



Western Washington University
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Salish Sea Ecosystem Conference

2020 Salish Sea Ecosystem Conference
(Online)

Apr 21st, 9:00 AM - Apr 22nd, 4:45 PM

A baseline of seasonal changes in the at sea distribution and abundance of marine birds near shipping lanes around southern Vancouver Island.

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Shared Knowledge for the Future

Oiling threats to marine birds and their prey populations in the Salish Sea.

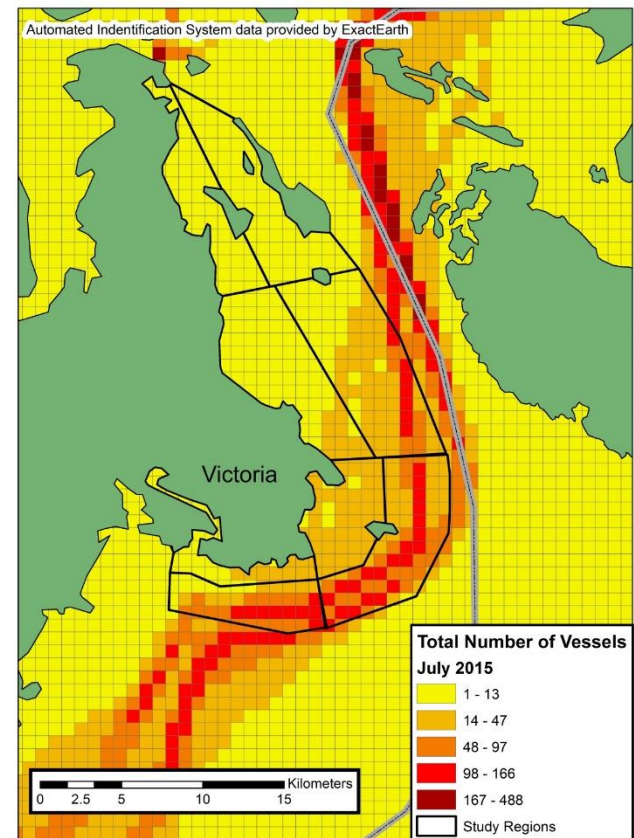
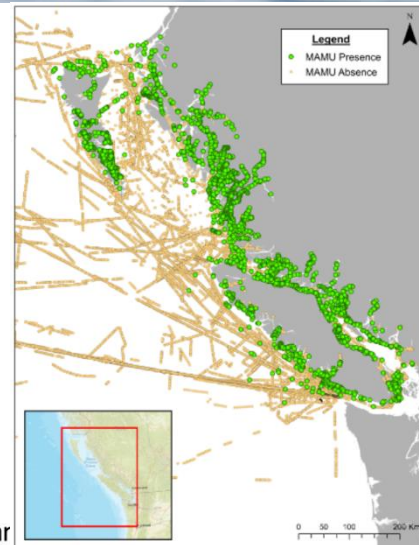
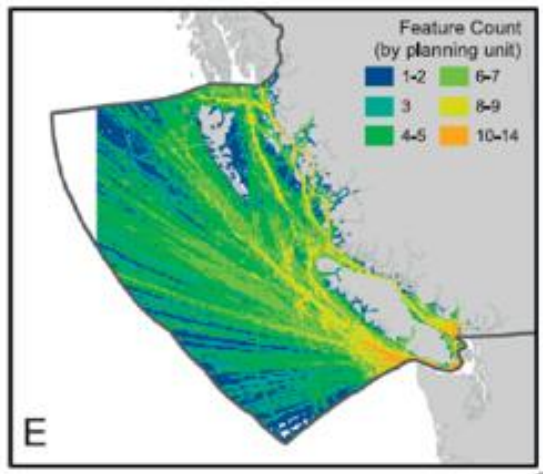
Authors: D.F. Bertram, P.D. O'Hara, A.M. King, C.L.K. Robinson, & K. Woo

Date: 20 April 2020

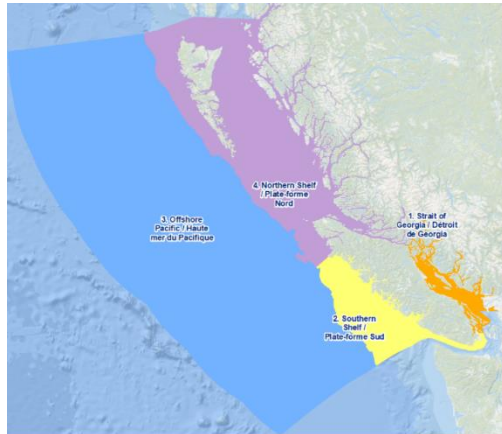
Venue: Virtual

Project: Quantification of oiling threats to marine birds and their prey habitats in BC

- Oil from vessels (risk estimation, eg., Wong et al. 2018, Leiske et al. 2020)
- Scale: coast wide, and Salish Sea (2015-2019) studies.



Marine Spatial Planning: DFO Pacific Marine Bioregions



BC coast



South Coast



TMX expansion: Expect 7 fold increase in tanker traffic



March 2016



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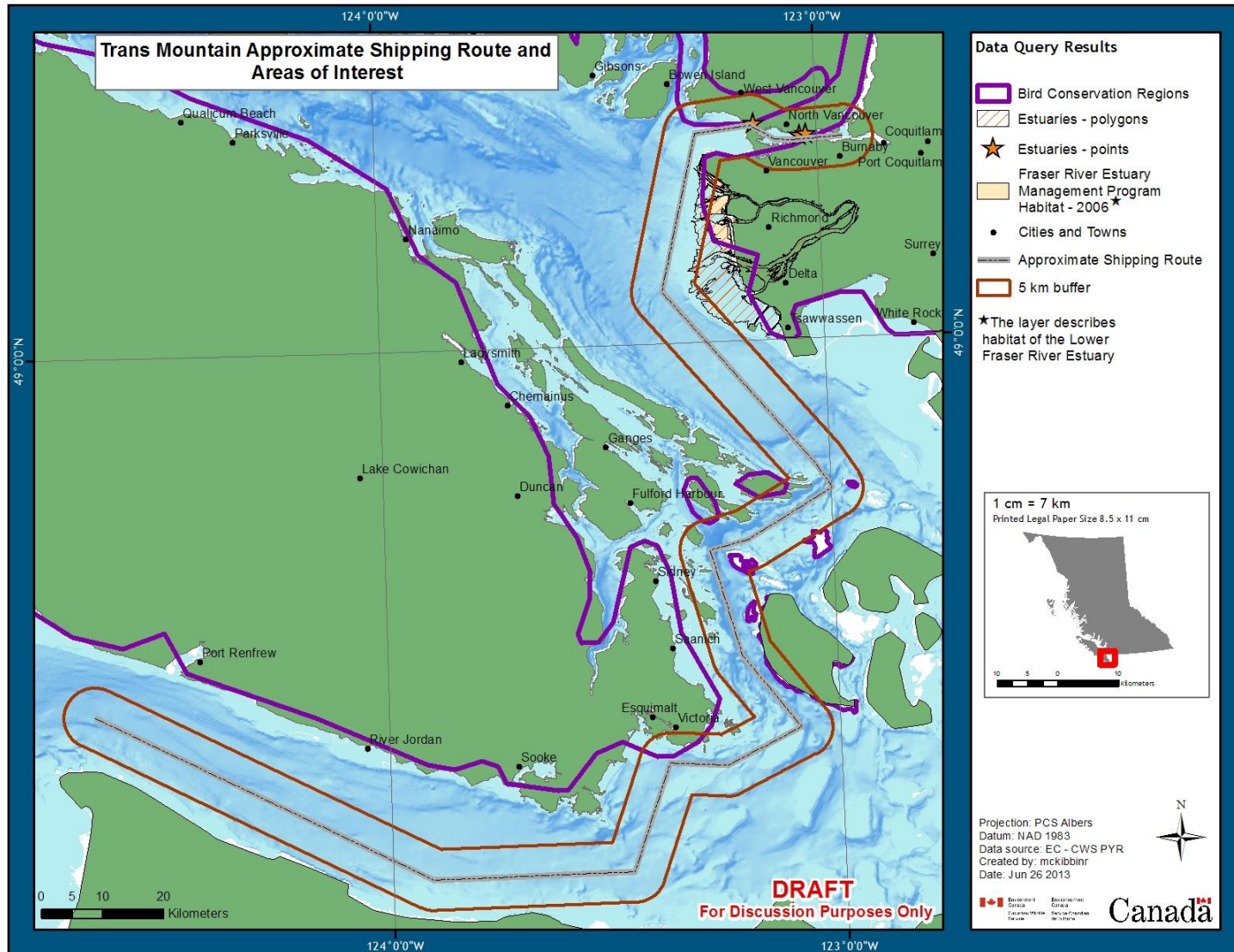


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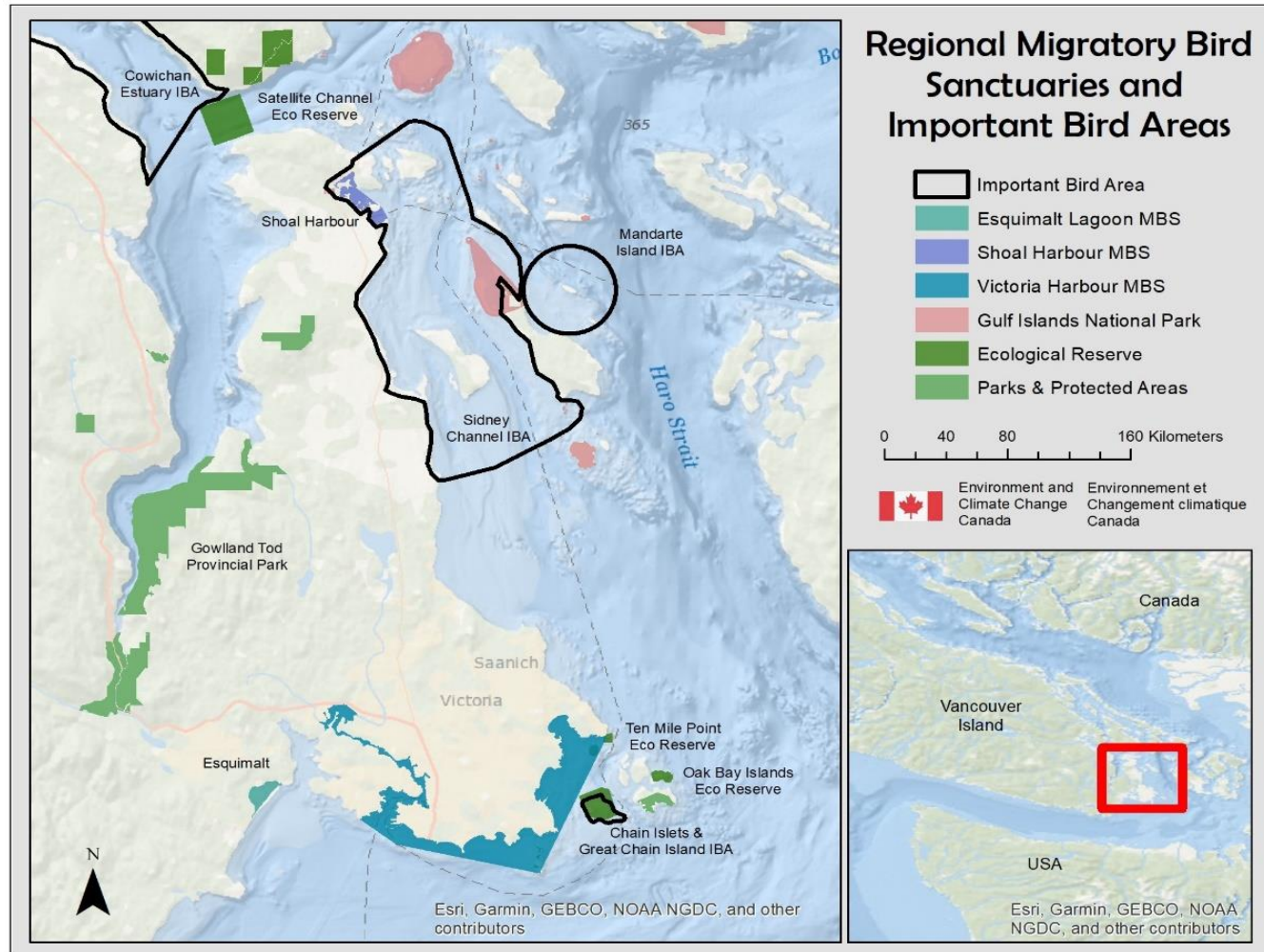
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TMX Expansion Project: Route and Areas of Interest



