BOEM

Bureau of Ocean Energy Management

# Birds and Offshore Wind Energy Development:

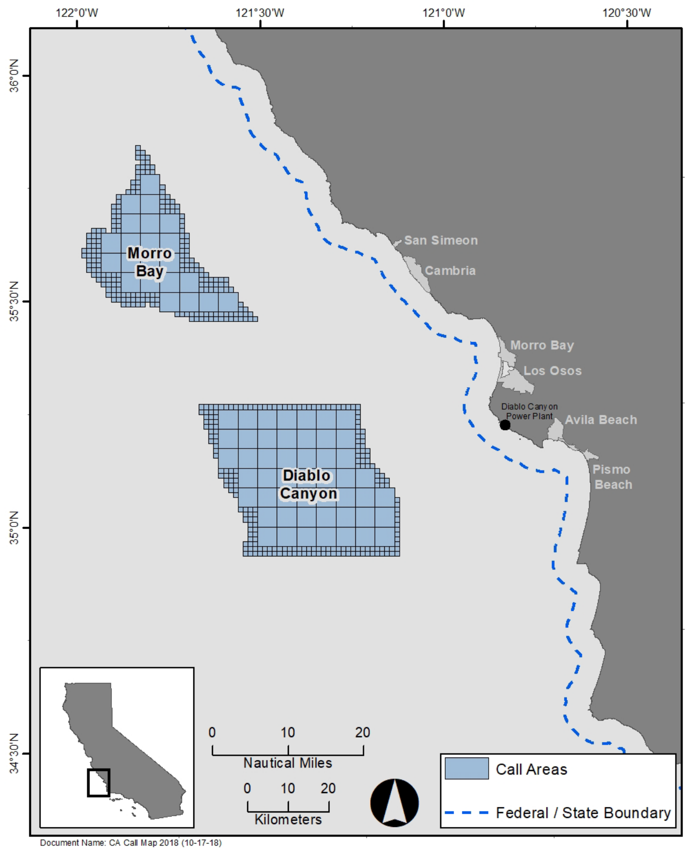
## BOEM's Avian Study Strategy to Assess Data Needs and Effects

BOEM Pacific OCS Region

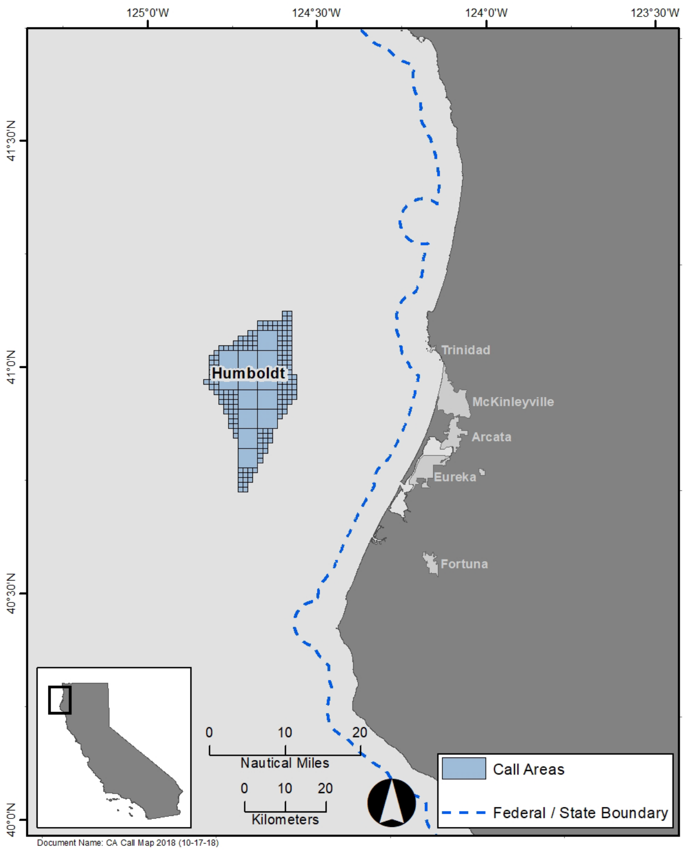
January 8, 2020

David M. Pereksta | West Coast Renewable Energy Science Exchange Webinar

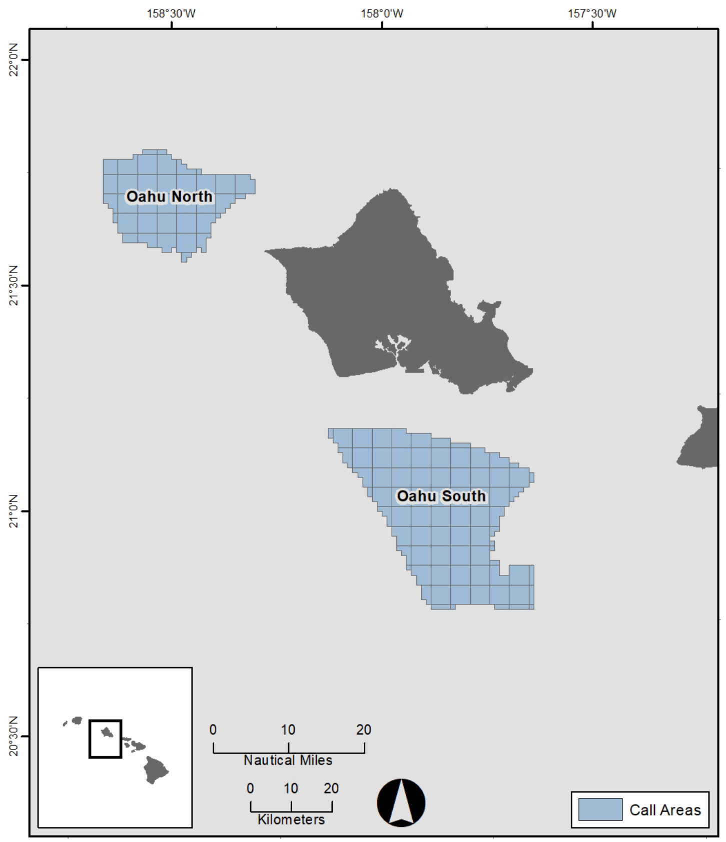
# Wind Energy Call Areas – Pacific OCS Region




Central California




Northern California




Hawaii

# Bird Baseline – Shore, Nearshore, and Pelagic

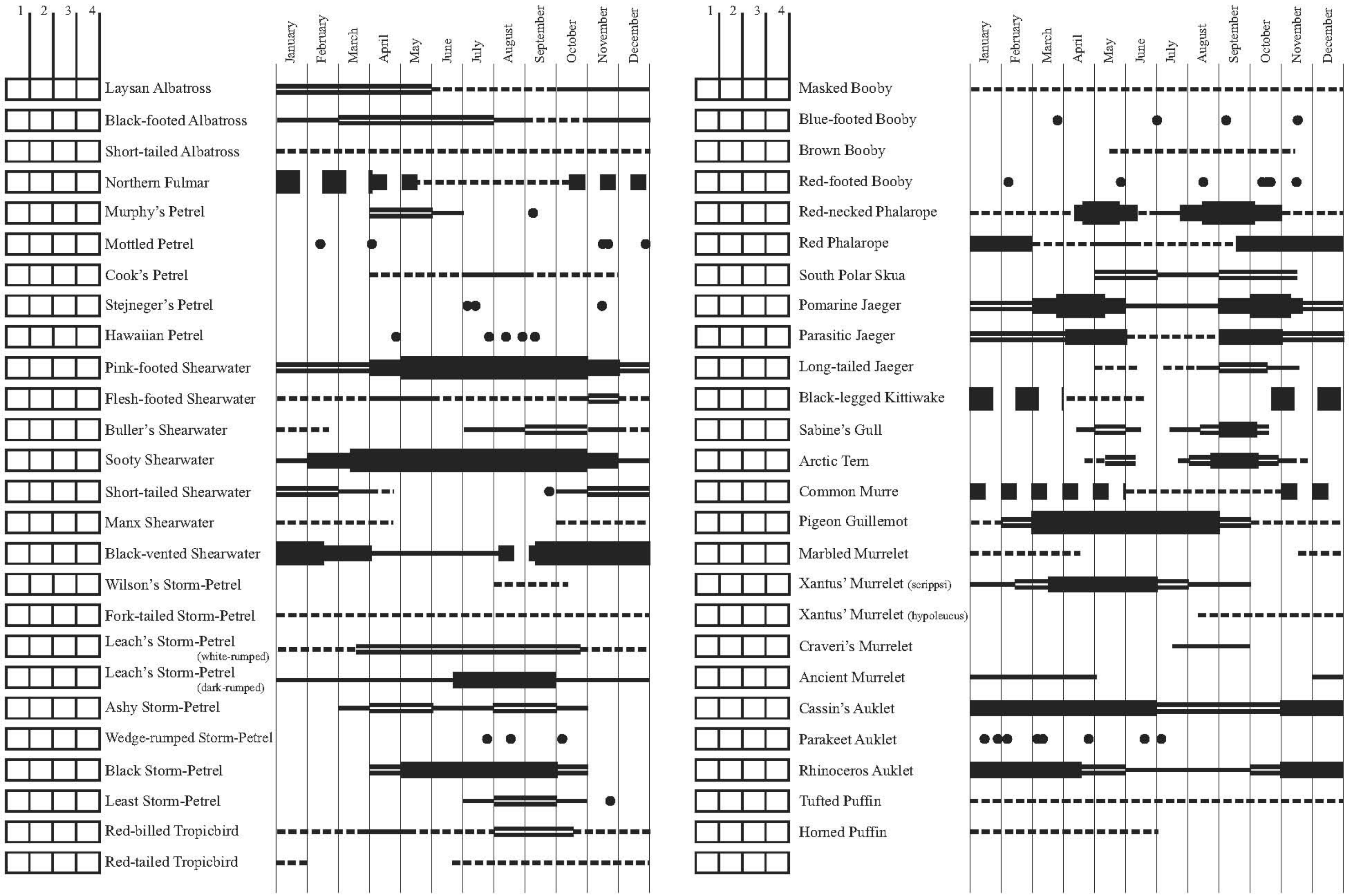
**Species Diversity on the Pacific OCS (West Coast and Hawaii)**

- Nearshore and shoreline species
  - Sea ducks, loons, grebes, shorebirds, gulls, terns
- Pelagic species primarily in deep offshore waters
  - 50+ species including tubenoses, jaegers, alcids
  - Pelagic shorebirds, terns, gulls

**Special Status Species**

- 13 ESA listed species
- 80 species with some level of special status on the Pacific OCS and coast
  - Several very rare species endemic to the Pacific OCS

# Bird Baseline – Pelagic Species



# Interactions…Birds Have It Tough

## Hazards

- Birds at risk from anthropogenic sources

## Annual Bird Deaths in the U.S. and Canada

- Cats:  2.6-3.8 billion
  - 33 island bird extinctions worldwide!
- Windows:  624 million
- Automobiles:  214 million
- Power lines:  175 million
- Pesticides and toxics:  67-90 million
- Fossil fuel powerplants:  14 million
- Communication towers:  7 million
- Persecution:  4 million
- Oil and waste water:  1.4-2 million
- Land-based wind turbines:  100,000-440,000 (4.2 birds/MW/year)

# Offshore Wind Energy Effects – Birds

## Collision Hazard

- Rotors and support towers

## Avoidance

- Displacement from feeding grounds
- Movement barriers
    - Migration and feeding

## Attraction

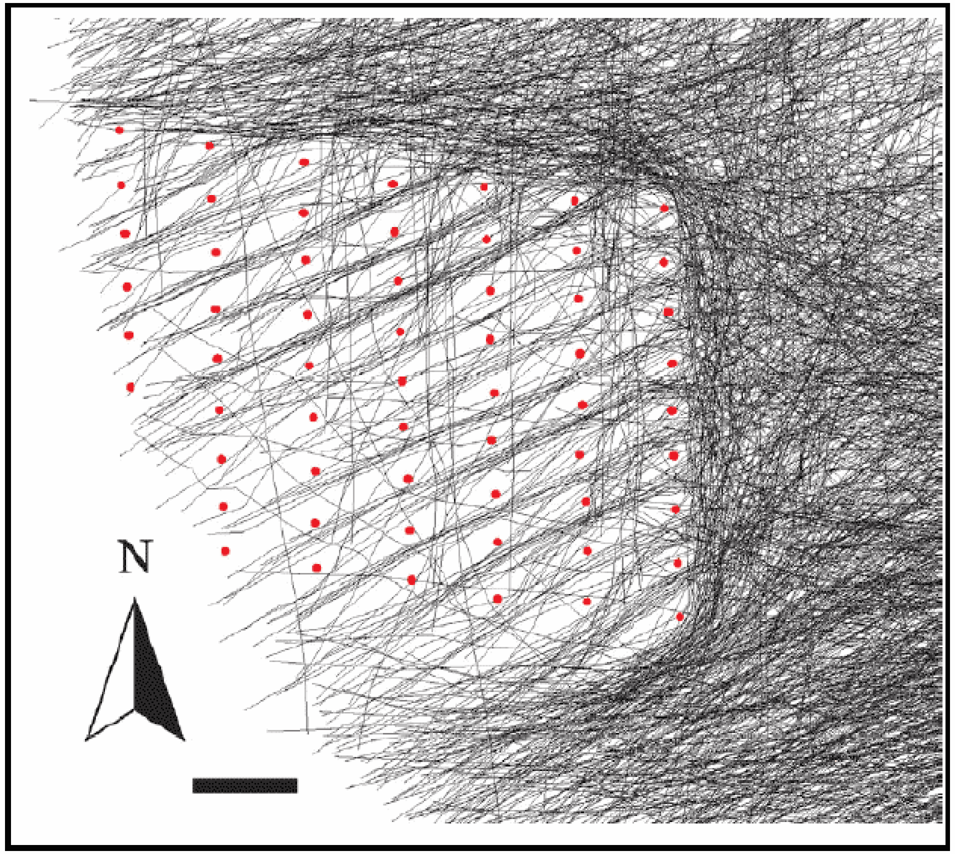
- Prey base and habitat alteration/completion
- Light attraction/disorientation
- Perching – including falcons

**Effects from one project could be minimal, but cumulative impacts from multiple projects could be substantial**

# European Experience

## Effects Monitoring Ongoing

- Collision Risk
  - Poorly quantified; monitoring difficult
  - Behavioral changes minimize collision risk
  - Risk greatest to species flying more frequently at turbine blade height
- Barrier effects – migration
  - Most species avoid wind farms
  - Most show gradual avoidance; others dramatic
  - Greater problem for commuting birds
- Displacement
  - Avoidance of project areas after buildout
  - Significance depends on availability of alternate feeding grounds



# European Experience

## Effects Monitoring Ongoing

- Attraction
  - Cormorants strongly attracted
  - Gulls and Red-breasted Mergansers weakly attracted
  - Perching and prey increases
- Avoidance
  - Great Crested Grebe, Northern Gannet, and loons strongly avoided
  - Sea ducks, fulmars, alcids weakly avoided
  - Data for some species still lacking
- Weak attraction or avoidance – no recognizable effect
  - Common Eider, Black-legged Kittiwake, Common and Arctic Terns

# Wind Energy Mitigations – Birds

## Siting is Critical!

- Tough to undo once done, so spend time before the project understanding bird status, distribution, and movements in area

## Other Mitigations

- Construction timing
- Turbine design and repowering
  - Fewer larger ones with minimal perching opportunities
- Turbine layout
  - Wider spacing
- Turbine operation and curtailment
  - Slower speeds; temporary shutdowns
- Acoustic deterrents
- Visual approaches
- Offsite/onsite compensation

# Ecological Information for Renewable Energy

- Seasonal distribution, abundance, density
- Migration routes and patterns
- Attraction and avoidance behavior
- Displacement effects
- Prey base changes
- Nocturnal activity and movement
- Effects of noise, vibration, lights and structures
- Collision risk

**Difficult information to collect due to weather, remoteness, vessel availability, etc.**

# Multi-tiered Approach and Goals

## Broad-scale Assessments

- Facilitate planning at landscape level
- Government supported

## Site-specific Assessments

- Project-level planning and assessment
- Project proponent supported
- BOEM guidelines based on statistical analysis

## Goals

- Identify baseline conditions
- Detect changes associated with anthropogenic effects
- Evaluate the effects of past policies and management activities
- Design and implement projects that will minimize adverse effects to marine resources to the maximum extent possible

# Strategic Approach to Renewable Energy Research

## Synthesize Existing Data

- Identify existing information and data gaps
- Predictive modeling

## Collect New Data

- At sea surveys and colony catalogs
- Telemetry studies
- Technology advancement

## Assess Risk

- Impacting factors
- Assess interactions, risk, vulnerability

## Monitor

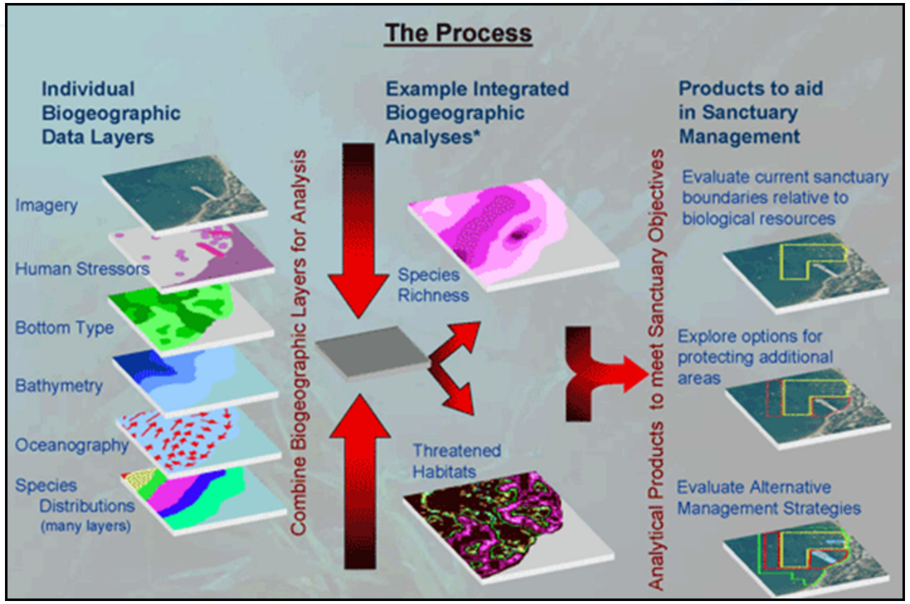
- Track change over time resulting from project construction and operation

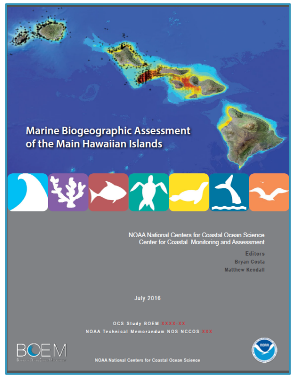
# Marine Biogeographic Assessment – Main Hawaiian Islands

## Objectives

- How are select marine species or taxonomic groups distributed spatially and temporally around the MHI?
- What environmental conditions potentially influence these distributions?
- Where are ecologically unique and productive habitats located?
- How are ecologically important areas being used by living marine resources?
- What significant gaps exist in our knowledge of the physical, biological, and ecological characteristics of marine systems of the MHI?

