

Year-Round Abundance Monitoring of Large Whales Throughout the
Yuutu?it?ath Government & Maa-nulth Nations' Southern Marine Territory
2022-2024 Final Report

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Photo credit: J. Crosby

Introduction

Yuutu?i?ath are the ‘people of the safe harbour’. Historically synchronized with marine life and cycles, Yuutu?i?ath are intrinsically connected with the ocean. The Yuutu?i?ath Government (YG) recognize that there is an increase in marine shipping traffic along the West Coast of Vancouver Island (WCVI) in areas that large cetaceans are known to frequent (Tamburello, et al., 2025). Concerns with the recovering North Pacific humpback population interacting with the large vessels in this area are coupled with climate change impacts response (DFO, 2017; DFO, 2025; Cheeseman, et al., 2024), the recent coastwide gray whale unusual mortality events (UME) (P. Cottrell, pers comm., 2025), and the decline of the endangered southern resident killer whales within their critical habitat (Thornton, et al, 2022). The negative impacts facing large cetaceans call for a mounting awareness of the cumulative effects from anthropogenic and climatic impacts within the Yuutu?i?ath food, social and ceremonial rights-based area and traditional territory.

The Yuutu?i?ath Government’s marine stewardship program aims to address data gaps on the year-round abundance and distribution of large whales throughout YG and the Maa-nulth First Nation’s marine territory. This work focuses on aerial monitoring efforts throughout Barkley Sound and offshore over the continental shelf of the West Coast of Vancouver Island within the boundaries of the Maa-nulth First Nations’ Treaty Agreement - designated ‘southern Maa-nulth Domestic Fishing Area’ (MDFA). This data contributes to the collective knowledge of year-round whale occurrence within marine shipping vessel corridors, and abundance within critical habitat (sanctuary areas) off the WCVI. Aerial-based whale surveys were performed from March 2022 through June 2025. This study was one of the only repeated, year-round aerial marine mammal monitoring efforts occurring offshore of the WCVI.

Study Area

The study area includes the entire southern Maa-nulth Domestic Fishing Area, bounded by 49° 3.100' N, 125° 43.304' W at the northernmost point (Wickanninish Bay); out to 48° 8.148' N, 126° 41.893' W and 47° 58.095' N, 126° 22.525' W at the south westernmost points (offshore); 48° 30.271' N, 124° 48.433' W at the easternmost point (mouth of the Juan de Fuca Strait); and to the northeasterly point of 49° 6.070' N, 124° 49.189' W within the Alberni Inlet (Fig. 1. Southern Maa-nulth Domestic Fishing Area map).

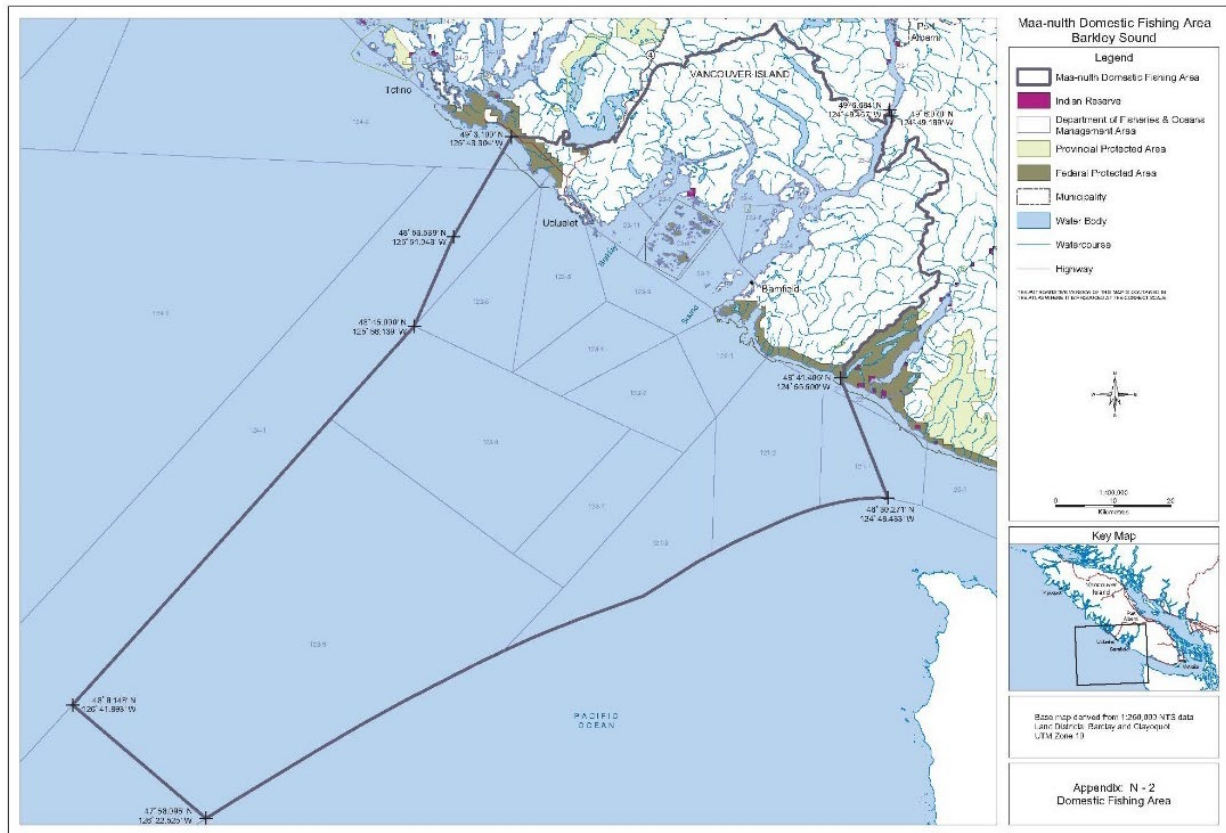


Figure 1. Southern Maa-nulth Domestic Fishing Area Boundary with UTM reference points.

