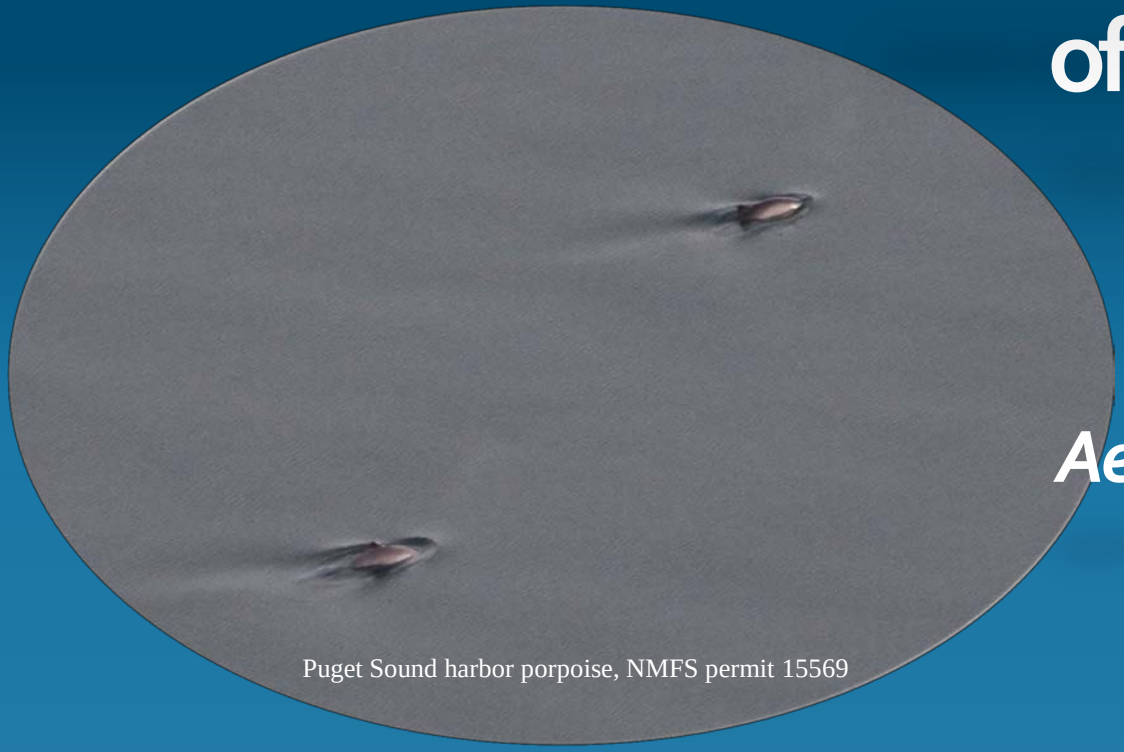
Regional and Seasonal Density and Abundance of Harbor Porpoise:

Recolonization of Puget Sound Aerial Surveys 2013 -2 015



Puget Sound harbor porpoise, NMFS permit 15569

Mari A. Smultea, Thomas A. Jefferson, David Steckler, Greg Campbell, Kate Lomac-MacNair, Sarah Courbis, Kristen Ampela, Andrea Balla-Holden, and Sean Hanser

SES

NAVFAC Naval Facilities Engineering Command

HDR

Acknowledgements

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Photographs taken under NMFS Permits 14451 and 15569.

Historical Occurrence*

Year	Puget Sound Harbor Porpoises
~1940s	Common in Puget Sound
1970's	Disappearance (*rare / absent during surveys*)
1997	NMFS survey – *a few seen*
~1998 - 2015	Sightings, strandings, acoustic recordings *begin increasing*
2013-2016	US Navy funds our aerial surveys

* Scheffer & Slipp 1948, Everitt et al. 1979, Osborn et al. 1988, Osmek et al. 1996, Laake et al. 1998, Jeffries 2011, 2012, 2014, Ű 2009, Anderson 2014, Carretta et al. 2014, Calambokidis et al. 2015, Evenson et al. 2015, Jefferson et al. *in review*

