Some like it hot: using citizen science to identify marine bird hotspots in Puget Sound

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Speaker
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Using citizen science to identify marine bird hotspots in Puget Sound

Timothy Jones¹, Julia Parrish¹, Scott Pearson², Peter Hodum⁴, Eric Ward⁵, Adam Sedgley⁶, Jennifer Lang³, Toby Ross³

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Photo © John Marshall
Puget Sound Seabird Survey (PSSS)

Documenting nearshore habitat use by wintering seabirds

- Survey season: Oct - Apr
- 200+ volunteers
- 121 active sites
- ~4,800 acres nearshore habitat
PSSS: How it’s done

• Teams of 2 - 5 surveyors
• Survey duration = 15 - 30 min
• All surveys conducted within 2 hours of high tide
• Identify and record all seabirds on the water within 300 m of shore
• Record survey conditions
Nearshore marine bird hotspot analyses

- Dr. Timothy Jones, University of Washington

- Hotspot = particular sites that harbor a high number or occurrence of seabirds

- Developed a suite of techniques related to hotspot identification
  - Building on Ward et al. 2015
Aims of the study

1. Determine which species display hotspot behavior
2. Identify hotspot locations
   a. Classify locations as stable, seasonal or intermittent hotspots, as well as coldspots
3. Group species by hotspot location similarities
Study area and site selection
Species selection

Cormorants
- Double-crested Cormorant
- Pelagic Cormorant

Grebes
- Horned Grebe
- Red-necked Grebe
- Western Grebe

Loons
- Common Loon
- Alcids
- Pigeon Guillemot
- Rhinoceros Auklet

Scoters
- Surf Scoter
- White-winged Scoter

Ducks
- Bufflehead
- Common Goldeneye
- Harlequin Duck

Gulls
- Glaucous-winged Gull
- Mew Gull
Hotspot Typologies

Uniform

<table>
<thead>
<tr>
<th>Hot  &gt; 0.15</th>
<th>Cold  &lt; 0.015</th>
</tr>
</thead>
</table>

[Image of birds and landscape]
Hotspot Typologies

Uniform

Abundance
Hotspot Typologies

Uniform

Abundance

General
Hotspot Typologies

Seasonal

Western Grebe

- Oct
- Nov
- Dec
- Jan
- Feb
- Mar
- Apr

- Red: Hot (> 0.28)
- White: Neither
- Blue: Cold (< 0.028)
Classifying hotspots

- **Stable hotspot**
- **Intermittent hotspot**
- **Seasonal hotspot**
- **Coldspot**

Graph showing the changes in site-specific abundance over time from October to April, with thresholds for hotspot and coldspot.
Grouping species based on hotspot locations
Looking ahead:
Project expansion and analysis opportunities
Thank you!

Jennifer Lang
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References


Distance sampling

• Bearing and distance are recorded for each bird on the water
  • Distance: # mm the bird is from visual horizon
• Distance of each bird is triangulated using:
  • Distance between observer & visual horizon in line with the bird’s bearing
  • Eye height & arm length of data collector
Distance sampling

*Visual Horizon* is the opposite shore for those sites where it exists (some may be obscured by stationary objects or weather)

Classification decision tree

P = list of site-specific monthly values of fitted abundance/occupancy
\( \tau_h \) = hotspot threshold, \( n_h \) = number of months where value \( \geq \tau_h \)
\( \tau_c \) = coldspot threshold, \( n_c \) = number of months where value \( \leq \tau_c \)
PSSS Data Potential

- Evaluate QAQC, exploring bias
- Improve aerial survey models for nearshore habitat
- Evaluate areas of different seabird aggregations
- Explore new collaborations

Winter 1993-99