Methods

Large cetacean monitoring was performed aerially from a fixed-wing Cessna 180J (C-GEAE, Serial # 18052571), scheduled twice monthly, year-round, and departing from the Ucluelet small craft harbour. Flights were performed along either of two transect routes: (A.) *Offshore* up to 75 km straight line distance from the Ucluelet Peninsula shoreline, with an average total transect survey of 694 km. (Fig.2a) or (B.) To the *Continental Shelf* - focusing monitoring efforts along the shelf (~200m depth) and nearer inshore, with an average total transect survey of 602 km (Fig.2b). Both flight paths cover the critical marine habitat areas of Swiftsure Bank and the continental shelf break. Parallel transect spacing is 10 km, whereby observers determined positive sighting ability well over the 5 km halfway point in clear conditions.

Nearshore flights closer to the surf line and into Barkley Sound were also performed when conditions were too poor further out. These flights are considered under incidental monitoring effort, with an average total transect survey of 356 km.

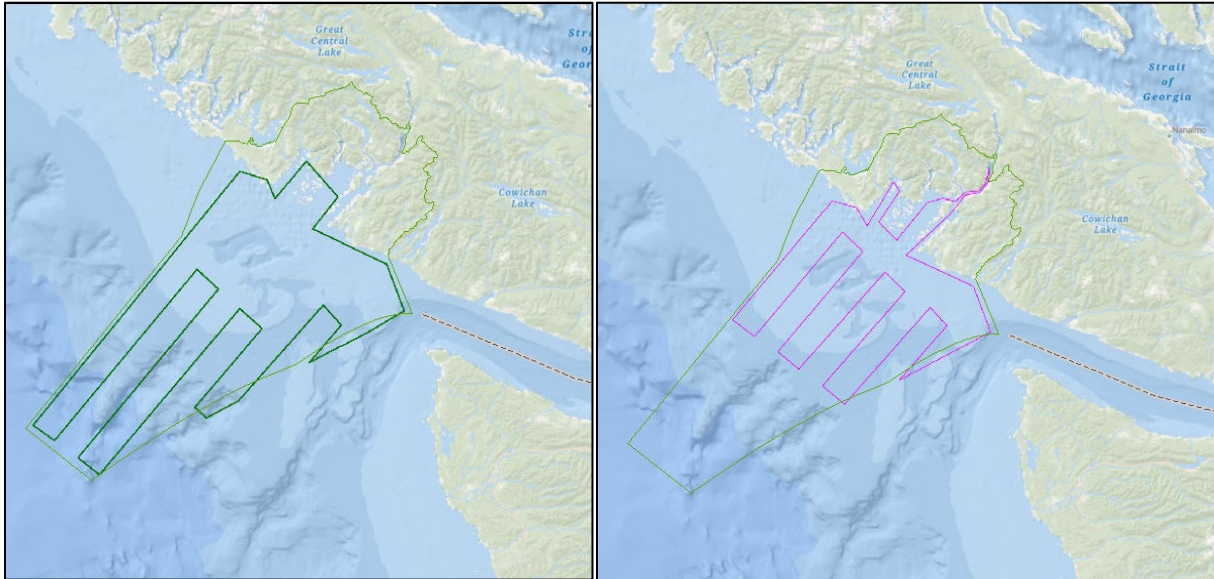


Figure 2a. & 2b. Large Cetacean Survey Flight Paths within the Southern Maa-nulth Domestic Fishing Area boundary for (2a.) Offshore (2b.) Continental Shelf surveys.

All flights were flown under the best predicted and available weather conditions. Ideal marine survey conditions were performed with winds under 25 km/hr, zero fog or low-lying cloud, low to no precipitation, and with calm seas. Observations and species identification were successful with the plane between 260-305 m; this aligns with other aerial marine mammal monitoring studies. Overly white-capped wave conditions, heavy fog, or high winds (greater than 25km/h) were not conducive to effective, confident whale sightings; such conditions were avoided, with surveys re-scheduled.

Data were recorded for: flight start and finish time, sea state, and visibility conditions. When a large cetacean was spotted, the number of individuals and species were verified, with flight track and UTM position obtained using a Garmin InReach GPS. If the whale was beyond 5 km away from the transect route, the whale was recorded while along the flight path with position later corrected for distance. Blow shape was used as an indicator of species, though identifications were verified closer visually; if the animal took a dive prior to full verification (but had an obvious large blow) the whale was labelled as ‘unidentified large whale’ (UnID LW). Comments were recorded for behavior, body condition, as well as proximity to large vessels.

Mitigations to lessen any stress on the animals included using a canon digital mirrorless camera with a telephoto lens (100-400 mm) to assist with species identifications, and focused awareness to spending the minimum time required to identify and record the species and location before moving away from the individual animals.

