Welcome to the BOEM-Oregon Science Exchange

July 22, 2015 10:00 am
Audio: call toll free 1-866-796-8371, passcode: 2221051
We will begin shortly!

If you are having technical difficulties, please call John Sanchez at 805-384-6315 or send us a chat message.

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Bureau of Ocean Energy Management

Pacific Region Studies

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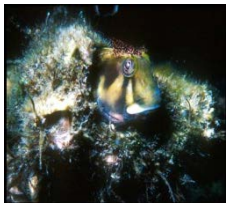
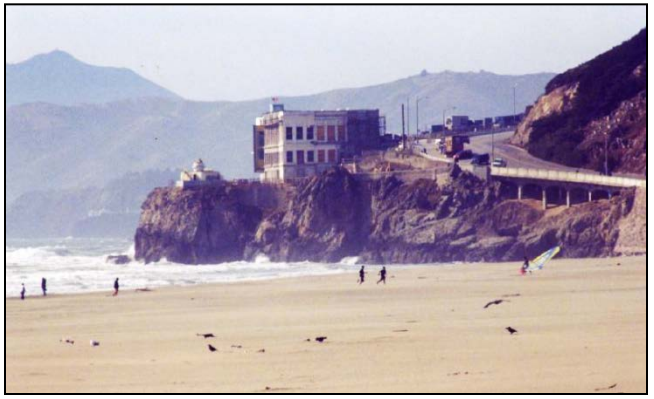
www.boem.gov/Pacific-Studies/

http://www.boem.gov/Pacific-Region-Renewable-Energy/



Program Goals for Offshore Ocean Energy Studies

- Establish the information needed for assessment and management of environmental impacts
- Predict environmental impacts on the potentially affected human, marine, and coastal environments
- Monitor human, marine, and coastal environments for effects and trends



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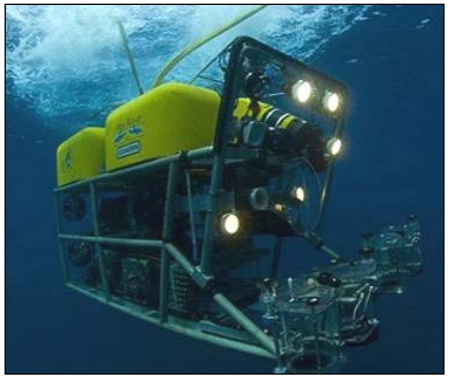

Perspective on Pacific Region Studies

- 1973 – 2015
- ~ 310 Studies Completed at > $ 142 M
- 37 Ongoing Studies ~ $ 22.7 M
  - 20 renewable energy ~ $ 12.3 M
  - 10 conventional energy ~ $ 4.3 M
  - 7 both energy programs ~ $ 6.1 M

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Selected BOEM Research Informing Renewable Energy Offshore Oregon

July 2015

http://www.boem.gov/Selected-BOEM-Research-Informing-Oregon/

Pacific Region Staff

Great Diversity of Scientists

Cultural Anthropologist/Archaeologist

Physical Scientist/Air Quality Specialist

Marine Biologists/Ecologists

Oceanographer/Water Quality Specialist

Marine Mammal Specialist

Invertebrate Zoologist/Benthic Specialist

Avian Specialist

Fish/Fisheries Specialist

Geologist

Geophysicist

Pacific Region Avian Specialist

David Pereksta

Seabirds and Marine Mammals off the Pacific Northwest

David Pereksta

Bureau of Ocean Energy Management
Pacific Region

July 22, 2015

Information Gaps for Renewable Energy

- Site-specific seasonal distribution and abundance – scale
- Seasonal density maps
  - Feeding, breeding, high use areas, migration routes, colony flight pathways
- Avoidance behavior
- Migration routes and patterns
  - Distance from shore, timing, passage height, each with weather/climate
- Energetic consequences
- Potential effects on prey
- Nocturnal activity and movement
- Effects of noise, lights and structures; collision risk

Objectives

- Conduct aerial at-sea surveys of seabirds and marine mammals in shelf and slope waters off northern California, Oregon, and Washington and summarize species and seasonal at-sea densities,
- Conduct a comparison with existing similar surveys in northern California, Oregon, and Washington, and
- Validate and enhance aerial survey data for numerically abundant indicator species and certain resident breeding and non-resident migratory seabird species through existing and supplementary telemetry

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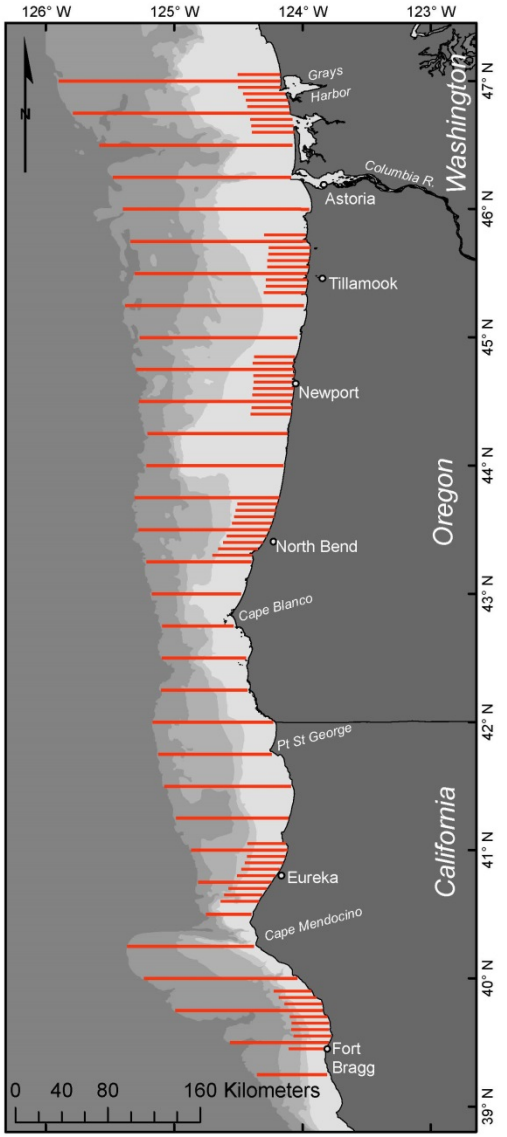
Seabird & Marine Mammal Surveys



PaCSEA Design

- 2 survey years: 2011 & 2012
- 3 oceanographic seasons (Winter, Upwelling, Davidson)
- Fort Bragg, CA (39.3° N) to Grays Harbor, WA (47° N)
- Focused on federal waters outside of the 3-mile state boundaries
  - 32 east-west-oriented uniform transects, 28-km spacing, to 2,000-m isobath
  - 6 focal areas consisting of ten 25-km parallel transect lines at 6-km spacing
- All marine birds, mammals, turtles, vessels, features

Survey Methods

- Aerial strip transects (Briggs et al. 1985, Mason et al. 2007)
- 61-m ASL, 160 km hr-1
- 2 dedicated observers, 75-m strips adjacent to track-line
- Co-pilot observer for incidental sightings, data acquisition, navigation
- Species ID to lowest taxon, recorded digitally, archived, transcribed, and cross-checked
- 2 airborne sensors: IR pyrometer (SST), HOBILabs HydroRad-3, full-spectra-radiometer (ocean color)

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Survey Results - Summary

Survey Effort

- Completed a total of 26,752 km, low elevation aerial survey effort
- 3 bathymetric domains
  - Inner-shelf waters (<100-m depth); 33% (8,887 km)
  - Outer-shelf waters (100-200-m depth); 20% (5,219 km)
  - Continental slope waters (200-2,000-m depth); 47% (12,646 km)

Sightings

- 15,403 sightings of 59,466 individual marine birds
  - 12 families, 54 species
- 16 cetacean species and 5 pinniped species
  - Baleen whales – humpbacks (114 sightings; 264 individuals)
  - Odontoceti – 11 species; harbor porpoise (164 sightings; 270 indiv.)
  - Pinnipeds - 246 sightings of 375 individuals

Survey Results - Birds

Winter

- 7 species groupings >90% of total counted (19,033)
- Common Murre – 70.4% of total
  - Surf/White-winged Scoters (4.8%), Herring/Thayer's Gulls (3.8%), Cassin's Auklets (3.8%), Glaucous-winged Gulls (3.7%), Black-legged Kittiwakes (2.0%), and Western Gulls (1.9%).