2013-2015
Seasonal line transect surveys
Puget Sound

- *Last systematic aerial survey*
  - *NMFS 1997*
- *Last stock assessment*
  - *2002-03 survey*
  - *OUTSIDE Puget Sound**

**Chambers and Calambokidis 2003*

Survey Goals

U.S. Naval installations - inland Puget Sound

- Marine mammals
  - occurrence, distribution, numbers, habitat use, behavior

- **Updated** density/ abundance
  - 4 seasons
  - 8 subregions

Harbor porpoise, NMFS permit 15569

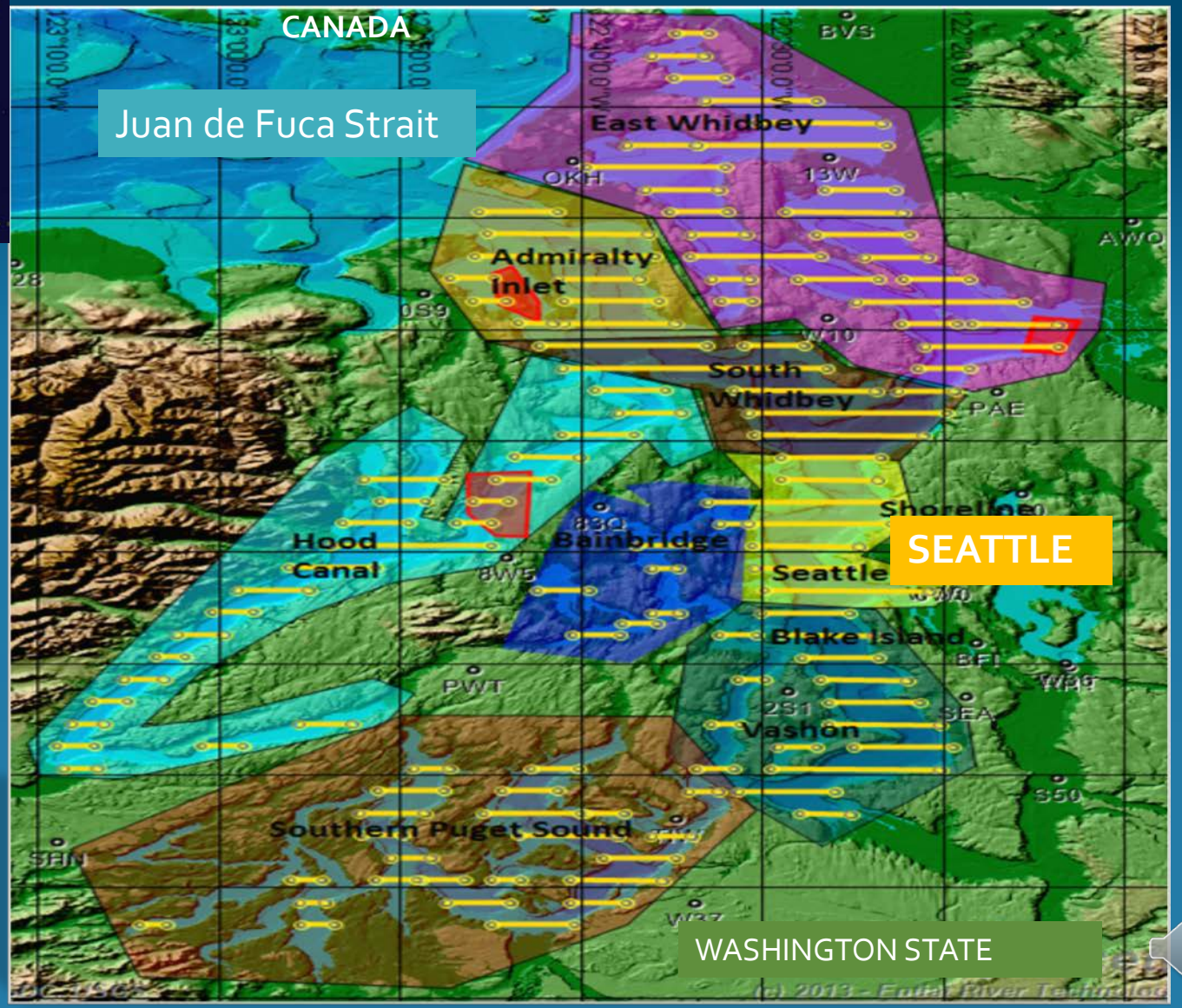
Survey Area – 8 Subregions

transect lines = 850 km

3.7-km line spacing

= Navy installation

= Survey Line



Methods

- Partenavia airplane
  - 2 observers
  - 1 belly observer
  - 1 recorder
- Systematic lines
  - 228 m altitude
  - 100 kt speed