Study area conservation designations

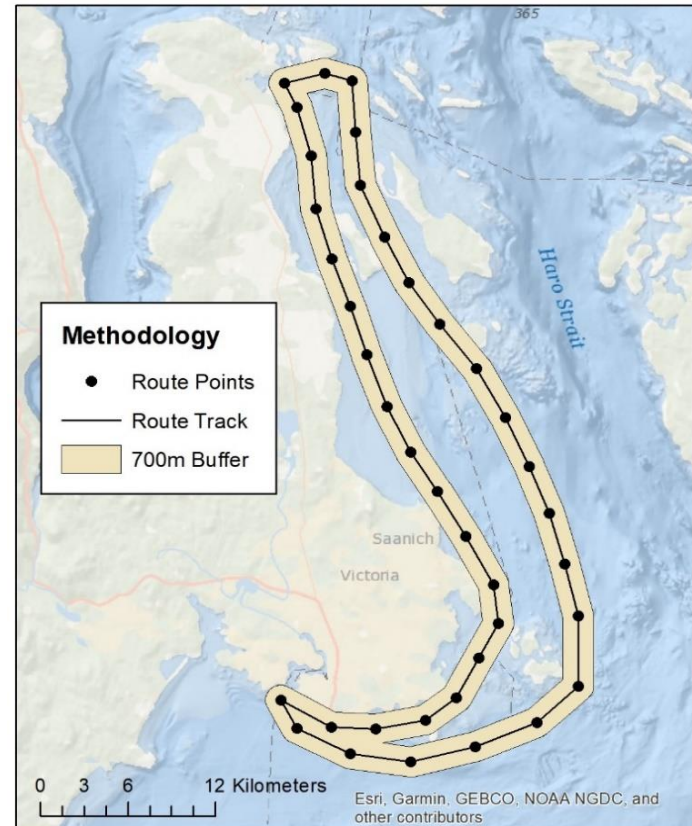
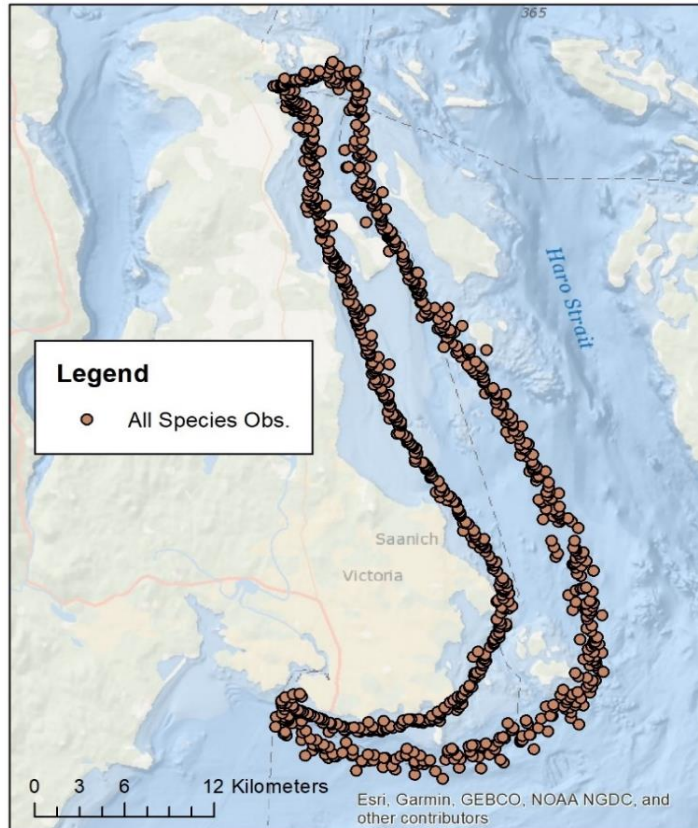


Marine bird survey methods

- FV Misty Lady, Captain Bruce Evans
- Sidney to Victoria (inside) and return (outside), 8hrs max.
- Bird Observer (Bertram, Maftei, Halpin)
- 200 m on starboard side of vessel
- All species counted
- Locations recorded at 10 minute intervals
- Year round time series
- Nov 2015 - Dec 2019
- 46 cruises



Survey route, segment centroids, and “zone” of bird count data.



Family Alcidae: wing-driven pursuit divers for *forage fish and zooplankton*

- RHAU (Rhinoceros Auklet), local nesting in WA
- COMU (Common Murre, big colonies in Oregon & Alaska)
- MAMU (Marbled Murrelet) forest nesting, small numbers on southern VI.
- PIGU (Pigeon Guillemot) local nesting
- ANMU (Ancient Murrelet) nest exclusively in Haida Gwaii



RHAU: Rhinoceros Auklet



- Oftens feeds Pacific Sand Lance to young
- Major breeding colony (72,000) on Protection Island, WA.

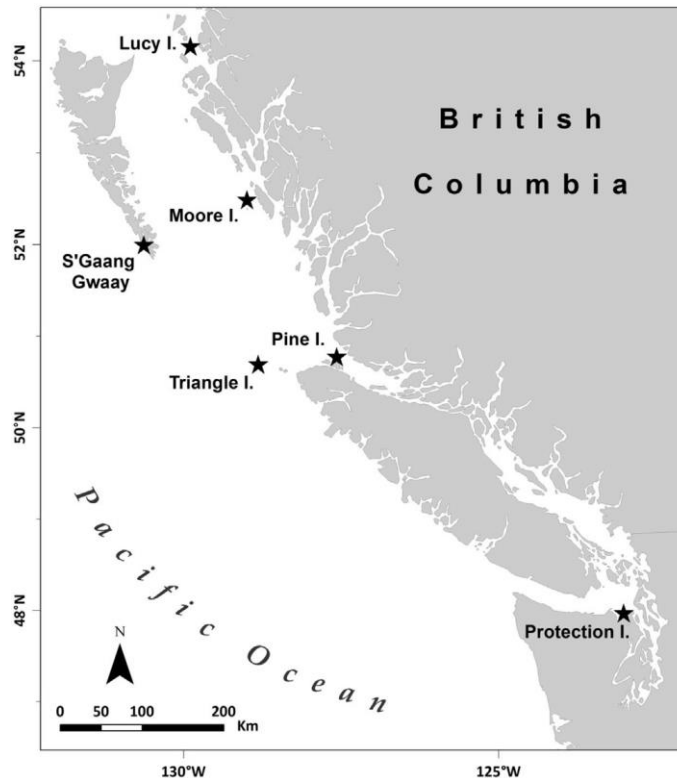


Fig. from Hipfner et al 2018

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COMU: Common Murre

- Breeds mostly outside of BC
- Dads feed young post fledging
- Eat PSL and herring – ball formation instigators



Photo: James Clowater

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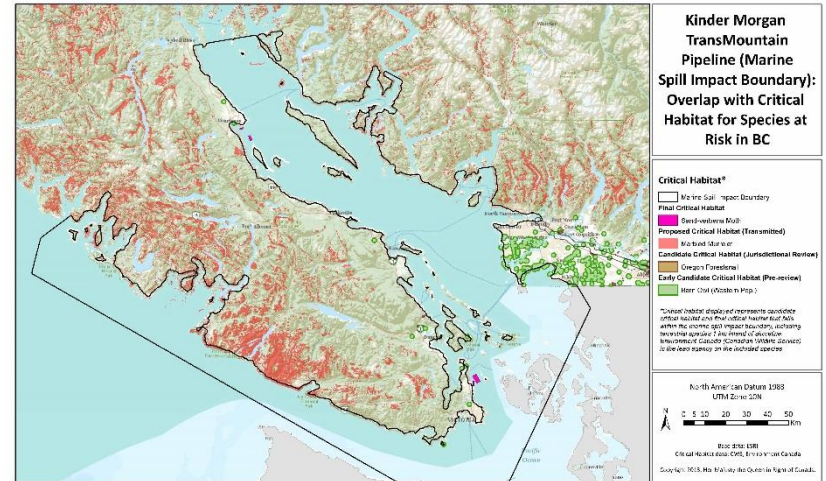


MAMU: Marbled Murrelet, *Threatened*, under SARA

- Forest nesting habitat (in red)
- Force PSL to “ball up”



Summer: Photo, Mark Cunnington



Winter: Photo Luke Halpin



PIGU: Pigeon Guillemot

- Fish eater, schooling, and benthic species
- Broad breeding distribution, including locally