Results

From March 2022 to June 2025, a total of 70 aerial surveys were performed, including 44 offshore surveys, 26 continental shelf surveys, and three nearshore monitoring flights (Table 1.).

Monitors recorded 1126 large cetacean observation events, totalling 3019 individuals including North Pacific humpback whale (*Megaptera novaeangliae*), Northeast Pacific gray whale (*Eschrichtius robustus*), Northeast Pacific orca (*Orcinus orca*), fin whale (*Balaenoptera physalus*), Northern minke whale (*Balaenoptera acutorostrata*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*) (Figures 3- 5; Appendix A maps).

Total large cetacean abundance sightings were grouped quarterly for seasonal abundance of the three most recorded whale species: gray whales, humpbacks and orcas (Table 1.).

Table 1. Monitoring effort by survey year and type, with observation values for the top recorded large whale species within the Maa-nulth Domestic Fishing Area, 2022-2025.

Year & Survey Type	No. Surveys	No. Gray Whale	No. Humpback Whale	No. Orca Whale	No. Fin Whale	No. UnID LW	Total Obs.
2022 Offshore	11	2	454	98	11	3	568
2023 Offshore	18	49	250	81	31	6	417
2024 Offshore	5	-	372	6	7	6	391
2025 Offshore	10	22	299	36	38	11	406
Total	44	73	1375	221	87	26	1782
2022 Shelf	6	21	78	1	-	-	100
2023 Shelf	8	13	337	104	4	2	460
2024 Shelf	12	95	484	61	4	6	650
Total	26	129	899	166	8	8	1210

* UnID Unidentified Large Whale

*Nearshore surveys (2023 n=1 survey, 2 Hb, 2024 n=2 survey, 16 Hb)

Humpbacks were observed often in large numbers along the continental shelf, and at nutrient-rich upwelling areas, such as Swiftsure Bank (Appendix A). Fin whales were the most observed rorqual species in the deeper waters off the shelf, however minke, blue and sei whales were also observed. Gray whales were mostly seen feeding along the shallow tidal shelf in the summer, however, were recorded transiting multiple times in the offshore in the periphery seasons. Whales that were sighted by large blows but then took a dive by the time the plane got to their last observed location (and dive footprint) were recorded as ‘unidentified large whales’ - as a full positive identification could not be made to species. Orca, including the threatened southern resident ecotype, were recorded in the Swiftsure Bank area, as well as exhibiting predatory transient interactions further along the continental shelf area. Orca records are under-represented

in this nearshore dataset (southern residents and transients), based on local sightings of the orcas in the harbour and the range of habitat use surrounding the local coast.

Certain smaller marine mammals were recorded, though undoubtedly mostly missed, outside of occurring directly below the plane over the transect areas. Harbour porpoise and fur seal are well represented at Swiftsure Bank from vessel-based monitoring studies (DFO and Ditidaht, 2024) but are rarely seen from the plane. To save flight time and effort, sea lions and harbour seals were not recorded as a priority. Parks Canada (PC) performs regular monitoring of the sea lion haul-outs along the PC Long Beach Unit, and Fisheries and Oceans Canada performs rotational monitoring flights on nearshore seal haul-outs across Vancouver Island.

Though deceased whales are rarely observed, as they sink to the ocean floor, one sperm whale was recorded as deceased and decayed. One fin whale was observed barely responsive at the surface and bleeding into the water.

Incidental observations were recorded for smaller or more rare marine mammals, as observed individually or while interacting with the larger cetaceans. Examples of other recorded species include, Dall's porpoise, fur seal, Baird's beaked whales; Risso's dolphins, common dolphins, pacific white-sided dolphins, salmon sharks and blue sharks. Sea otters (difficult to identify at passing heights and speeds) have been noted when observed, as their numbers are known to be increasing along the WCVI (a large raft of 30+ individuals was often recorded at sea bird rocks). Ocean sunfish were also incidentally recorded, for future marine condition discussions (*Mola sp.*; n= 1437 indiv. over 293 records; May through October 2022-24, May-June 2025).