Summer

- 5 species >95% of total counted (17,063)
- Sooty Shearwaters - 54.1% of total ; Common Murres – 34.4%
  - Fork-tailed Storm-Petrels (3.3%), Western Gulls (2.1%), and Leach's Storm-Petrels (1.1%)

Survey Results - Birds

Fall

- 9 species >85% of total counted (23,376)
- Common Murres – 50.0% of total; Sooty Shearwaters – 10.5%
  - Cassin's Auklets (5.2%), Surf/White-winged Scoters (5.1%), Fork-tailed Storm-Petrels (3.8%), Red/Red-necked Phalaropes (3.2 %), California Gulls (3.1%), Northern Fulmars (2.7%), and Sabine's Gulls (2.2%)

Densities

- Average densities were similar in fall and winter; least in summer
- Varied according to bathymetric domain and season
  - Greatest over inner-shelf during fall; similar in winter and summer
  - Greatest over outer-shelf in winter; less in fall and summer
  - Greatest over continental slope in fall and winter; less in summer

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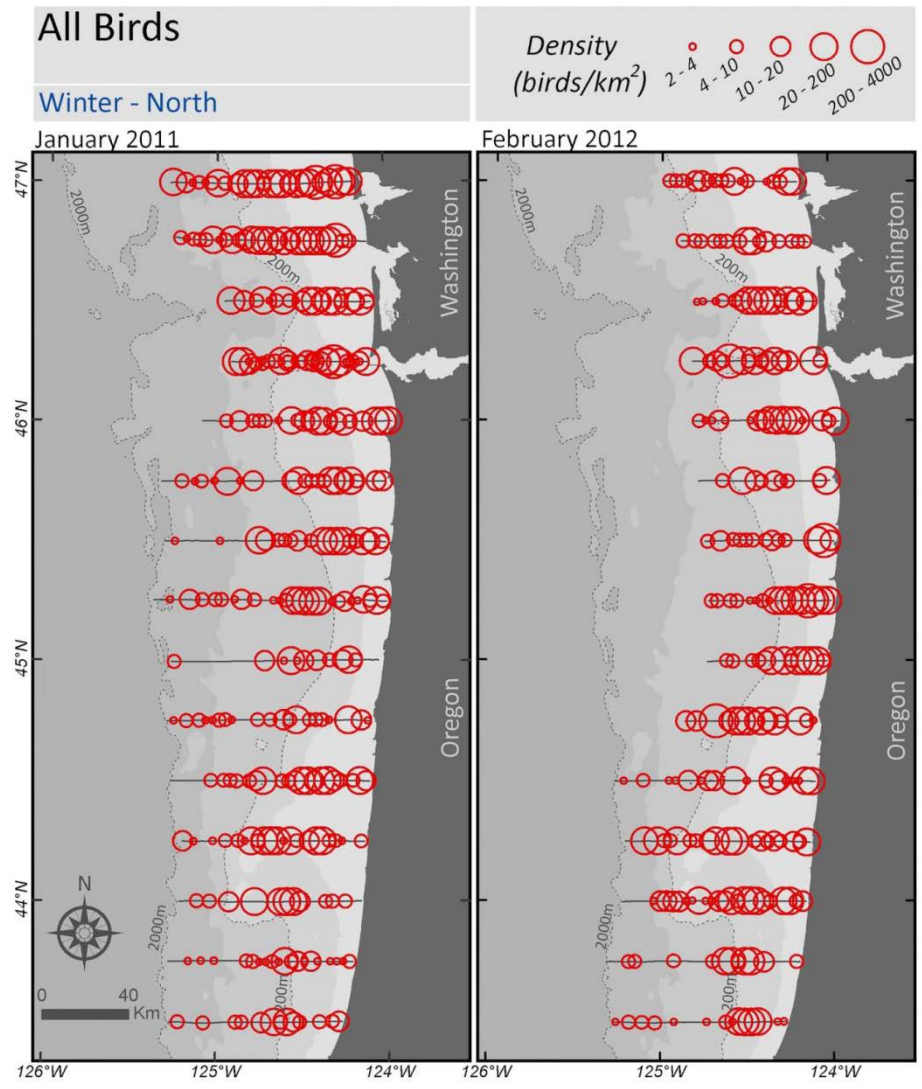
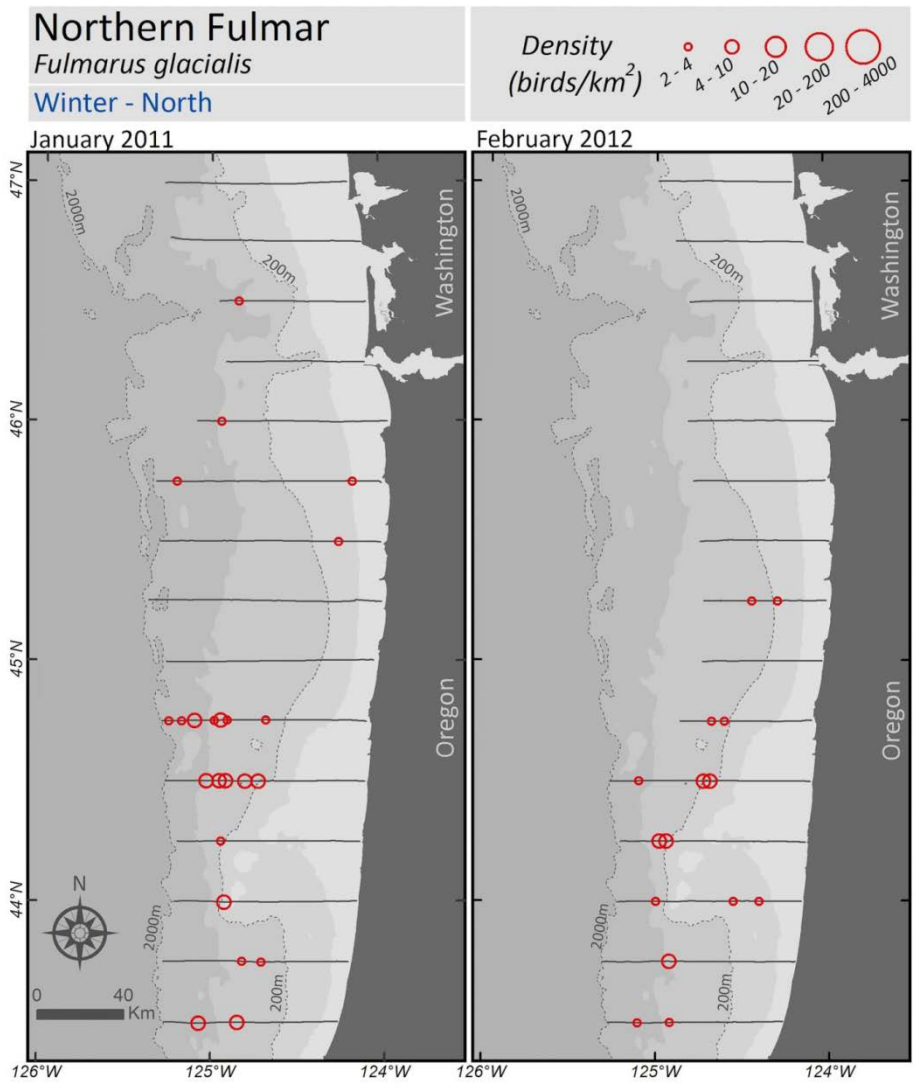
Bird Mapping

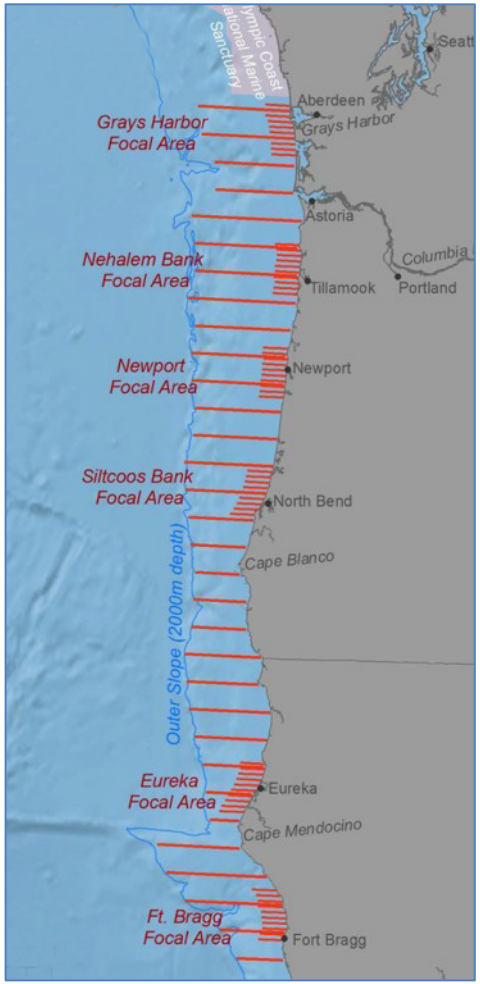


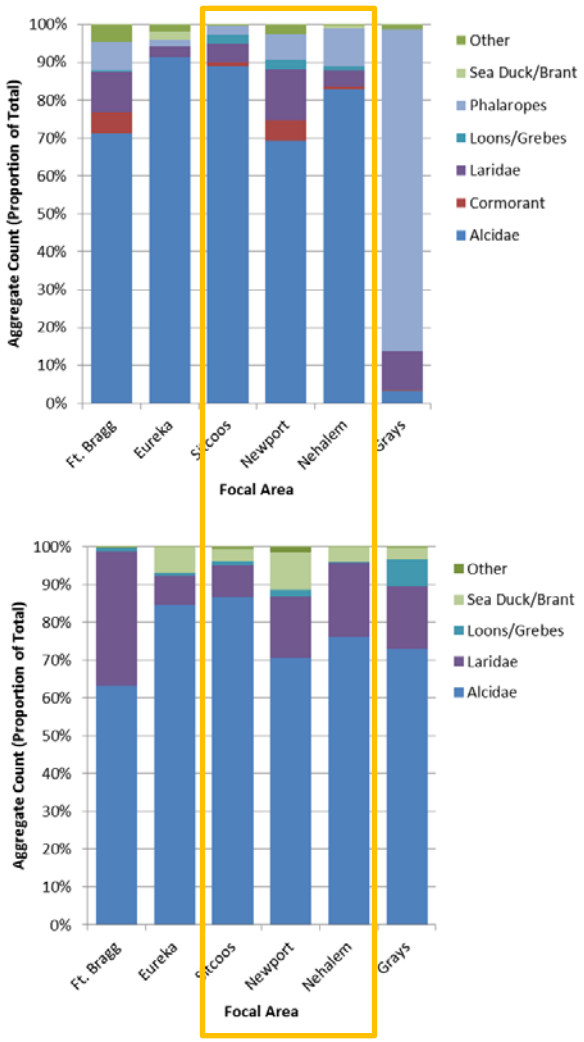


Focal Area Summaries: %N

Oregon Focal Areas

- ~1500 km trackline per month (6 areas), finer resolution inner shelf and site-specific patterns
- Alcidae dominate (murres followed by gulls)
- Newport has greatest diversity (cormorants in summer, sea ducks in winter)