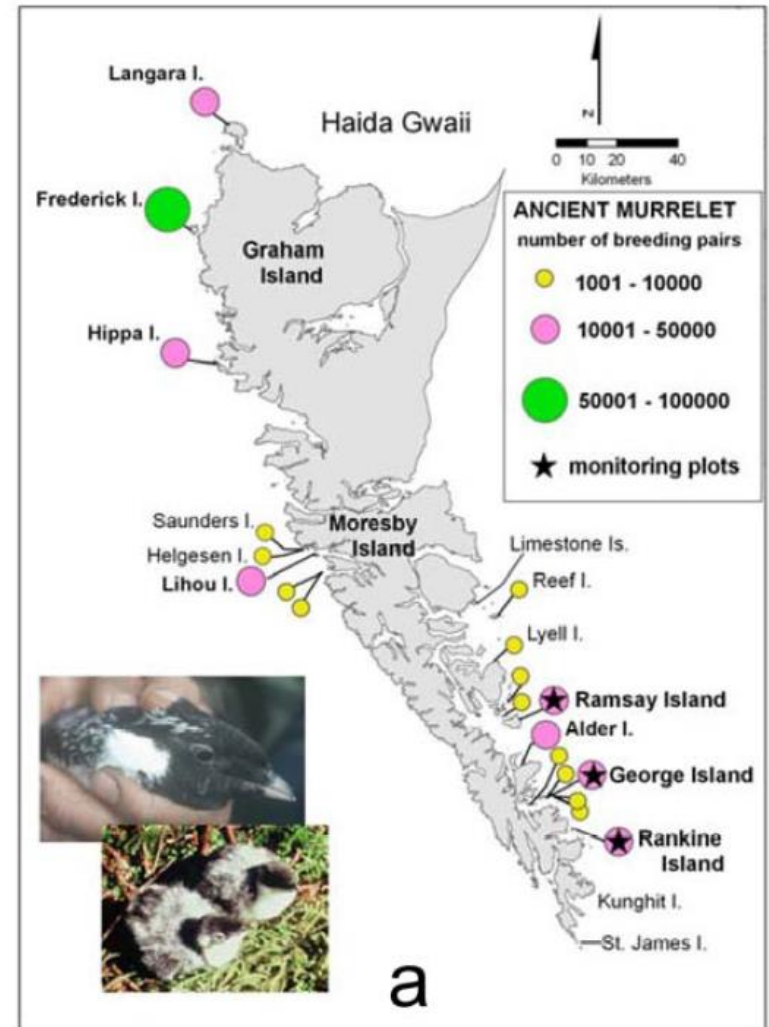
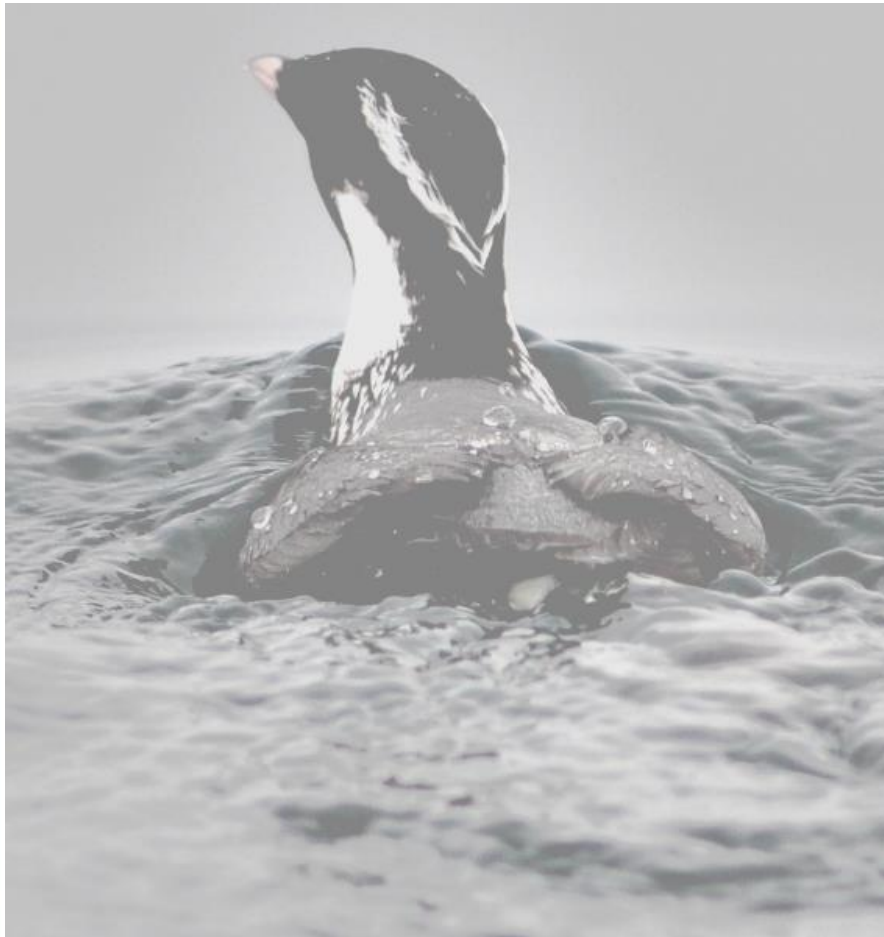
Summer Photo:
Kristin Charleton



Fall / winter Photo:
Luke Halpin



ANMU: Ancient Murrelet, *Special Concern* under SARA



Laskeek Bay
CONSERVATION SOCIETY

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Fig. from Rodway and Lemon 2011

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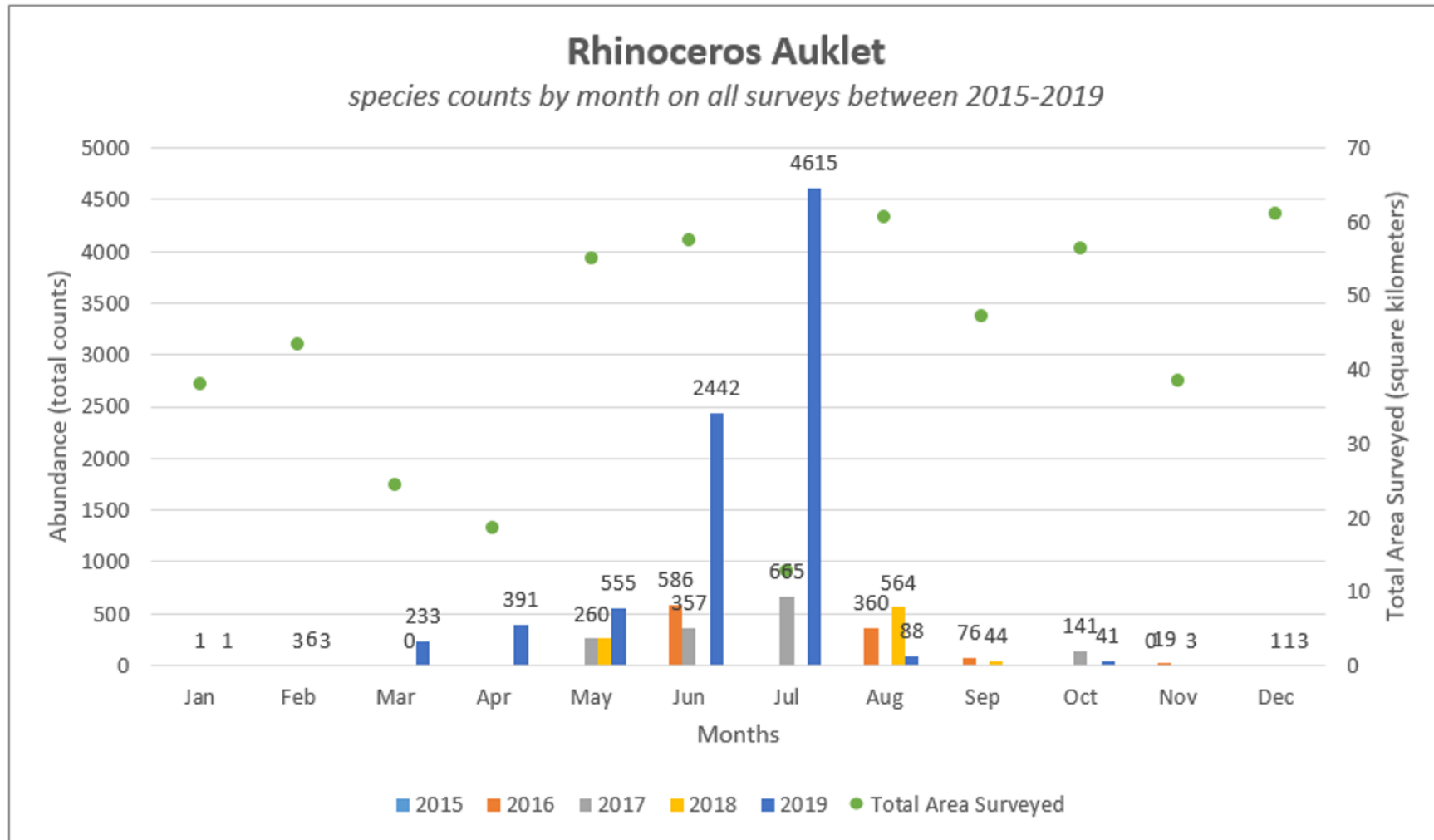
KDEs to show spatial patterns

- CSV dataset converted into a shapefile via centroid (midpoint of 10min segments) coordinates in ArcMap
- Raster for counts of each species (5) on each survey (46)
- Raster for survey effort (area, km²) on each survey
- Pool individual survey data from all years
- Raster math, stacked species / stacked effort
- Winter = October – March; Summer = April - September
- KDEs by species corrected for survey effort (km²)
- KDE *colours are relative within a figure not* between
- A detection of 1 bird in the winter looks like a hot spot!
- KDEs have *not yet been trimmed to reflect the 700m strip* to which the estimates apply!

