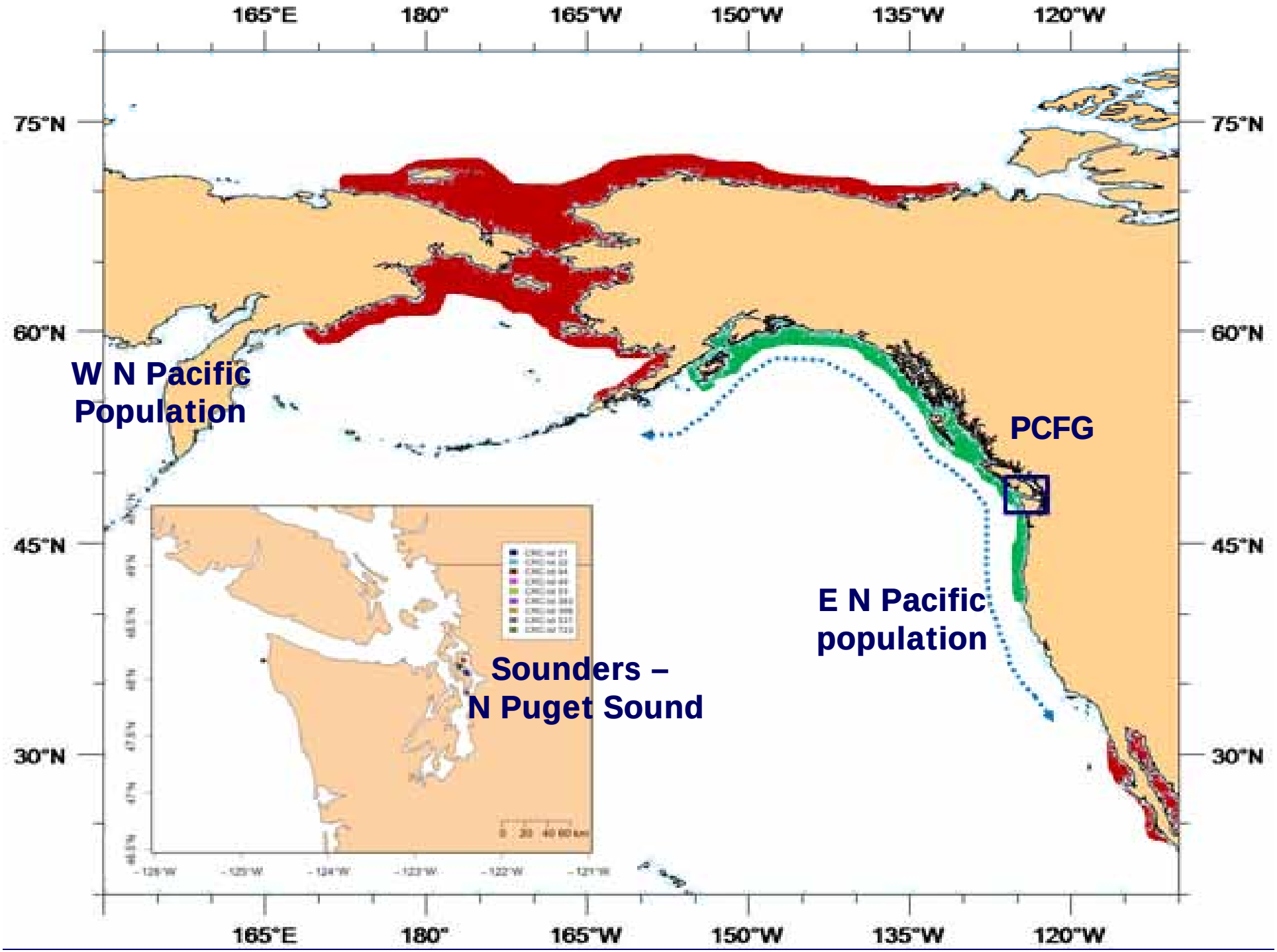
New research on gray whales in the Pacific Northwest and especially N Puget Sound

John Calambokidis

Research Biologist

Cascadia Research


165°E
180°
165°W
150°W
135°W
120°W
75°N
60°N
45°N
30°N
W N Pacific Population
PCFG
E N Pacific population
Sounders – N Puget Sound

Biologically Important Areas

Aquatic Mammals 2015, *41*(1), 39-53, DOI 10.1578/AM.41.1.2015.39

4. Biologically Important Areas for Selected Cetaceans Within U.S. Waters – West Coast Region

John Calambokidis,[1] Gretchen H. Steiger,[1] Corrie Curtice,[2] Jolie Harrison,[3] Megan C. Ferguson,[4] Elizabeth Becker,[5] Monica DeAngelis,[6] and Sofie M. Van Parijs[7]

[1]*Cascadia Research, Olympia, WA 98501, USA*
E-mail: Calambokidis@CascadiaResearch.org
[2]*Marine Geospatial Ecology Lab, Duke University, Beaufort, NC 28516, USA*
[3] *National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD 20910, USA*
[4]*National Marine Mammal Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, Seattle, WA 98115, USA*
[5]*Southwest Fisheries Science Center, Marine Mammal and Turtle Division, Santa Cruz, CA 95060, USA*
[6]*NOAA Fisheries West Coast Region, Long Beach, CA 90802, USA*
[7]*Passive Acoustic Research Group, Northeast Fisheries Science Center, Woods Hole, MA 02543, USA*