Equipment

- Laptop computer
- *Mysticetus software*
- DSLR camera
  - 100-400 zoom lens
- Clinometer
- 3 WAAS GPSs

Harbor porpoise /M. Deakos
NMFS permit 15569

Mysticetus™ Data Collection Software

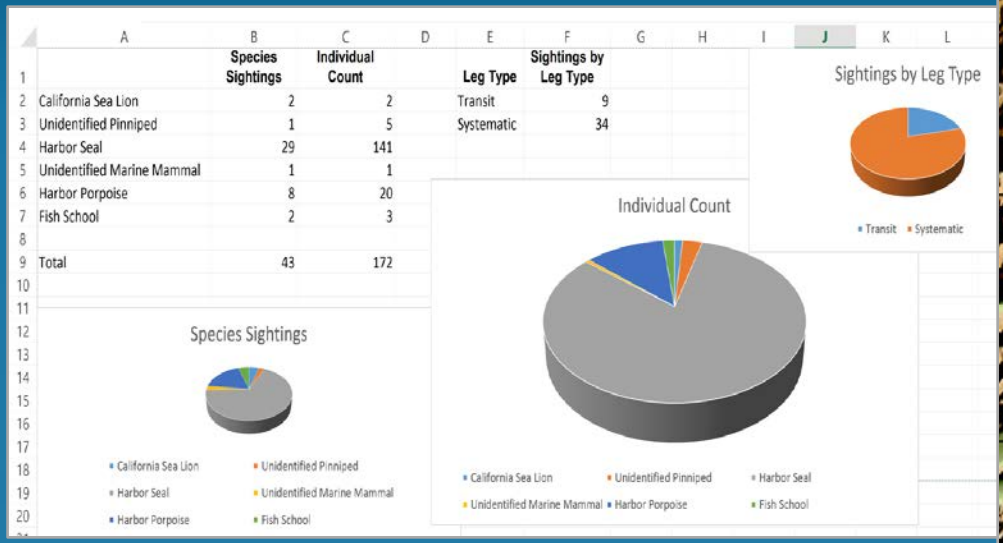
Real-time Display

Instant Daily Report & Map

Species

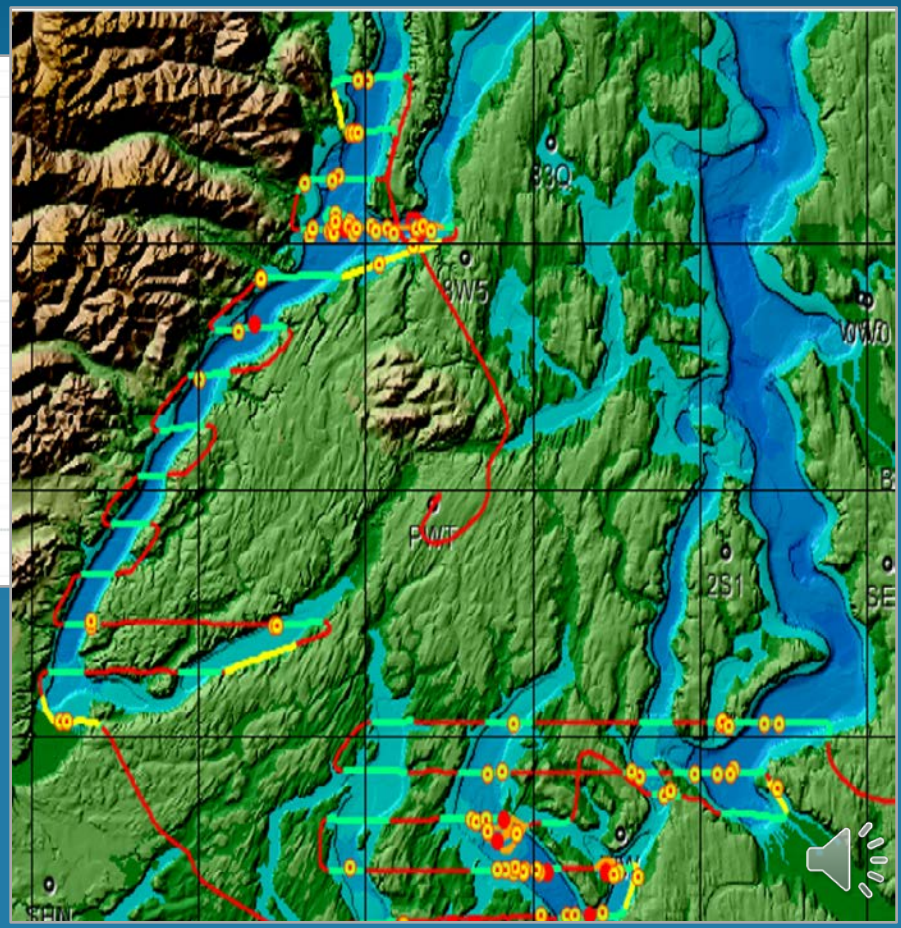
	Species Sightings	Individual Count
California Sea Lion	2	2
Unidentified Pinniped	1	5
Harbor Seal	29	141
Unidentified Marine Mammal	1	1
Harbor Porpoise	8	20
Fish School	2	3
Total	43	172

Leg Type	Sightings by Leg Type
Transit	9
Systematic	34



Sightings by species **# Individuals**

Daily Sighting Locations & Tracklines



Data Collection

- Group size (# calf)
- Behavior state (forage, mill, social, travel, rest)
- Heading
- Group cohesion

