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

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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
TMX Expansion Project: Route and Areas of Interest

Trans Mountain Approximate Shipping Route and Areas of Interest

Data Query Results
- Bird Conservation Regions
- Estuaries - polygons
- Estuaries - points
- Fraser River Estuary Management Program Habitat - 2006
- Cities and Towns
- Approximate Shipping Route
- 5 km buffer

The layer describes habitat of the Lower Fraser River Estuary

DRAFT
For Discussion Purposes Only

Projection: PCS Albers
Datum: NAD 1983
Data source: EC - CWS PYR
Created by: Inkblot
Date: Jun 26 2013

1 cm = 7 km
Printed Legal Paper Size 8.5 x 11 cm

Canada

nada
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.
COMU: Common Murre

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

Photo: James Clowater
MAMU: Marbled Murrelet, *Threatened*, under SARA

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

Summer: Photo, Mark Cunningham

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

Fig. from Rodway and Lemon 2011
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!
RHAU: present during breeding season

Rhinoceros Auklet

*species counts by month on all surveys between 2015-2019*

![Graph showing the abundance of Rhinoceros Auklets by month from January to December between 2015-2019]

- **Total Area Surveyed** (square kilometers)
- **Months**
- **Abundance (total counts)**

Legend:
- 2015
- 2016
- 2017
- 2018
- 2019
- Total Area Surveyed
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

Marbled Murrelet

*species counts by month on all surveys between 2015-2019*

Abundance (total counts)

- Jan: 27
- Feb: 24
- Mar: 10
- Apr: 22
- May: 19
- Jun: 13
- Jul: 25
- Aug: 0
- Sep: 11
- Oct: 19
- Nov: 8
- Dec: 46

Total Area Surveyed (square kilometers)

- Jan: 27
- Feb: 24
- Mar: 10
- Apr: 22
- May: 19
- Jun: 13
- Jul: 25
- Aug: 0
- Sep: 11
- Oct: 19
- Nov: 8
- Dec: 46

Legend:
- 2015
- 2016
- 2017
- 2018
- 2019
- Total Area Surveyed
MAMU: segregation, Coal Island and Ten Mile Point ‘hot spots’
PIGU: Year round, swell in numbers late summer / fall

Pigeon Guillemot
species counts by month on all surveys between 2015-2019

Abundance (total counts)

Total Area Surveyed (square kilometers)

Months
Jan 141 131 0 0 130 112 271 144 163
Feb 166 48 52 36 22 11 182 15 163
Mar 115 52 36 22 11 182 15 144 93
Apr 26 111 49 11 1 15 6 79
May 59 112 4 11 8 104
Jun 59
Jul 11 1
Aug 115 182
Sep 112
Oct 271
Nov
Dec

2015 2016 2017 2018 2019

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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
Tug boat traffic: summer = winter
Recreational Vessels: summer > winter

![Map showing vessel traffic comparison between summer and winter](image-url)

- **Vessel Traffic July 2015**
  - Fishing & Recreation:
    - 0 - 1
    - 2 - 5
    - 6 - 13
    - 14 - 21
    - 22 - 59
    - BC Coastline

- **Vessel Traffic Jan 2016**
  - Fishing & Recreation:
    - 0 - 1
    - 2 - 5
    - 6 - 13
    - 14 - 21
    - 22 - 27
    - BC Coastline
Next steps: Seasonal Oil movement by winds

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

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
- SeaDoc Society Grant to CLKR & DFB
- Captain Bruce Evans, FV Misty Lady
- Deborah Faust, database support
- Mark Maftei, Luke Halpin, bird observers
- Leon McCartney, data entry and GIS support