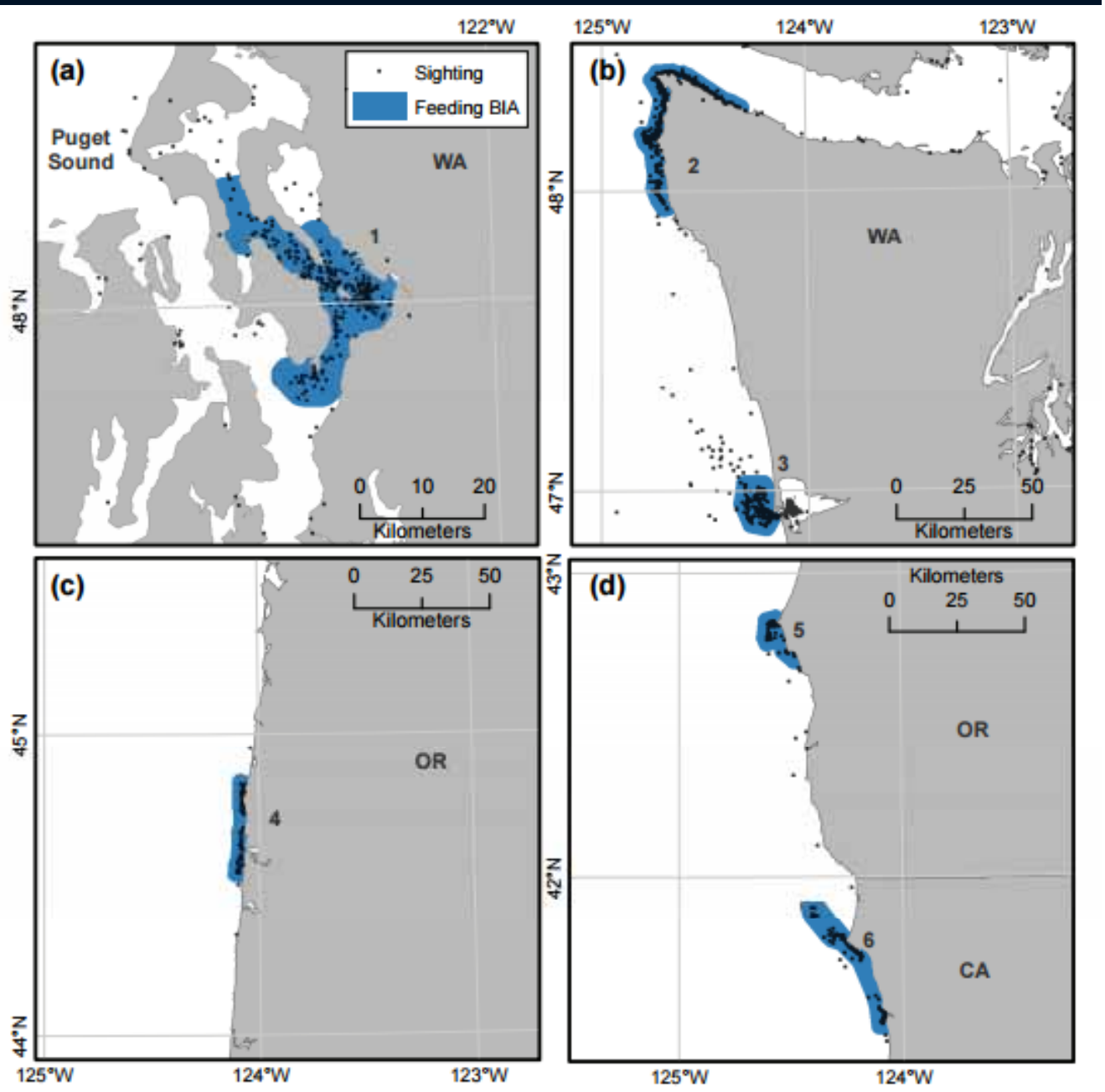
Abstract

In this review, we combine existing published and unpublished information along with expert judgment to identify and support the delineation of 28 Biologically Important Areas (BIAs) in U.S. waters along the West Coast for blue whales, gray whales, humpback whales, and harbor porpoises. BIAs for blue whales and humpback whales are based on high concentration areas of feeding animals observed from small boat surveys, ship surveys, and opportunistic sources. These BIAs compare favorably to broader habitat-based density models. BIAs for gray whales are based on their migratory corridor as they transit between primary feeding areas located in northern latitudes and breeding areas off Mexico. Additional gray whale BIAs are defined for the primary feeding areas of a smaller resident population. Two small and resident population BIAs defined for harbor porpoises located off California encompass the populations' primary areas of use. The size of the individual BIAs ranged from approximately 171 to 138,000 km². The BIAs for feeding blue, gray, and humpback whales represent relatively small portions of the overall West Coast area (< 5%) but encompass a large majority (77 to 89%) of the thousands of sightings documented and evaluated for each species. We also evaluate and discuss potential feeding BIAs for fin whales, but none are delineated due to limited or conflicting information. The intent of identifying BIAs is to synthesize existing biological information in a transparent format that is easily accessible to scientists, managers, policymakers, and the public for use during the planning and design phase of anthropogenic activities for which U.S. statutes require the characterization and minimization of impacts on marine mammals. To maintain their utility, West Coast region BIAs should be re-evaluated and revised, if necessary, as new information becomes available.

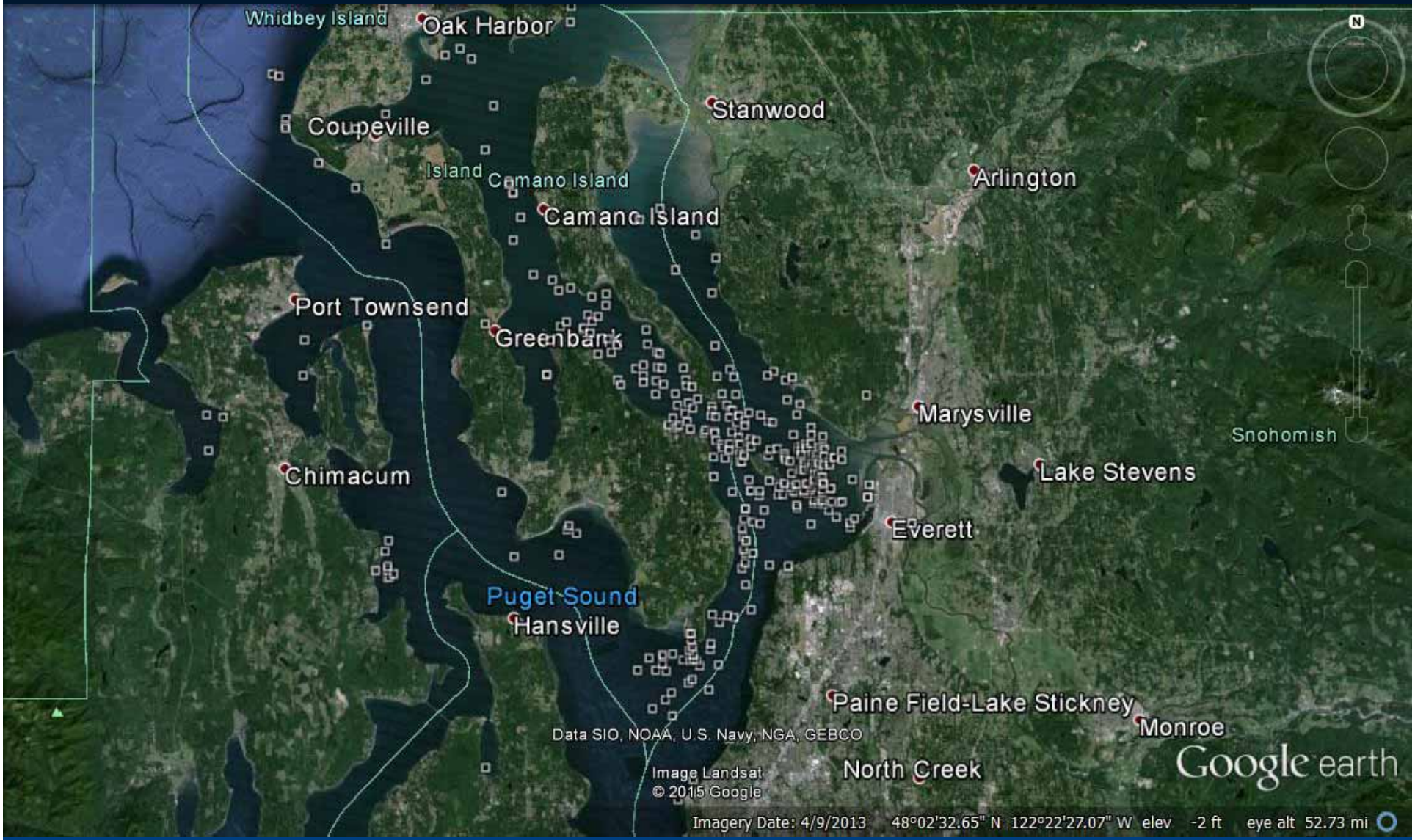
Key Words: feeding area, migratory corridor, resident population, anthropogenic sound, species distribution, U.S. West Coast, North Pacific Ocean