**https://espis.boem.gov/final%20reports/5555.pdf**



# Marine Biogeographic Assessment – Main Hawaiian Islands

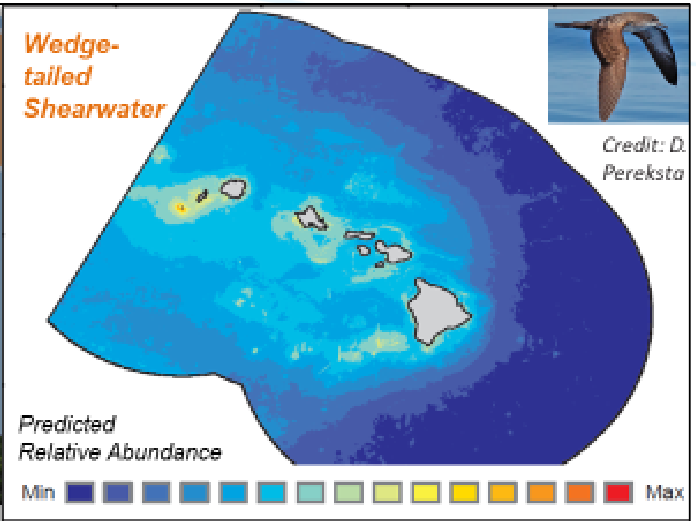
## Chapter 7 Seabirds

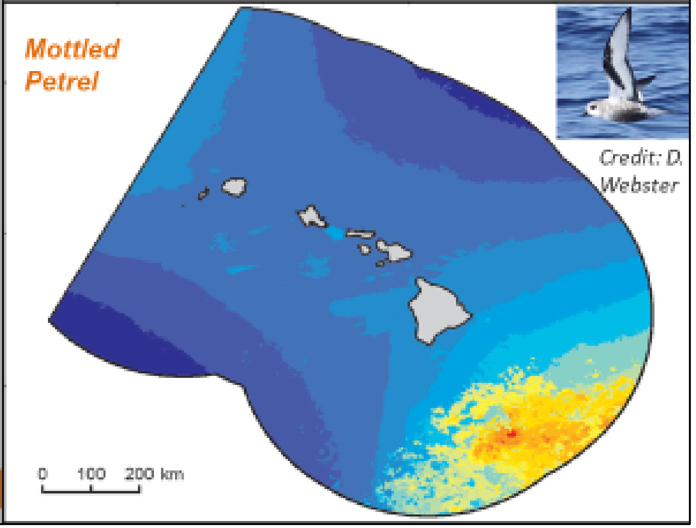
*A. Winship, B. Kinlan, L. Ballance, T. Joyce, J. Leirness, B. Costa, M. Poti, P. Miller*

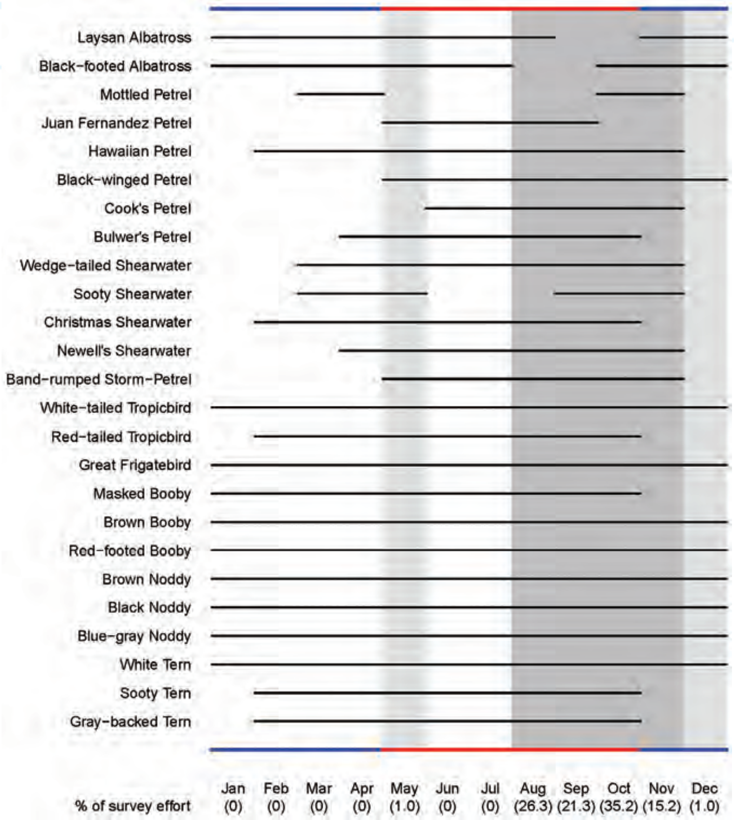
**GIS Data:** *(78 Spatial Layers)*

- At-sea presences 24 spp (42)
- Foraging ranges for 8 spp (8)
- Spatial predictions & uncertainty for 14 species (28)
- Model inputs (listed in Chapter 2)

***Data Sources***: NOAA SWFSC MMTD




*Monthly presence of seabird species in the Main Hawaiian Islands. Black lines indicate months present, based on a literature review. Blue and red lines indicate winter and summer (as defined in Chapter 2), respectively. Dark grey shading indicates months with 98 percent of the survey effort, light grey shading indicates months with the remaining 2 percent of the survey effort, and no shading indicates no survey effort.*

# Data Synthesis and Predictive Modeling

## Objective

Improved species-specific distributions and density estimates of seabirds that can be extended to non-surveyed areas to provide critical information for renewable energy siting

- Identify, collect, and synthesize data from all available marine bird surveys
- Develop a predictive statistical model of seabird distribution taking into account all available data and relationships with environmental variables
- Map the predictive distribution of marine birds to identify areas of persistent aggregation and persistent avoidance ("hotspots" and "coldspots")

# Data Synthesis and Predictive Modeling – Survey Data

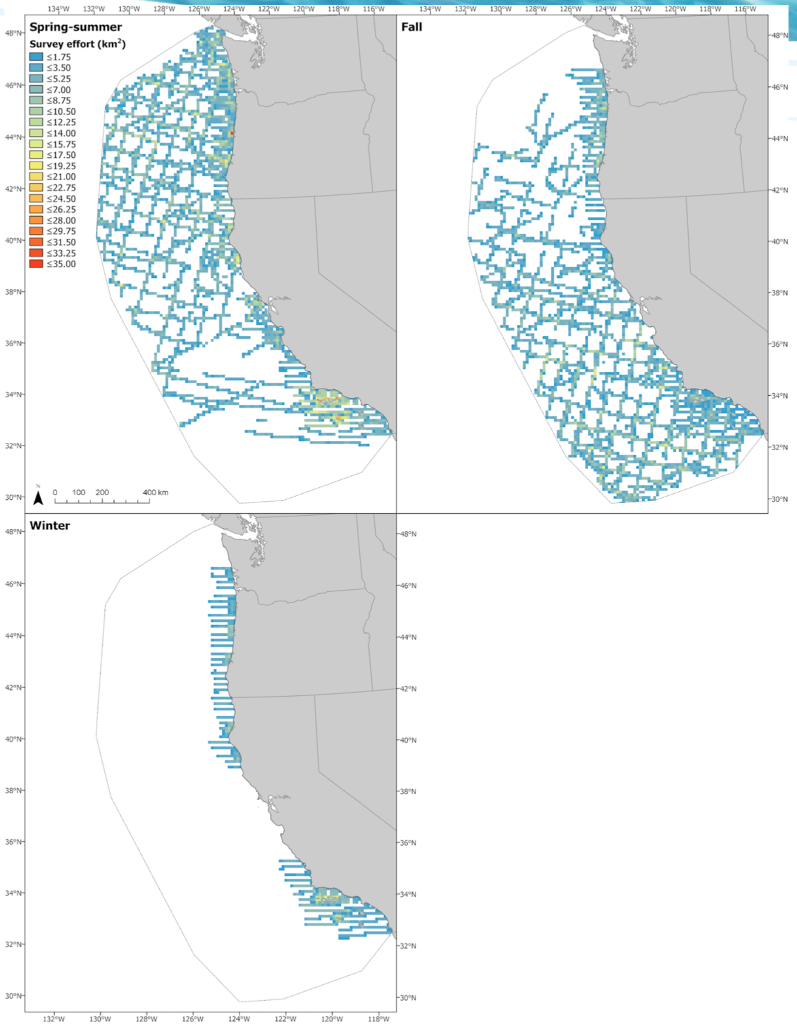
**Aerial – USGS**

- Southern California surveys (1999-2002)
- PaCSEA (2011-12)

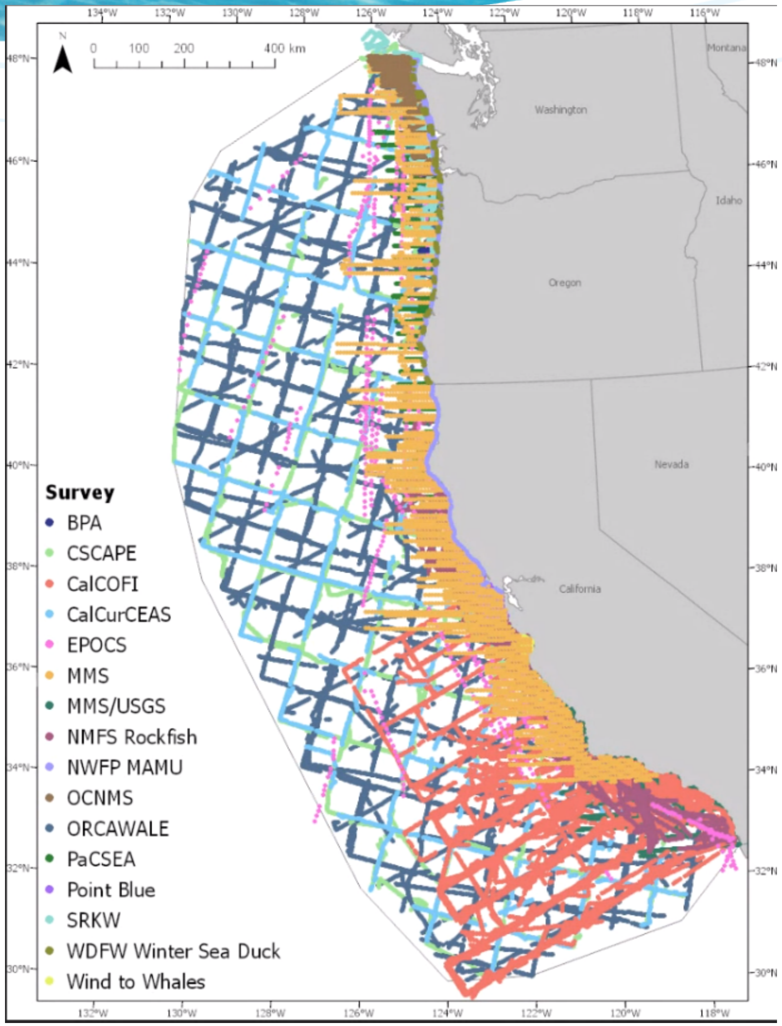
**Boat – NOAA**

- ORCAWALE (1996, 2001, 2008)
- CSCAPE (2005)
- CalCurCEAS (2014)

- Visual sightings
- Strip transect methodology
- Segmentation (2.4 km segments)
- 41 species
- 3 seasons (spring-summer, fall, winter)
- 79 species-season combinations



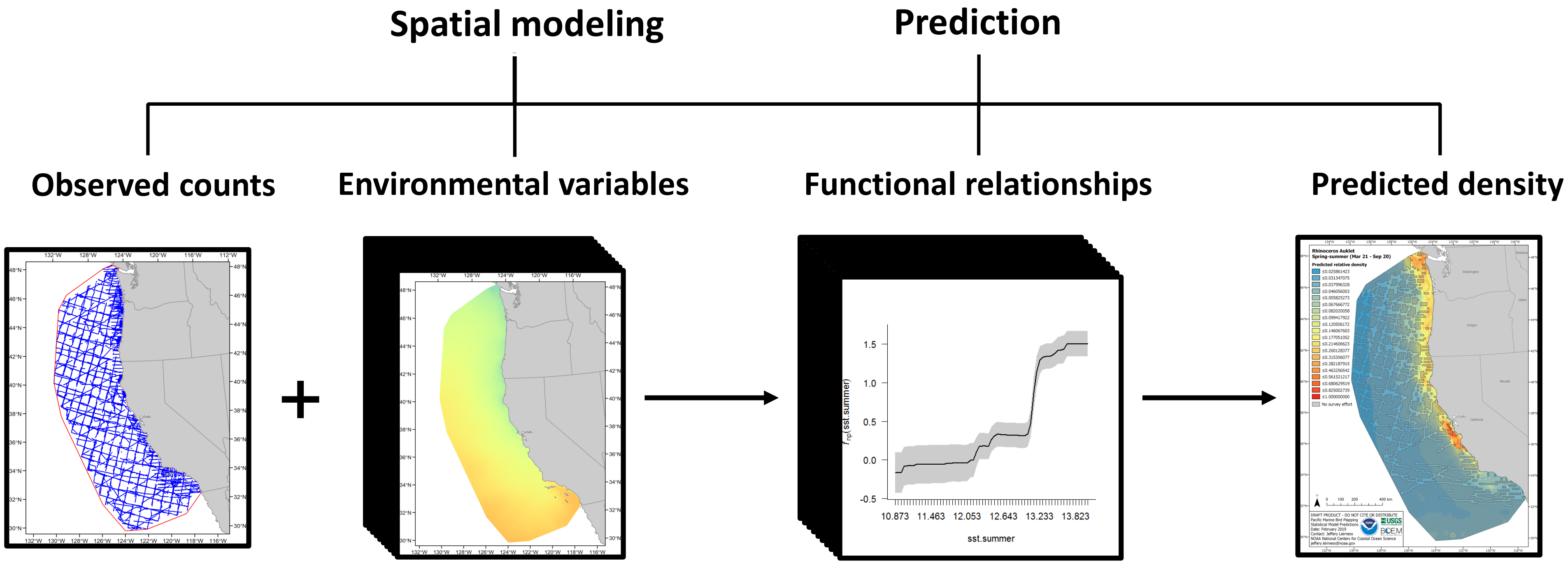

Phase One



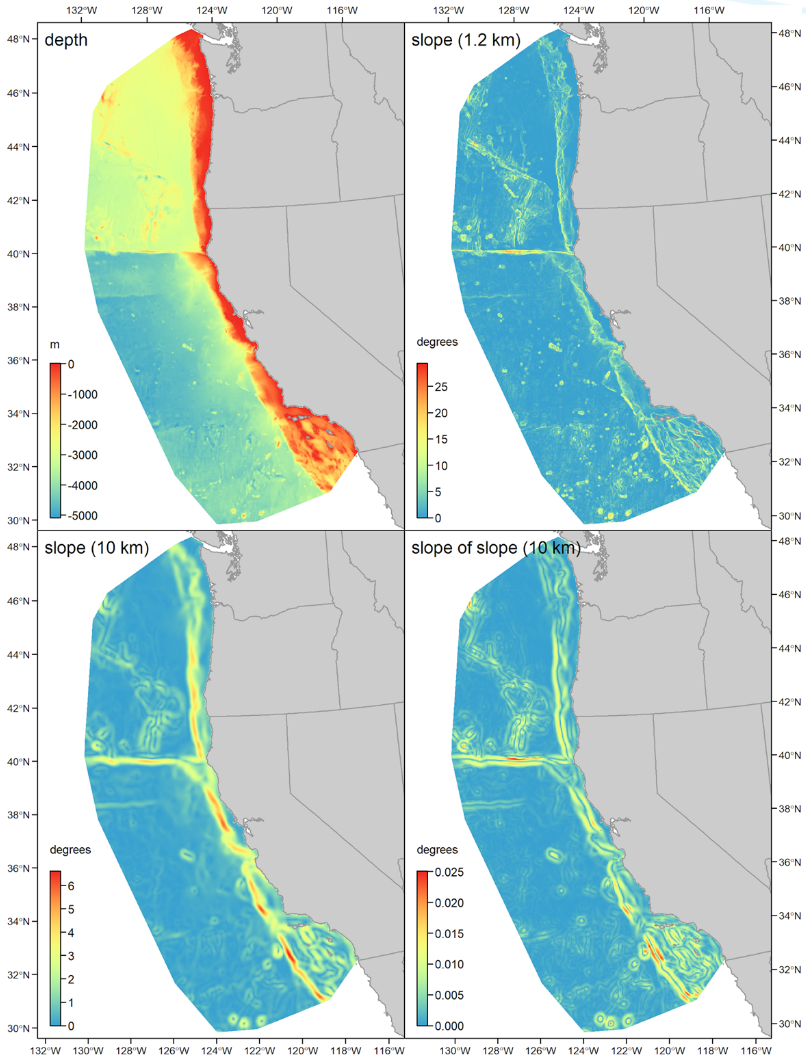

Phase Two

# Spatial Predictive Modeling

- Survey coverage variable with gaps
- Comprehensive environmental datasets available
- Relate species counts to environmental variables
- Predict density across entire region



# Environmental Predictor Variables




## Static (e.g., bathymetry): 12 variables

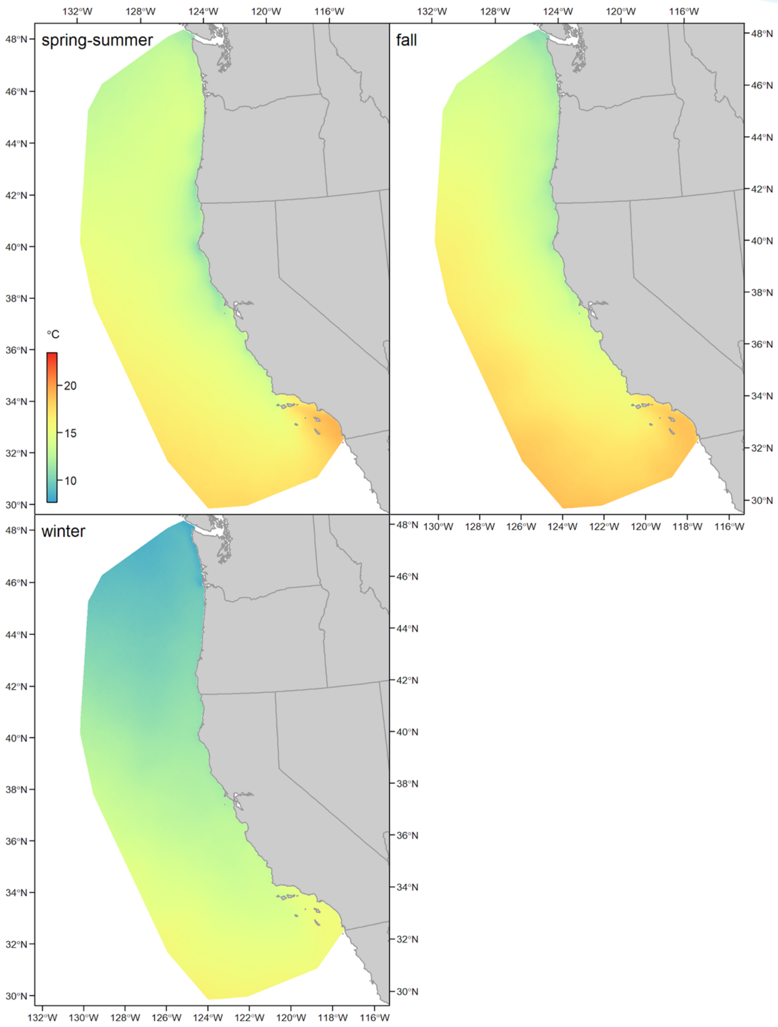
## Geographic

- Projected longitude (x-coordinate)
- Projected latitude (y-coordinate)
- Distance to land