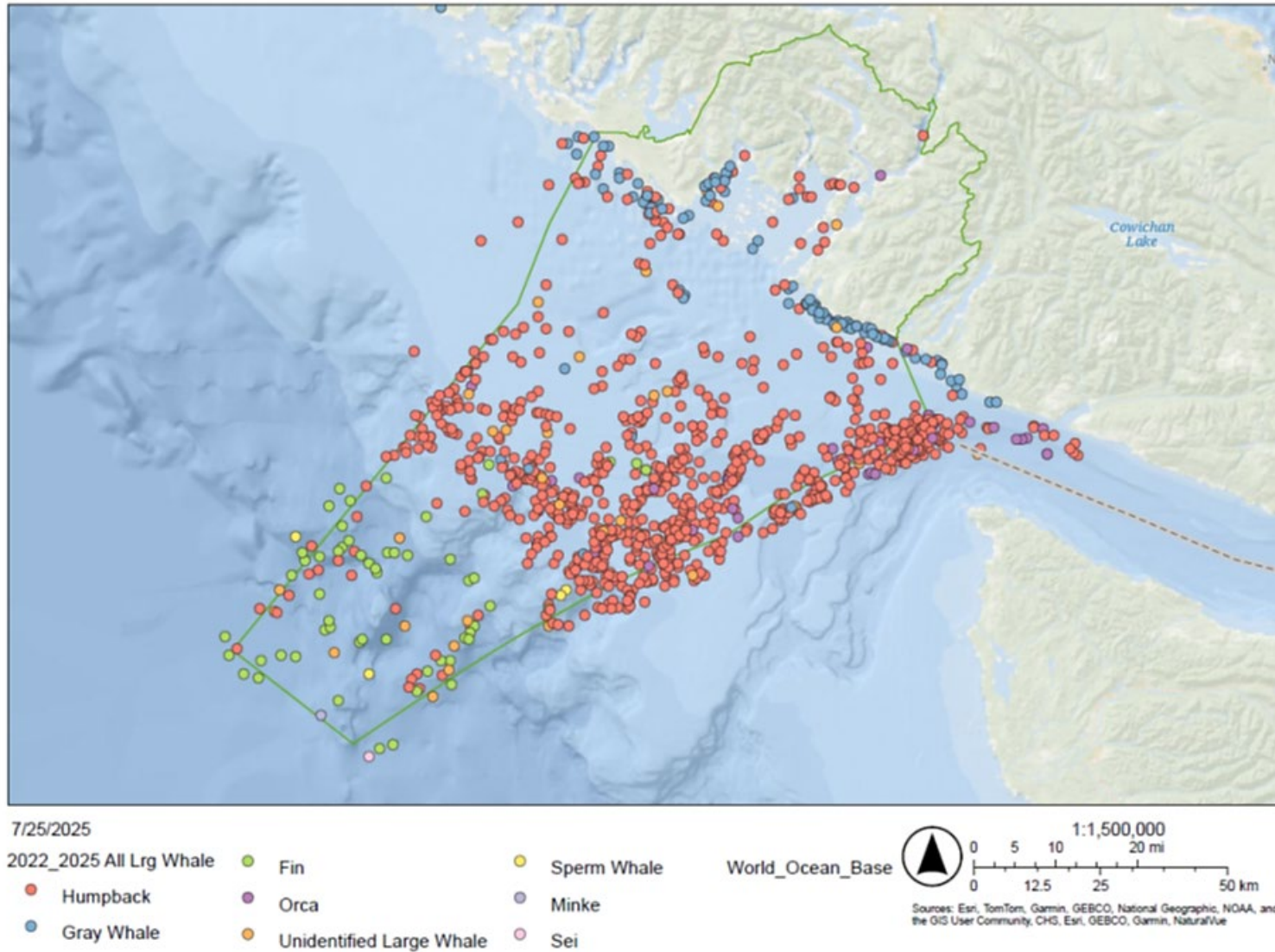
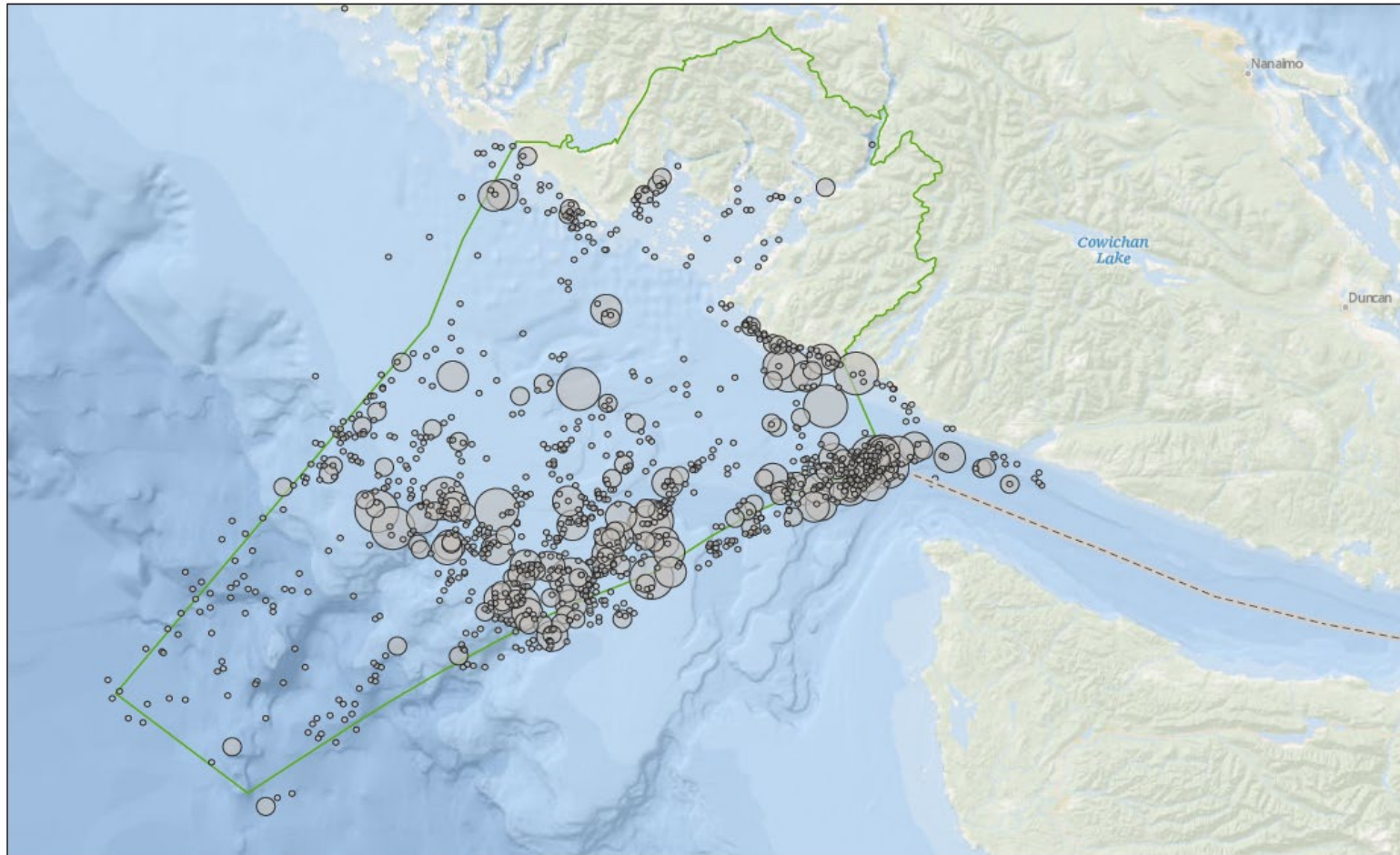