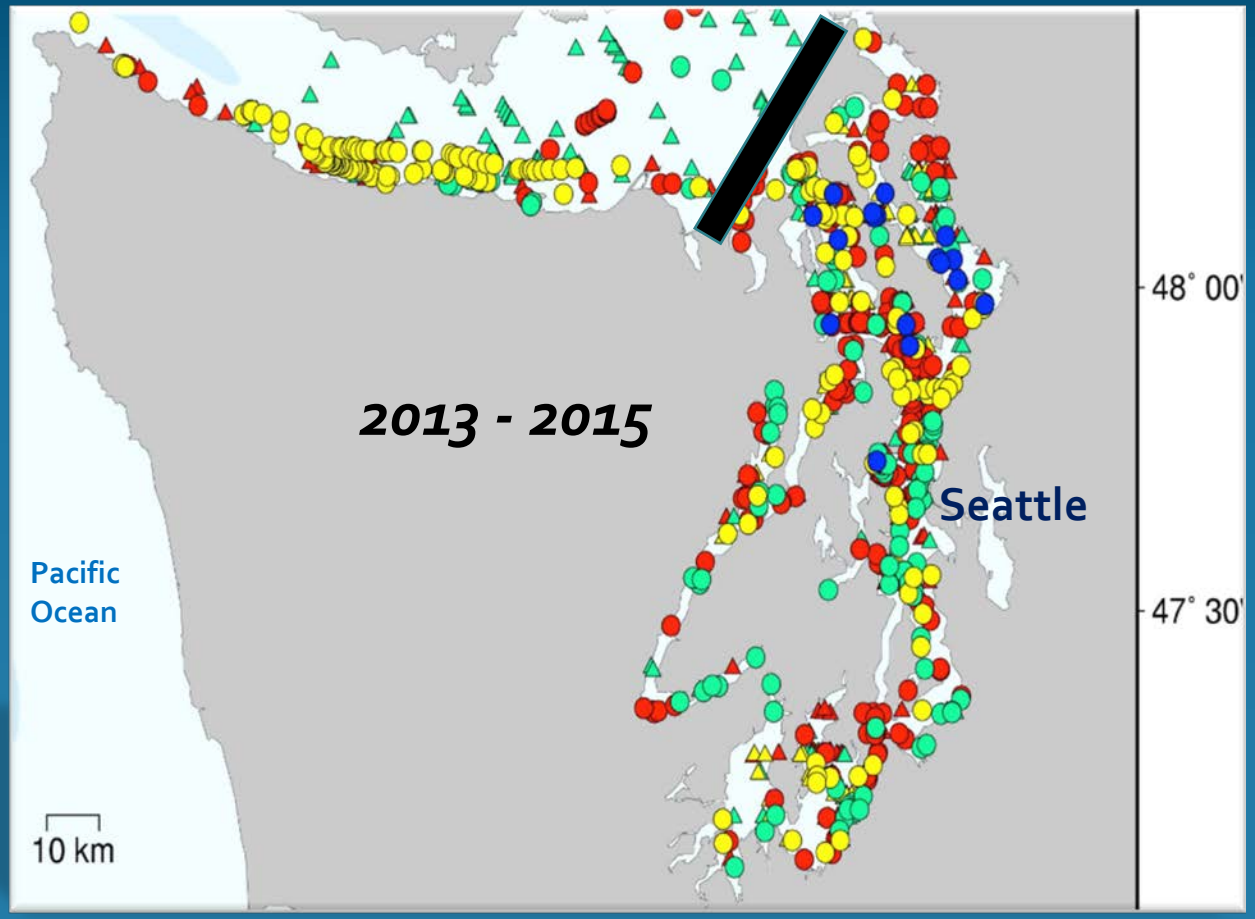
Circle group –

- Confirm
- Photograph

Harbor porpoise photographed in Admiralty Inlet under NMFS permit 15569.

RESULTS

ALL *Harbor Porpoise Sightings*



Sightings Used in Density Estimate

All Other Sightings

Puget Sound study boundary

Red = Fall

Blue = Winter

Green = Spring

Yellow = Summer

RESULTS
Filtered Effort & Sightings*

Season	# Survey	Year	Effort (km)	# Groups
Autumn	1	2014	1,670	103
Summer	2	2013 & 2014	1,574	128
Winter	1	2015	Bad weather	0
Spring	1	2015	1,658	103

**data suitable for density analyses (Beaufort sea state < 3)*

Seasonal Density & Abundance

Season	Indiv. Density	Abundance	% CV
Autumn	0.9	2,253	49%
Summer	1.0	2,674	42%
Spring	1.6	4,349	47%
ALL	0.91	2,387	39%

g(0)=2.92 (Laake et al. 1997)

Sub-region Density & Abundance

g(0)=2.92
(Laake et al. 1997)

Sub-region	Indiv. Density	Abundance	% CV
S Whidbey	2.47	661	44%
E Whidbey	0.77	497	43%
S Puget Sound	0.89	404	43%
Admiralty Inlet	1.46	377	41%
Hood Canal	0.47	185	44%
Seattle	0.69	147	57%
Vashon	0.27	96	47%
Bainbridge	0.23	21	55%

They're Baaaaaack!!!