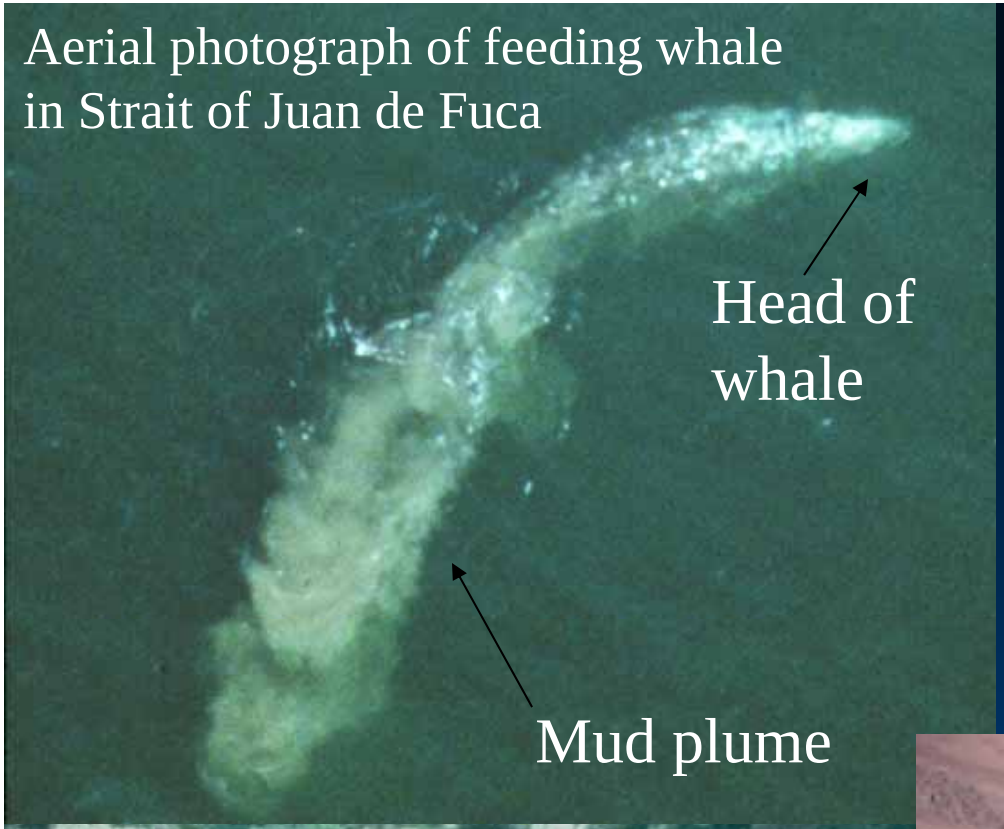
Introduction

This review document coalesces existing published and unpublished information to define Biologically Important Areas (BIAs) in U.S. waters of the West Coast region (shoreward of the offshore boundary of the U.S. Exclusive Economic Zone [EEZ]) for cetacean species that meet the criteria for feeding areas, migratory corridors, and small and resident populations defined in Table 1.2 of Ferguson et al. (2015b) within this issue. A comprehensive overview of the BIA delineation process; its caveats (Table 1.4). strengths, and limitations; and its relationship to international assessments also can be found in Ferguson et al. Table 1.3 provides a summary of all BIAs identified, including region, species, BIA type, and total area (in km²). A summary also can be found at http://cetsound.noaa.gov/important. Table 1.1 defines all abbreviations used in this special issue. Metadata tables that concisely detail the type and quantity of information used to define many of these BIAs are available as an online supplement. Our intent is to delineate BIAs by synthesizing information that is not publicly available from existing sources, is only partially represented through peer-reviewed publications,

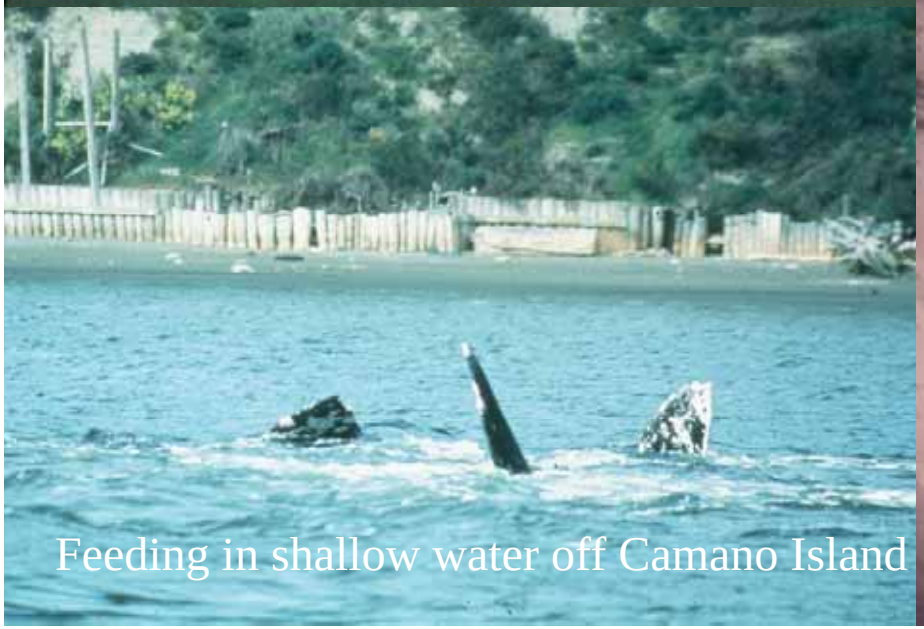


Gray whale positions since 2010





Variety of prey and habitats overall: Feeding on ghost shrimp in N Puget Sound



Cascadia activities with N Puget Sound gray whales 2015-16

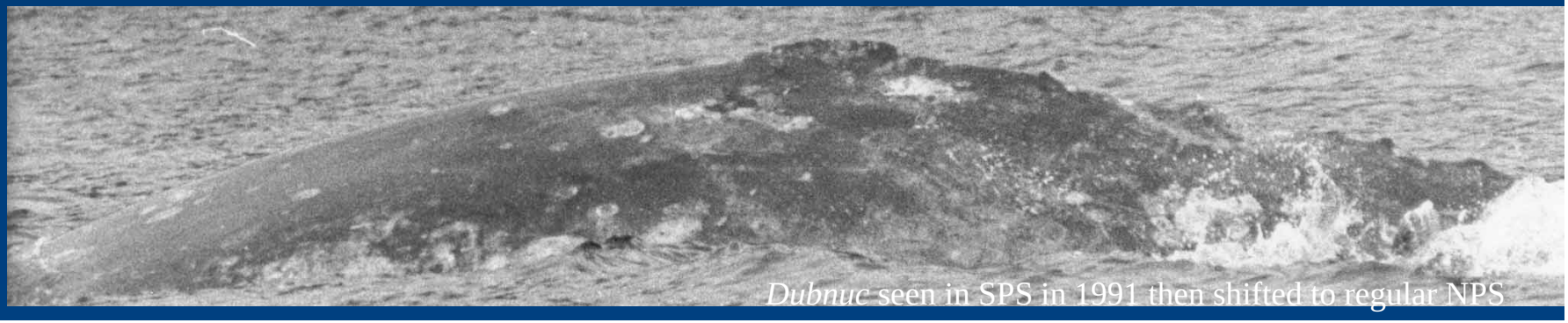
- Project with DNR studying gray whale predation on ghost shrimp in N Puget Sound
- Recognition of N Puget Sound Biologically Important Feeding Area
- Work with whale watch companies getting opportunistic sightings and IDs
- Dedicated small boat surveys of larger region for occurrence and photo-ID
- More precise monitoring of feeding including collection of fecal samples
- Deployment of video tags with suction cups to examine feeding behavior in both intertidal and benthic areas