Figure 3. Year-round large cetacean species abundance by observation event (not weighted for individuals per record) within the southern Maa-nulth Domestic Fishing Area, March 2022 – June 2025.



7/25/2025

2022_2025 All Lrg Whale

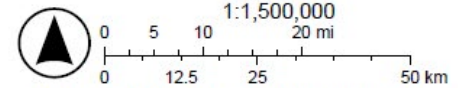
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○ > 3 – 9

○ > 9 – 20

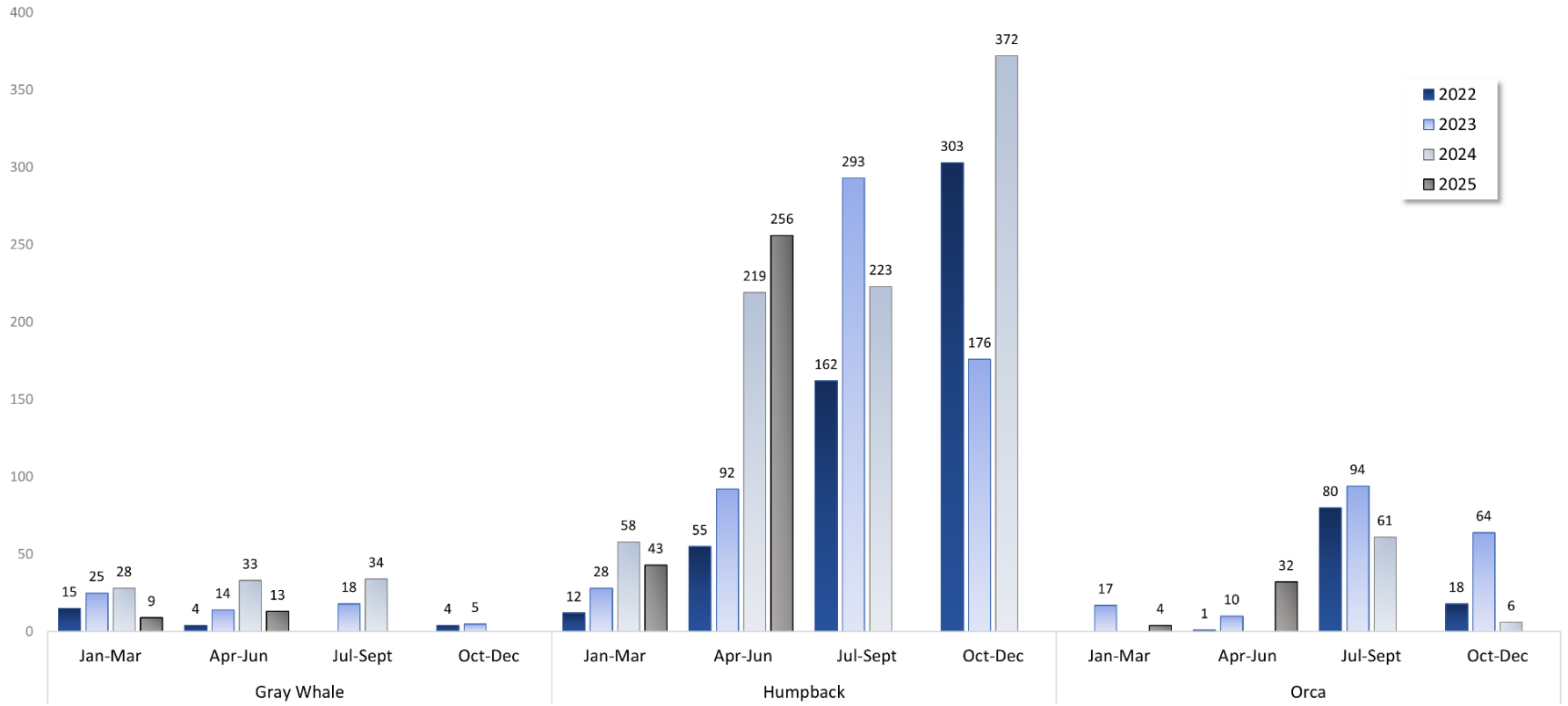
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Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, CHS, Esri, GEBCO, Garmin, NaturalVue

Figure 4. Year-round large cetacean abundance, within the southern Maa-nulth Domestic Fishing Area, March 2022 – June 2025.