## Bathymetric

- Depth
- Slope (1.2 km & 10 km)
- Slope of slope (1.2 km & 10 km)
- Planform curvature (10 km & 20 km)
- Profile curvature (10 km & 20 km)

# Environmental Predictor Variables




**Dynamic (e.g., sea surface temperature): 23 variables**

## Oceanographic

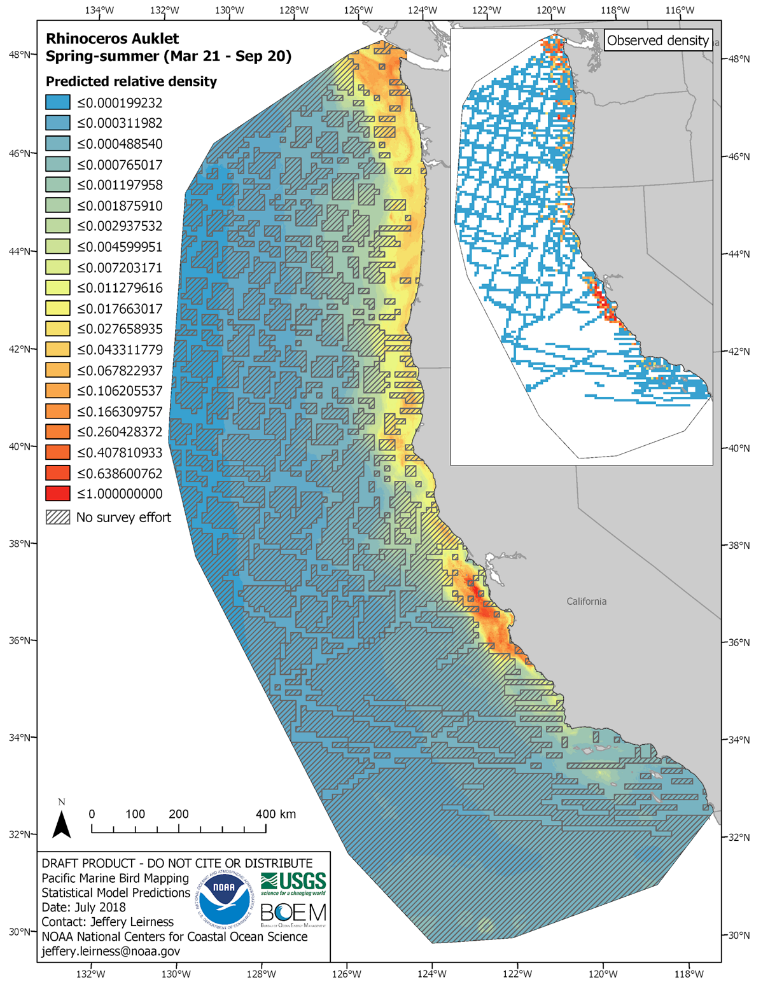
- Chlorophyll-a (mean & front strength)
- Turbidity index
- Current velocity (u & v directions)
- Current divergence
- Current vorticity
- Sea surface height (mean & sd)
- Eddy probability (cyclonic & anticyclonic)
- Sea surface temperature (mean, sd, front strength, & anomaly frequency)
- Ekman upwelling
- Salinity (mean & sd)
- Mixed layer depth

## Atmospheric

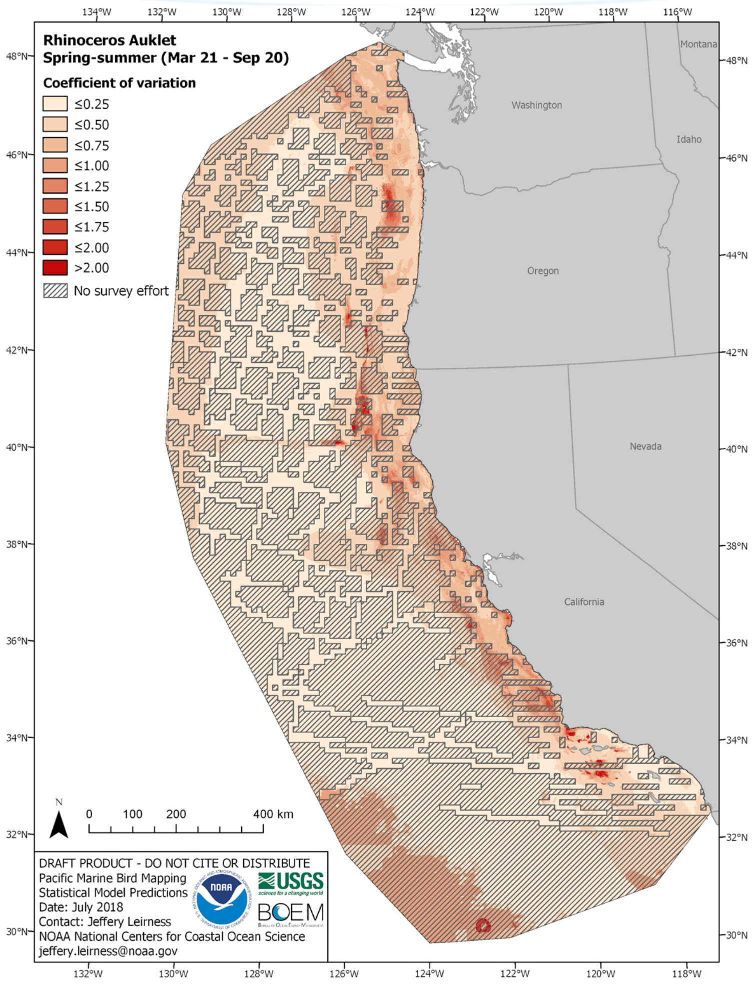
- Wind stress (x & y directions)
- Wind divergence

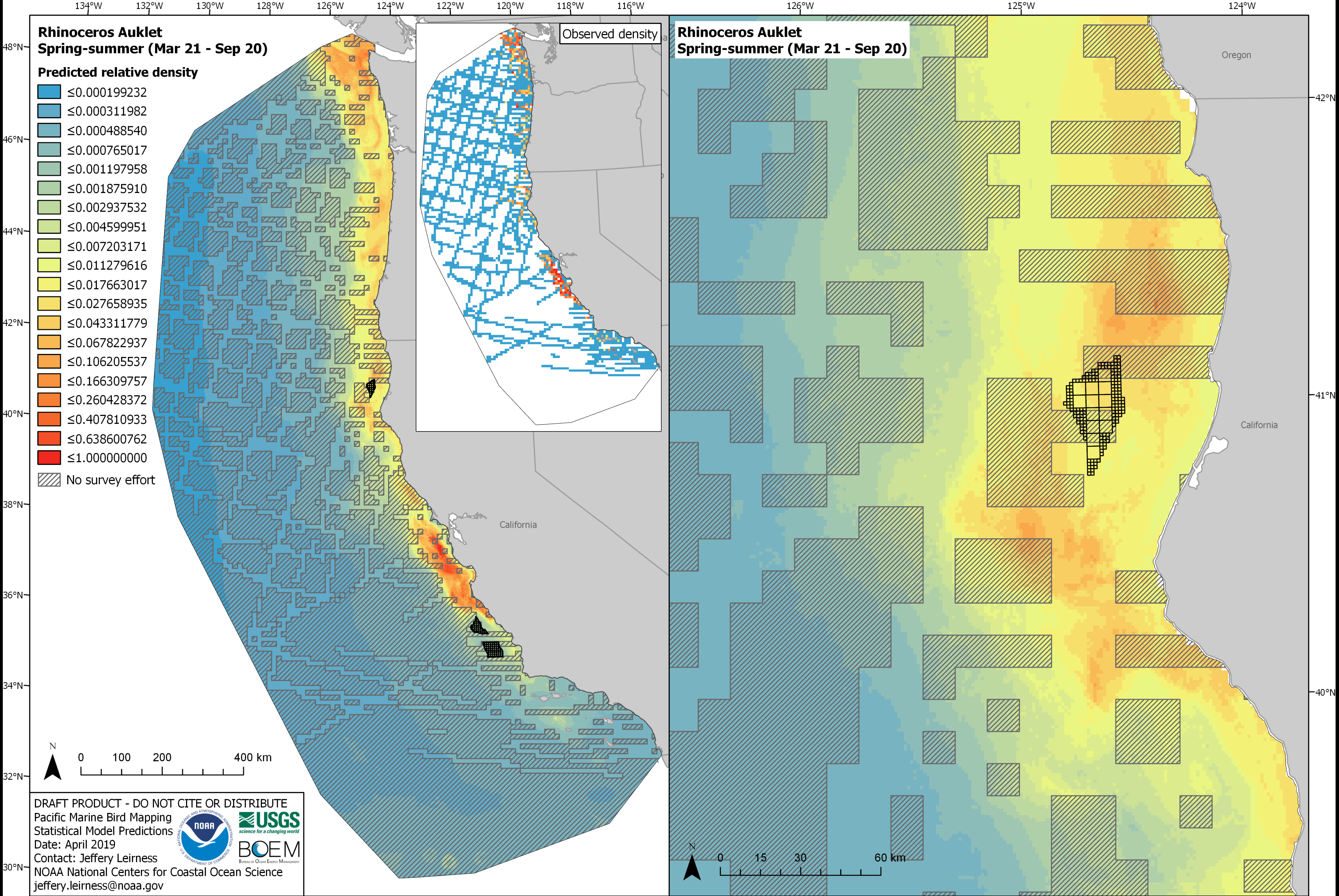
# Data Synthesis and Predictive Modeling – Products

## Relative Density

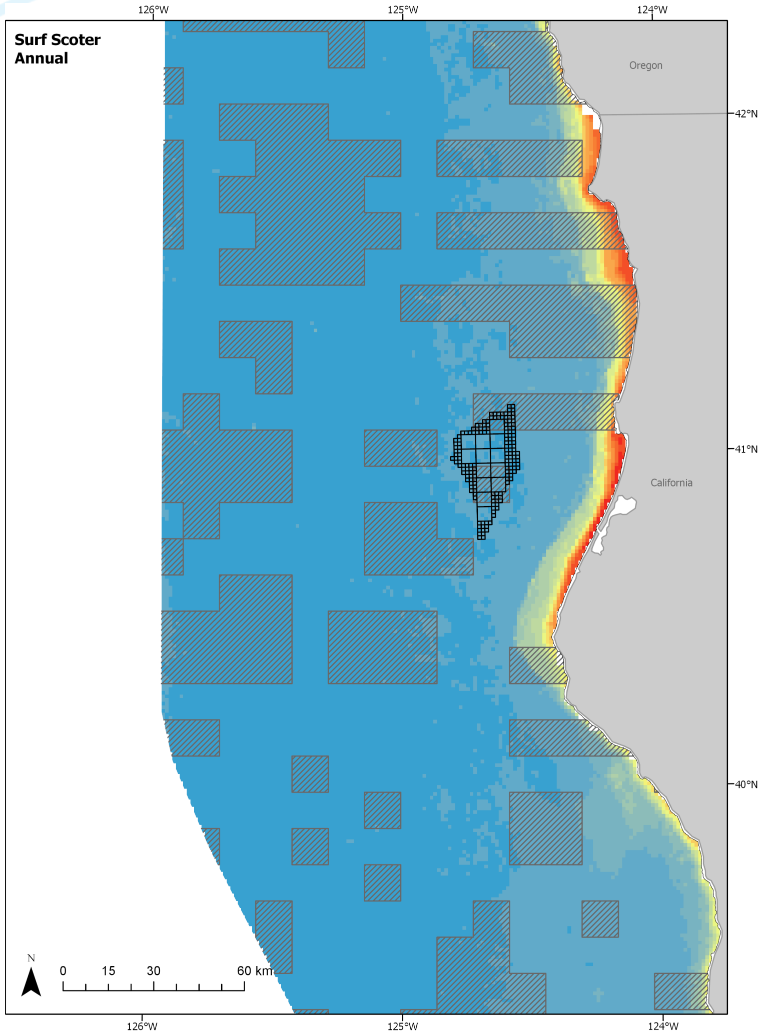


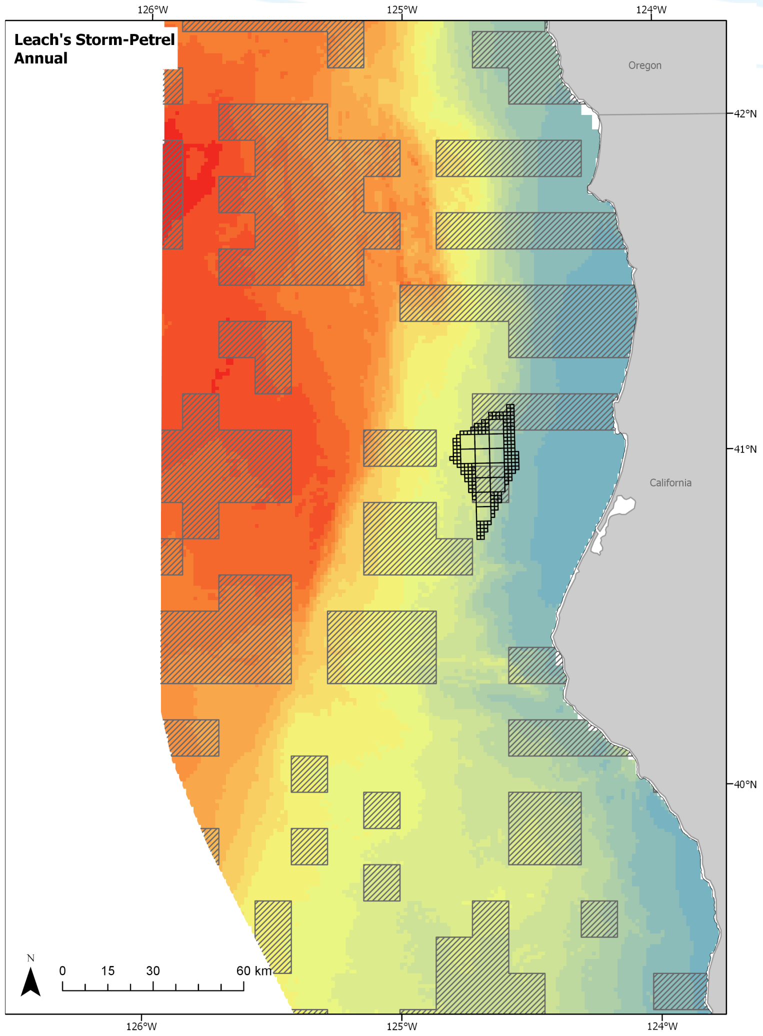

## Coefficient of Variation

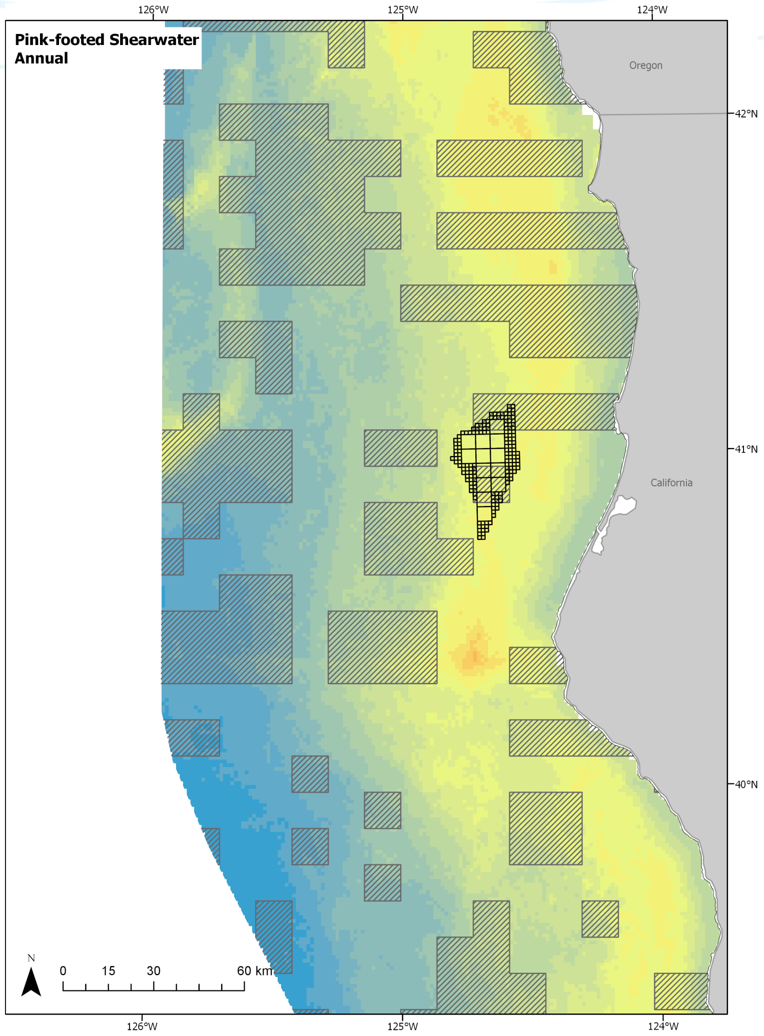



Rhinoceros Auklet
Spring-summer (Mar 21 - Sep 20)
Predicted relative density
≤0.000199232
≤0.000311982
≤0.000488540
≤0.000765017
≤0.001197958
≤0.001875910
≤0.002937532
≤0.004599951
≤0.007203171
≤0.011279616
≤0.017663017
≤0.027658935
≤0.043311779
≤0.067822937
≤0.106205537
≤0.166309757
≤0.260428372
≤0.407810933
≤0.638600762
≤1.000000000
No survey effort
Observed density
California
N
0 100 200 400 km
134°W 132°W 130°W 128°W 126°W 124°W 122°W 120°W 118°W 116°W
48°N 46°N 44°N 42°N 40°N 38°N 36°N 34°N 32°N 30°N
DRAFT PRODUCT - DO NOT CITE OR DISTRIBUTE
Pacific Marine Bird Mapping
Statistical Model Predictions
Date: April 2019
Contact: Jeffery Leirness
NOAA National Centers for Coastal Ocean Science
jeffery.leirness@noaa.gov
NOAA
USGS
science for a changing world
BOEM
Rhinoceros Auklet
Spring-summer (Mar 21 - Sep 20)
Oregon
California
126°W 125°W 124°W
42°N 41°N 40°N
N
0 15 30 60 km