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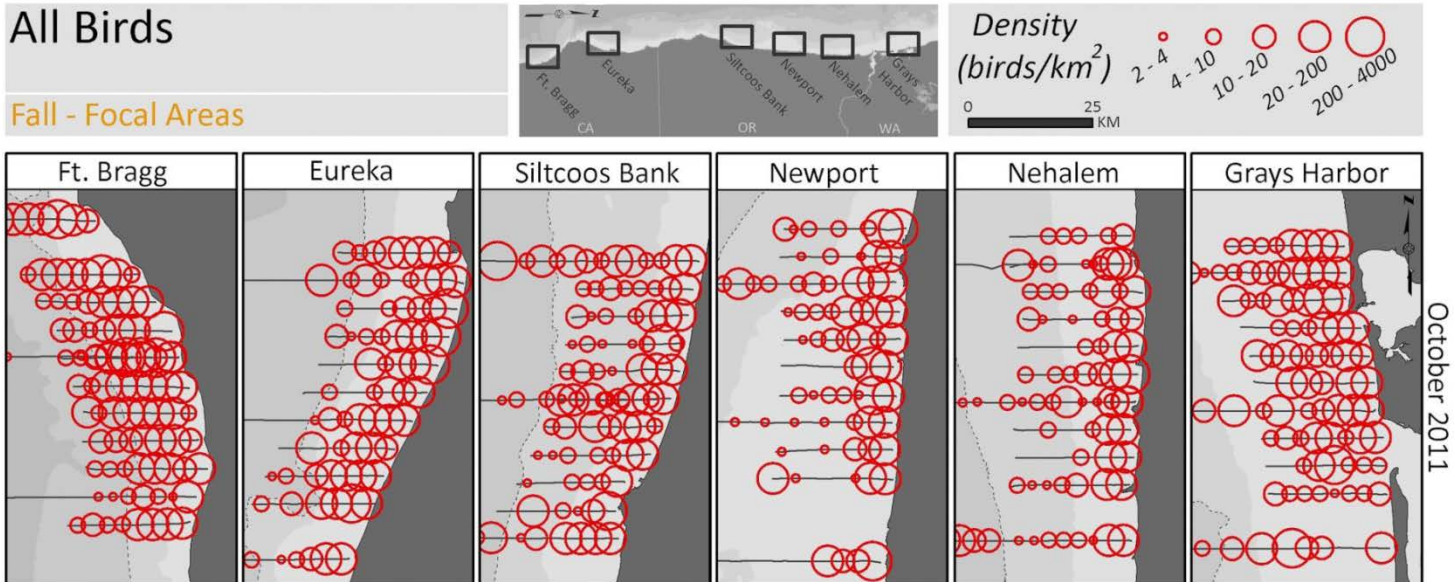
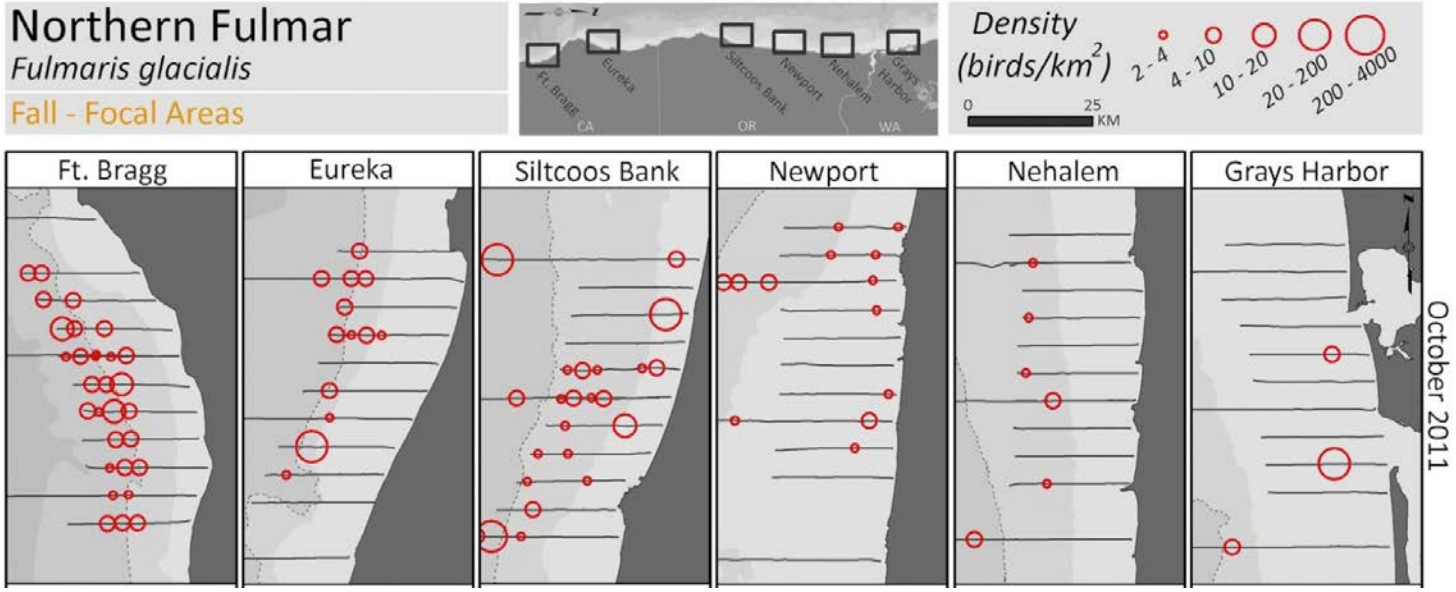
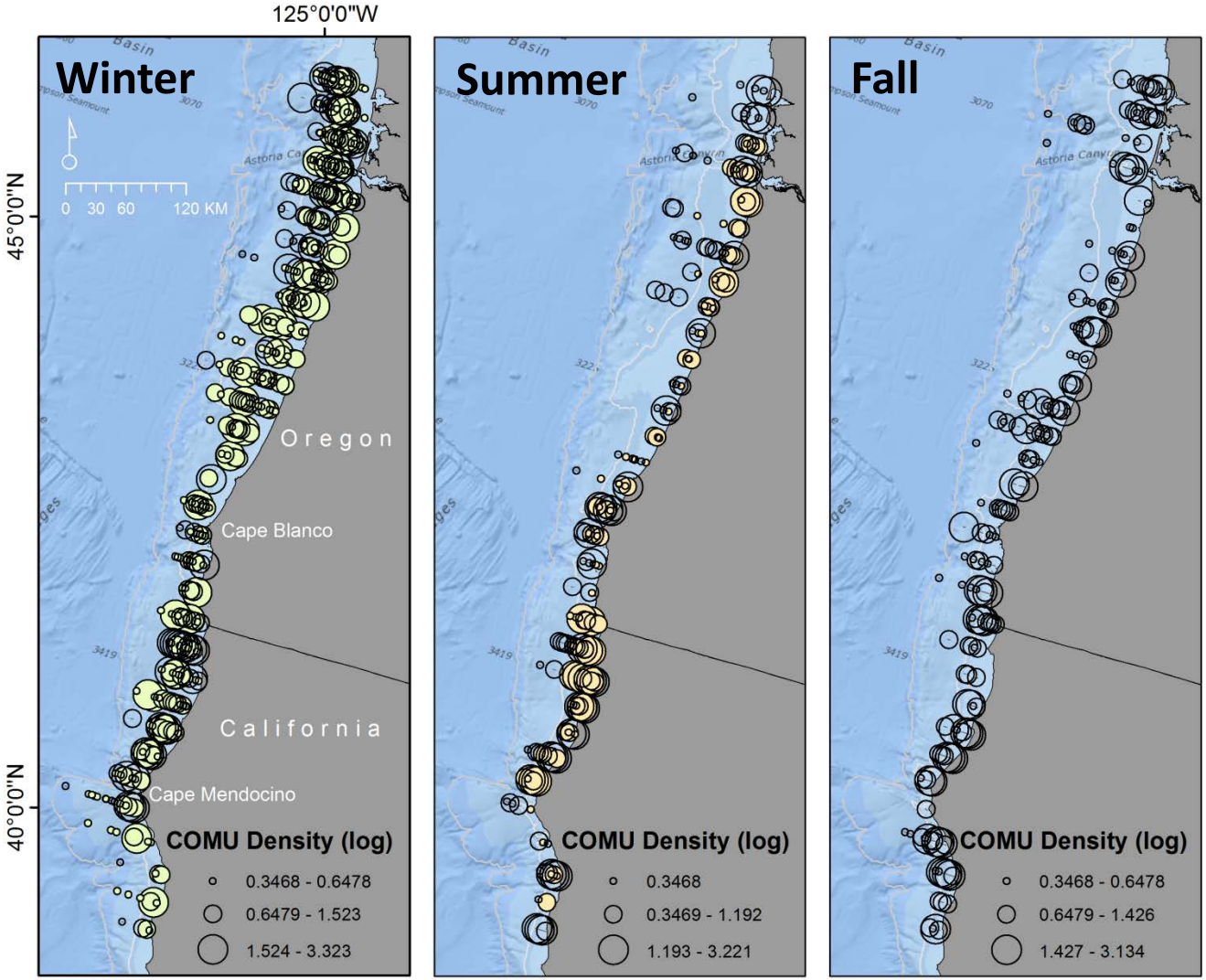
Focal Areas