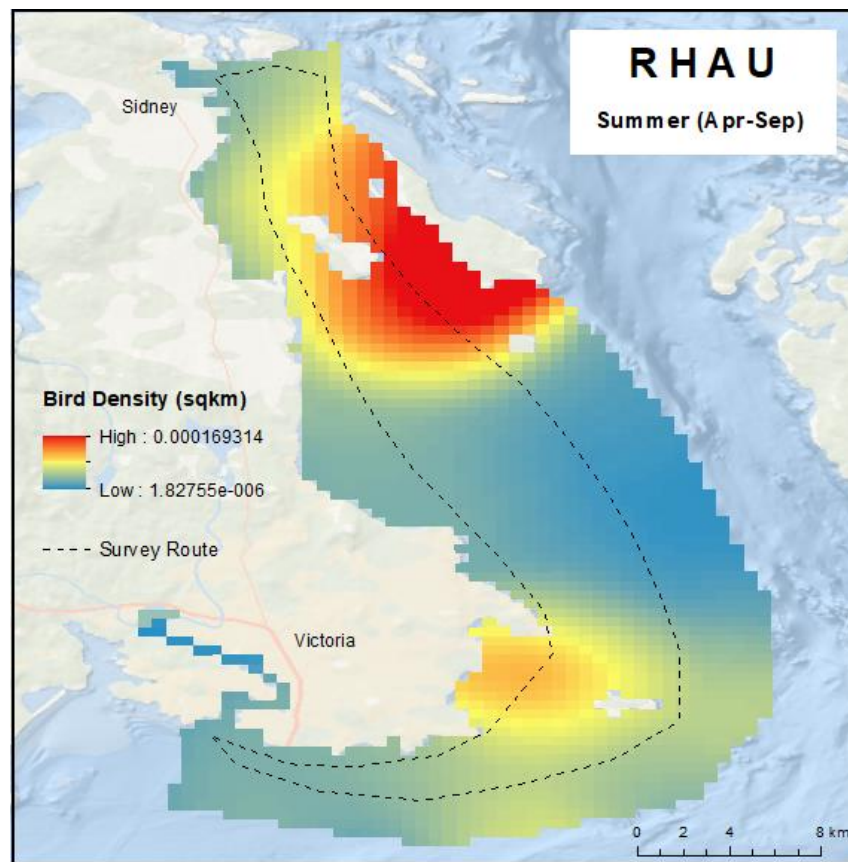
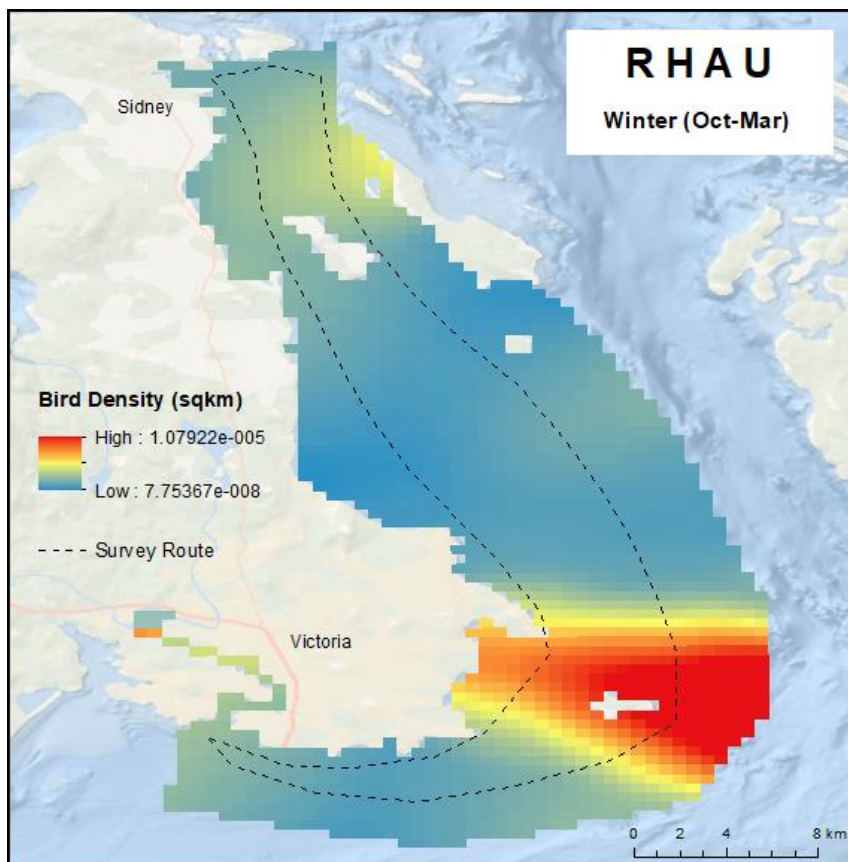
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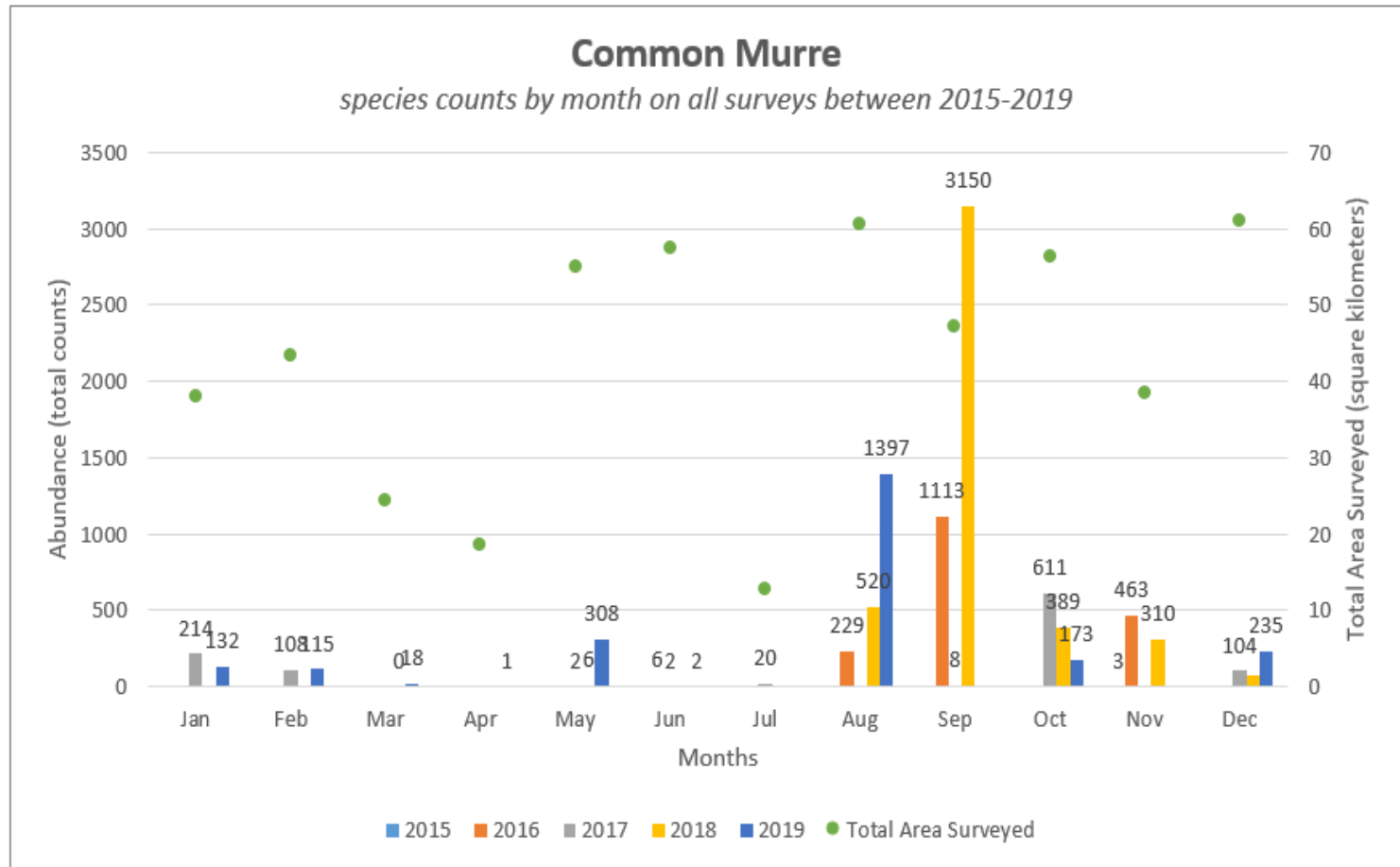
RHAU: present during breeding season



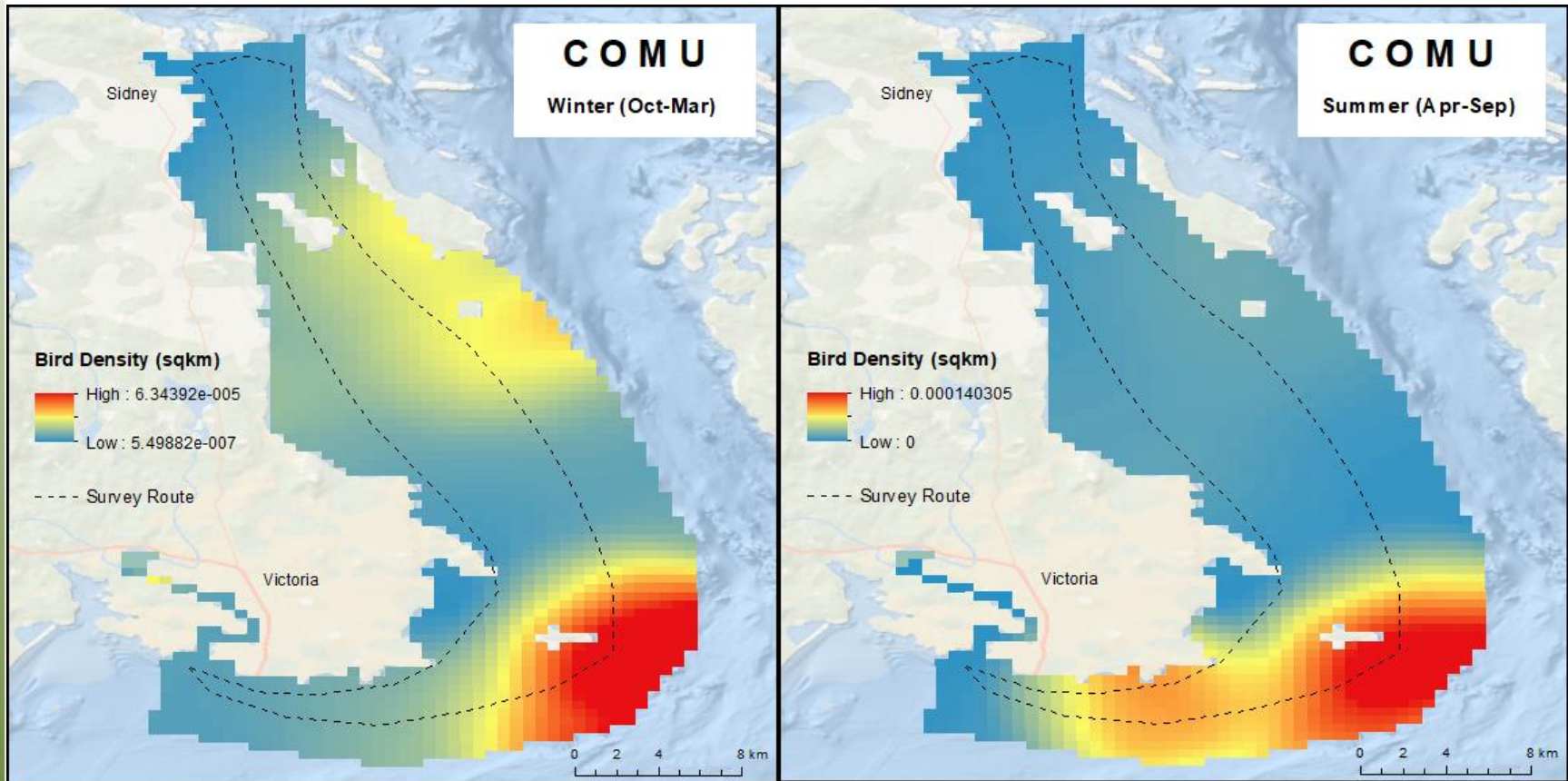
RHAU: Winter in Juan de Fuca, Summer in Sidney Channel IBA



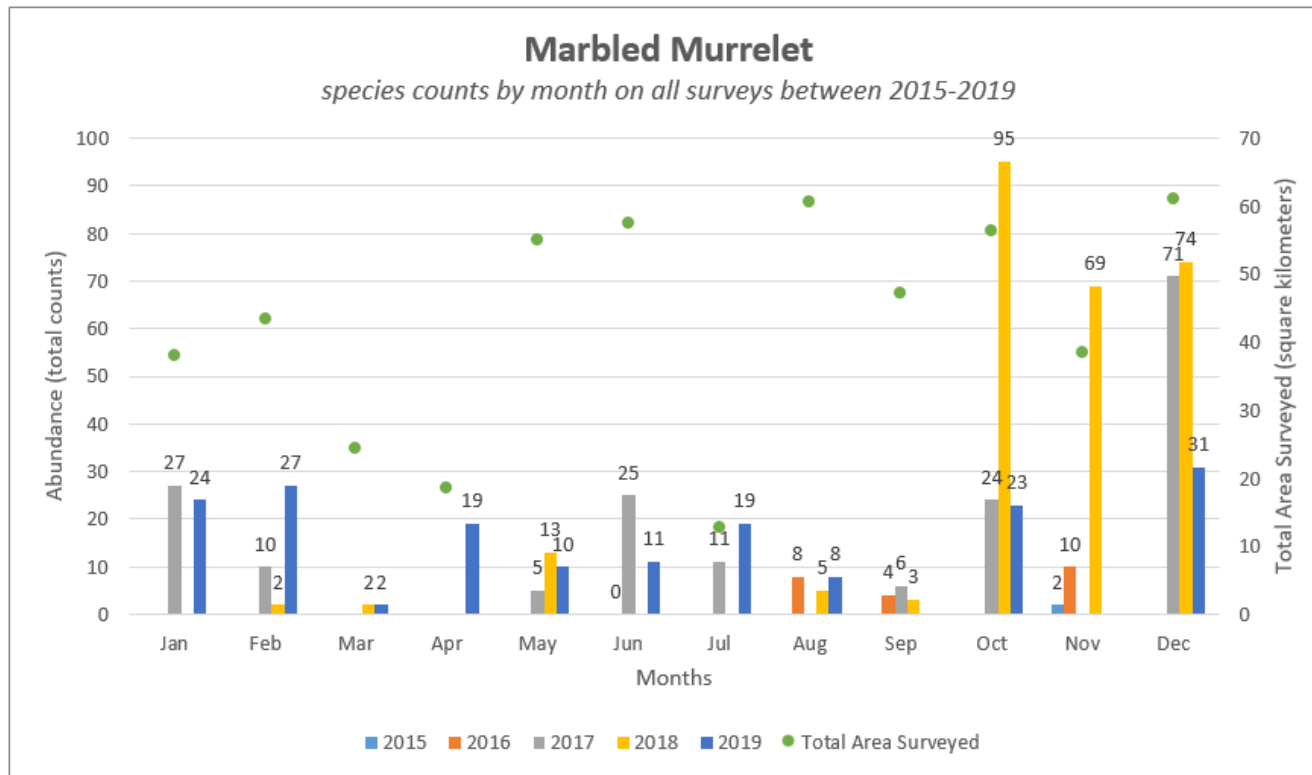
COMU: abundant late summer / fall, arrival post breeding