# Data Synthesis and Predictive Modeling – Products



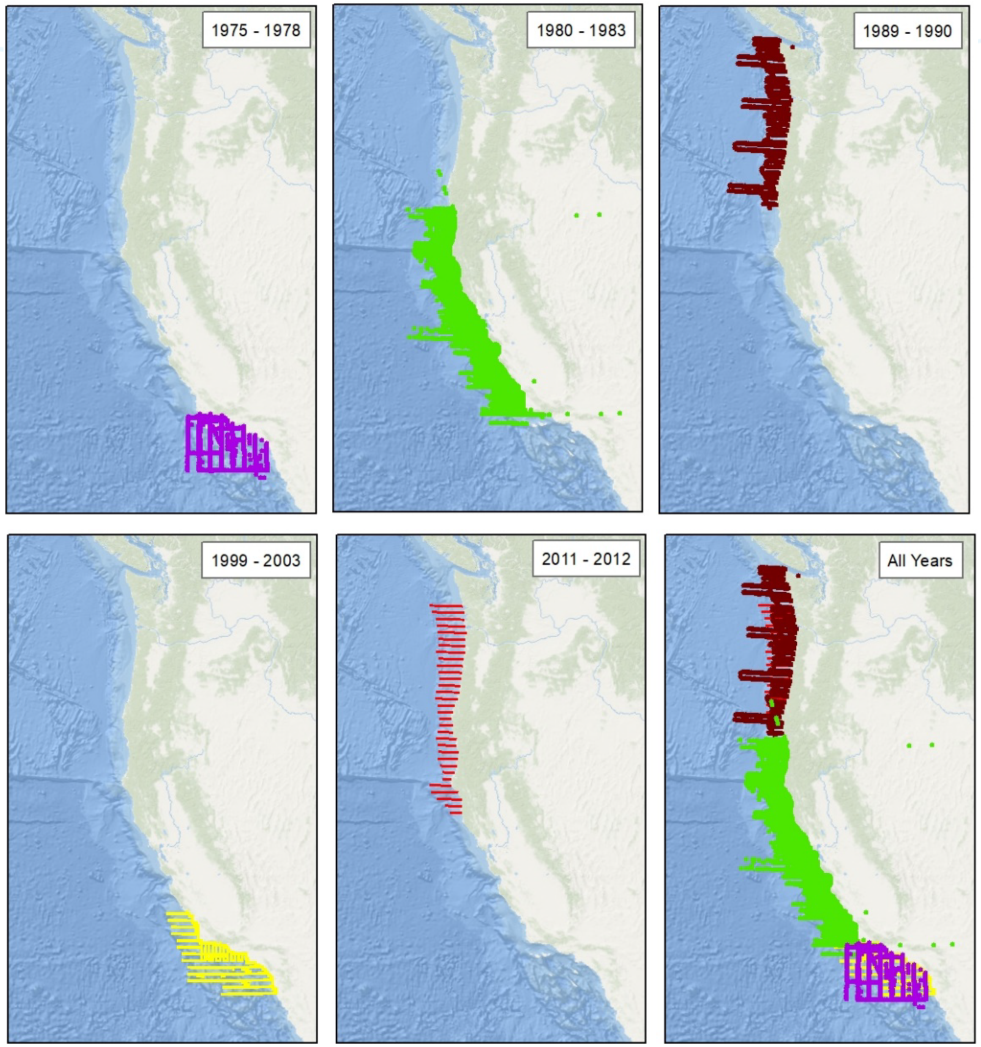



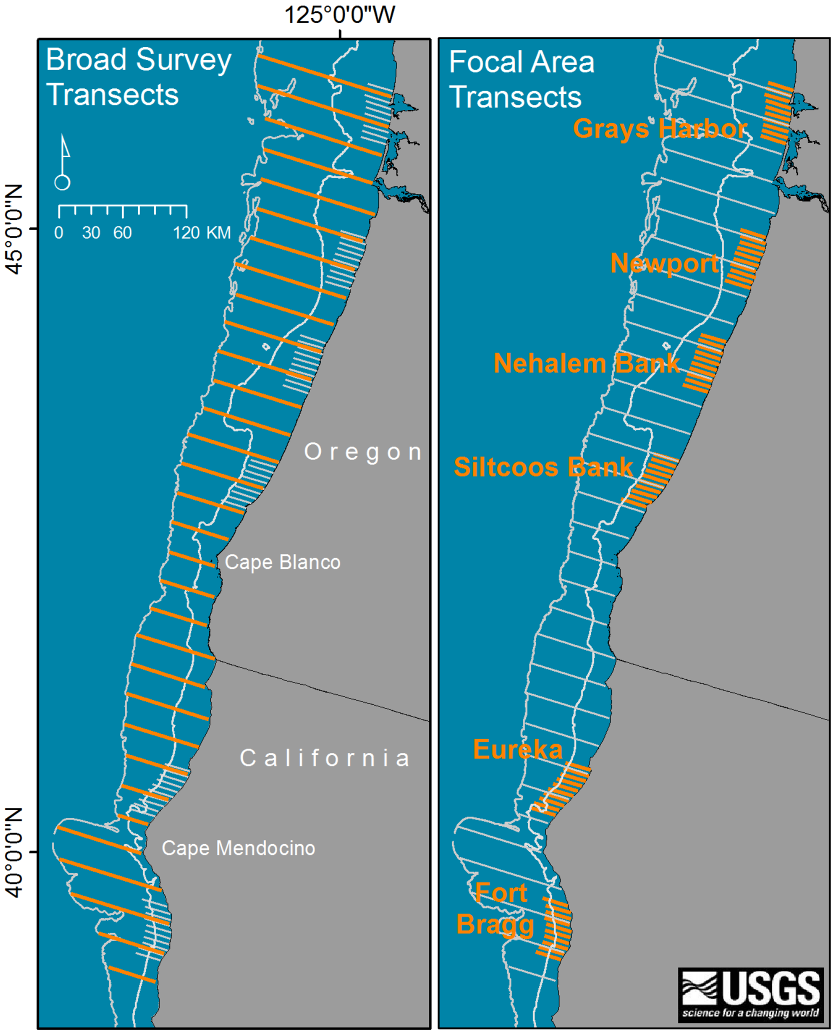
# Marine Wildlife Surveys

## Seabird and Marine Mammal Surveys

- Distribution, abundance, and habitats
  - Potential renewable energy development
- Identify baseline to evaluate change over time
  - Survey during all phases of construction and operation
- Variety of survey platforms
  - Traditional aerial and ship surveys
  - Use of new technologies: high-definition video, unmanned aircraft, radar, sound recording, thermographic
- Comparisons to older datasets
- Validate and enhance aerial survey data



# Marine Wildlife Surveys – N. California to Washington




## 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 seaward of the 3-mile federal/state boundaries
- 32 east-west-oriented uniform transects, 28-km spacing, to 2,000-m isobaths
- 6 focal areas consisting of ten 25-km parallel transect lines at 6-km spacing
- All marine birds, mammals, turtles, vessels, features

https://espis.boem.gov/final%20reports/5427.pdf

# Marine Wildlife Surveys – N. California to Washington

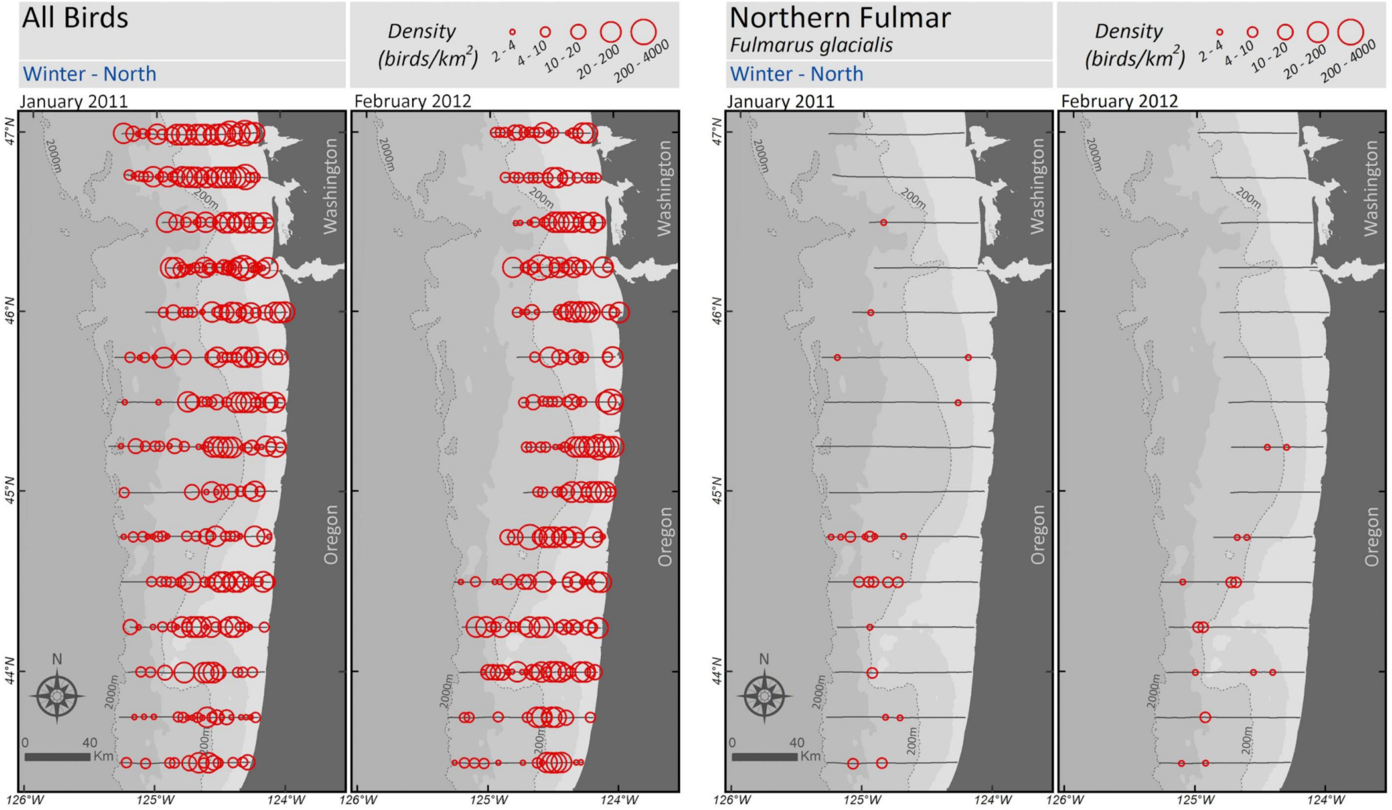
## Survey Effort

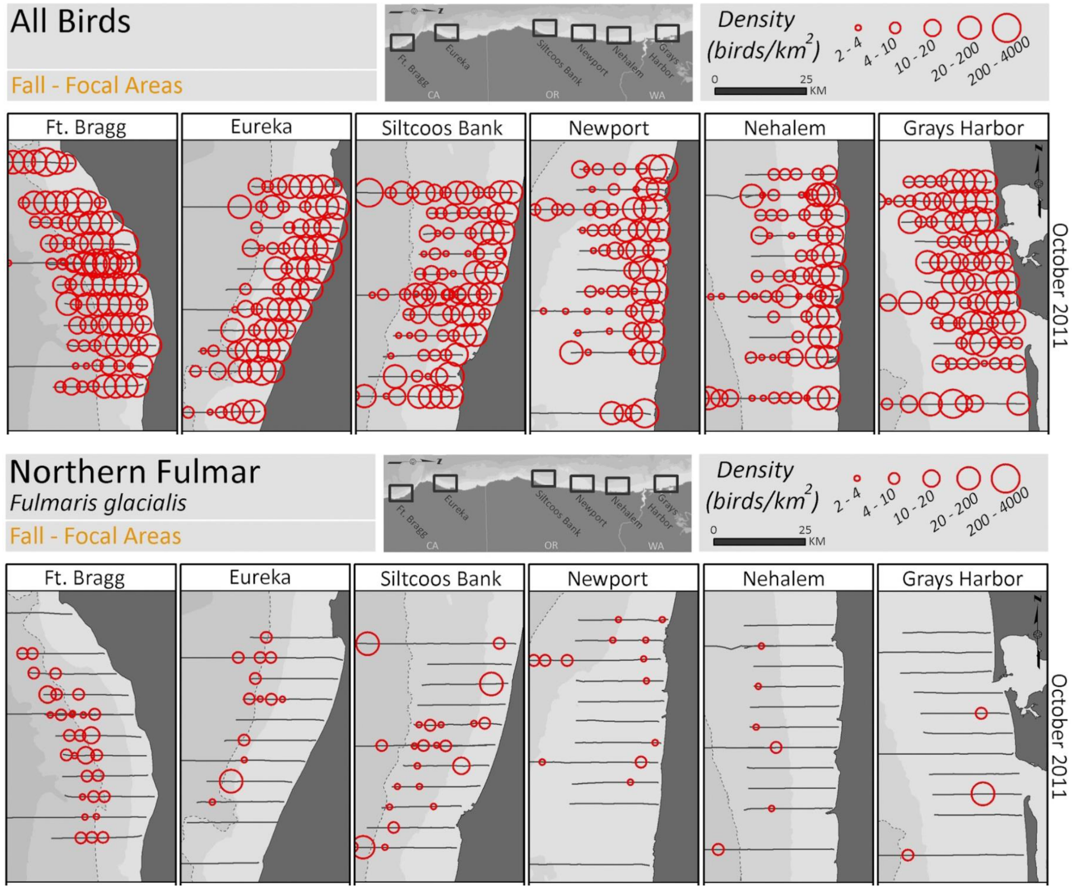
- Completed a total of 26,752 km, low elevation aerial survey effort
- 3 bathymetric domains
  - Inner-shelf waters (<100-m depth);  33% (8,887 km)
  - Outer-shelf waters (100-200-m depth); 20% (5,219 km)
  - Continental slope waters (200-2,000-m depth); 47% (12,646 km)

## Sightings

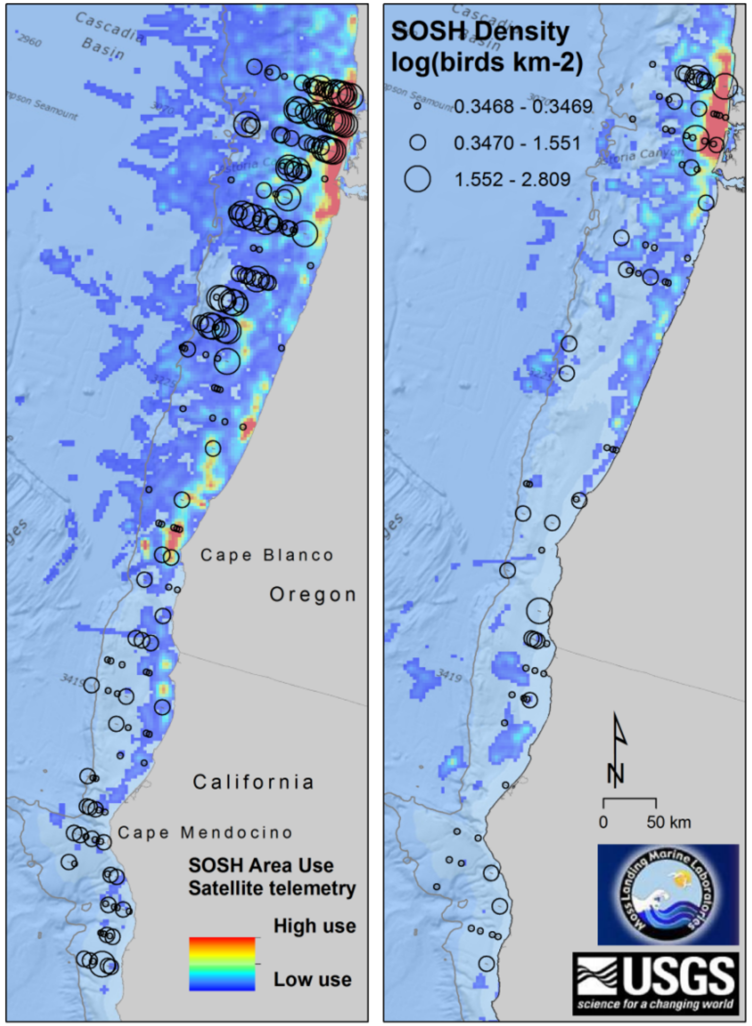
- 15,403 sightings of 59,466 individual marine birds
  - 12 families, 54 species
- 16 cetacean species and 5 pinniped species
  - Baleen whales – humpbacks (114 sightings; 264 individuals)
  - Odontoceti – 11 species; harbor porpoise (164 sightings; 270 individuals)
  - Pinnipeds - 246 sightings of 375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

# Marine Wildlife Surveys – N. California to Washington



# Marine Wildlife Surveys

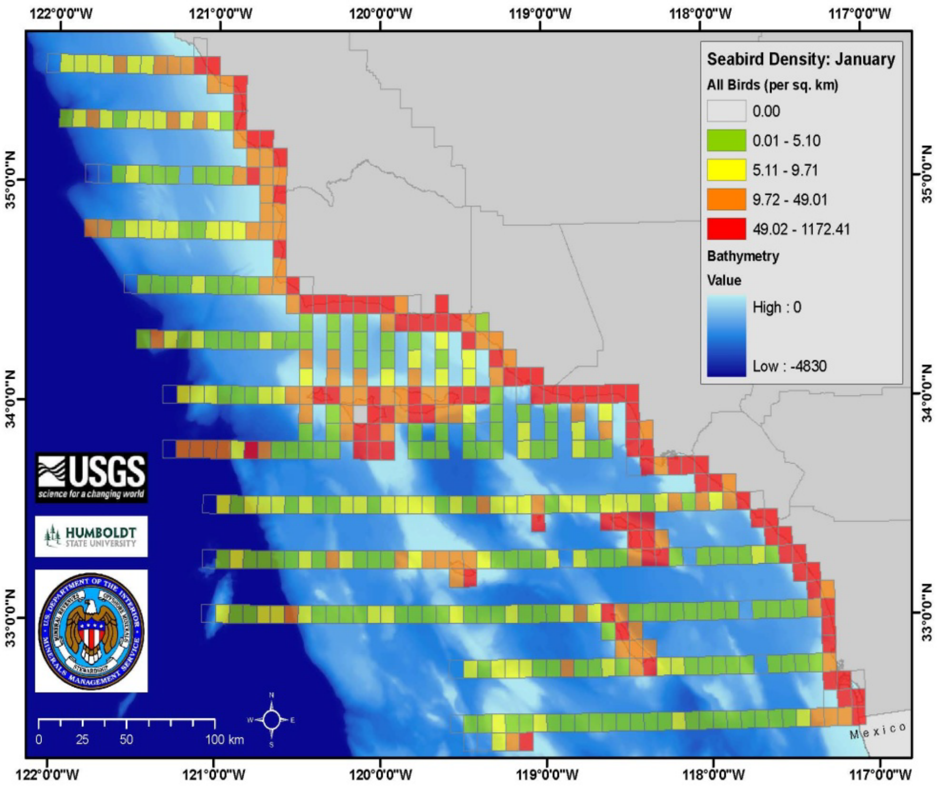



- USGS WERC has conducted marine bird telemetry since 1995
- More than 11 species within the CCS
- Telemetry provides area-use through time to better integrate species' responses to dynamic ocean conditions
- Techniques have been adopted world-wide for describing ranges, habitat affiliations, and hot-spots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