*Not weighed for survey effort, based on an average of two flights per month.

Figure 5. Quarterly Gray Whale, Humpback, and Orca abundance within the Southern Maa-nulth Domestic Fishing Area, Mar 2022- June 2025.

Discussion

Critical abundance data, that may be otherwise missed in other seasonal-based or summer inventories, was recorded with the arrival of gray whales and humpbacks during the return of the herring early in the year (January/February), as well as when they remain to feed as the herring broadcast spawn (February/March). Though species abundance information may be recorded more often in the nearshore because of ecotourism tours occurring during the herring spawn (as held by OceanWise Sightings Network), this was crucial information to gather over the larger extent of the MDFA while the whales transited through.

Similarly, without consistent year-round monitoring, the large numbers of humpback whales recorded each December traversing local waters would be missed. DFO (2017), published results of aerial surveys (n=34 days between 2012-2015) observing humpback, fin and blue whales in the fall and winter months, concentrated mostly in September. The authors acknowledge that humpback whales are migratory, and that fall-winter survey effort does not represent the full year-round impact of large whale occurrence relative to whale-vessel encounters or lethal vessel strike. Nonetheless, there are correlations between the whale distribution model in DFO (2017) and this study, with the highest densities of humpbacks at ~200m depth (i.e. along the continental shelf) and fin whale densities predicted in depths exceeding ~400m, west of the shelf. A recently published CSAS report analysing humpback whale, Dall's porpoise and harbour porpoise densities throughout the Salish Sea to Swiftsure Bank (WCVI) observed year-round seasonal shifts in distributions, and also highlighted the importance of these repeated, year-round surveys to inform patterns and impact mitigation action (DFO, 2025).

Large aggregations of whales were often found in conflict with designated shipping lanes, especially at Swiftsure bank, and along the edge of the continental shelf break. Whales (i.e. humpbacks, fins, and orcas) have been observed directly in the shipping vessel's paths. With the increase in marine shipping traffic and rise in humpback populations, these interactions are forecasted to be increasingly common. This is also a concern in areas of high recreational fishing and small vessel transiting areas (i.e. Barkley Sound to Swiftsure Bank), as emerging whales can be injured by transiting vessel props.

Conclusion

Coinciding with local, Indigenous knowledge, we found that large cetaceans occur regularly and year-round within the southern Maa-nulth Domestic Fishing Area, with high concentrations surrounding nutrient-dense upwelling areas and designated critical marine habitat; these areas also coincide with marine vessel shipping lanes and commercial and recreational fishing areas.

This study has significantly contributed to the greater understanding of the seasonal and spatial occurrences of large whales within the Maa-nulth marine territory. As negative cumulative effects and pressures rise on marine species, this emphasizes the importance of consistent and regular monitoring in adding to the collective knowledge efforts for making informed, data-driven decisions on mitigation measures and planning.

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Acknowledgements

This project was supported by the Yuutu?it?ath Government as a priority program within the Department of Lands and Resources. Special gratitude to Yuutu?it?ath Government staff who participated in the planning, logistics, monitoring, and reporting on this project.

Thank you to Westcoast Wild Adventures float plane pilots: L. Rouleau, J. Rubel and J. Hartikainen.

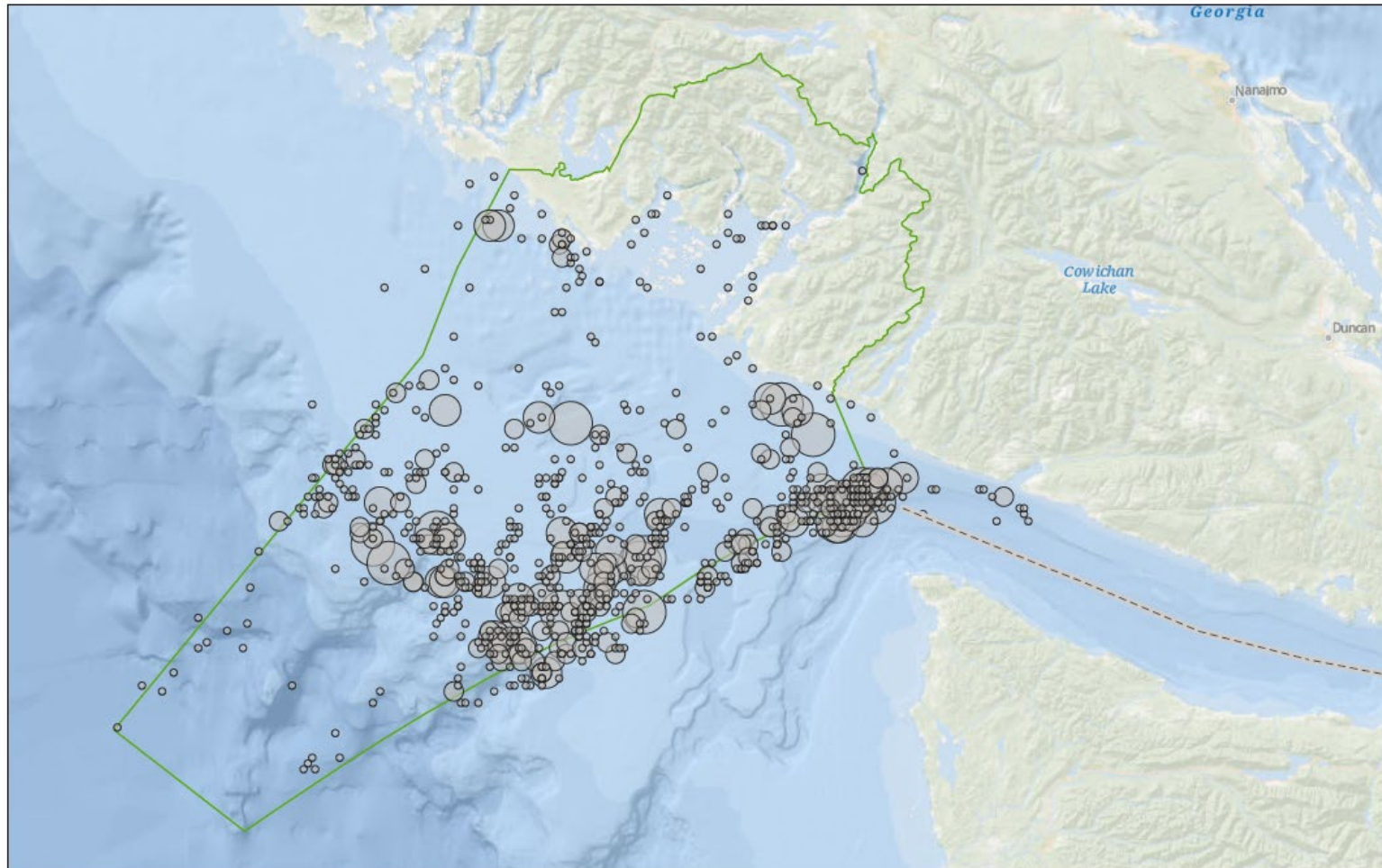
This project was funded through Salish Sea Initiative- TMX Accommodation, administered and supported by Department of Fisheries and Oceans, Canada. Appreciation to their staff for logistics planning, methodology assistance, and reporting support.