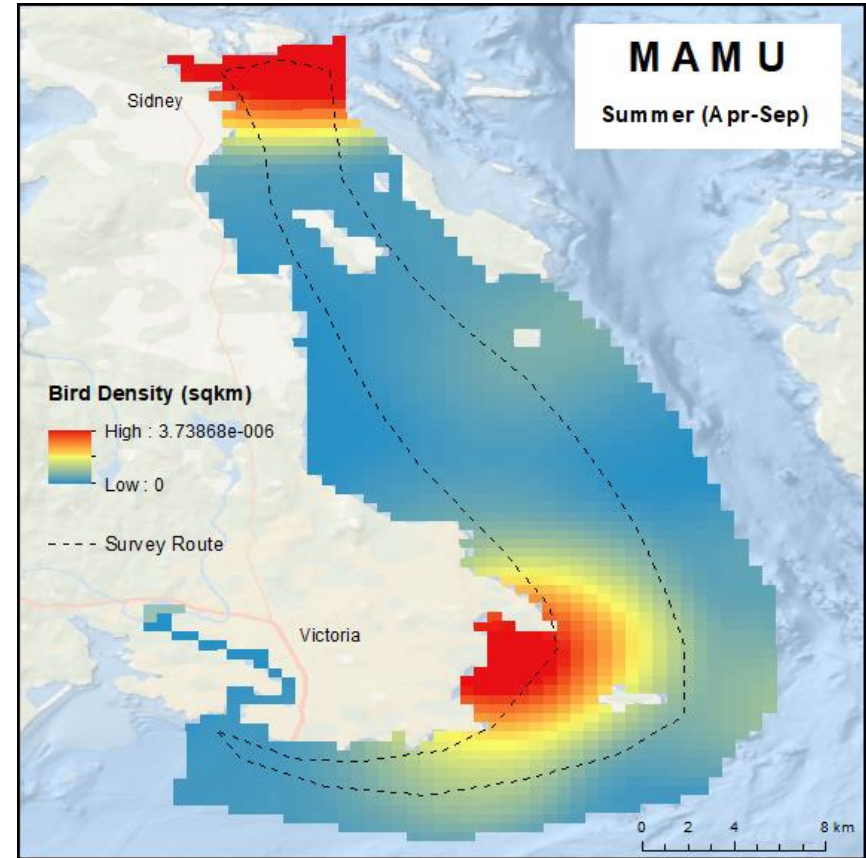
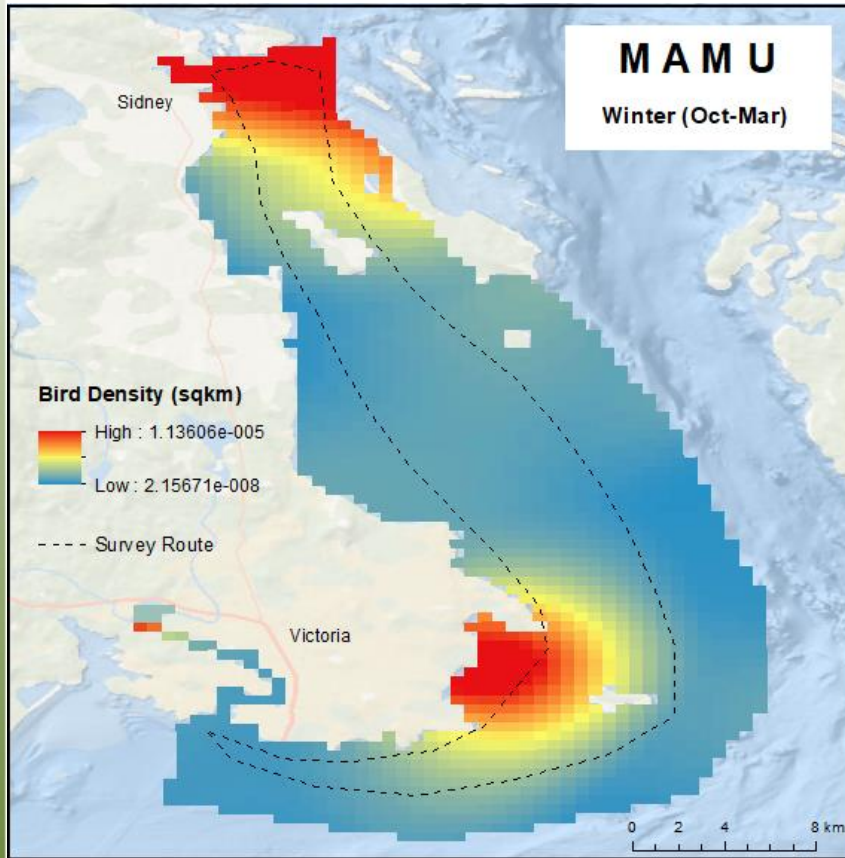
COMU: Most common Juan de Fuca St.