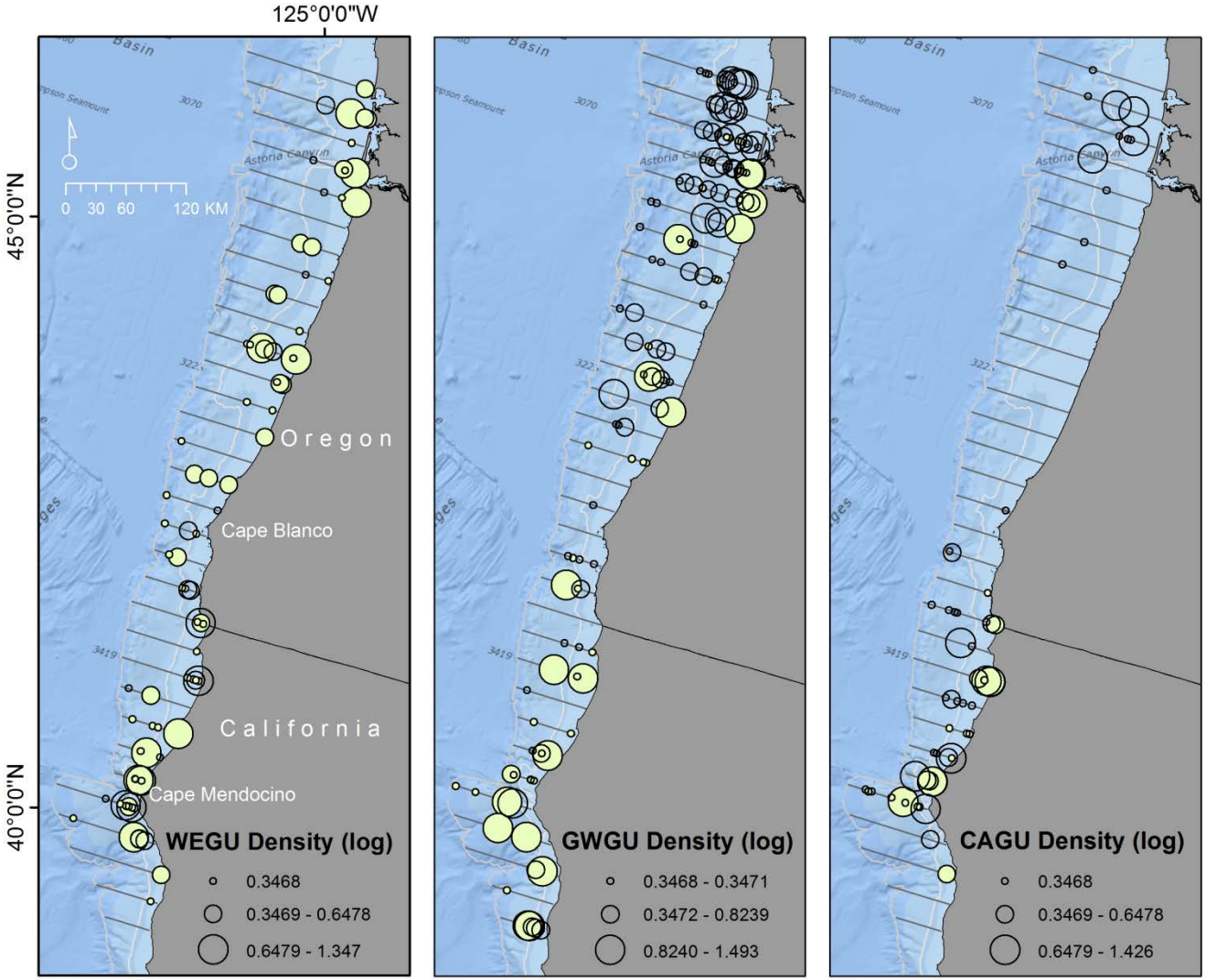
U.S. Department of the Interior
March 3, 1849

Common Murre (30-73%N)



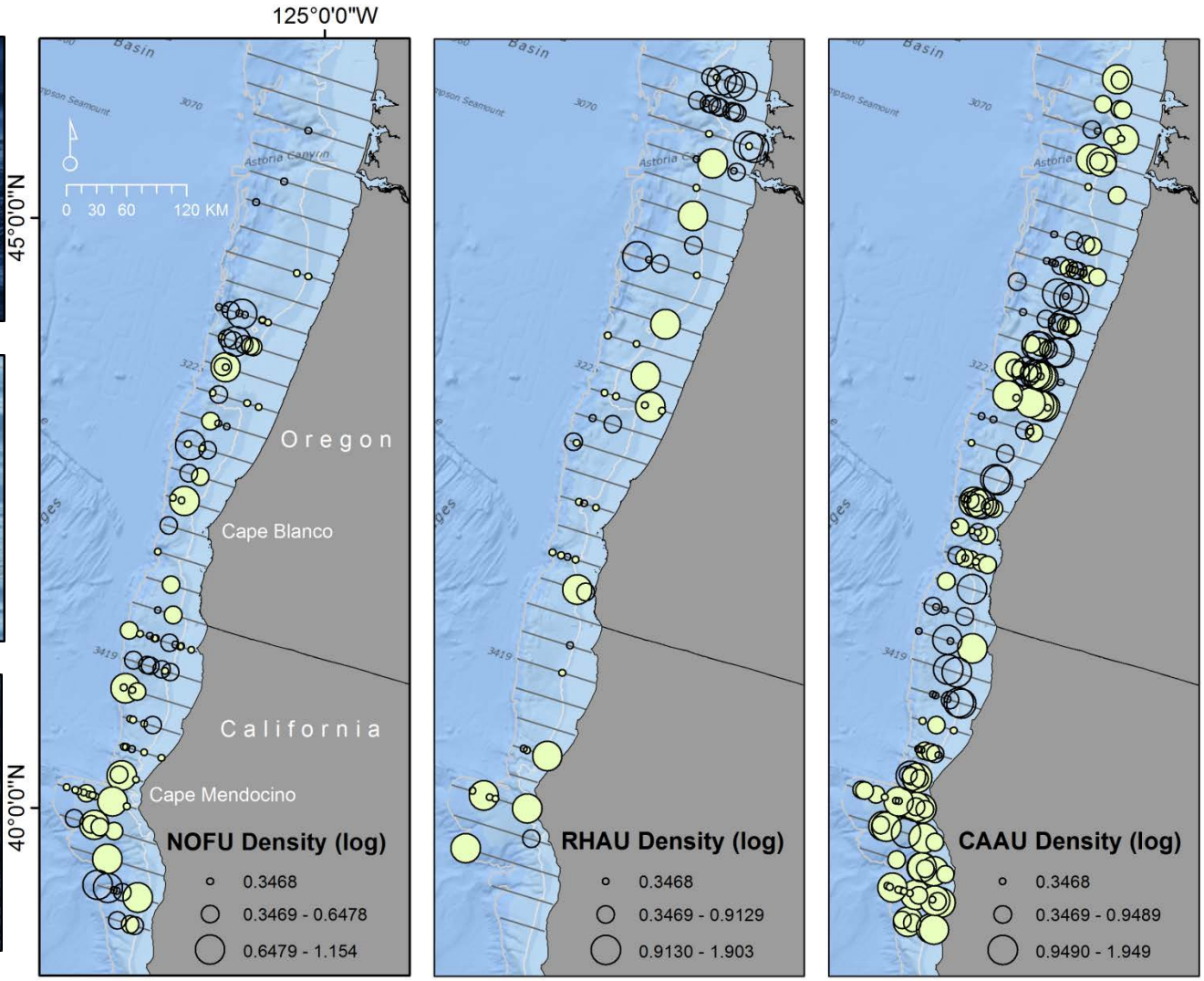
Open circles = 2011; filled circles = 2012

Abundant Wintering Gulls



Open circles = 2011; filled circles = 2012

Additional Abundant Wintering Species



Open circles = 2011; filled circles = 2012

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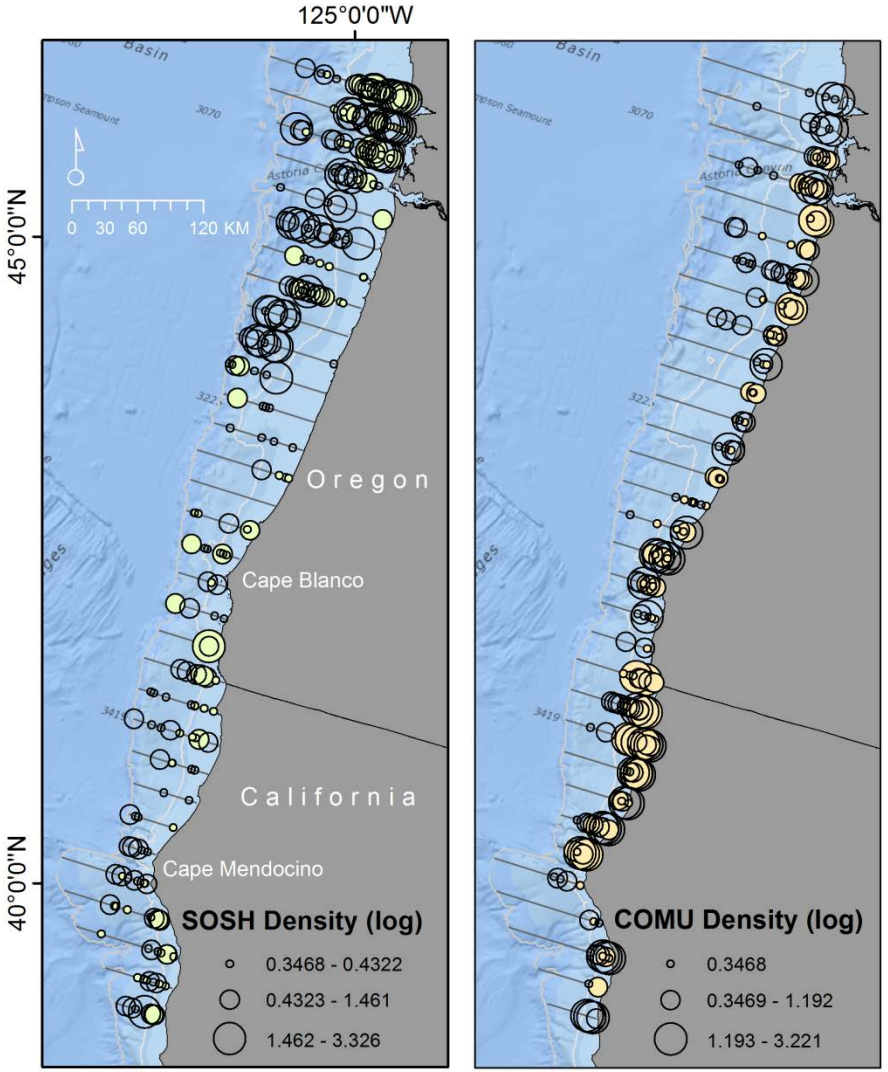
Inter-species Distribution Patterns