Gray whale occurrence in N Puget Sound

North Puget Sound

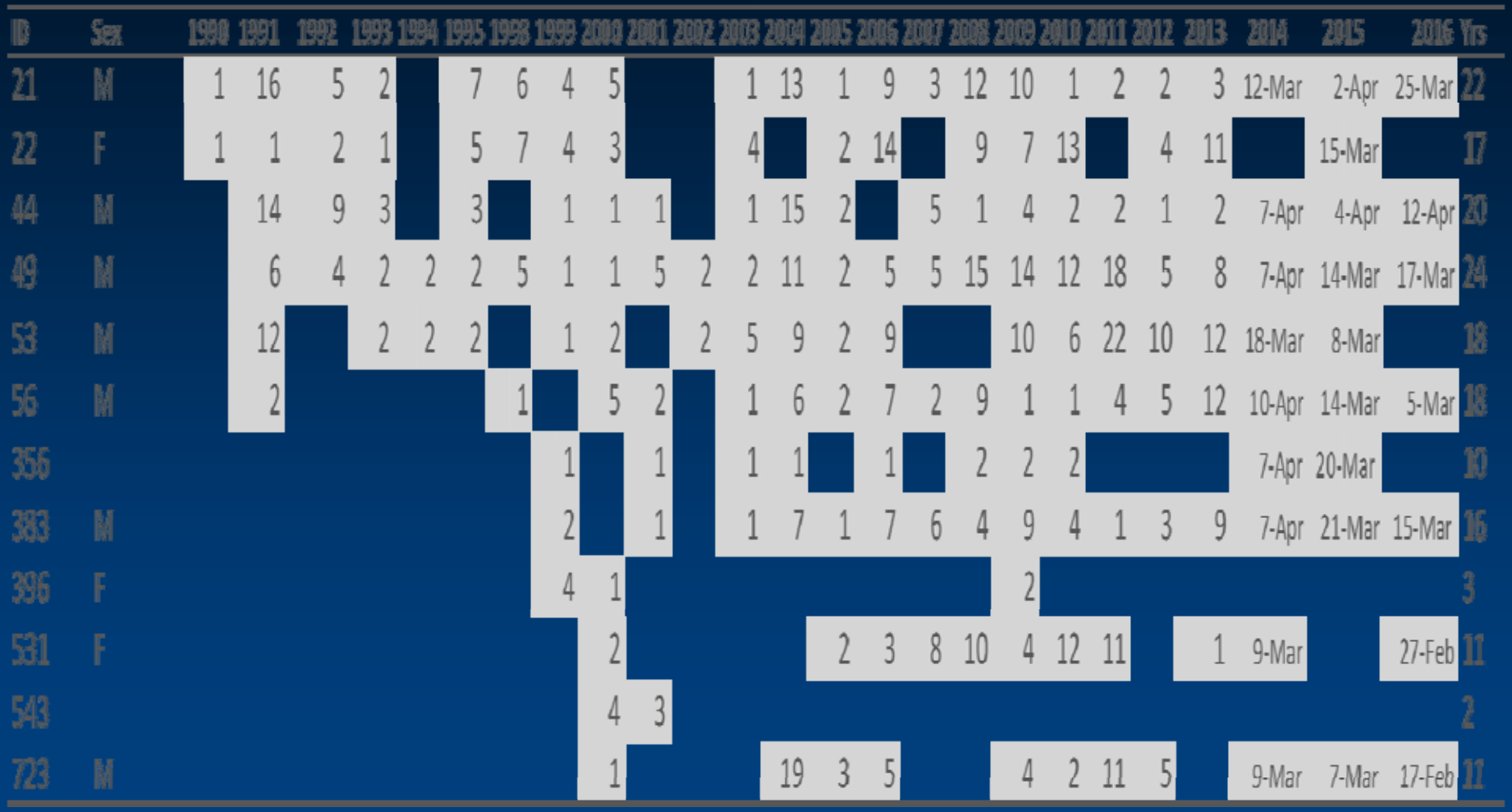
- Primarily seen March through June then not other areas
- >40 unique individuals identified (up to 24/year but in years with many stragglers in broader region)
- 12 whales seen in 3 or more years, core group arrived in two waves 1990-91 & 1999-2000

- 2 whales “discovered” N Puget Sound



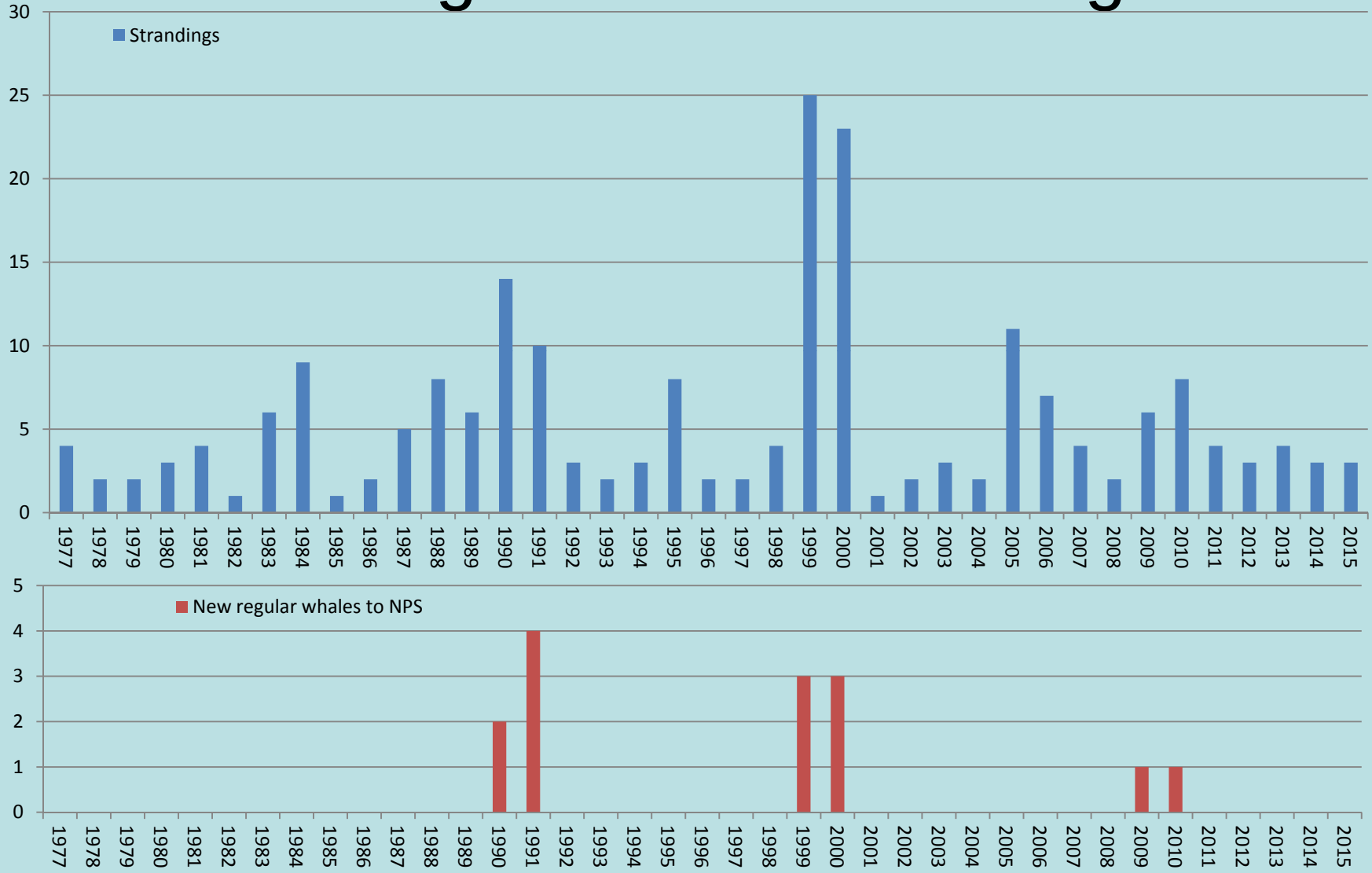
Dubnuc seen in SPS in 1991 then shifted to regular NPS