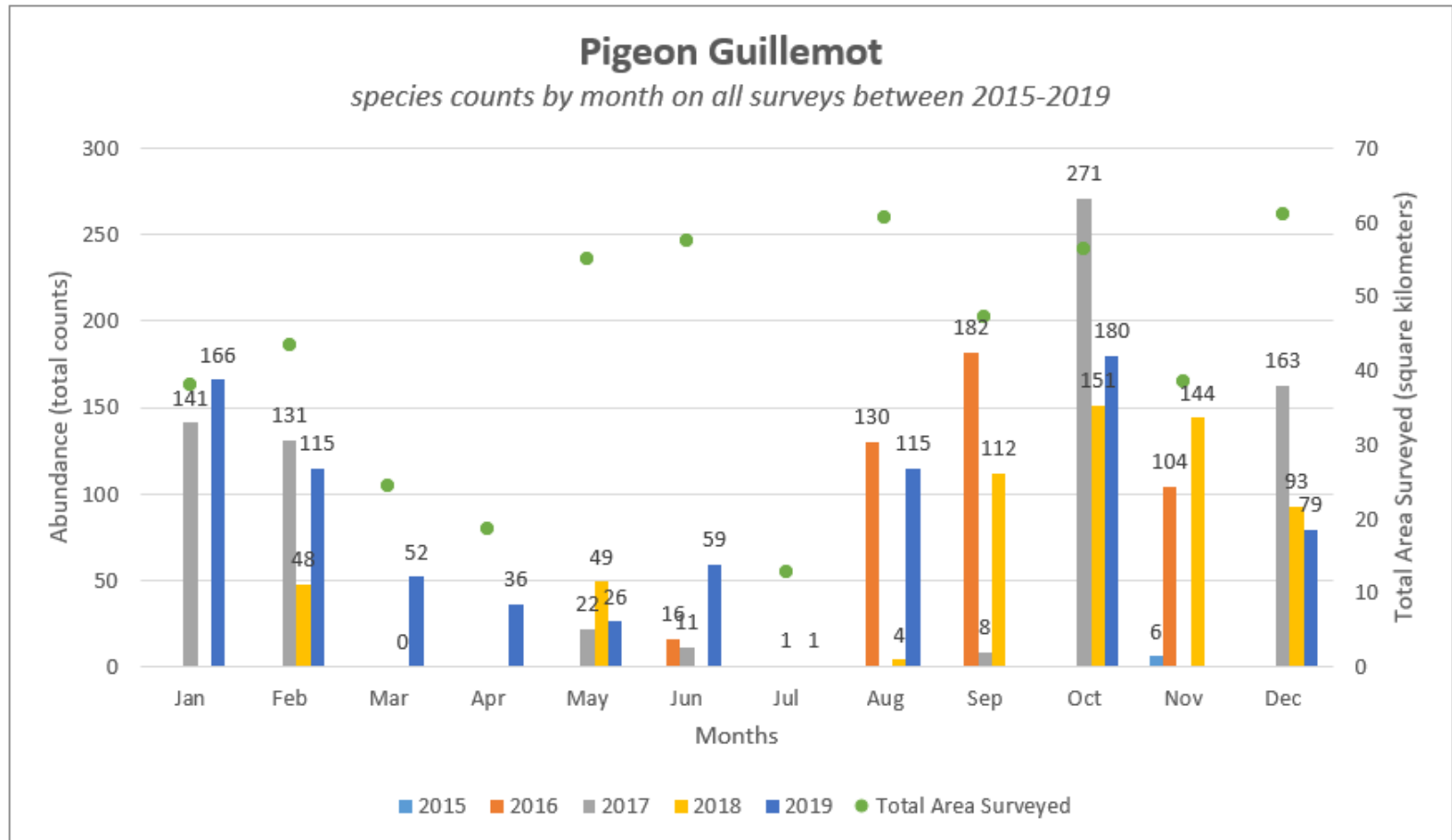
MAMU: Year round presence



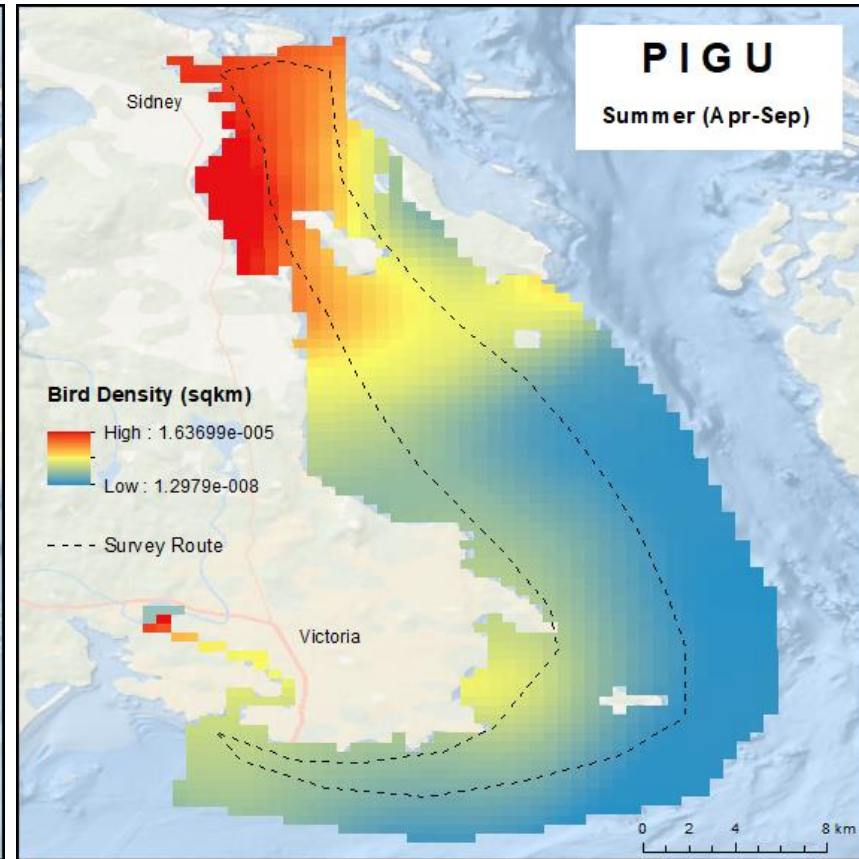
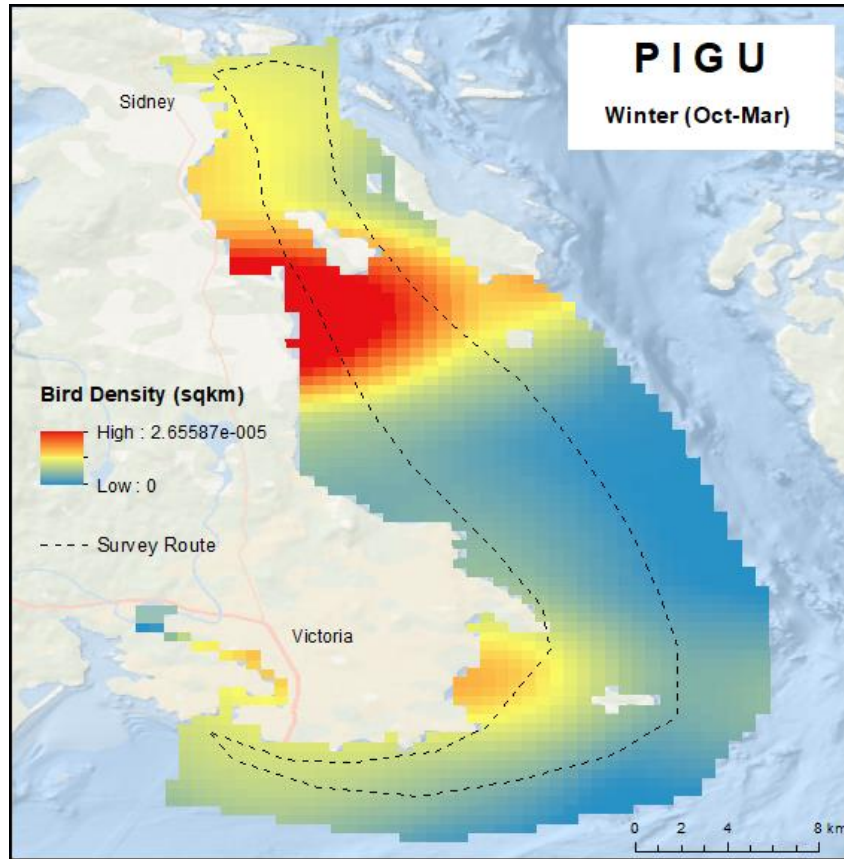
MAMU: segregation, Coal Island and Ten Mile Point 'hot spots'



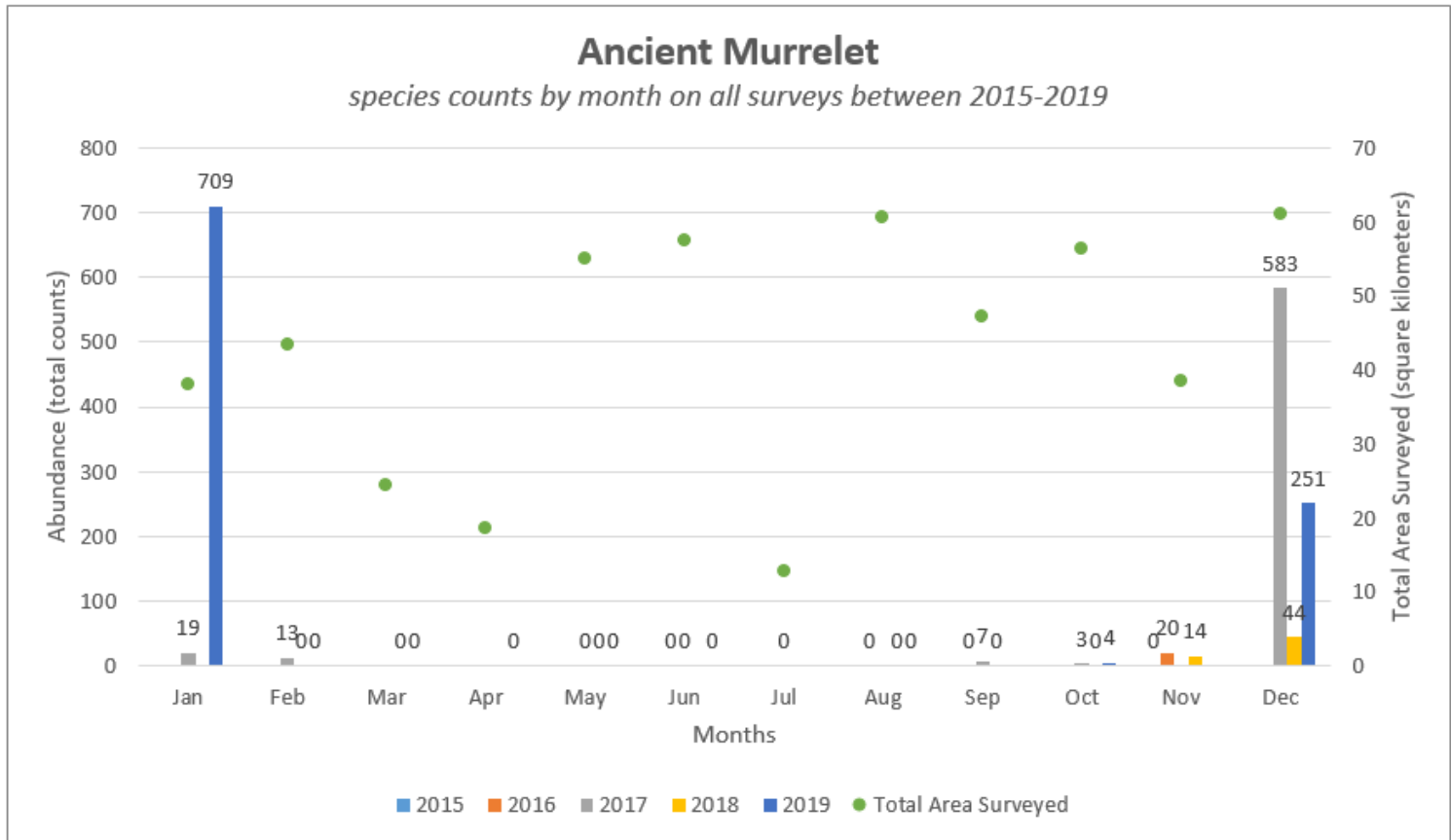
PIGU: Year round, swell in numbers late summer / fall