# Marine Wildlife Surveys – Southern California

## Most Recent Survey 1999-2001

- 2004 & 2007 publications
- Flew 55,000 km
  - 485,000 seabirds (67 sp)
  - 64,000 mammals (19 sp)
  - 248 radio-marked birds
- Updated info from early 1980s
- Summarized in relational database on public webpage

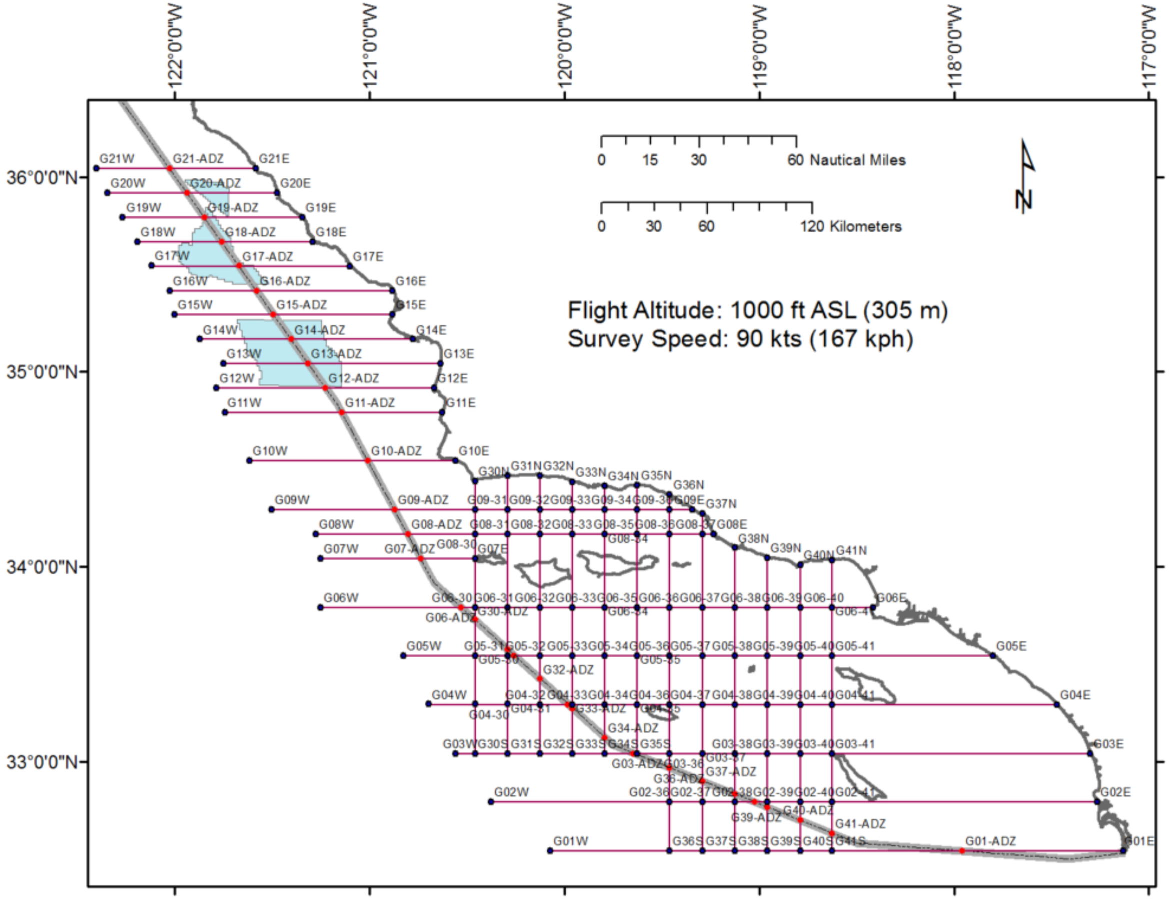


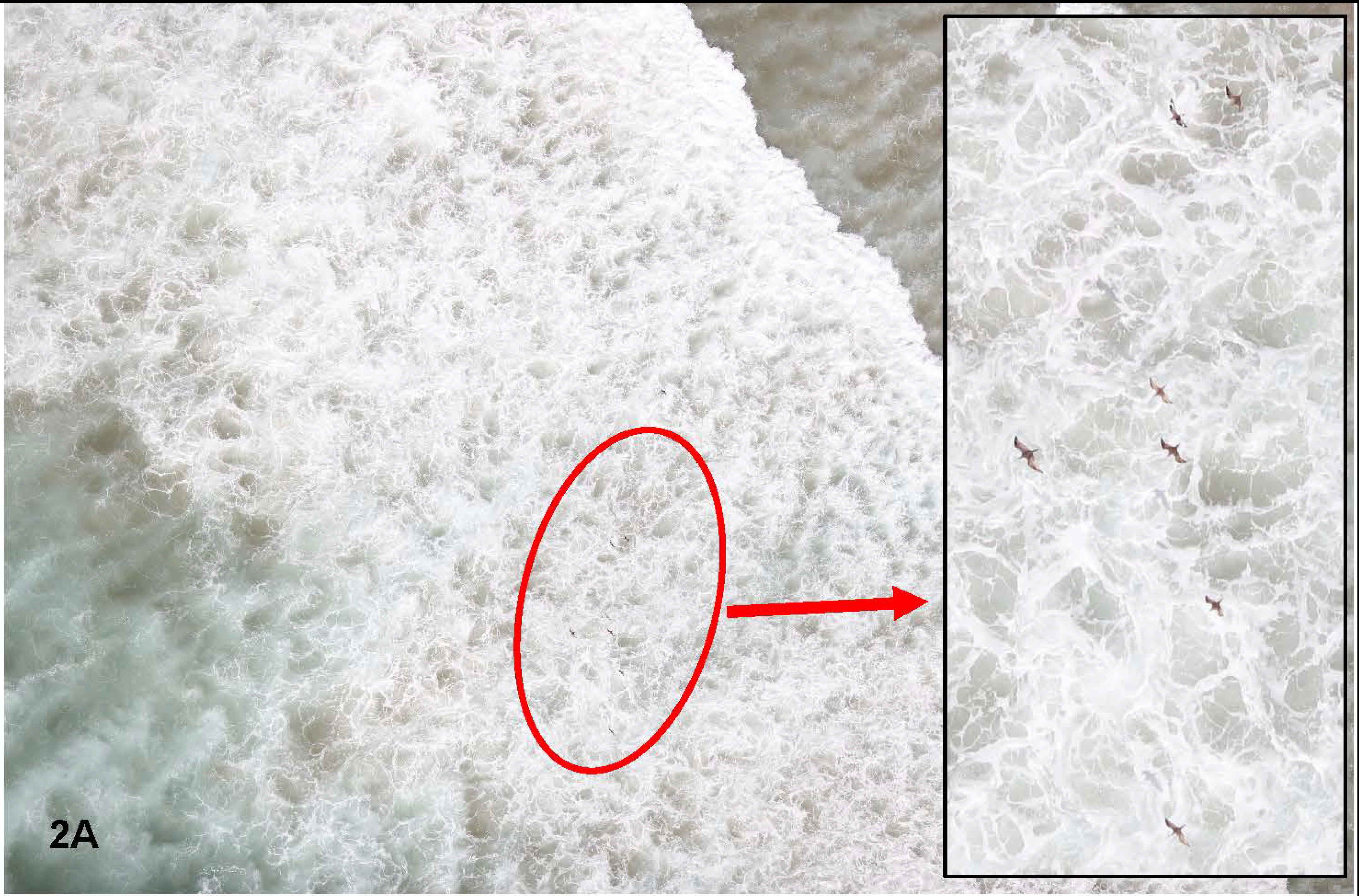

AT-SEA DISTRIBUTION AND ABUNDANCE OF SEABIRDS OFF SOUTHERN CALIFORNIA: A 20-YEAR COMPARISON

JOHN W. MASON, GERARD J. McCHESNEY, WILLIAM R. McIVER, HARRY R. CARTER, JOHN Y. TAKEKAWA, RICHARD T. GOLIGHTLY, JOSHUA T. ACKERMAN, DENNIS L. ORTHMEYER, WILLIAM M. PERRY, JULIE L. YEE, MARK O. PIERSON, AND MICHAEL D. McCRARY

Studies in Avian Biology No. 33
A Publication of the Cooper Ornithological Society

# Marine Wildlife Surveys – Southern California

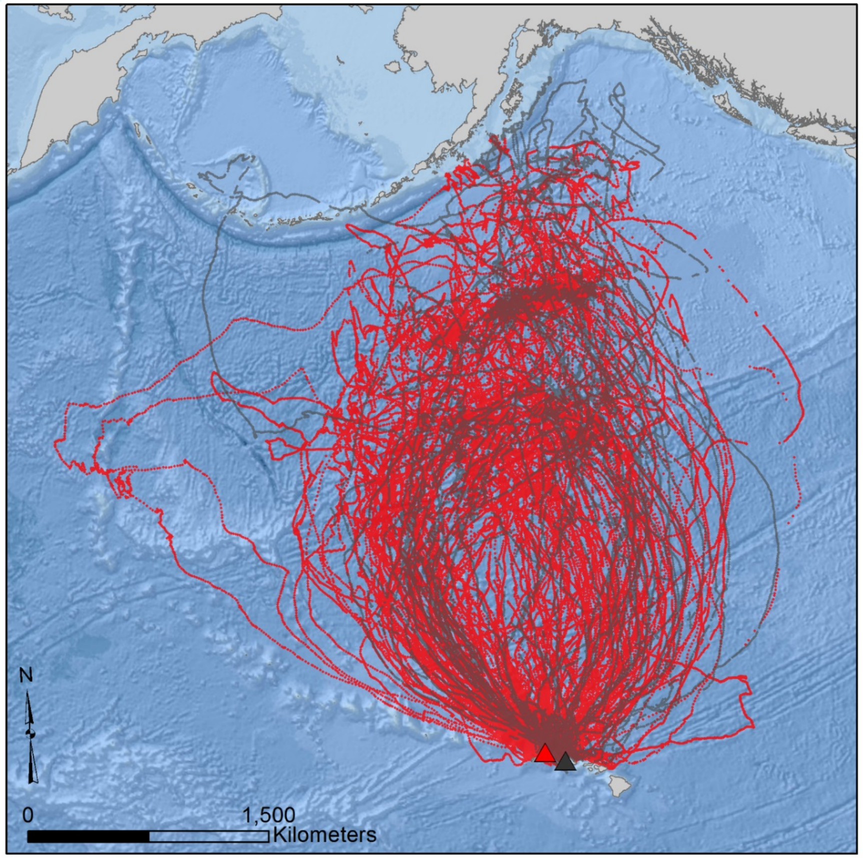




2A

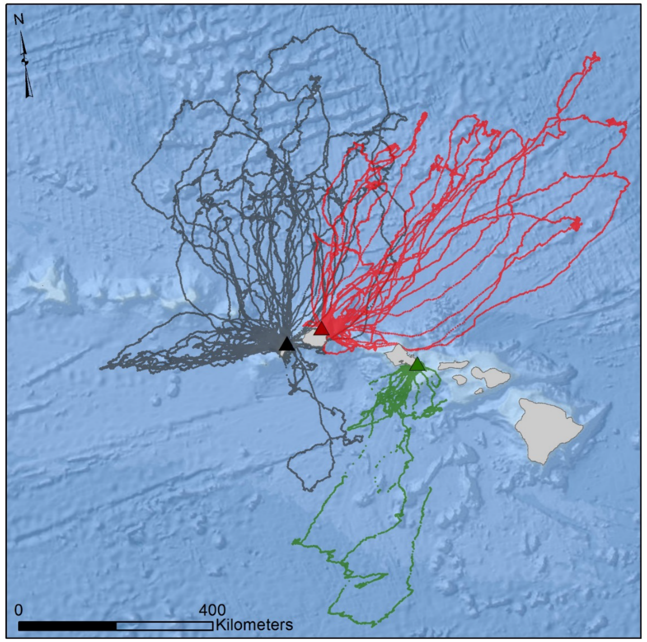
2E

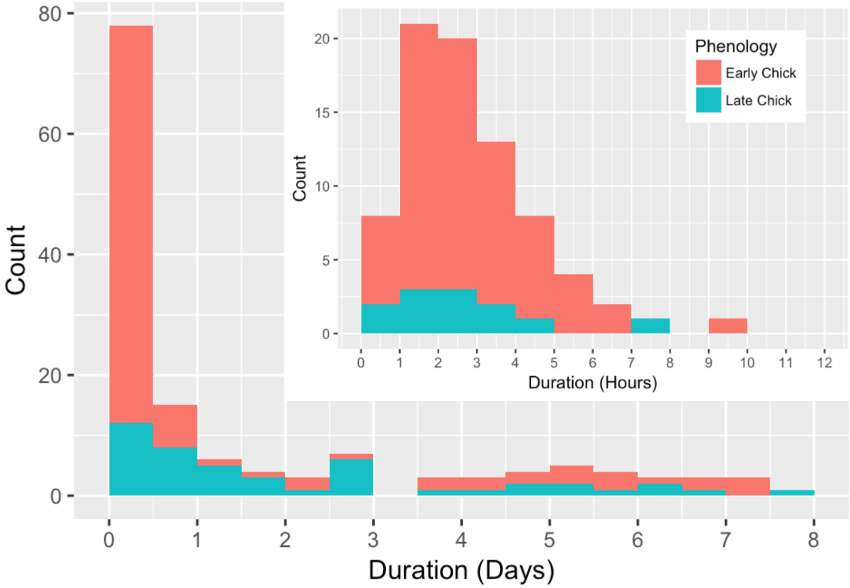
# Main Hawaiian Island Breeding Seabird Tracking

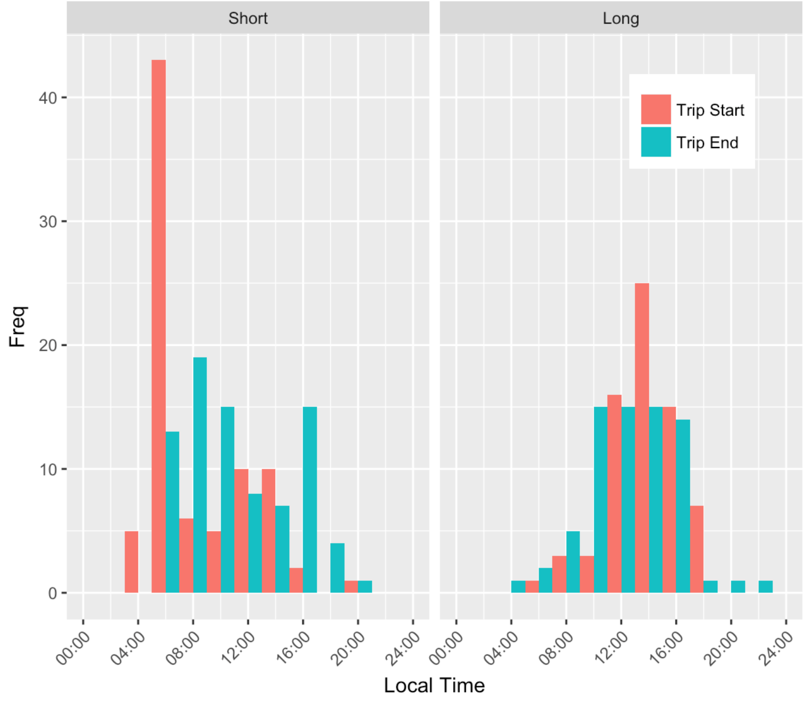
- Examine At-sea distributions and ranging behaviors
- Five abundantly breeding species
  - Red-tailed Tropicbird (103 deployed/59 recovered)
  - Laysan Albatross (36/35)
  - Wedge-tailed Shearwater (650/313)
  - Brown Booby (56/42)
  - Red-footed Booby (199/164)
- Tracked from 14 different sites through MHI
- Residence in Space and Time (RST) algorithm to classify behavior
  - Resting, transiting, searching/foraging
- GPS altitude to examine:
  - Species-specific flight height
  - Time spent flying in rotor-swept zone