North Puget Sound gray whales “Sounders” sighting histories for whales seen more than 2 yrs



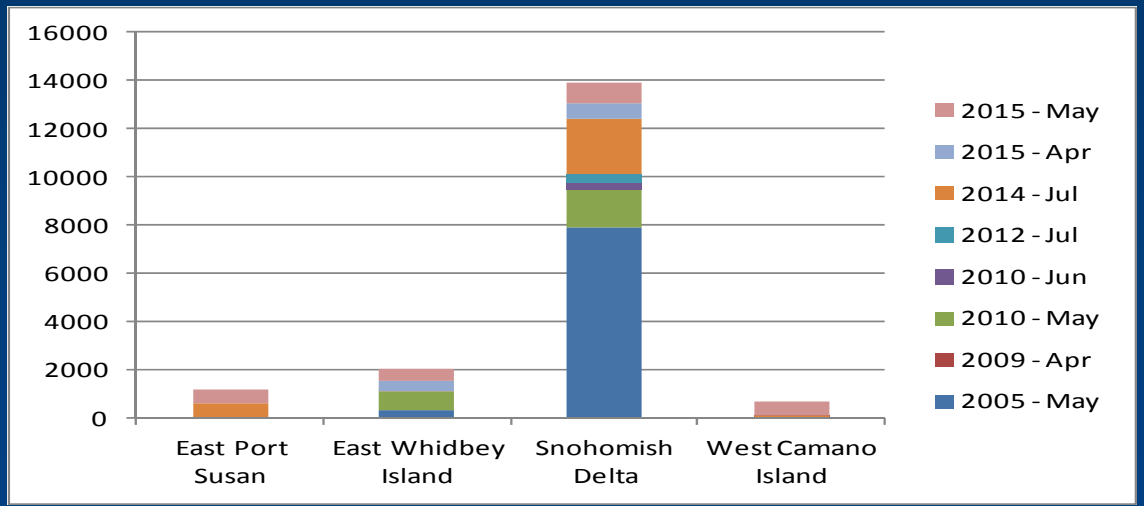
ID	Sex	1990	1991	1992	1993	1994	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Yrs
21	M	1	16	5	2		7	6	4	5			1	13	1	9	3	12	10	1	2	2	3	12-Mar	2-Apr	25-Mar	22
22	F	1	1	2	1		5	7	4	3			4		2	14		9	7	13		4	11		15-Mar		17
44	M		14	9	3		3		1	1	1		1	15	2		5	1	4	2	2	1	2	7-Apr	4-Apr	12-Apr	20
49	M		6	4	2	2	2	5	1	1	5	2	2	11	2	5	5	15	14	12	18	5	8	7-Apr	14-Mar	17-Mar	24
53	M		12		2	2	2		1	2		2	5	9	2	9		10	6	22	10	12	18-Mar	8-Mar		18
56	M		2					1		5	2		1	6	2	7	2	9	1	1	4	5	12	10-Apr	14-Mar	5-Mar	18
356									1		1		1	1		1		2	2	2				7-Apr	20-Mar		10
383	M								2		1		1	7	1	7	6	4	9	4	1	3	9	7-Apr	21-Mar	15-Mar	16
396	F								4	1									2								3
531	F									2					2	3	8	10	4	12	11		1	9-Mar		27-Feb	11
543										4	3																2
723	M									1				19	3	5			4	2	11	5		9-Mar	7-Mar	17-Feb	11