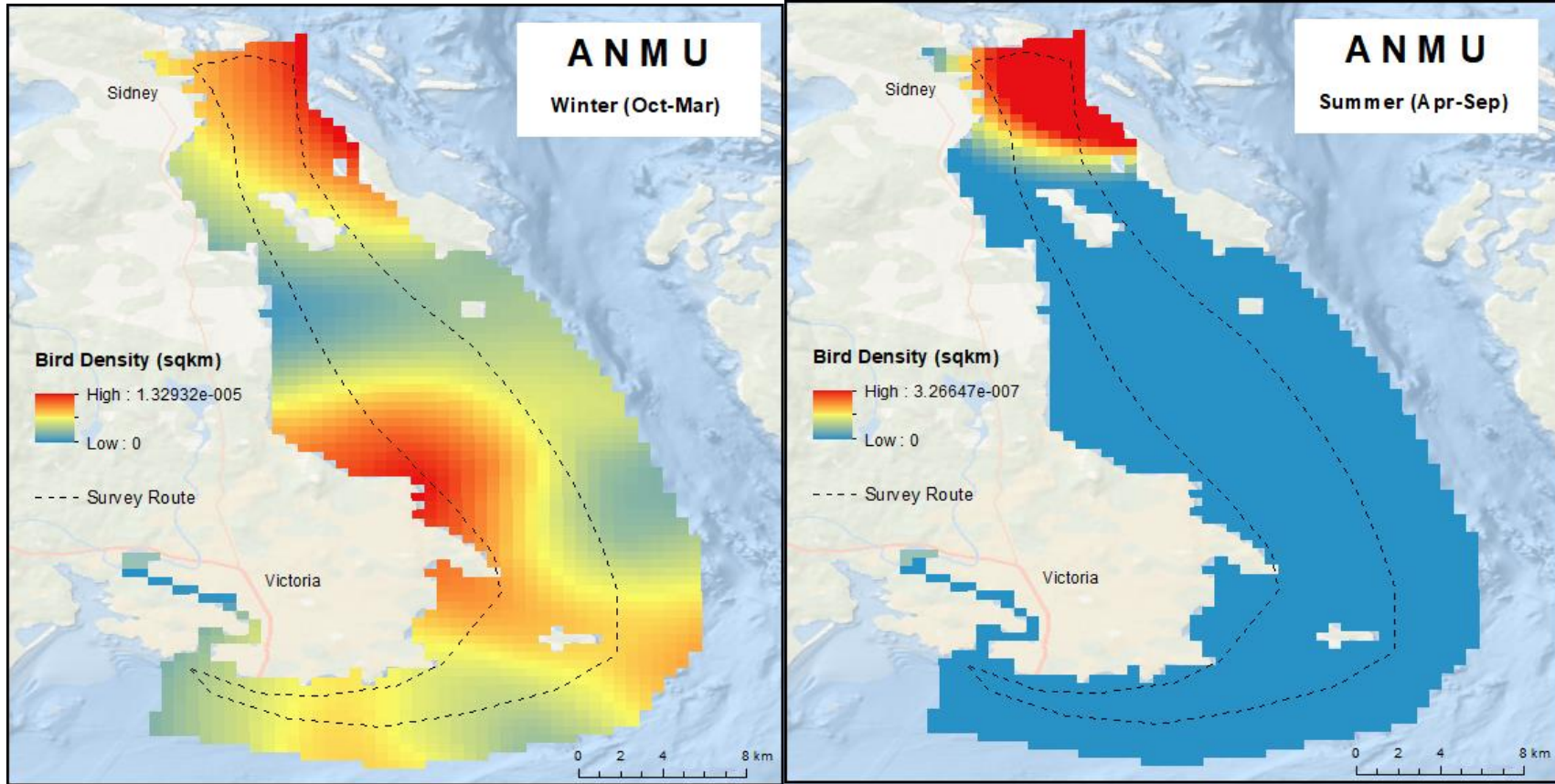
PIGU: Sidney Channel IBA, Oak Bay



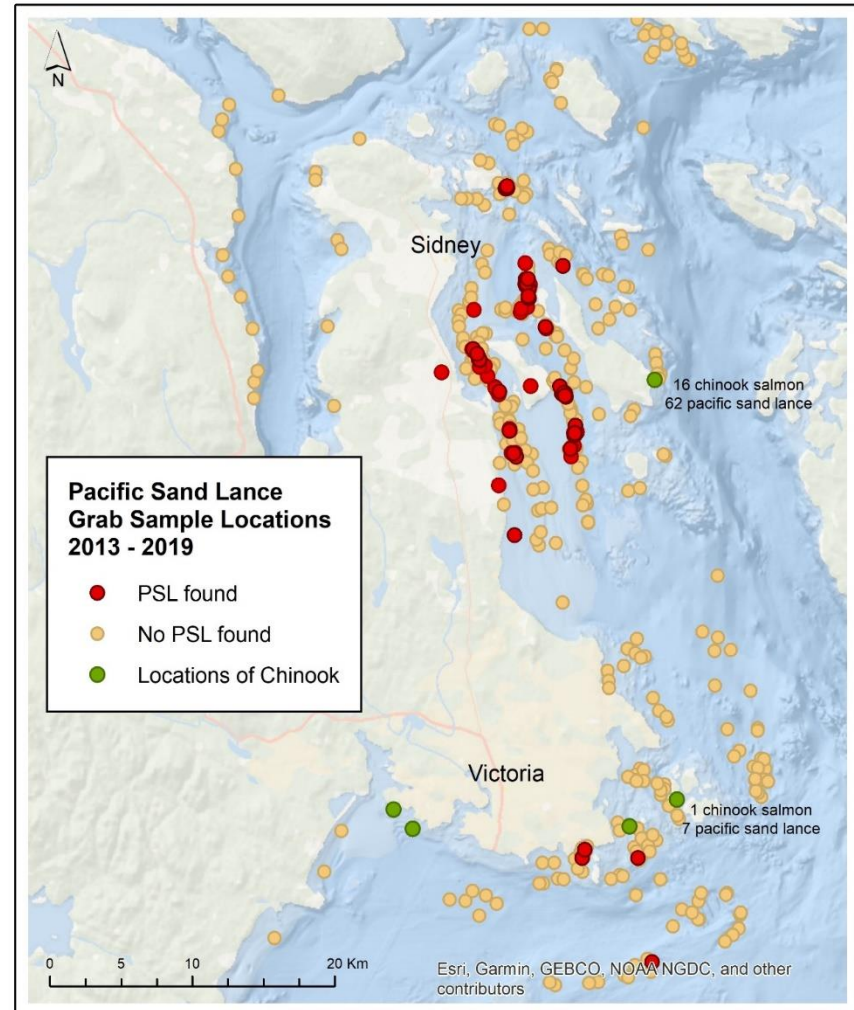
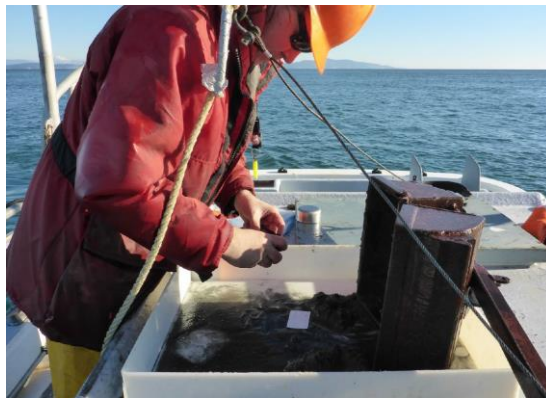
ANMU: Winter visitor only



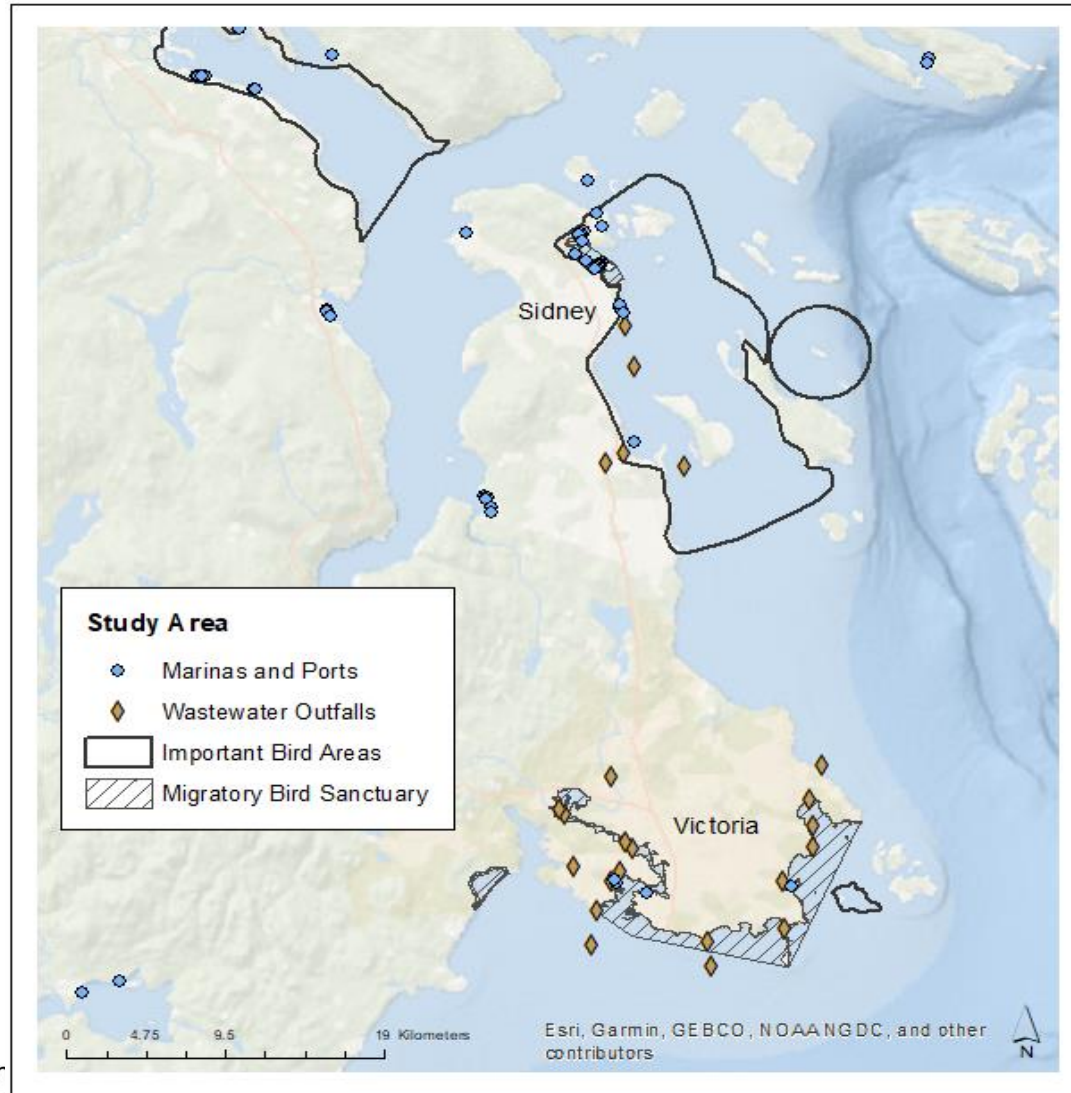
ANMU: Sidney Channel IBA, Victoria



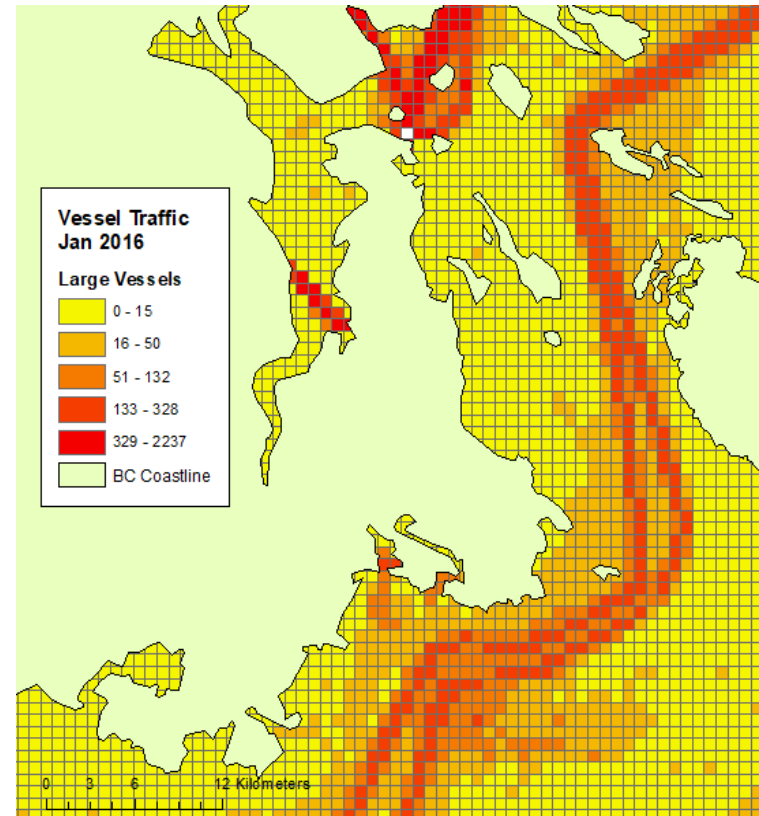
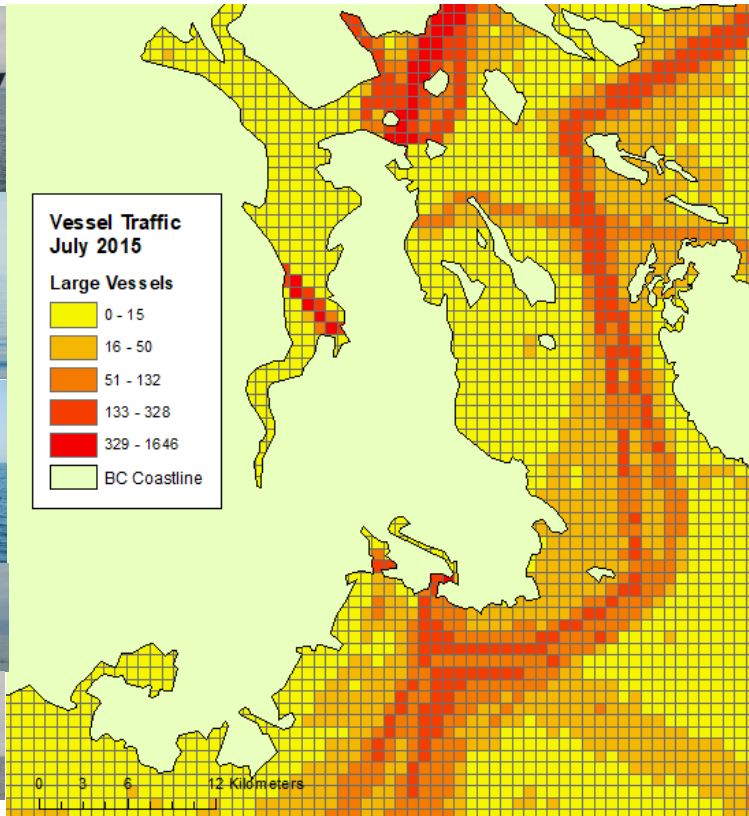
Pacific Sand Lance (PSL) subtidal habitat in Sidney Ch. IBA, Victoria MBS



Potential sources of oil: marinas, ports and wastewater outfalls in IBA and MBS.