Open circles = 2011; filled circles = 2012

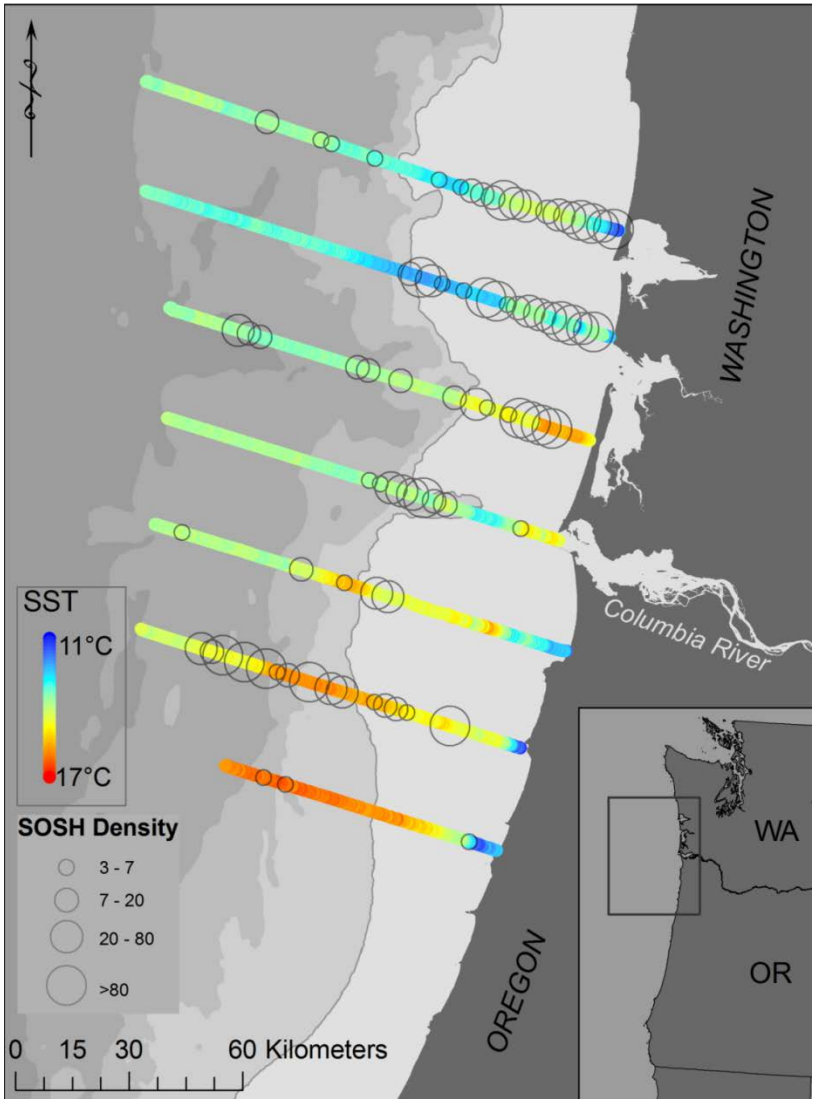
Columbia River Plume Associations

Used along-transect gradients in SST and ocean color to

- Identify fronts associated with, and independent of, the Columbia River plume in the northern CCS, and
- Examine relationships between these fronts and the distribution and abundance of the most abundant seabirds representing different foraging guilds

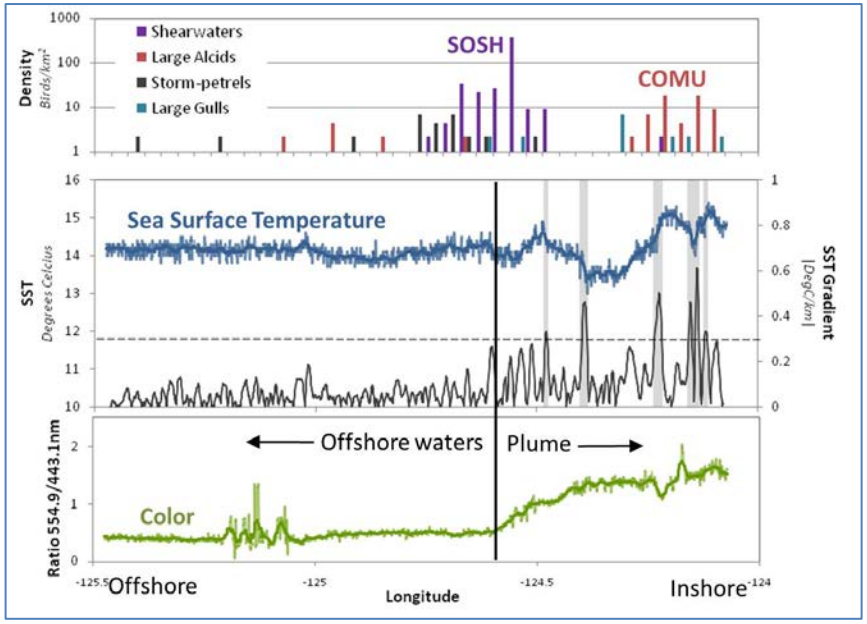
Preliminary analyses of Columbia River Plume

- Effective delineation of fronts
- Future classification of water masses



Airborne Hyperspectral Radiometery

- No previous avian study that couples aerial surveys with high-resolution, instantaneous oceanographic information.
- Presence of seabirds was significantly related to proximity to thermal fronts for Sooty Shearwaters, large alcids, and large gulls in both Jan and Jun for lower-gradient threshold fronts. Higher gradient fronts in Jan resulted in no relationship between bird presence and frontal location.



- Visual examination of SST and ocean color offshore of the Columbia River indicates the plume was well-defined by these variables. Densities of the most abundant seabird species are associated with the plume or its offshore boundary.
- We hope to expand these methods to use color and SST to delineate water masses and better predict seabird distribution and abundance related to these features and their specific frontal boundaries.

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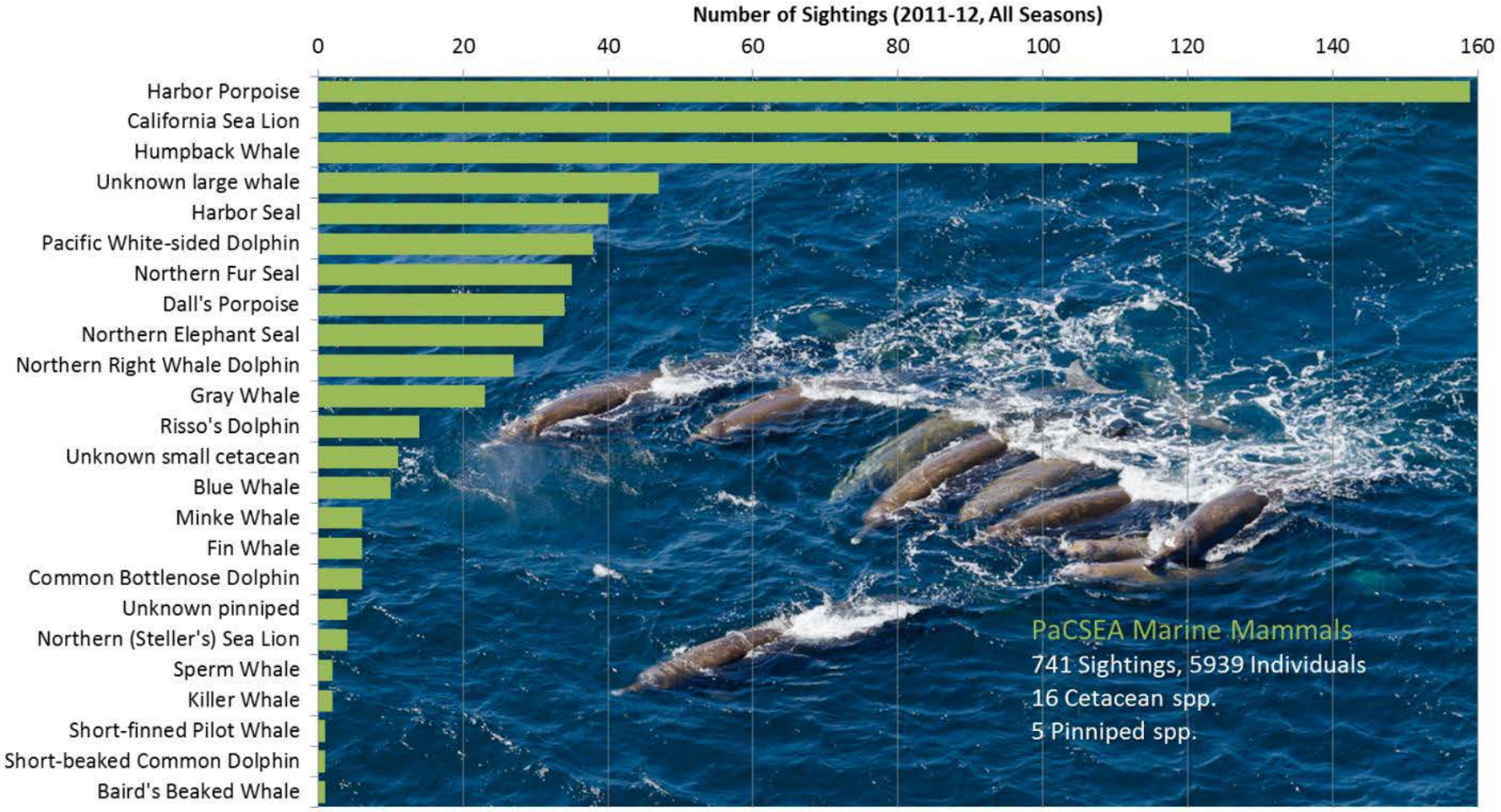
Marine Mammals - Sightings