WA strandings and new NPS regulars

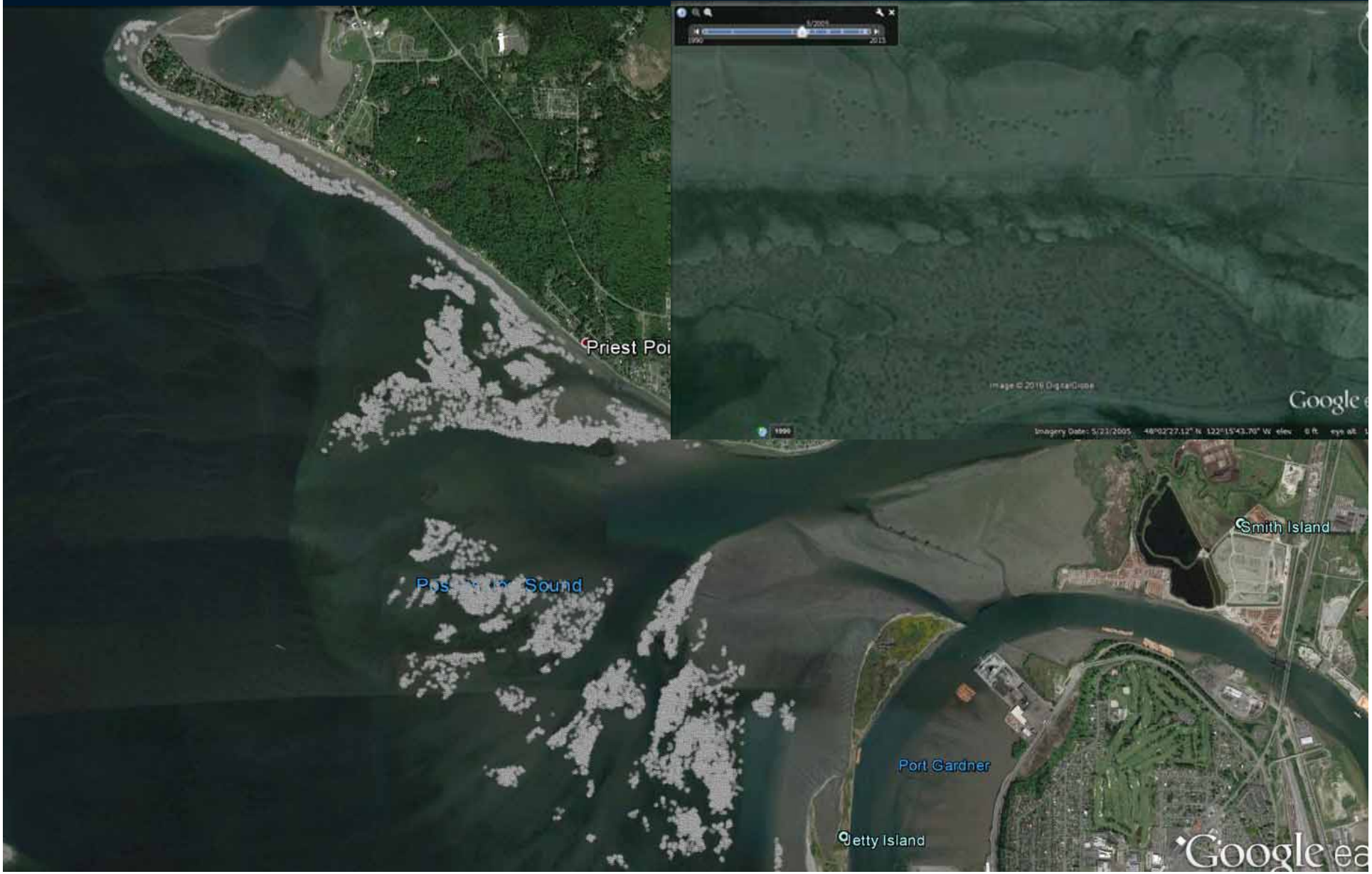


Gray whale feeding pits detected in N Puget Sound form Google Earth images

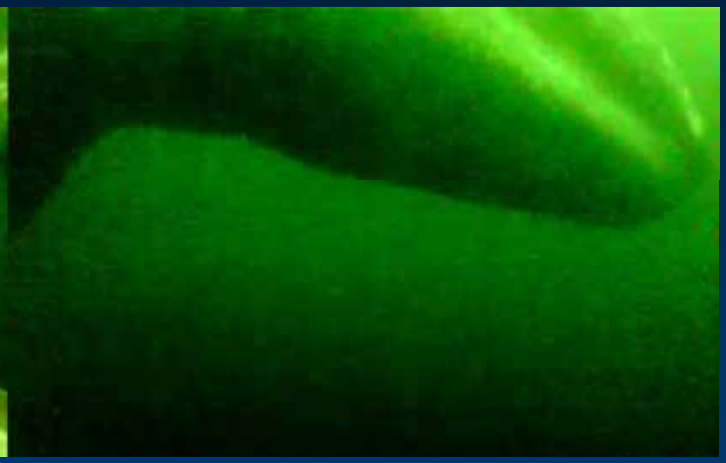
No. of Feeding Pits	Dates								
Regions	5/23/2005	4/30/2009	5/14/2010	6/11/2010	7/5/2012	7/10/2014	4/19/2015	5/2/2015	Grand Total
Central East Whidbey Island		0				0		0	0
East Camano Island		0				0		0	0
East Port Susan		0				610		542	1152
North East Whidbey Island		0				0		0	0
Skagit Bay		0				0		0	0
Snohomish Delta	7904		1585	257	343	2296	651	906	13942
South East Whidbey Island	342	0	766		0	16	371	522	2017
South Possession Sound	0	0	0	0	0	0	0		0
West Camano Island		30				92		525	647
Grand Total	8246	30	2351	257	343	3014	1022	2495	17758

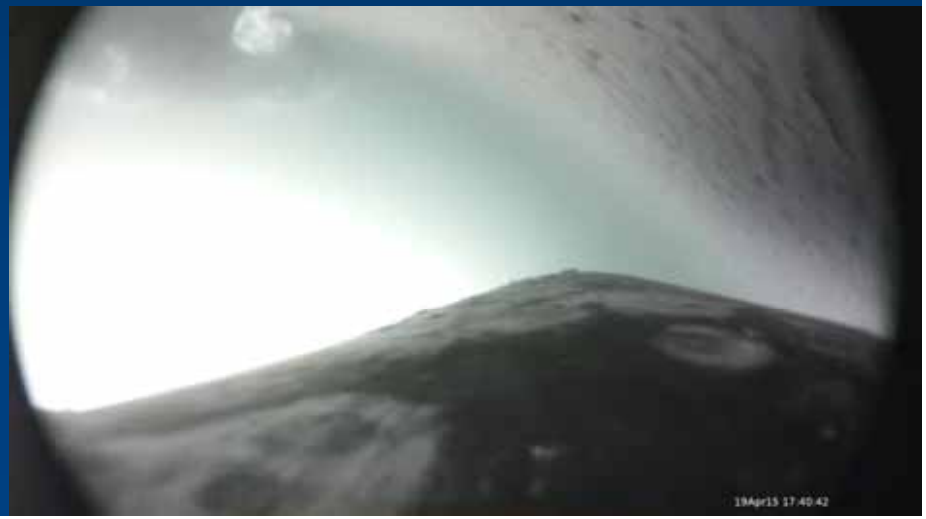


Google Earth feeding pits



2015 gray whale tag deployments on CRC 22 and 383





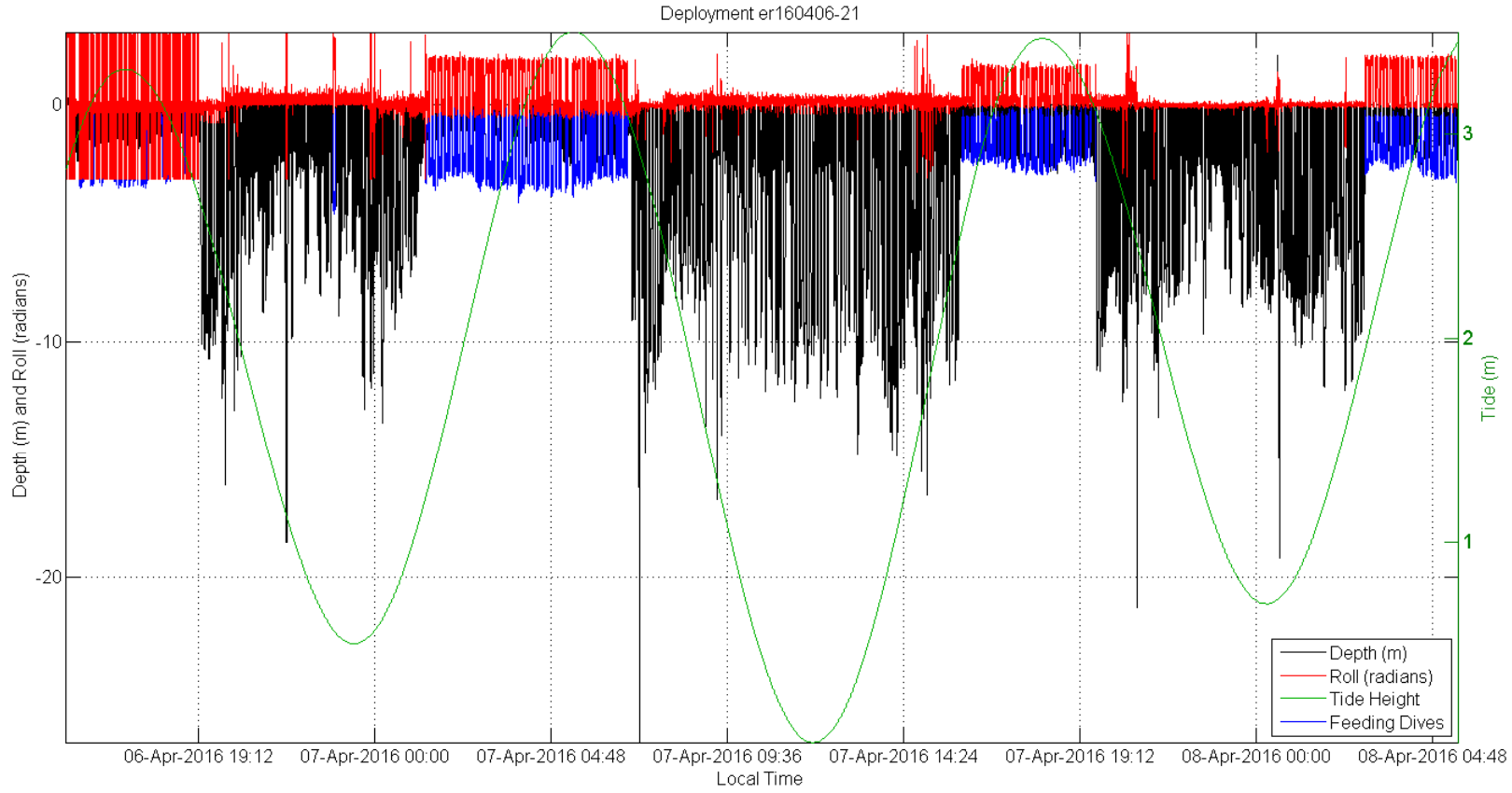
Behavior of whale 383 and 49 (Patch) near Hat Island March 2016