Gray whales sifting through sediment in Barkley Sound (J. Crosby, 2023).

Appendix A.

Humpback Whale Density, 2022-25



7/25/2025

2022_2025 Humpback

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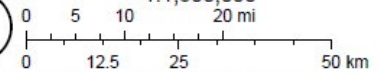


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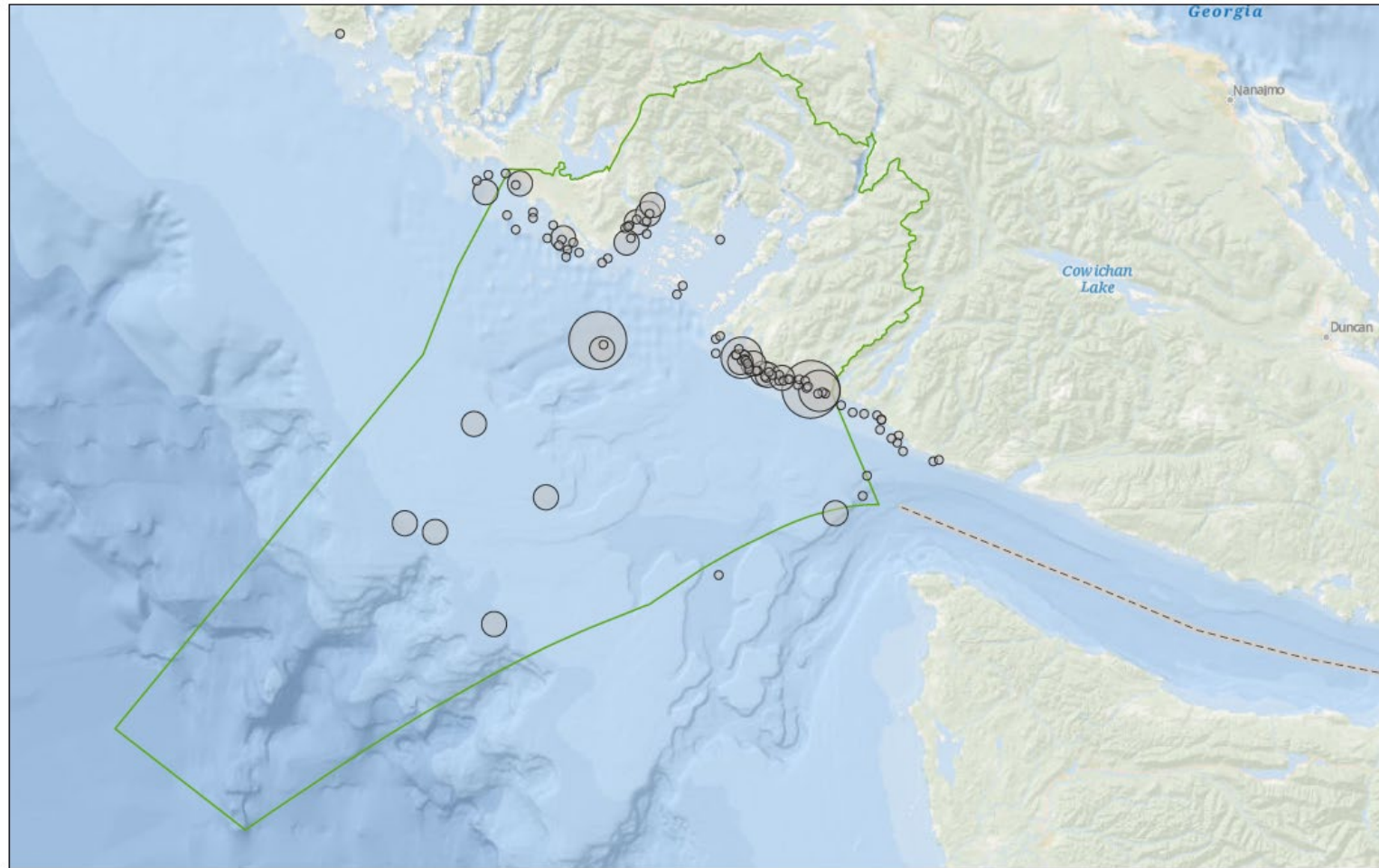