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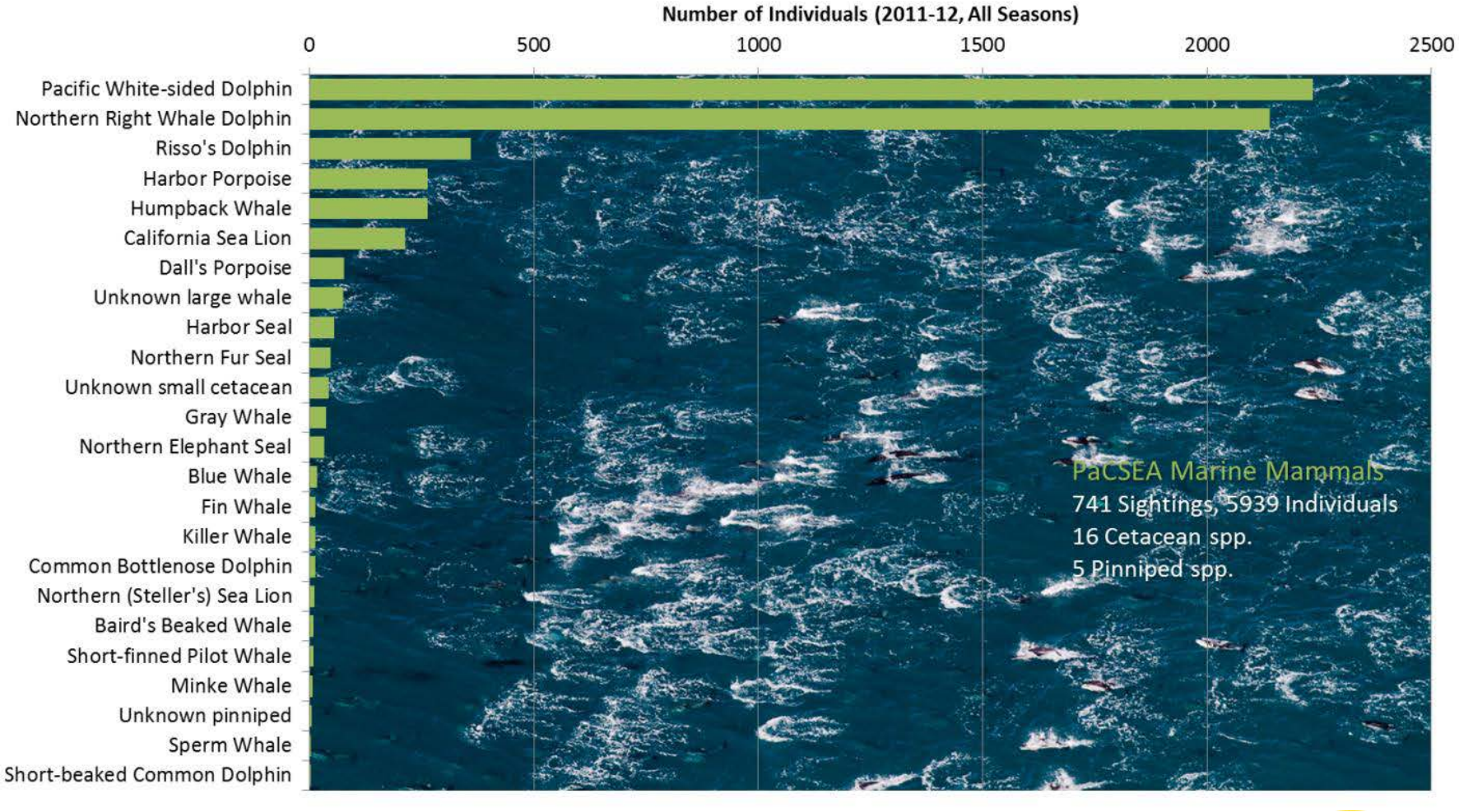
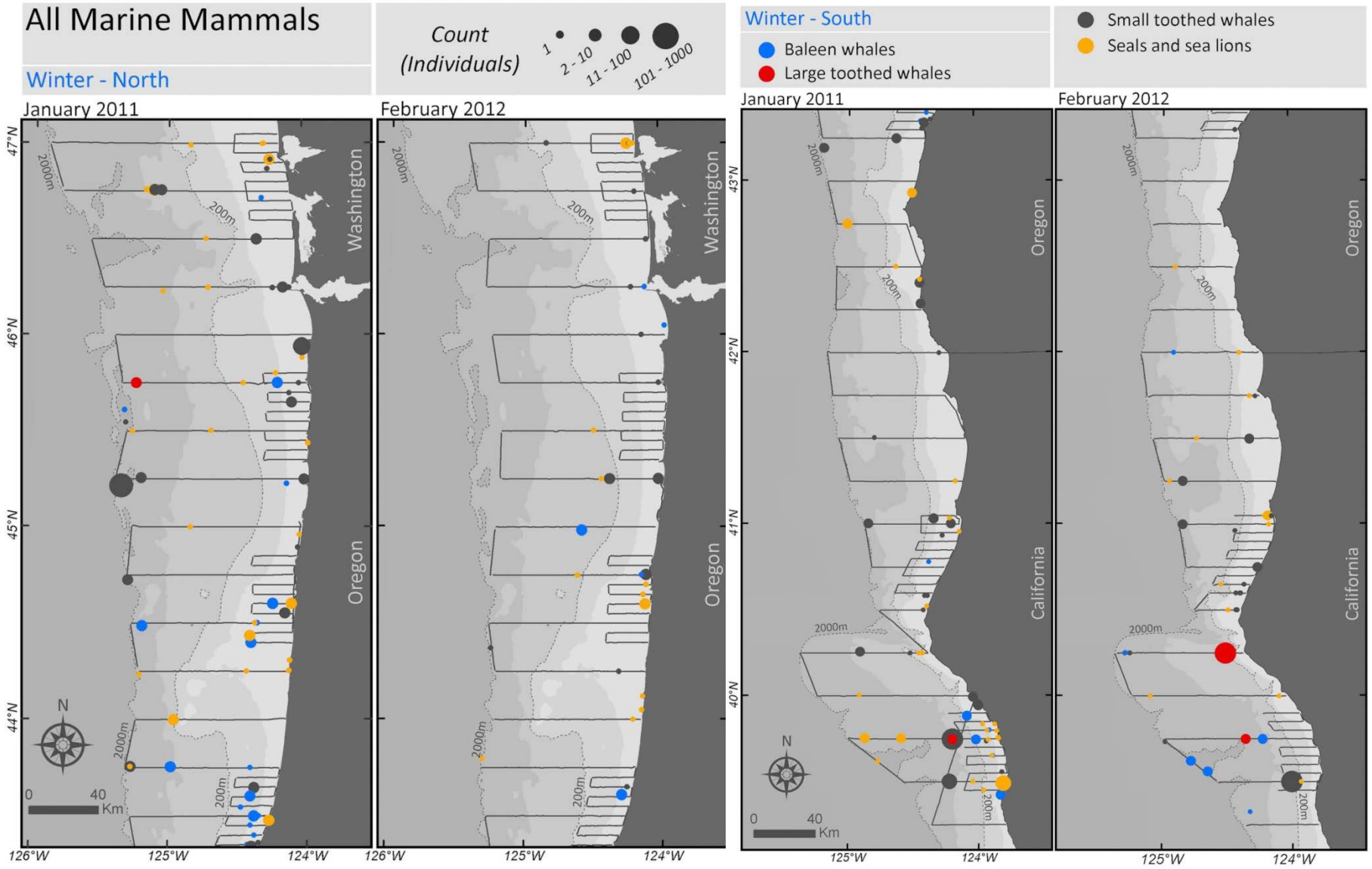
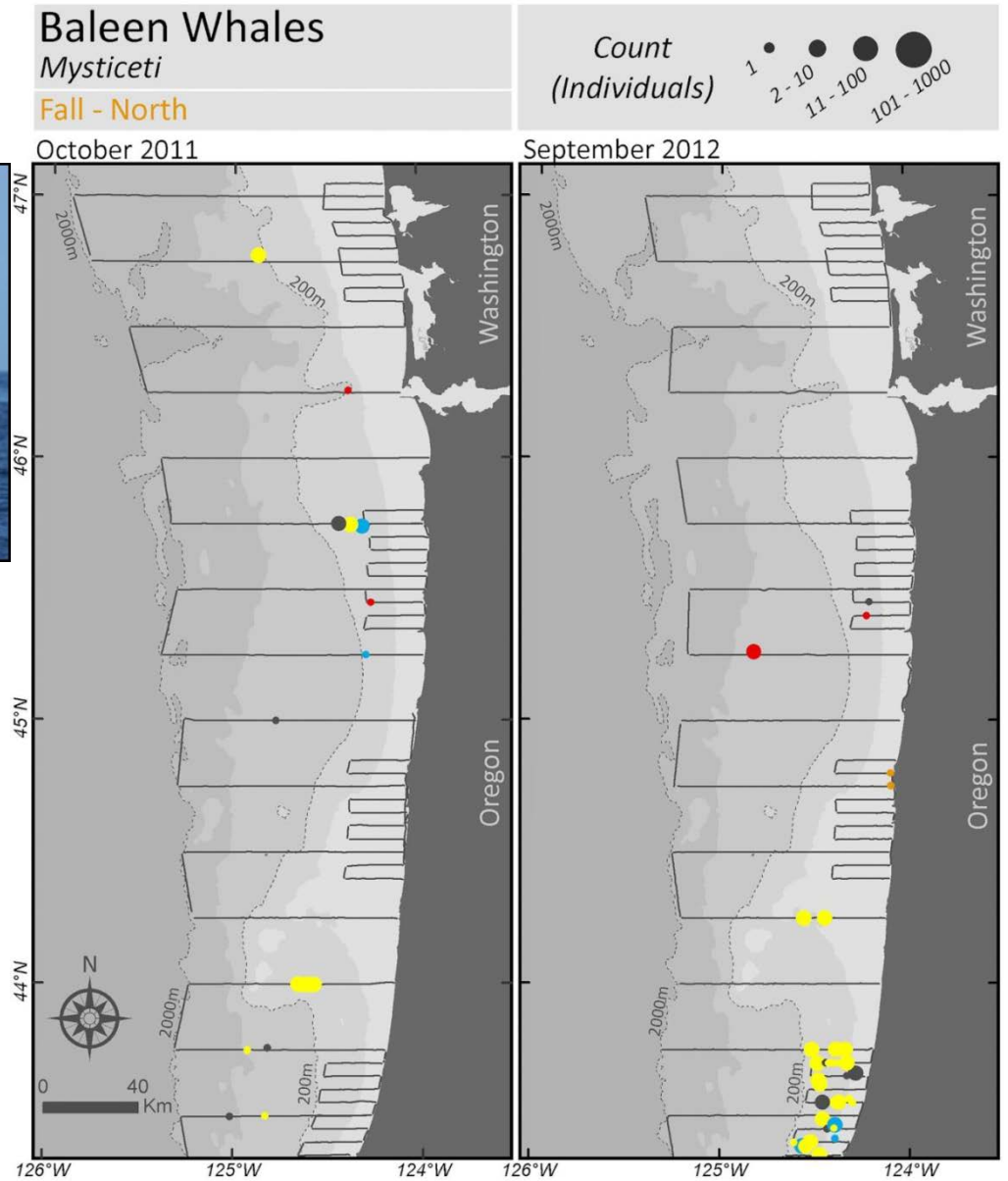
Marine Mammals - Individuals