Tag deployments – 2015-2016

Deploy	Vessel	Sighting	Tag#	Field ID	Sex	TagOffTime	H on	End data	H data
04/17/2015 10:15:00	ZIP	3	3	22	F	04/18/2015 03:38:28	17.4	04/18/2015 04:18:22	18.1
04/19/2015 08:55:00	ZIP	1	3	22	F	04/19/2015 08:56:00	0.0	04/19/2015 08:56:00	0.0
04/19/2015 13:37:00	ZIP	2	5	383	Biopsy	04/19/2015 19:57:38		04/19/2015 19:57:38	6.3
03/25/2016 08:31:31	ZIP	1	22	723	M	03/26/2016 07:34:37	23.1	03/26/2016 07:34:37	23.1
03/25/2016 14:39:07	ZIP	9	25	49	M	03/25/2016 15:38:19	1.0	03/25/2016 15:38:19	1.0
03/25/2016 18:01:55	ZIP	11	25	383	Biopsy	03/26/2016 07:02:30	13.0	03/26/2016 07:02:30	13.0
04/06/2016 14:29:00	ZIP	5	22	21	M	04/07/2016 08:39:17	18.2	04/07/2016 08:39:17	18.2
04/06/2016 15:52:00	ZIP	6	21	723	M	04/09/2016 11:24:00	67.5	04/08/2016 05:30:13	37.6
04/07/2016 13:56:20	ZIP	7	25	383	Biopsy	04/07/2016 18:21:52	4.4	04/07/2016 18:21:52	4.4
05/05/2016 13:17:26	ZIP	2	22	723	M	05/05/2016 17:42:00	4.4	05/05/2016 17:42:00	4.4
05/05/2016 13:52:40	ZIP	2	25	49	M	05/05/2016 20:22:00	6.5	05/05/2016 20:22:00	6.5
									132.6

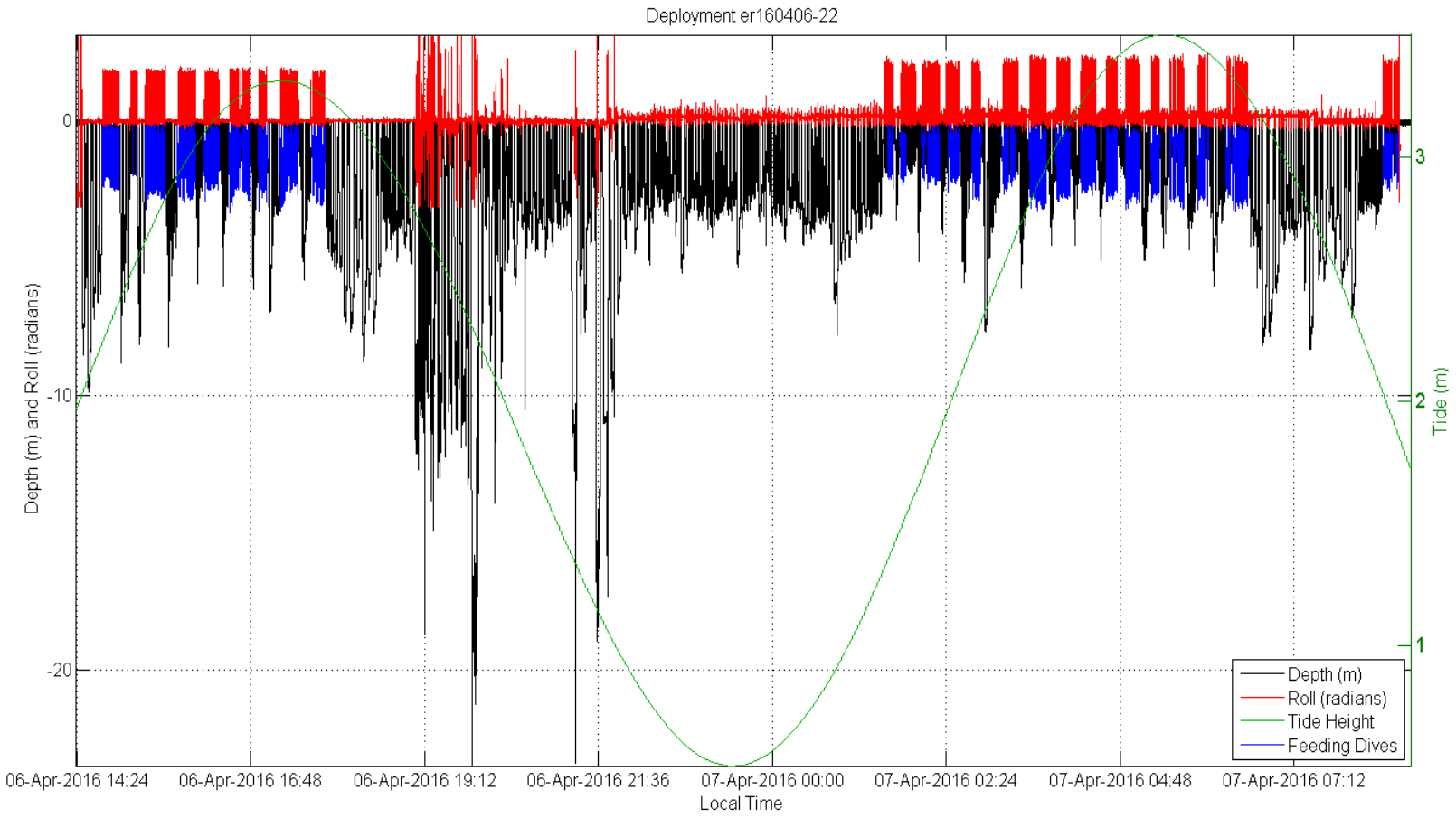
6 April 2016 Tag 21 – ID 723

- Tag deployed at 15:52 stayed on 67.5 h
- 37.6 h of data recorded
- ID Lucyfer stayed into June 2016



