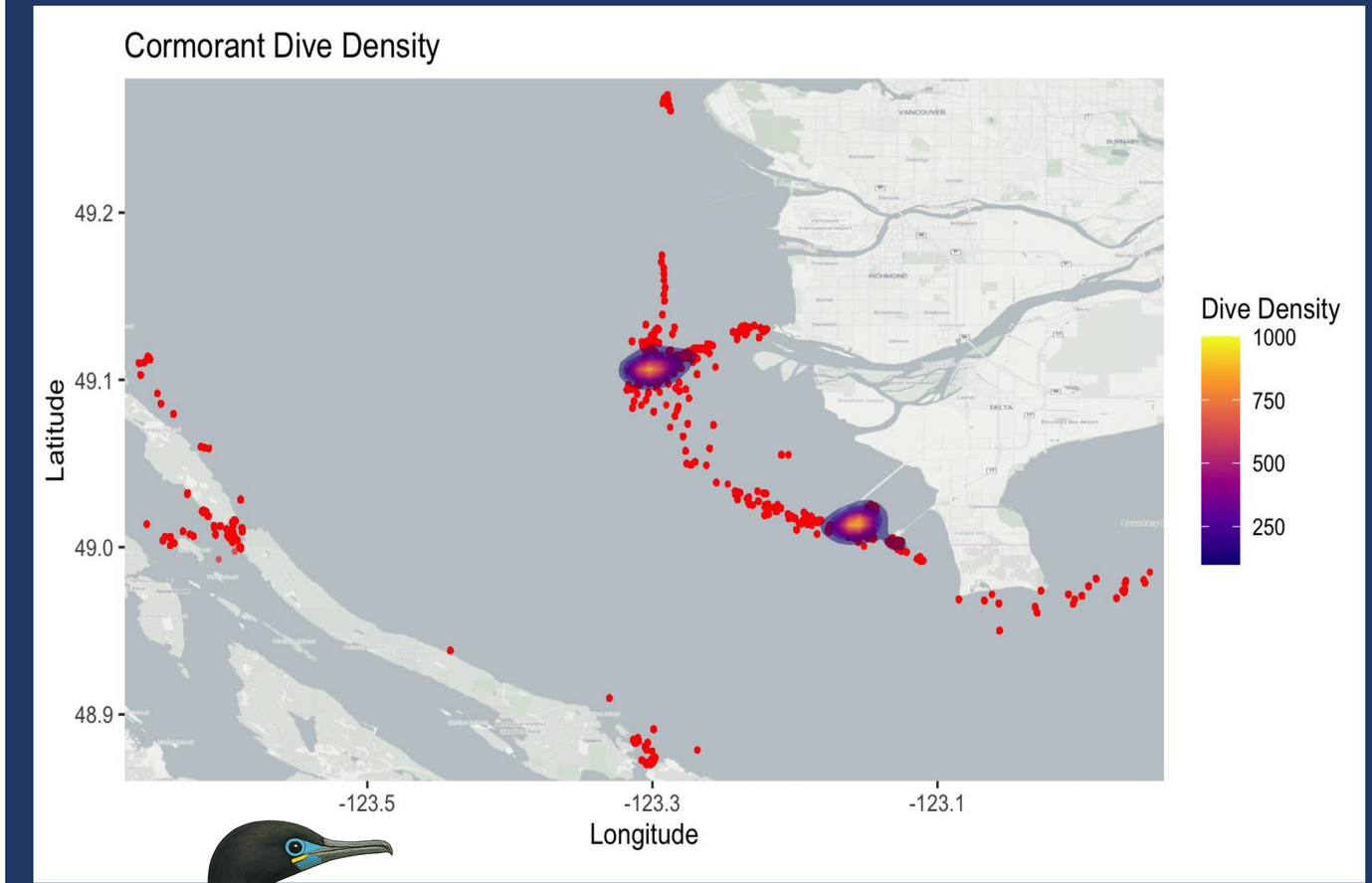

Figure 1. Dive density map of three individual cormorants (November 1-30, 2023). Dive hotspots indicate important Brandt's Cormorant foraging sites in BC.

FIGURES

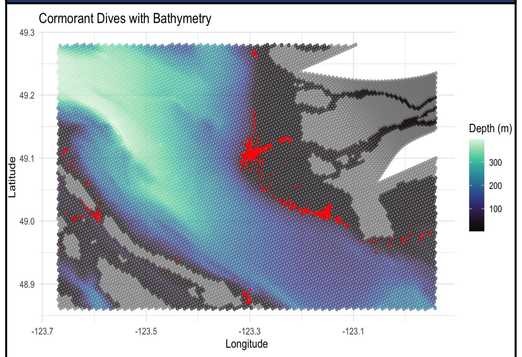

Figure 2. Dive locations for three different cormorants overlaid on bathymetry (ocean depth).

Region	Number of Dives	Percentage (%)
Ferry Terminal Area	112391	44.7
Fraser River	104280	41.5
Other Areas	34873	13.9

Figure 3. Distribution of dive counts between the Tsawwassen Ferry Terminal area, the Fraser River, and other areas using defined zones.

NEXT STEPS

- The Tsawwassen ferry terminal area has been identified as an important foraging region.

- Next steps will examine how ferry vessel activity influences cormorant foraging behavior using tracking data from all 30 cormorants.

- State switching models will be used to determine whether cormorants are more likely to transition into a foraging state in the presence of nearby ferries.

REFERENCES

[1] Cornell Lab of Ornithology. 2017. Brandt's Cormorant Life History. [Web page].

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