All Marine Mammal Sightings - Winter



Baleen Whales – Fall

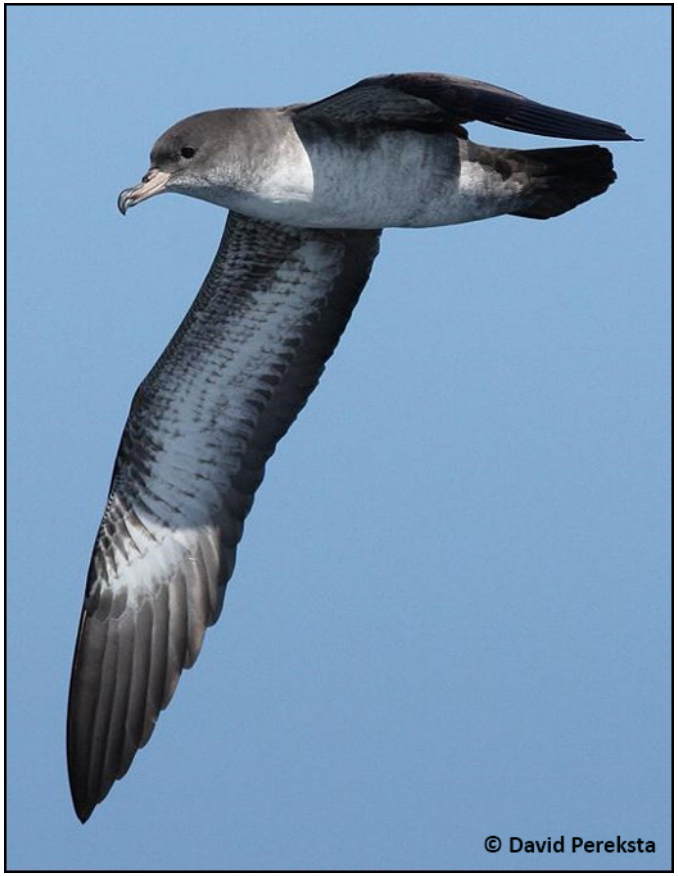


Fall - South

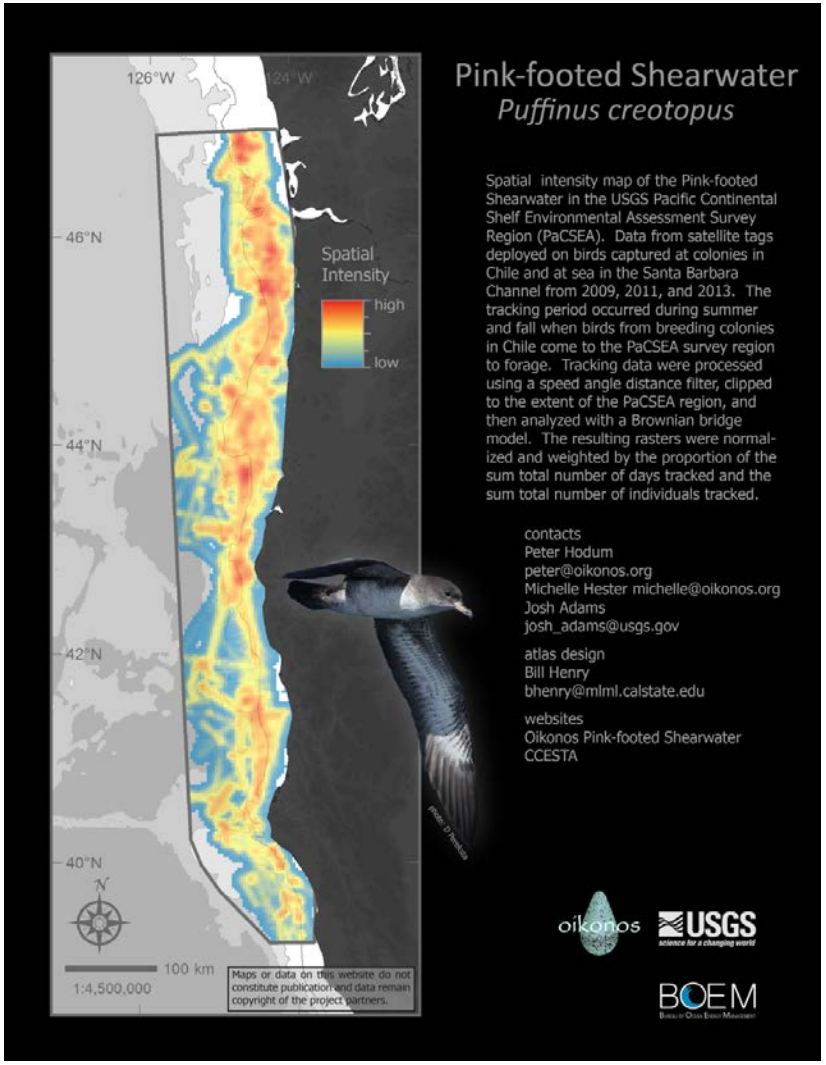
- Humpback Whale
- Gray Whale
- Fin Whale
- Blue Whale
- Unknown Large Cetacean
- Minke Whale

Additional Publications

- Atlas of the Pacific OCS
  - GIS-based atlas of telemetry datasets for 11 species
- Pacific Shelf Seabirds monograph
  - 20-year comparison with earlier surveys
- Seabird Community paper
  - Oceanographic affiliations and community patterns
- Shearwater Movements paper
  - At-sea distribution comparison of satellite telemetry and vessel-based surveys
- Hyperspectral Imagery techniques paper
  - Classify unique water masses and frontal structure



California Current Ecosystem Seabird Telemetry Atlas (CCESTA)



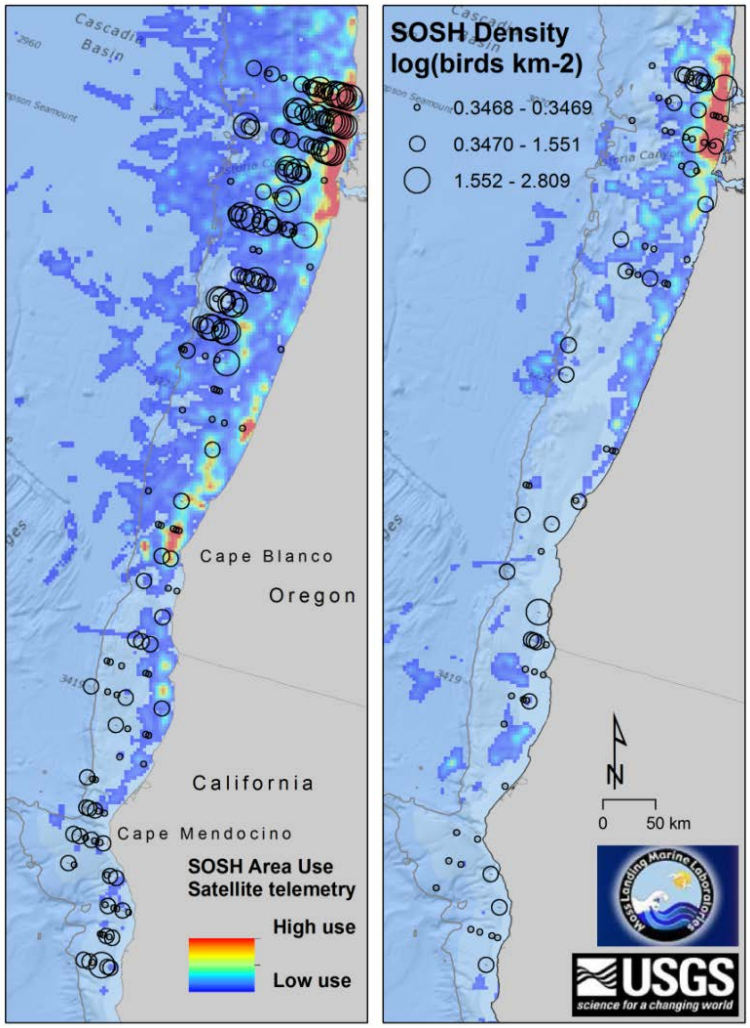
www.werc.usgs.gov/ccesta

- Aggregate available USGS seabird tracking data and data from cooperating researchers
- Publicize the contact information, websites, and related science outreach
- Provide streamlined, appropriately standardized methods to process and visualize extensive, spatially explicit tracking data
- Provide strict, end-user data license agreements to protect the intellectual property