Large vessel traffic: summer = winter

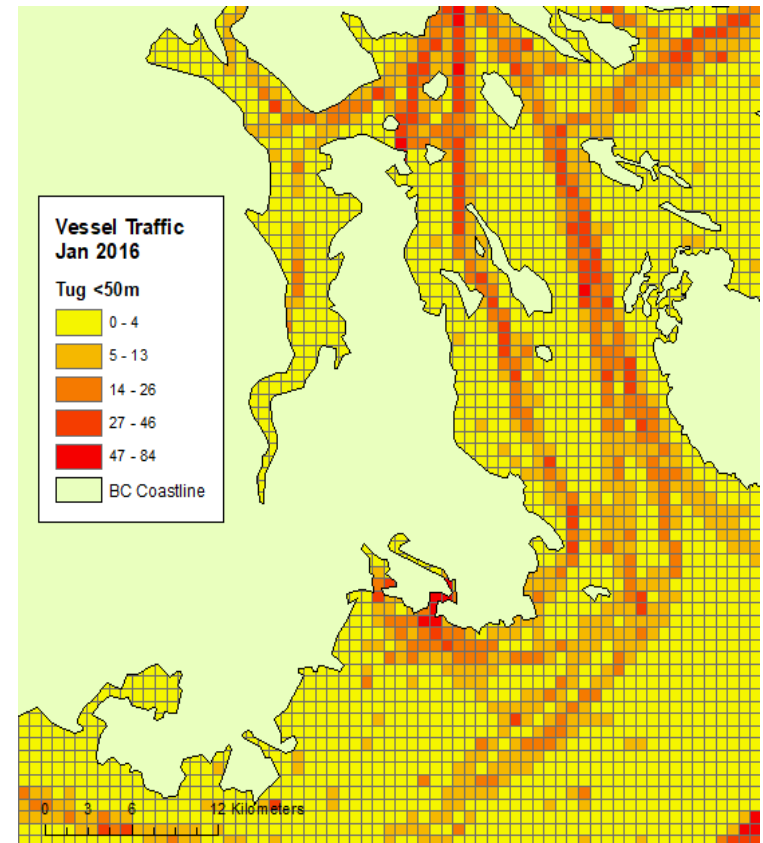
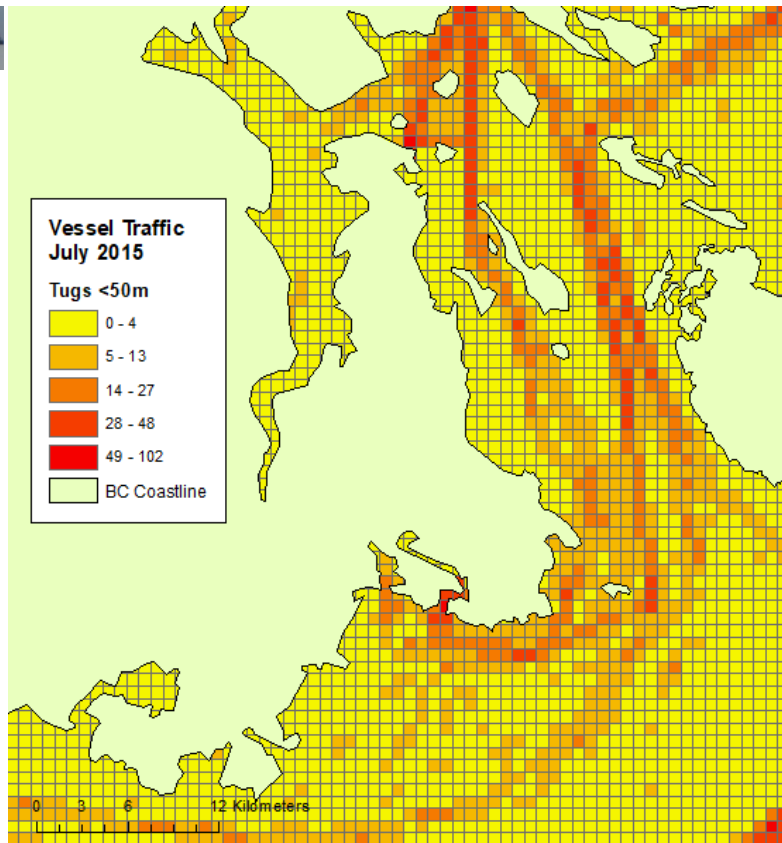


Large vessel traffic includes: Ferries, Passenger ships, Container Ships, Bulk Carriers, Crude Oil Tankers, Reefers, Chemical Products Carriers, Vehicle Carriers, Tankers, Naval Vessels, High Speed Ferries, and Other

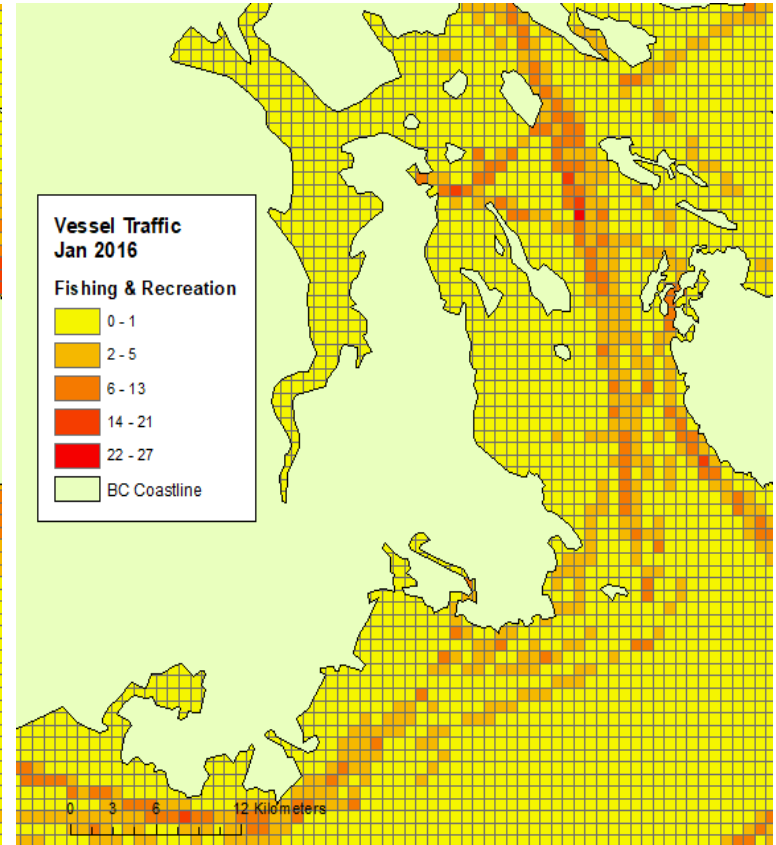
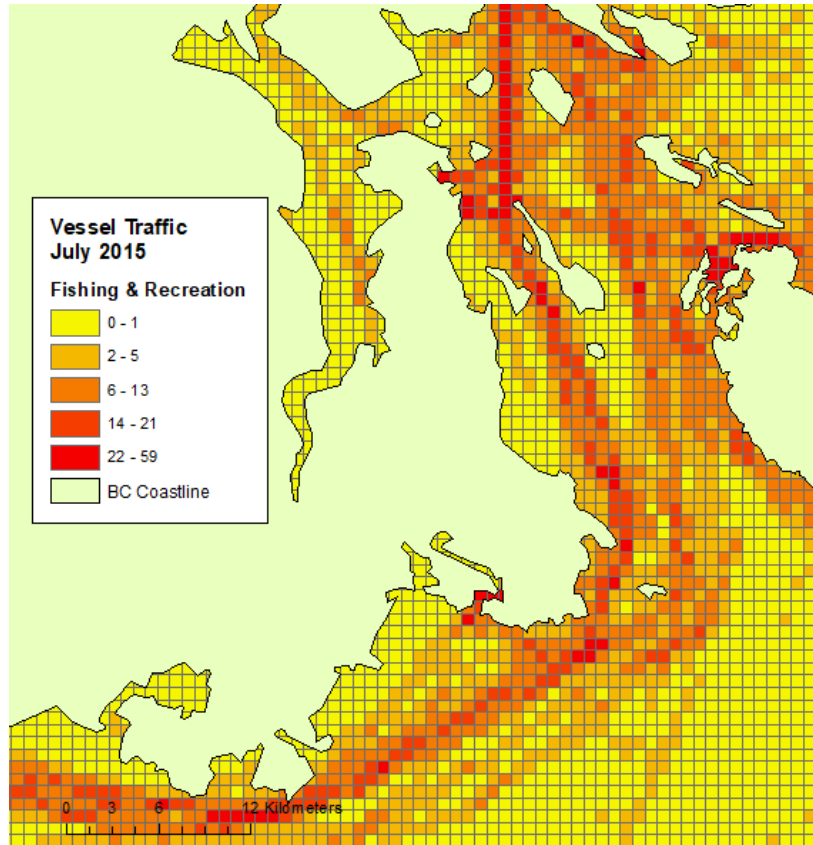
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Tug boat traffic: summer = winter



Recreational Vessels: summer > winter



Next steps: Seasonal Oil movement by winds

- Strait of Juan de Fuca weather buoy (NOAA)
- Winds SE in winter
- Winds NW in Summer

The screenshot shows the NOAA National Data Buoy Center website for station 46088. The page header includes the NOAA logo and the text "National Oceanic and Atmospheric Administration's National Data Buoy Center Center of Excellence in Marine Technology". The main content area displays the station name "Station 46088 (LLNR 16337) - NEW DUNGENESS - 17 NM NE of Port Angeles, WA" and "NOAA Environmental Lighted Buoy 46088". A photograph of the buoy is shown. The page also lists technical details such as "Funding provided by the United States Coast Guard", "Site elevation: sea level", "Air temp height: 3.4 m above site elevation", "Anemometer height: 3.8 m above site elevation", "Barometer elevation: 2.4 m above mean sea level", "Sea temp depth: 2 m below water line", "Water depth: 112.8 m", and "Watch circle radius: 152 yards". A map of the Strait of Juan de Fuca is included, showing the location of the buoy and other stations. The map is titled "Oceans" and shows the Strait of Juan de Fuca, Victoria, and the National Monument. A legend indicates that a large icon represents the selected station, a yellow diamond represents stations with recent data, and a red diamond represents stations with no data in the last 8 hours.

https://www.ndbc.noaa.gov/station_page.php?station=46088



Conclusions

- MAMU – year round (segregated, Coal and Oak Bay)
- RHAU – breeding season (Protection & Smith Island)
- COMU – influx in the late summer/early fall
- PIGU – year round, swell of migrants (Farallones?) in fall
- ANMU winter visitor only
- PSL – subtidal habitat primarily in Sidney Channel IBA
- *High risk of oiling* to birds and fish prey populations and habitats from extensive vessel traffic, marinas & ports



Acknowledgements

- ECCC CWS SARR Unit funds to KW
- ECCC S&T WRD funds to DFB
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