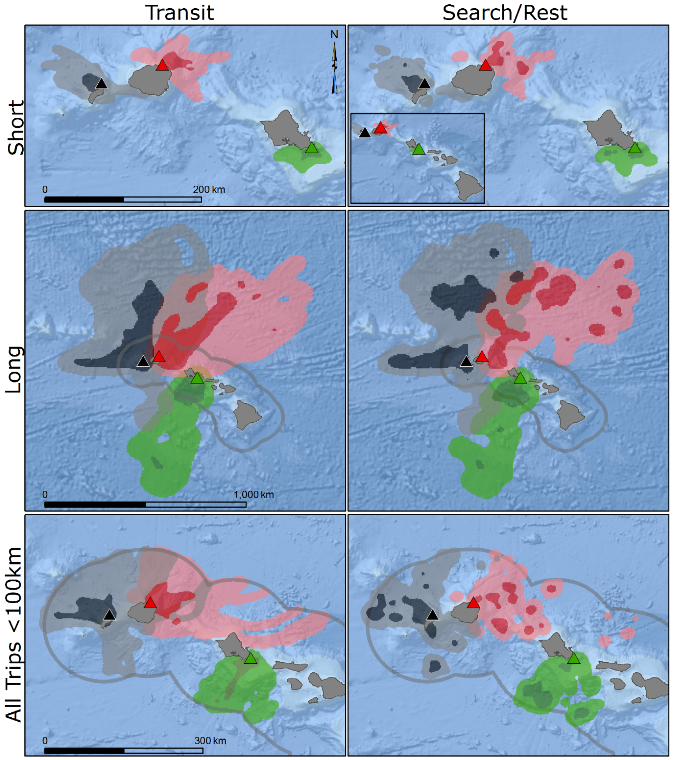



**Final report will be posted in the coming weeks**

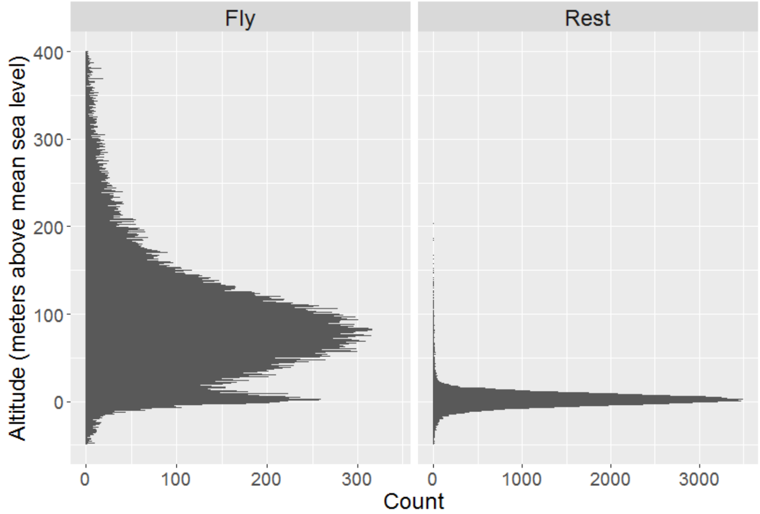


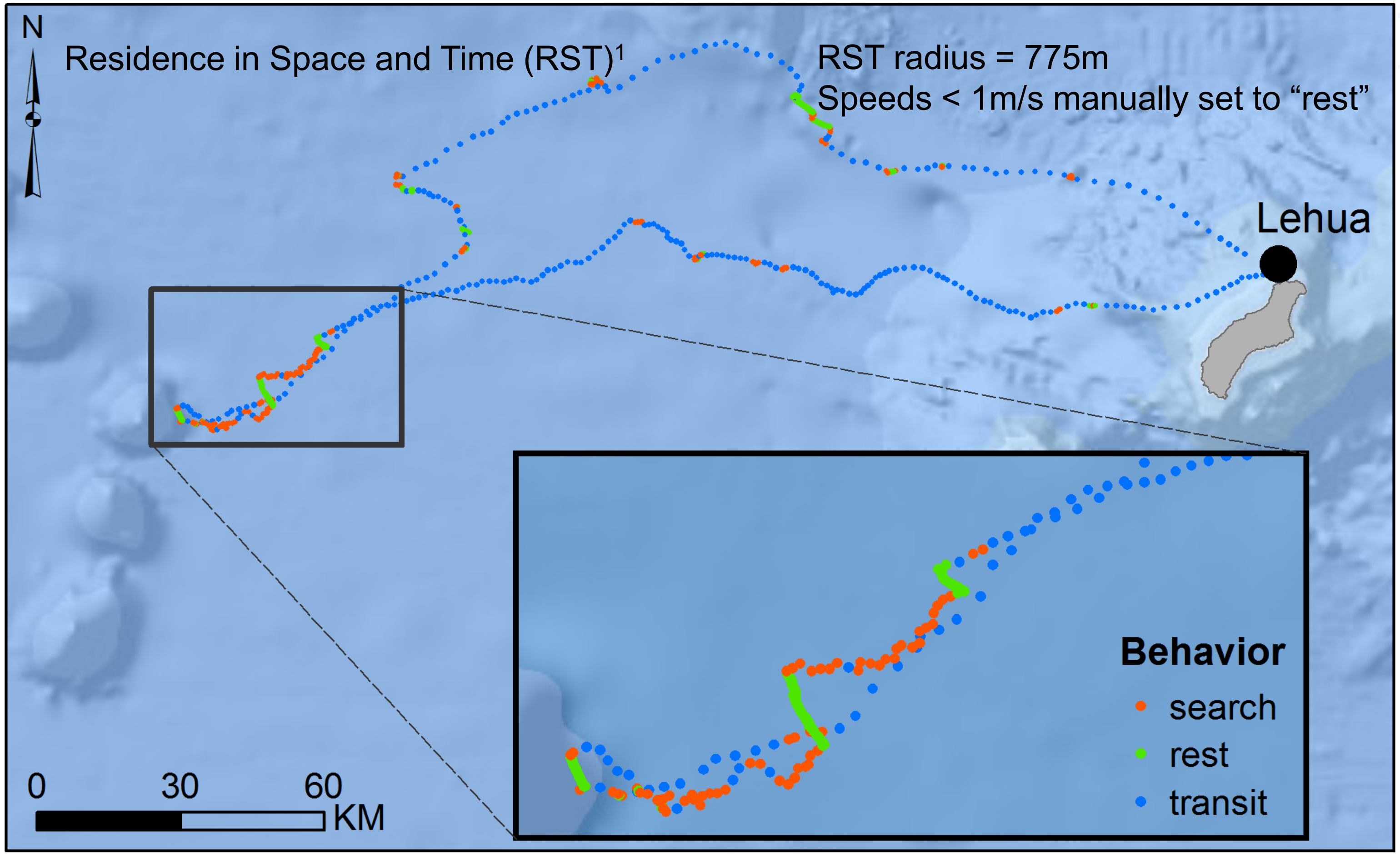




| Trip Type | Site (Year) | Birds | Trips | Duration (h) | Range (km) | Dist. Traveled (km) |
|---|---|---|---|---|---|---|
| Short | Hālona (2015) | 8 | 19 | 2.3 ± 1.1 | 22.4 ± 11.0 | 50.2 ± 24.7 |
| | Kīlauea Point (2016) | 6 | 21 | 3.1 ± 1.7 | 33.6 ± 17.7 | 81.8 ± 48.0 |
| | Lehua (2014) | 8 | 19 | 2.7 ± 1.6 | 20.4 ± 12.9 | 51.5 ± 34.2 |
| | Lehua (2015) | 7 | 23 | 3.4 ± 2.1 | 31.3 ± 17.2 | 79.4 ± 49.7 |
| | **Short Total** | **29** | **82** | **2.9 ± 1.7** | **27.4 ± 15.9** | **66.5 ± 42.9** |
| Long | Hālona (2015) | 9 | 13 | 55.4 ± 38.4 | 186.4 ± 176.2 | 460.1 ± 277.7 |
| | Kīlauea Point (2016) | 13 | 18 | 89.6 ± 55.6 | 387.4 ± 244.1 | 1069.9 ± 642.8 |
| | Lehua (2014) | 14 | 18 | 52.4 ± 34.2 | 182.4 ± 135.0 | 534.6 ± 355.7 |
| | Lehua (2015) | 16 | 21 | 103.0 ± 59.7 | 352.5 ± 178.4 | 1120.1 ± 555.8 |
| | **Long Total** | **52** | **70** | **79.9 ± 54.0** | **296.3 ± 206.2** | **888.0 ± 581.7** |
| All | Hālona (2015) | 10 | 32 | 18.6 ± 32.2 | 68.3 ± 116.2 | 139.3 ± 210.7 |
| | Kīlauea Point (2016) | 16 | 39 | 43.0 ± 57.4 | 196.9 ± 242.4 | 537.9 ± 659.6 |
| | Lehua (2014) | 17 | 37 | 26.2 ± 34.2 | 99.2 ± 124.2 | 279.6 ± 343.9 |
| | Lehua (2015) | 16 | 44 | 54.4 ± 65.8 | 184.6 ± 203.2 | 612.4 ± 658.0 |
| | **All Trips Total** | **59** | **152** | **37.6 ± 52.7** | **146.1 ± 191.6** | **427.0 ± 561.7** |

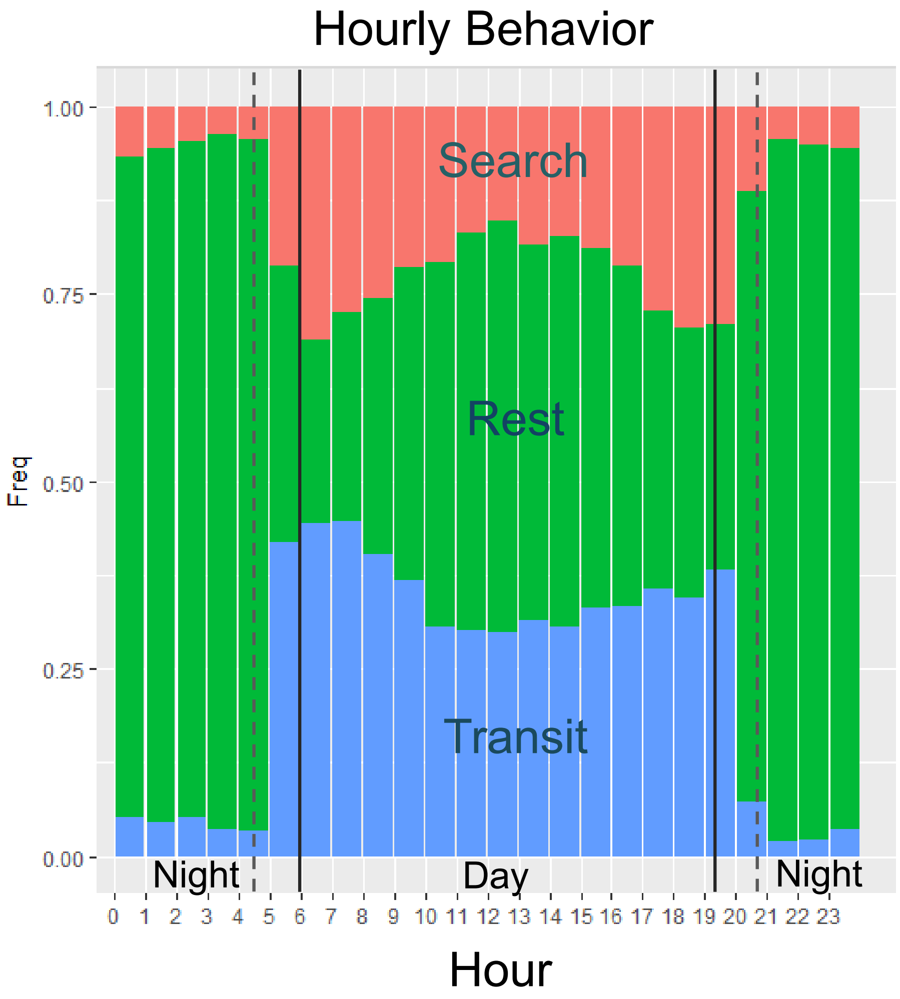


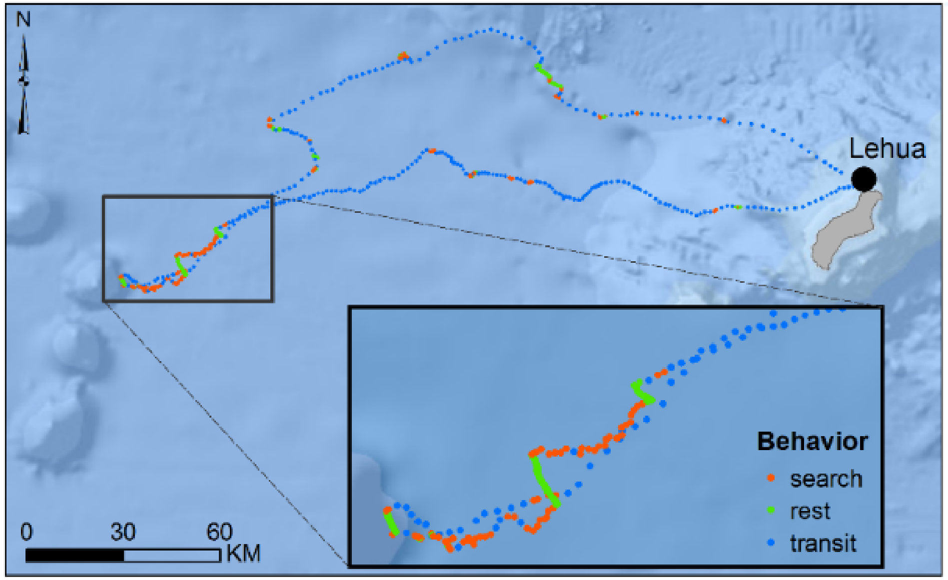
# Red-tailed Tropicbird – Behavioral Classification




[1]Torres, L. G., Orben, R. A., Tolkova, I., & Thompson, D. R. (2017). Classification of Animal Movement Behavior through Residence in Space and Time. *PloS one*, *12*(1), e0168513.

# Red-tailed Tropicbird – Daily Activity Patterns

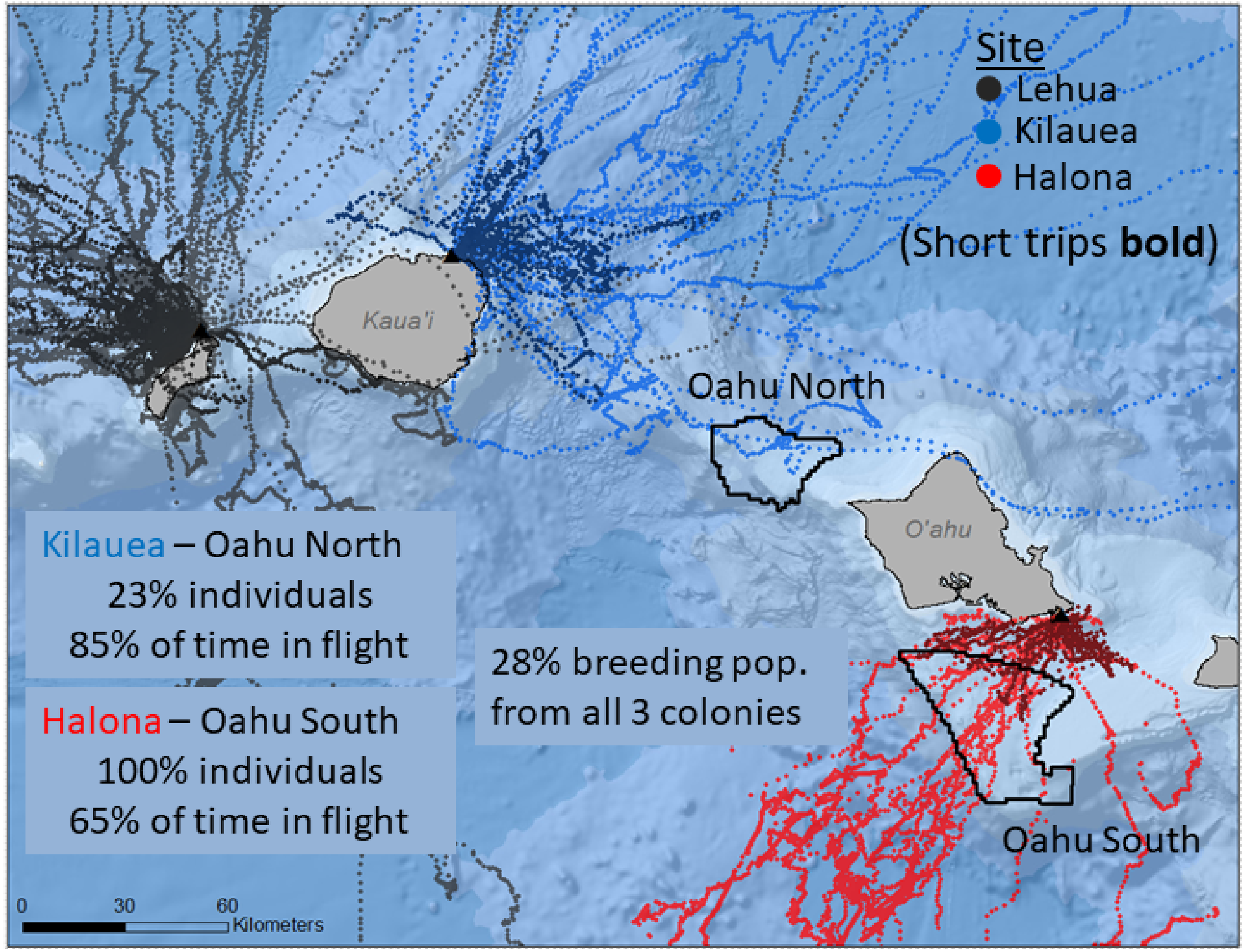


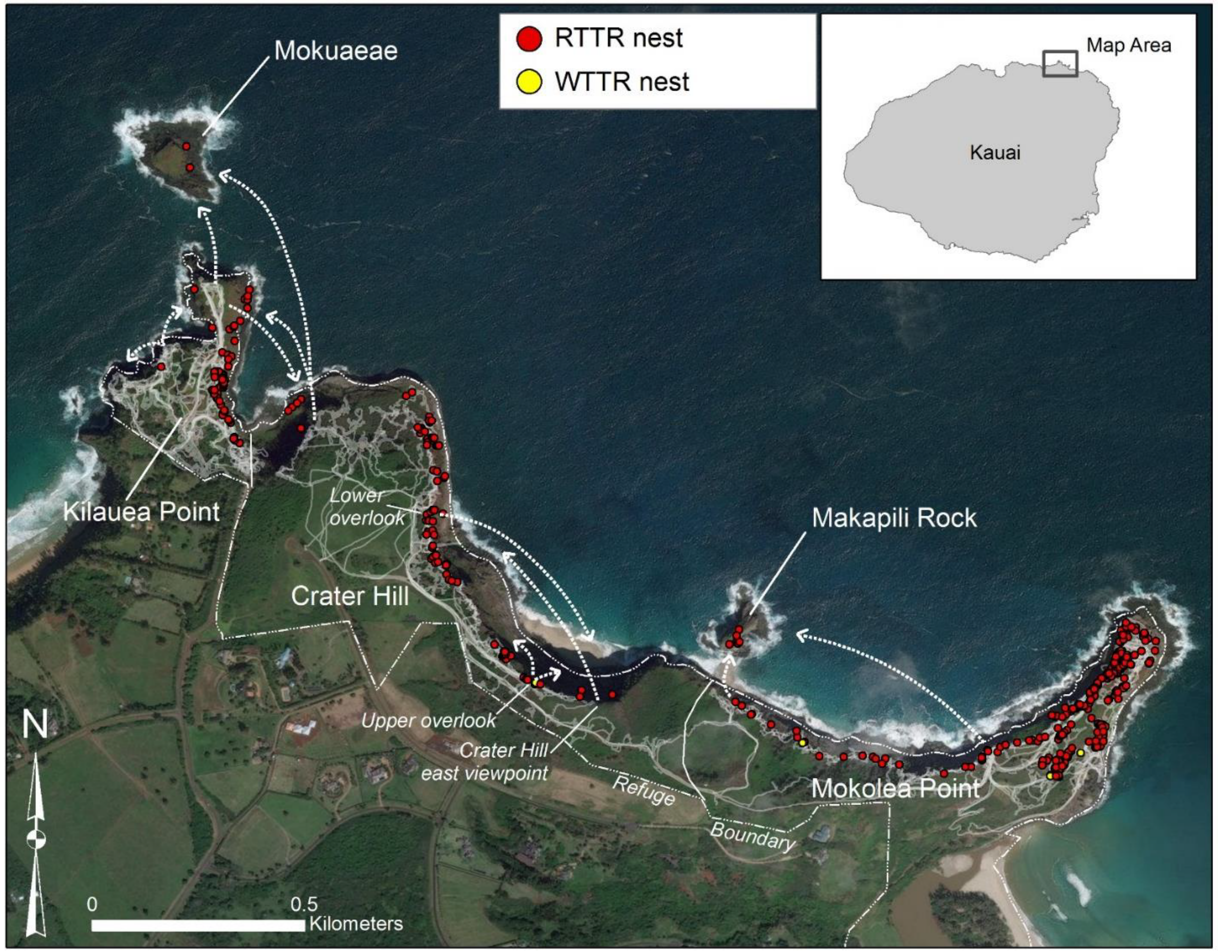

- Diurnal flight activity (50-75%)
- Early- and late-day peaks in transit/search
- Rest on water at night (95%)