Contributed Species:

Cassin's Auklet, Marbled Murrelet, Xantus's Murrelet, Common Murre, Ashy Storm-Petrel, Pink-footed Shearwater, Sooty Shearwater, Laysan Albatross, Black-footed Albatross, Surf Scoter --- and more species to be added in the future!

PaCSEA transect data evaluation and enhancement

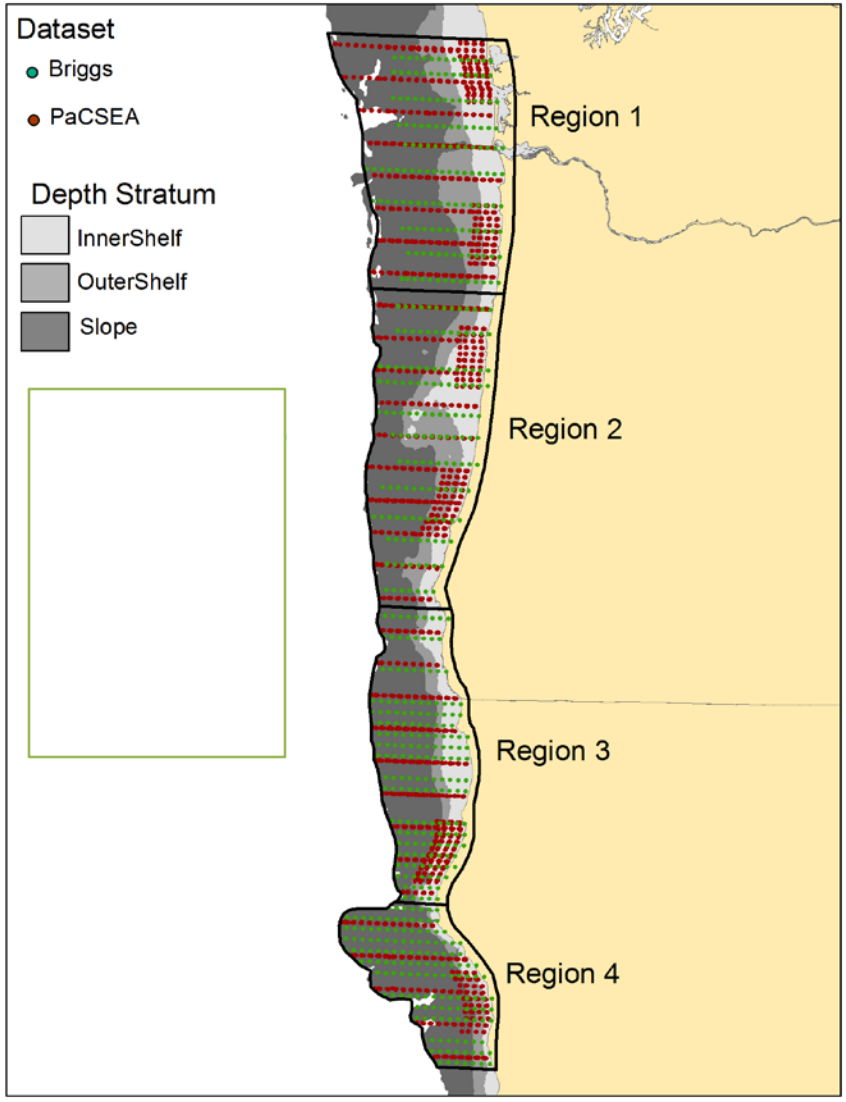


2009 2008

- USGS WERC has conducted marine bird telemetry since 1995
  - >11 species within the CCS
- Telemetry Provides area-use through time to better integrate species' responses to dynamic ocean conditions
- Techniques have been adopted world-wide for describing ranges, habitat affiliations, and hot-spots for MSP
- Compare tracking data with transect data
- Can disparate data types be combined to better represent distributions at sea?

PaCSEA – Briggs Historical Comparison

- Bathymetric (3) and biogeographic (4) domains
- Non-breeding vs. breeding season
- Effort weighted and scaled PaCSEA data to match Briggs data (~7 km)
  - Are there differences in densities or shifts in distribution when these surveys are compared?
  - Can we combine data for more robust distribution modeling associated with environmental parameters?



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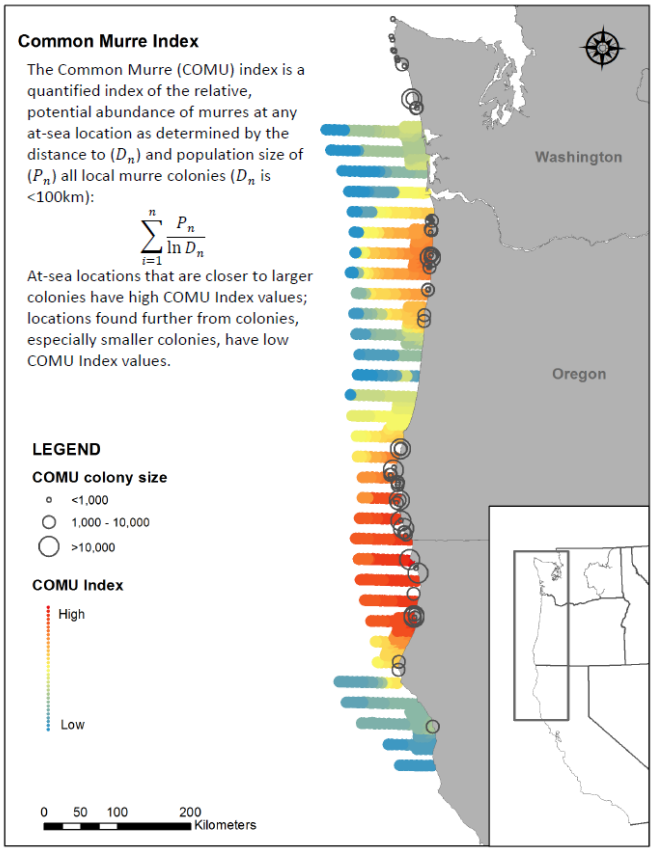
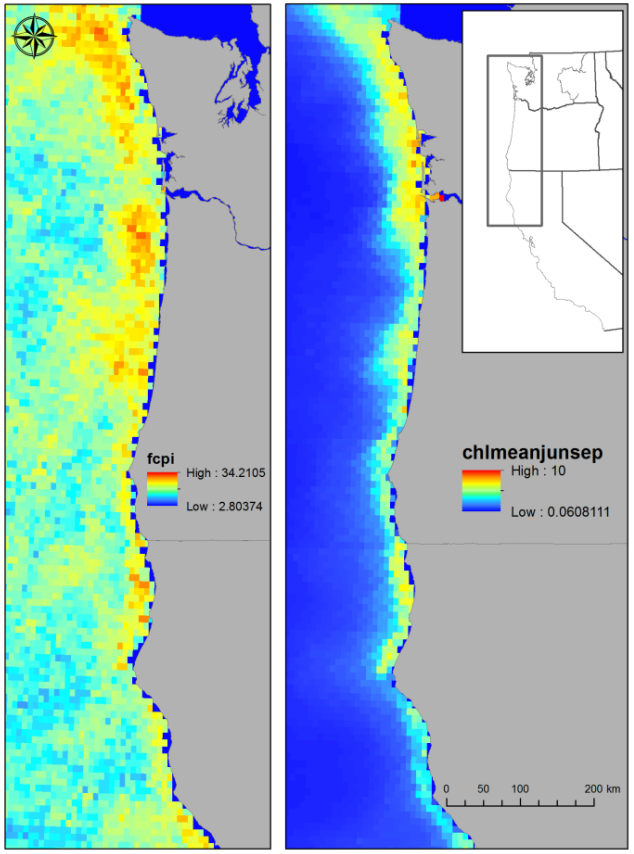
Incorporating New Biotic Predictors to Evaluate Distribution at Sea

Breeding seabird colony data



Remote sensing of chlorophyll

Suryan et al. (2012)



U.S. Department of the Interior
March 3, 1849

Final OCS Study Report

OCS Study
BOEM 2014-003

Pacific Continental Shelf Environmental Assessment (PaCSEA)

Aerial Seabird and Marine Mammal Surveys off Northern California, Oregon, and Washington, 2011-2012

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http://www.boem.gov/2014-003/

http://www.werc.usgs.gov/ProjectSubWebPage.aspx?SubWebPageID=4&ProjectID=235

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