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Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, CHS, Esri, GEBCO, Garmin, NaturalVue

Gray Whale Density, 2022-25



7/25/2025

2022_2025 Gray Whale

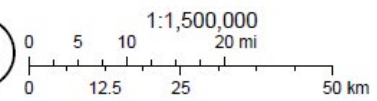
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○ > 5 – 8

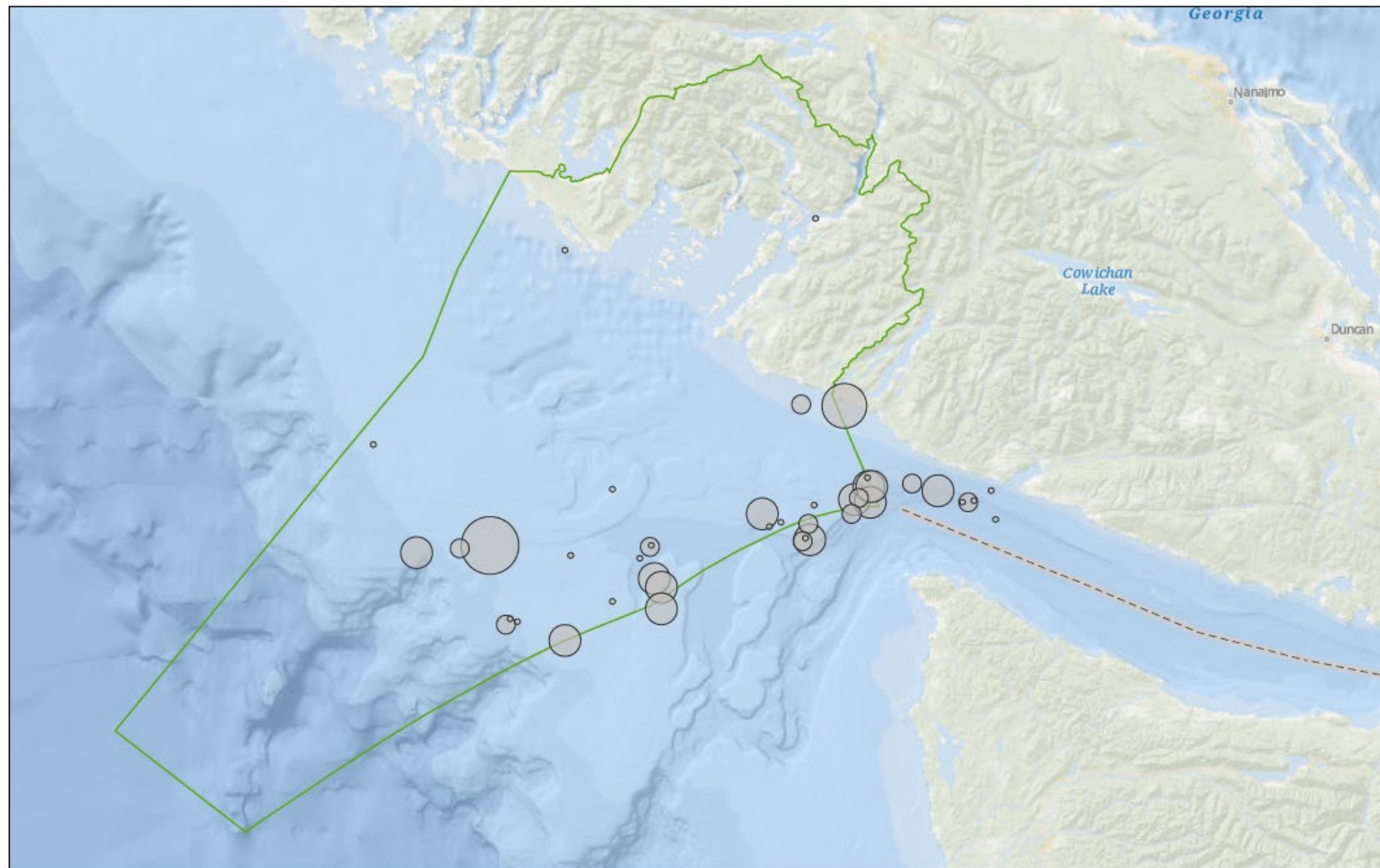
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Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, CHS, Esri, GEBCO, Garmin, NaturalVue

Orca Density, 2022-25



7/25/2025

2022_2025 Orca Occurrence

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○ > 10 - 20

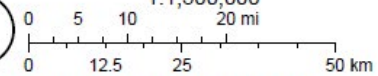
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Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, CHS, Esri, GEBCO, Garmin, NaturalVue