Harbor porpoises back in Puget Sound

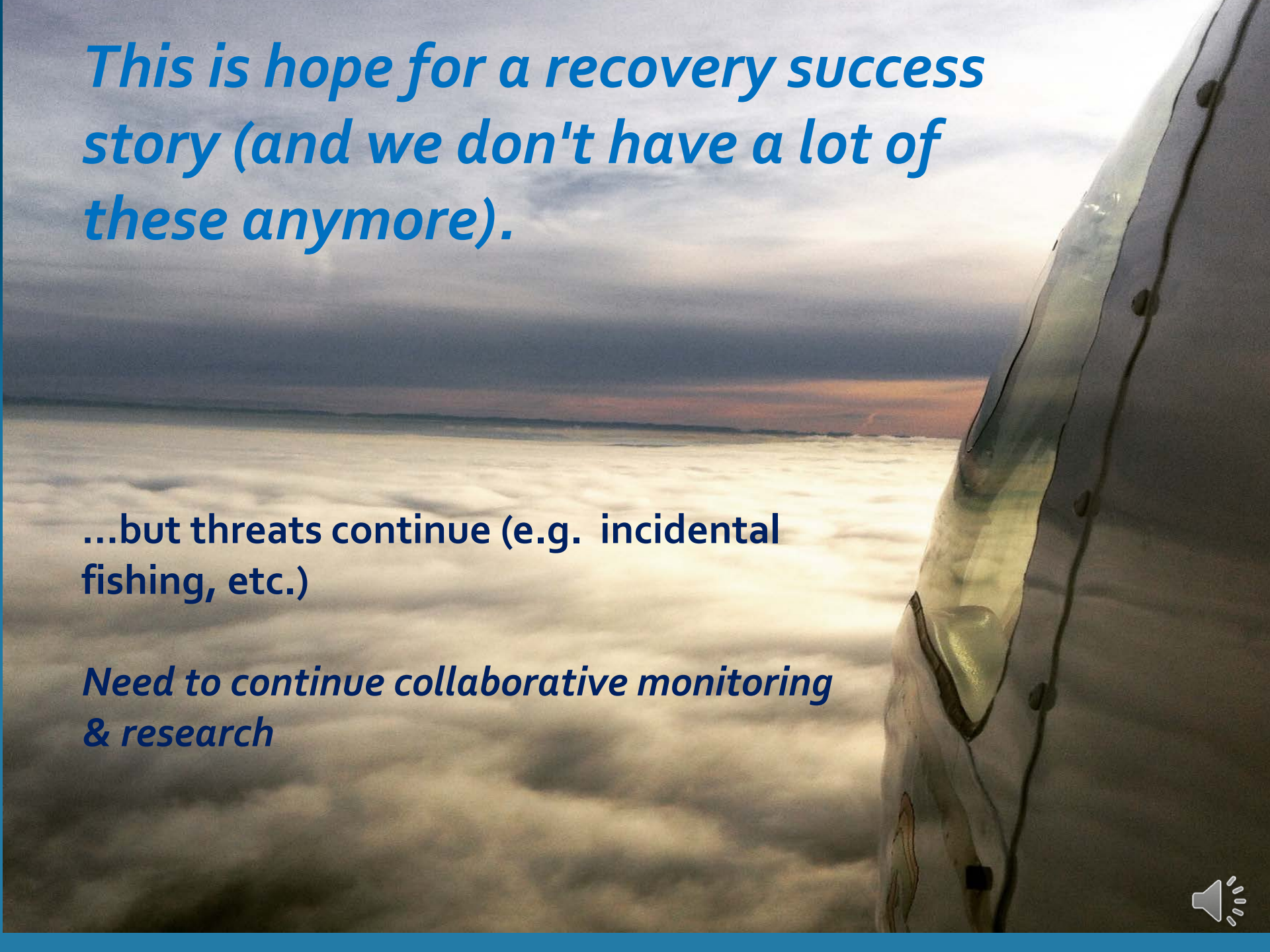
- *recolonizing* Puget Sound
- multiple *seasons*
- *all 8 subregions (variable)*
- *large numbers* (~2,400)

Harbor porpoise photographed by M. Smultea under NMFS permit 15569.

Why Increase in Puget Sound? *

- Prey recovery (herring)
- Decreased fisheries bycatch
- Lower contaminants
- Immigration from other regions?
- Decrease in Dall's porpoise?

* *Calambokidis et al. 2015, Evenson et al. 2015, Jefferson et al. in review*



This is hope for a recovery success story (and we don't have a lot of these anymore).

…but threats continue (e.g. incidental fishing, etc.)

Need to continue collaborative monitoring & research

More **Smultea Sciences** Presentations

1. **Results of daily marine mammal monitoring in coastal waters off Coos Bay, Oregon, Fall 2014**
    - **Poster** - Thursday, 17 Dec, 08:30 - 10:00
2. **Risks and Rewards of Group Living: Risso's vs. Common Dolphins:**
    - **Poster** -Thursday, 17 Dec, 17:30 – 19:30
3. **Blue Whale behavior and group dynamics as observed from an aircraft off southern California 2008-2013**
    - **Poster** - Thursday, 17 Dec, 17:30-19:30