**High diurnal, low nocturnal collision risk**

# Red-tailed Tropicbird – Overlap with Proposed Wind Sites

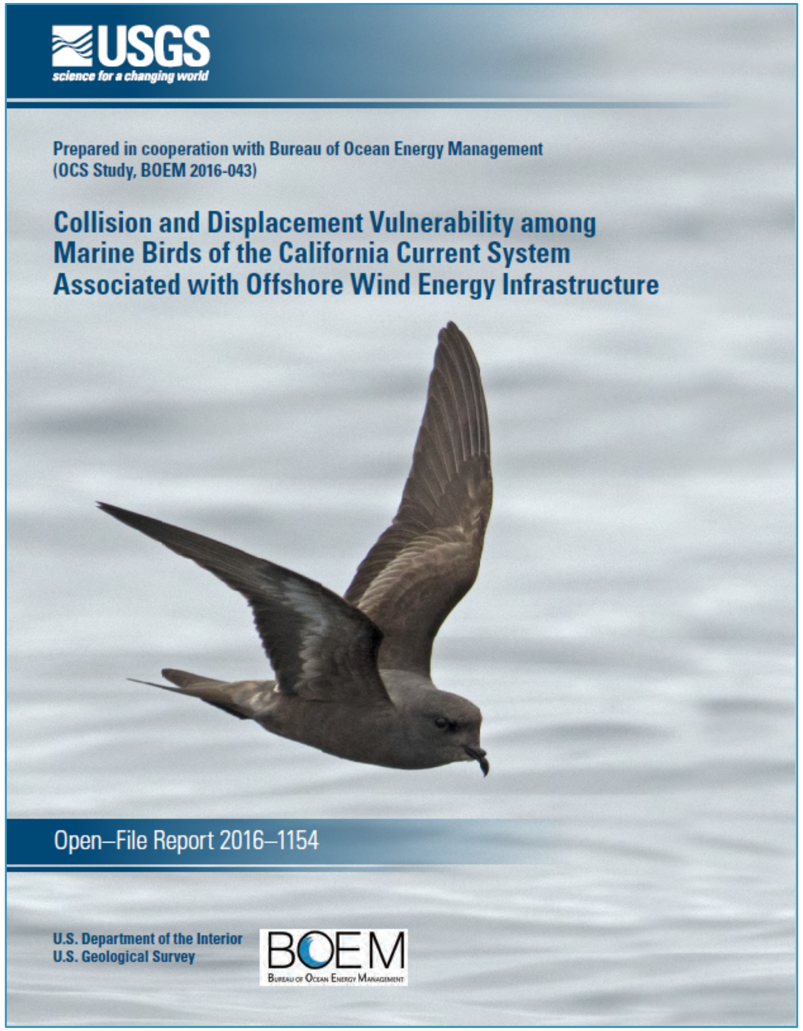


# Main Hawaiian Islands Breeding Seabird Atlas




- Address knowledge gaps in potential seabird vulnerabilities within the main Hawaiian Islands
- Compile
  - Existing seabird colony data
  - Point of contact for studies
  - Associated variables
- Identify and fill knowledge gaps
- Reference data to measure population trends

# Marine Bird Vulnerability to Offshore Wind Energy




- First comprehensive evaluation of marine bird vulnerability in Pacific
- Comprehensive vulnerability database for CCS species
  - 62 seabirds
  - 19 marine waterbirds
- Vulnerability driven by species-specific parameters
- Analyzed factors of **Displacement** and **Collision** Vulnerability, as a function of **Population** Vulnerability
- Uncertainty quantification
  - Opportunities to increase understanding
  - Database can be updated
- Vulnerability scores can be mapped using bird distributions to inform spatial planning

**https://pubs.er.usgs.gov/publication/ofr20161154**

# Vulnerability Metrics

**Population Vulnerability**

- POP = Global Population Score
- CCSpop = Proportion of Pop in CCS
- TS = Threat Status
  - IUCN, country, and state rankings
- AS = Adult Survival
  - High ranking = higher survival rate
  - Low ranking = lower survival rate
- BR = Breeding Score
  - Weighting factor for AS
- AO = Annual Occurrence
  - Number of months species found in CCS

# Vulnerability Metrics

## Collision Vulnerability

- DFA = Diurnal Flight Activity
- NFA = Nocturnal Flight Activity
  - More time = higher value
- MA = Macro-Avoidance
  - High avoidance = low collision risk
- RSZt = % time flying at height of Rotor Swept Zone
  - More time = lower value

## Displacement Vulnerability

- MA = Macro-Avoidance
  - High avoidance = high displacement risk
- HF = Habitat Flexibility
  - High Value = Specialized Forager
  - Low Value = Opportunistic Forager

# Calculating Vulnerability

**Population Vulnerability (PV)** = POP + (AO x CCSpop) + TS + (BR x AS)

**Displacement Vulnerability (DV)** = MA + HF

**Collision Vulnerability (CV)** = ((NFA + DFA) ÷ 2) + RSZ + MA

**Population Displacement Vulnerability** = PV x DV

**Population Collision Vulnerability** = PV x CV

* The uncertainty calculations have been removed from the formulas for ease of viewing

E.C. Kelsey, J.J. Felis, M. Czapanskiy, D.M. Pereksta, J. Adams. 2018. Collision and displacement vulnerability to offshore wind energy infrastructure among marine birds of the Pacific Outer Continental Shelf J. Environ. Manag., 227, pp. 229-247. https://doi.org/10.1016/j.jenvman.2018.08.051

# Calculating Vulnerability

**Pink-footed Shearwater**

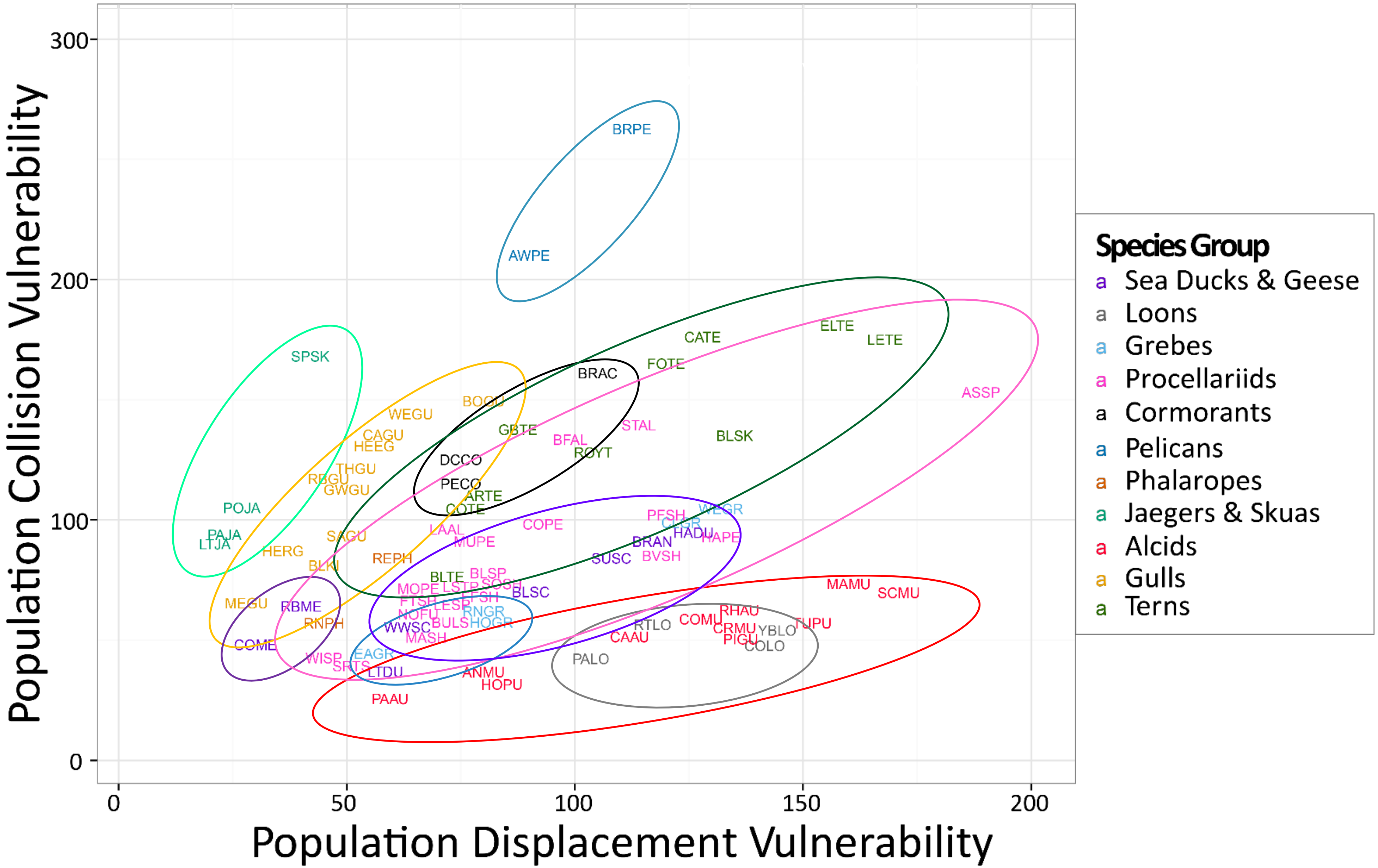
- Population Vulnerability = 20
- Collision Vulnerability = 5
- Displacement Vulnerability = 6

**Population Collision Vulnerability = CV x PV**

- PCV = 100
- Rank - HIGH

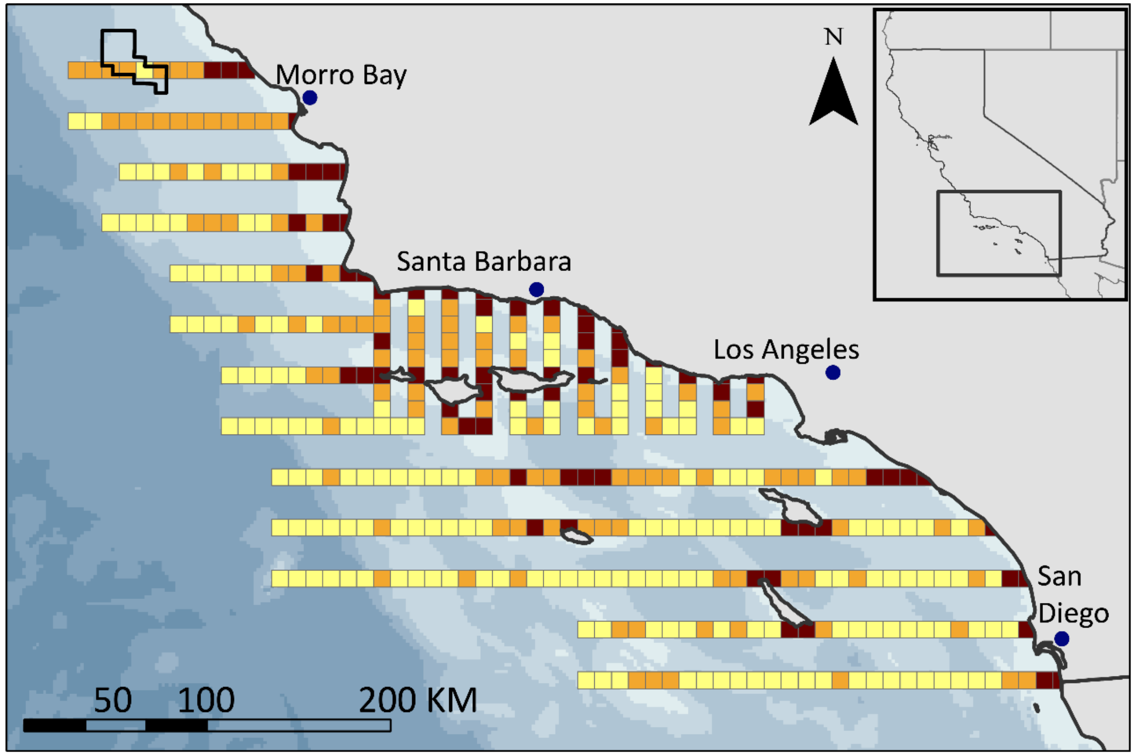
**Population Displacement Vulnerability = DV x PV**

- PDV = 120
- Rank - MEDIUM

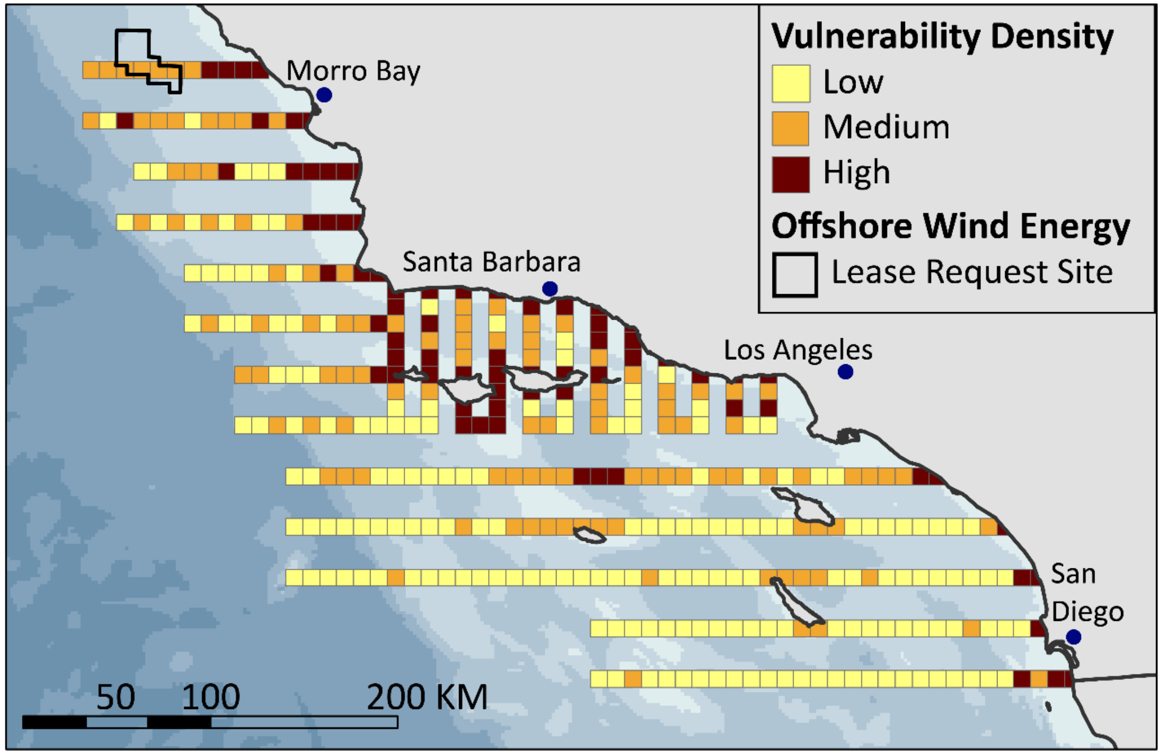

Population Collision Vulnerability
Population Displacement Vulnerability
0
100
200
300
0
50
100
150
200
Species Group
Sea Ducks & Geese
Loons
Grebes
Procellariids
Cormorants
Pelicans
Phalaropes
Jaegers & Skuas
Alcids
Gulls
Terns
BRPE
AWPE
SPSK
POJA
PAJA
LTJA
CATE
ELTE
LETE
FOTE
BRAC
ASSP
BOGU
WEGU
CAGU
HEEG
GBTE
BFAL
STAL
ROYT
BLSK
DCCO
PECO
ARTE
COTE
THGU
RBGU
GWGU
PFSH
WEGR
CLGR
HADU
BRAN
HAPE
SUSC
BVSH
COPE
LAAL
MUPE
SAGU
HERG
BLKI
REPH
BLTE
BLSP
SOSH
BLSC
MOPE
LSTP
FTSH
LESP
LESH
NOFU
RNGR
WWSC
BULS
HOGR
MASH
MEGU
RBME
RNPH
COME
WISP
EAGR
SRTS
LTDU
ANMU
HOPU
PAAU
MAMU
SCMU
RHAU
COMU
RTLO
CRMU
YBLO
TUPU
CAAU
PIGU
COLO
PALO

# Marine Bird Vulnerability to Offshore Wind Energy

A.




B.




**Population Collision Vulnerability**

**Population Displacement Vulnerability**

# Lighting Studies – Conventional and Renewables

**Nocturnal Surveys for Ashy Storm-Petrels and Scripps's Murrelets on Offshore Oil Platforms – Southern California**

- Radar and visual surveys
- Evaluate how these species interact with bright lights
- Applicability to conventional and renewable energy development

**Other Lighting Studies**

- Evaluation of lighting schemes for offshore wind facilities
- Light color and intensity of oil and gas platforms
- Determine impacts to migratory birds

https://espis.boem.gov/final%20reports/5409.pdf

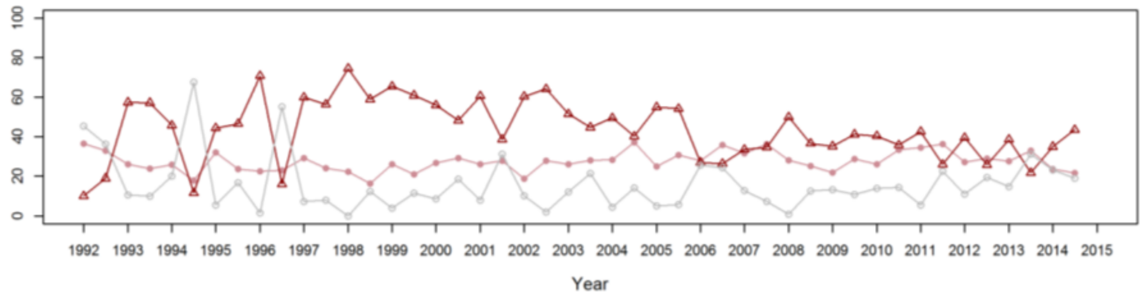
# Synopsis of Research Programs

## Synopsis of Research Programs that can Provide Baseline and Monitoring Information for Offshore Energy Activities in the Pacific Region

**Objectives:**

- Identify ongoing or completed research programs that contain information on species and habitats sensitive to offshore energy activities
- Review the capability of these programs to provide baseline and monitoring data to understand and mitigate potential impacts of offshore energy development in the Pacific Region

https://www.boem.gov/2019-042/




USGS

# Synopsis of Research Programs

## Types of Data for Seabirds

Colony count data
Nest count data
Roosting count data
At-sea counts from shore
At-sea distribution/abundance
(vessel-based)
At-sea behavior
Colony behavior
(attendance, activity, flight direction, etc.)
Telemetry/sensors
Nest/burrow occupancy
Hatching success
Fledging success
Breeding success
Chick growth/morphometrics
Phenology
Sub-adult/Adult survival
Adult morphometrics
Blood/feather/tissue sampling
Chick diet
Adult diet
Contaminants
Beach surveys for carcass deposition
Necropsy/tissue archival
Disturbance
Predation
Mist-netting
Acoustics
Other

# Synopsis of Research Programs – Seabird Metadata

How are your data archived?
- notebooks or paper
- computer HD
- server-based

When do you collect data?
- spring
- summer
- fall
- winter

How often do you collect data?
- multiple times per year
- every year
- every 2 years
- every 5 years
- at variable internals

Are data protocols?
- standardized
- well-described
- available
- not described

Are data entered in:
- spreadsheets
- relational database

Is data entry current?

How frequently are results summarized and/or reported?

Are raw data available to the public?

Are raw data available upon request or by data-use agreement?

Are summary data available to the public?

Are summary data available upon request or by data-use agreement?

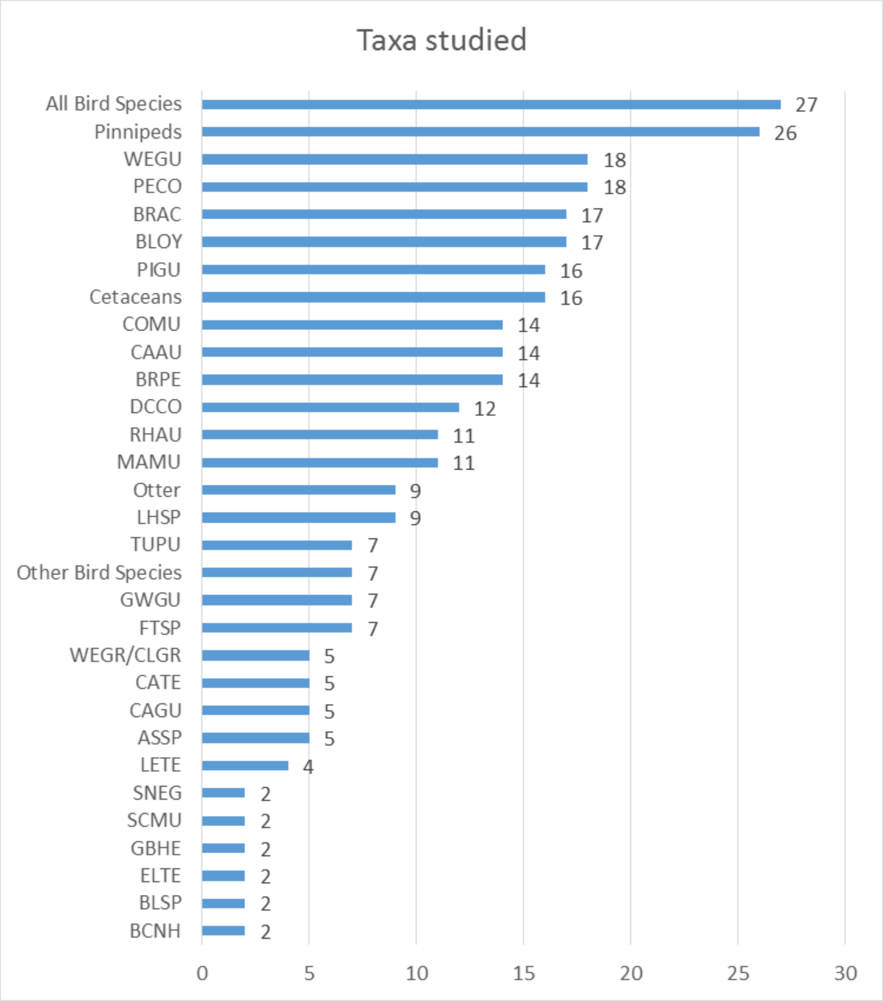
# California Current System Seabirds

**60 data sets** identified

| | |
|---|---|
| **California** | **44** |
| **Oregon** | **13** |
| **Washington** | **3** |

26 marine bird species

| | |
|---|---|
| Marine mammals | 42 |
| Cetaceans | 16 |
| Pinnipeds | 26 |




USGS

# Proposed Pacific Seabird Monitoring Network

## Objective

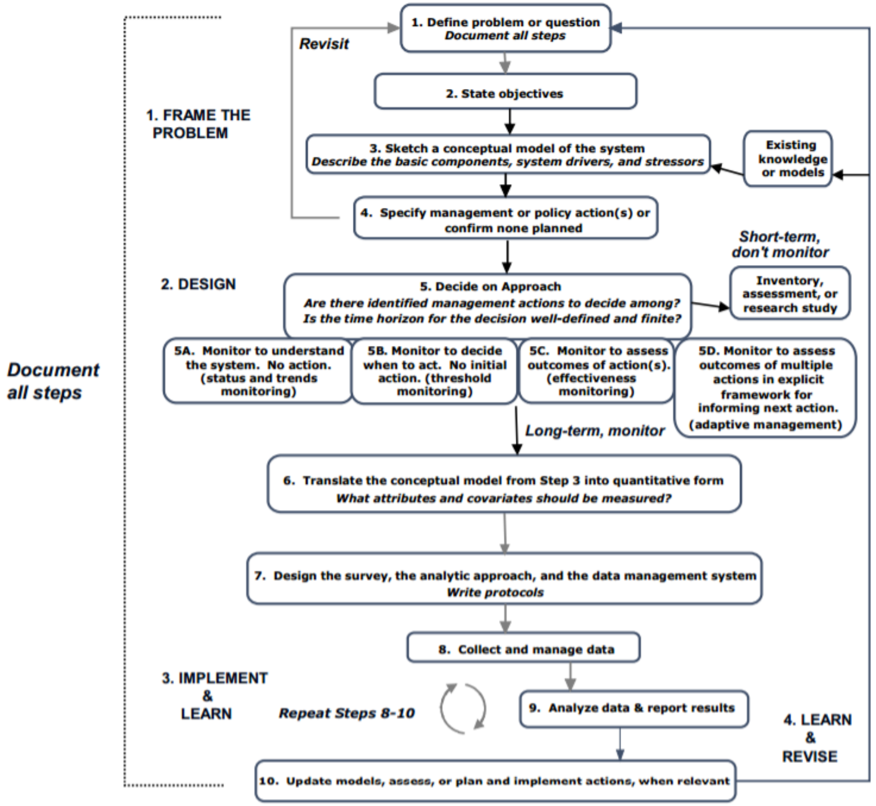
Coordinate and support a **monitoring program** of vulnerable seabird species that encompasses offshore energy projects in the Pacific OCS

- Develop a monitoring program using acoustic methods, satellite imagery, or other appropriate technology to inform ongoing or prospective offshore energy projects within the Pacific

# Proposed Pacific Seabird Monitoring Network

## Specific Research Questions

- Using the Vulnerability Index and other sources, can we identify a suite of indicator species suitable for monitoring the potential effects of offshore energy activities in the Pacific?
- Building upon information gathered in data synthesis efforts, can we coordinate and supplement ongoing research to meet our objectives?
- Which monitoring design is the most efficient to distinguish regional population trend modifications resulting from offshore energy projects compared to other factors affecting seabirds?
- What lessons can we derive from a pilot monitoring effort to refine baseline information that can be applied to a long-term monitoring program designed to inform offshore energy?




Reynolds, JH, Knutson MG, Newman KB, Silverman ED, and Thompson WL. 2016. A road map for designing and implementing a biological monitoring program. Environmental Monitoring and Assessment 188:1-25

# Offshore Acoustic Bat Study

## Objectives

- Enhance the understanding of seasonal bat migration activities offshore of the west coast of the U.S. and Hawaii
- Increase monitoring of seasonal bat activities in the Pacific to produce regional datasets

## Methods

- A sustained, multi-year deployment of acoustic bat detectors in a variety of remote coastal and offshore settings
  - Offshore islands, navigational structures, IOOS buoys, oil and gas platforms, and NOAA research vessels
  - Incorporate logistical and technical lessons gathered during the DOE Atlantic and Great Lakes study

# Over Water Migration Movements of Black Brant

## Goal

- Identify oversea Black Brant migratory routes from Alaska to the U.S. Pacific coast to understand pathways, timing, and flight altitude

## Objective

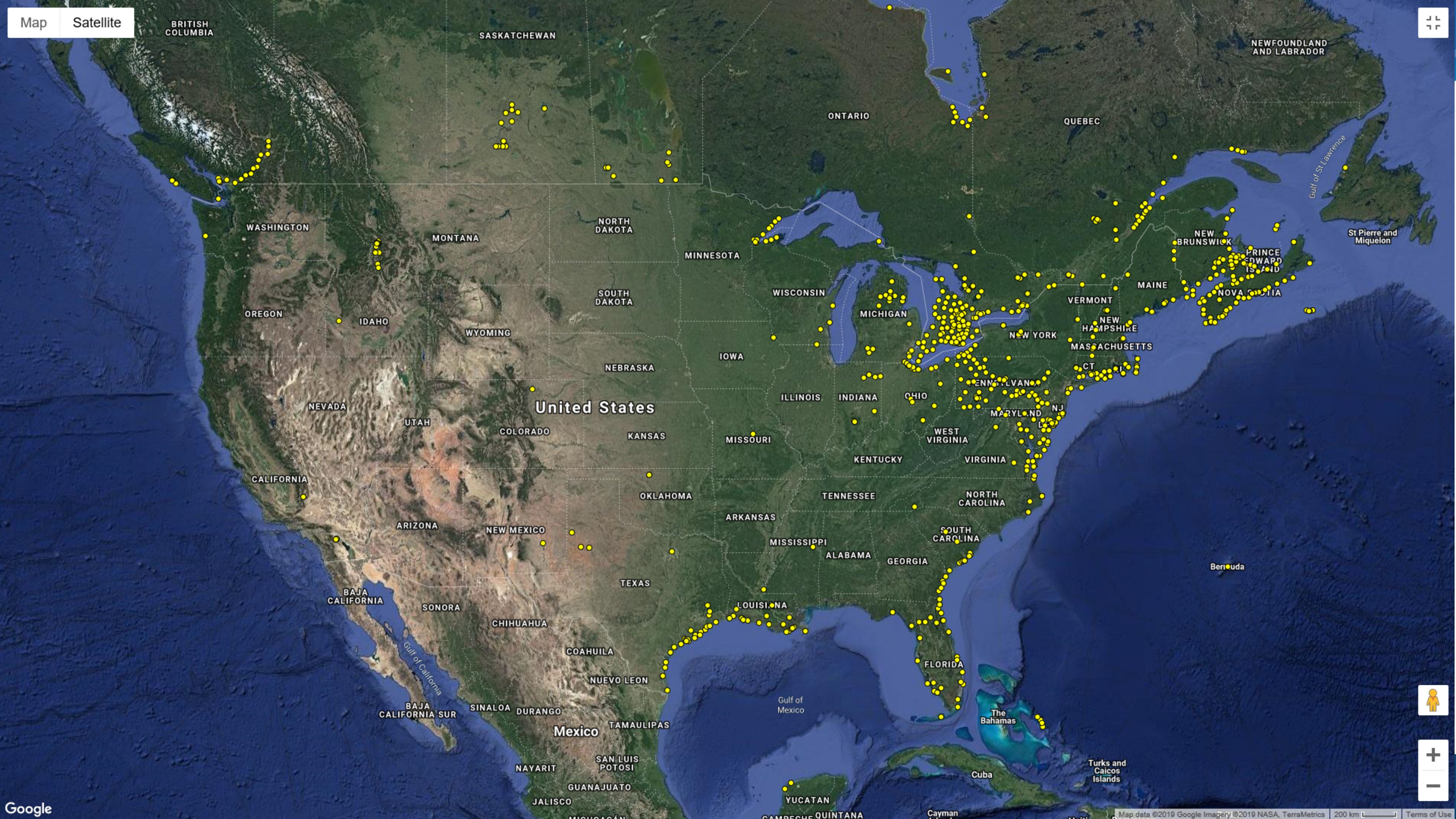
- Collect data on over-water migration routes for Black Brant along the Pacific coast of North America to facilitate assessing impacts to the species from offshore wind energy development

## Methods

- Fifty (50) Black Brant per year for 3 years would be outfitted with GPS/GSM collars (Global Positioning System/Global System for Mobile Communications) prior to their southbound migration
  - These devices provide minute-by-minute data for up to 5 years including latitude, longitude, and altitude of the birds as they migrate

# Motus Wildlife Tracking

- Small-bodied migratory species of birds and bats are vulnerable to displacement and collision, but determining potential impacts is a challenging data gap given the historic size of tracking equipment and associated challenges in data recovery
- The Motus Wildlife Tracking System is a new international collaborative network that uses coordinated automated radio-telemetry arrays to study movements of small flying organisms including birds, bats, and insects
- While there are over 750 Motus receiving stations around the world, only 8 exist on the west coast of the U.S. and Canada; 7 of which are in British Columbia and none on the Hawaiian Islands
- BOEM has supported Motus tracking along the Atlantic Coast
- The Pacific Region received three external stakeholder ideas for Motus-related studies in 2017

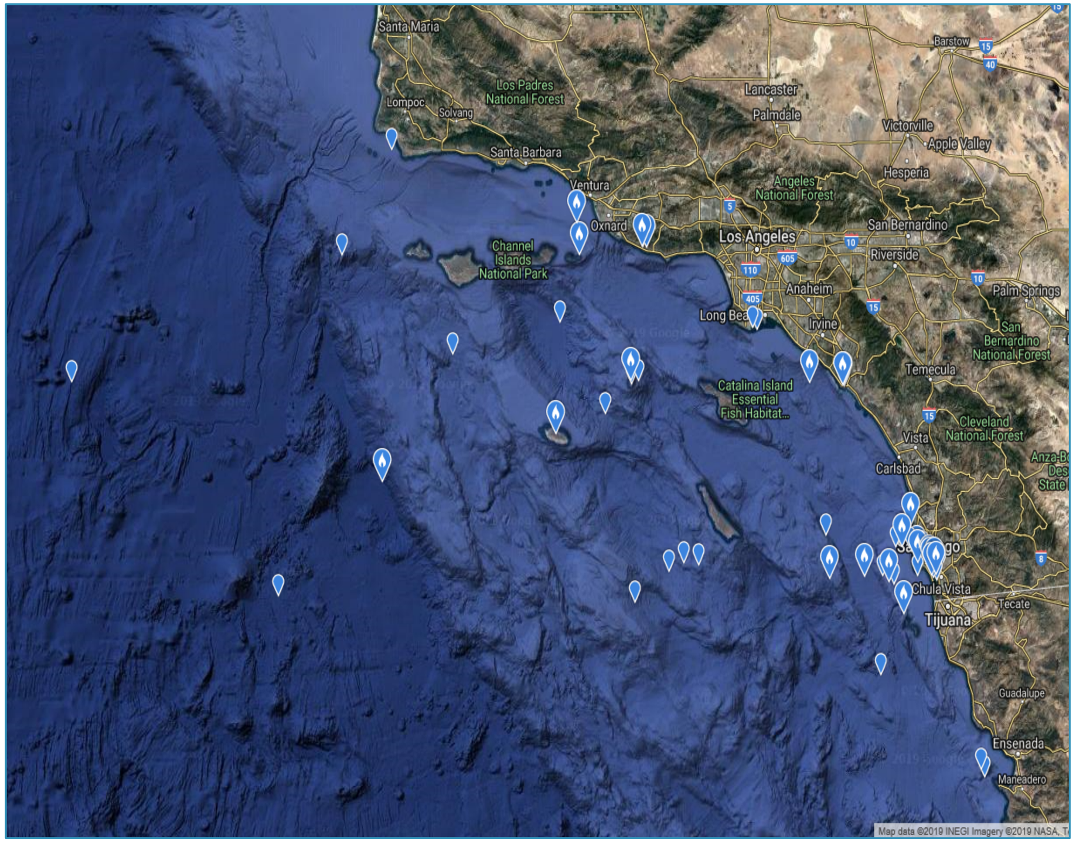

Map
Satellite
BRITISH COLUMBIA
SASKATCHEWAN
ONTARIO
QUEBEC
NEWFOUNDLAND AND LABRADOR
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
NEW BRUNSWICK
PRINCE EDWARD ISLAND
St Pierre and Miquelon
Gulf of St Lawrence
WISCONSIN
MICHIGAN
MAINE
VERMONT
NOVA SCOTIA
OREGON
IDAHO
SOUTH DAKOTA
WYOMING
NEW HAMPSHIRE
NEW YORK
MASSACHUSETTS
IOWA
NEBRASKA
CT
NEVADA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
UTAH
United States
NJ
MARYLAND
COLORADO
KANSAS
MISSOURI
WEST VIRGINIA
KENTUCKY
VIRGINIA
CALIFORNIA
OKLAHOMA
TENNESSEE
NORTH CAROLINA
ARKANSAS
ARIZONA
NEW MEXICO
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
Bermuda
TEXAS
BAJA CALIFORNIA
SONORA
LOUISIANA
CHIHUAHUA
COAHUILA
FLORIDA
Gulf of California
NUEVO LEON
Gulf of Mexico
BAJA CALIFORNIA SUR
SINALOA
DURANGO
The Bahamas
Mexico
TAMAULIPAS
SAN LUIS POTOSI
Turks and Caicos Islands
NAYARIT
Cuba
GUANAJUATO
YUCATAN
JALISCO
Google
Map data ©2019 Google Imagery ©2019 NASA, TerraMetrics
200 km
Terms of Use

# Motus Study Objectives

- Support data collection efforts on the timing and scale of movements for shorebirds, marine birds, bats, and other taxa in relation to offshore energy and other coastal development projects
- Expand tracking capabilities along the Pacific Coast and in Hawaii
- Collaborate with others on enhancing a tracking network in the Pacific Region
  - Will allow for value-added projects in the future from non-BOEM funded efforts

# Citizen Science

- We have a variety of tools and portals to capture citizen science…use them!
  - eBird, iNaturalist, and others
- Scientific research is limited by a number of factors so citizen science can fill critical data gaps
- Agencies are starting to embrace this and are coordinating data collection efforts using citizen scientists
  - USFWS Brown Pelican roost survey
  - BeachCOMBERS



# Conclusion

- Proposals for wind energy developments off the Pacific Coast of the U.S. and Hawaii have the potential to affect a variety of living resources including marine and coastal birds, and bats
- BOEM is the lead Federal agency for offshore renewable energy development in Federal waters and it is our mission to address the potential effects to avian species
- BOEM has developed a science-based strategy for assessing existing data and identifying gaps, collecting new data to address those gaps, assessing risk and vulnerability, and ultimately monitoring to detect effects resulting from the construction and operation of offshore wind energy projects
- BOEM is listening to stakeholder concerns and is being responsive
- The ultimate goal is to design and implement projects that minimize impacts to the maximum extent possible

BOEM

Bureau of Ocean Energy Management

BOEM.gov

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# Data Portals

MarineCadastre
https://marinecadastre.gov/
Joint BOEM and NOAA initiative

Databasin.org
Conservation Biology Institute
California Offshore Wind Energy Gateway

West Coast Ocean Data Portal
http://portal.westcoastoceans.org/