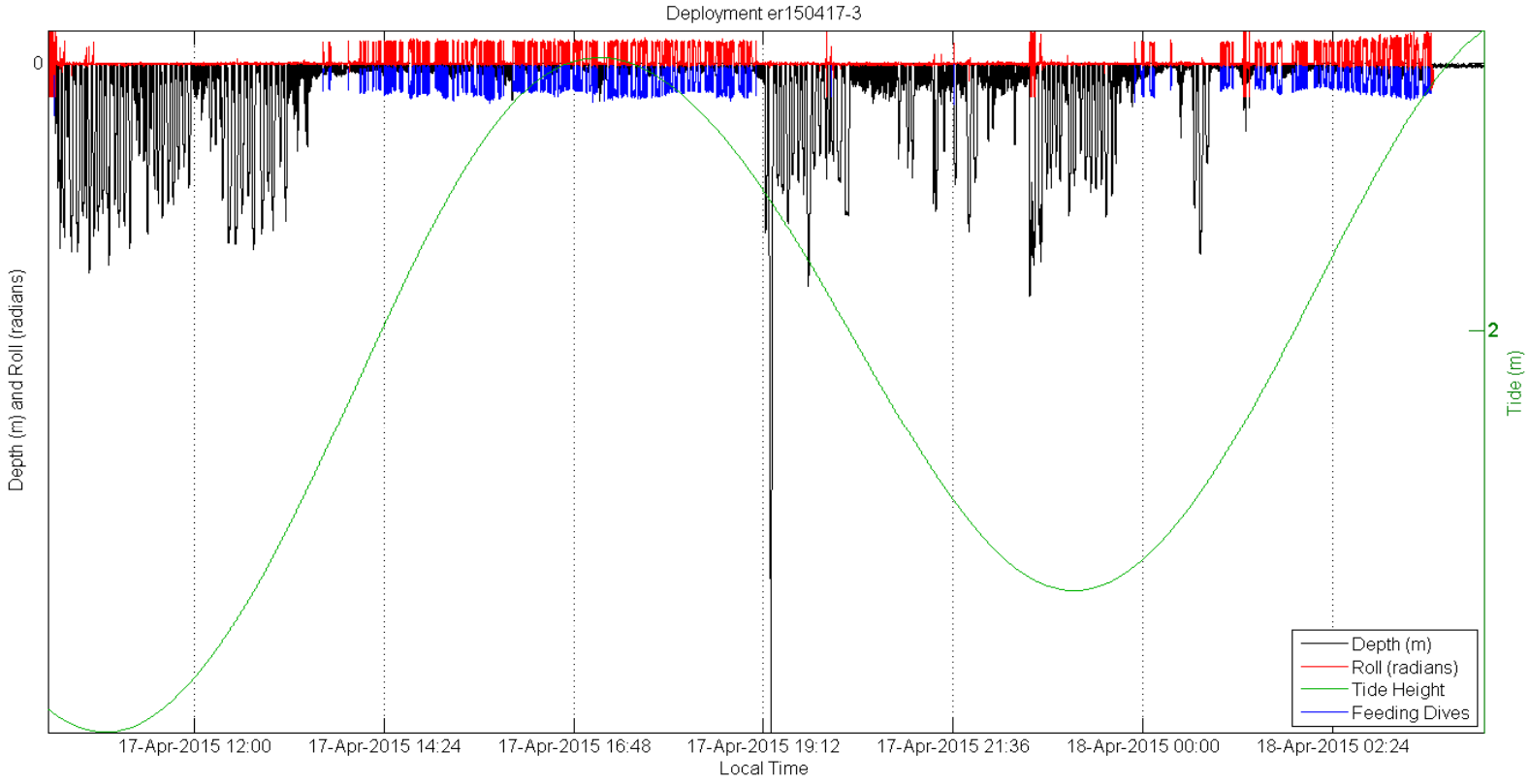
6 April 2016 Tag 22 – ID 21

- Tag deployed at 14:29 stayed 18.2 h of data recorded
- ID Shackleton earliest animal Identified in region



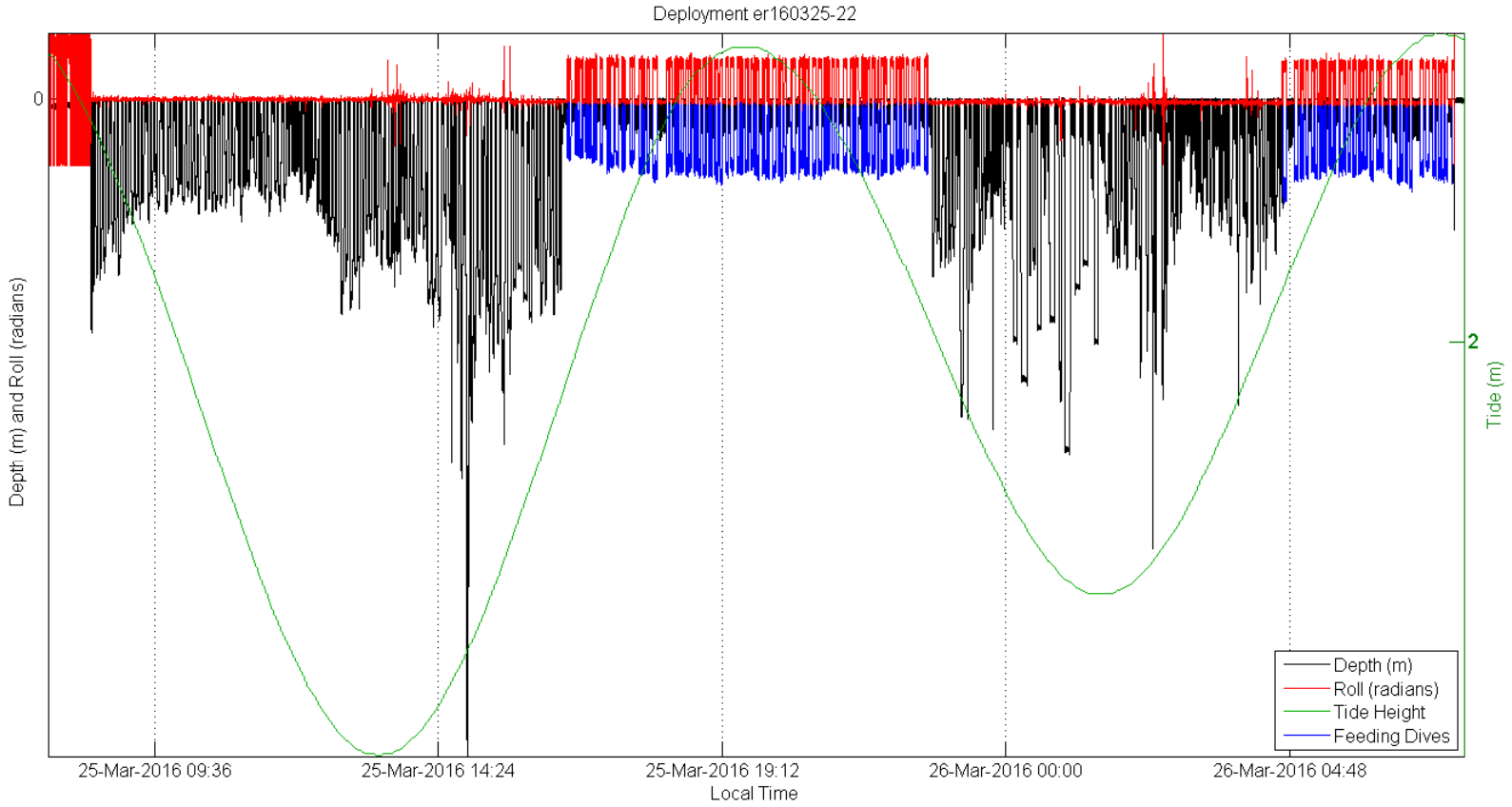
17 April 2015 Tag 3 – ID 22

- Tag deployed at 10:15 and recorded 18 h of data
- ID 22 (Earhart) one of the few females
- Present in 2015 and not 2016, seems to skip year every 3-4 years possibly when she has a calf.



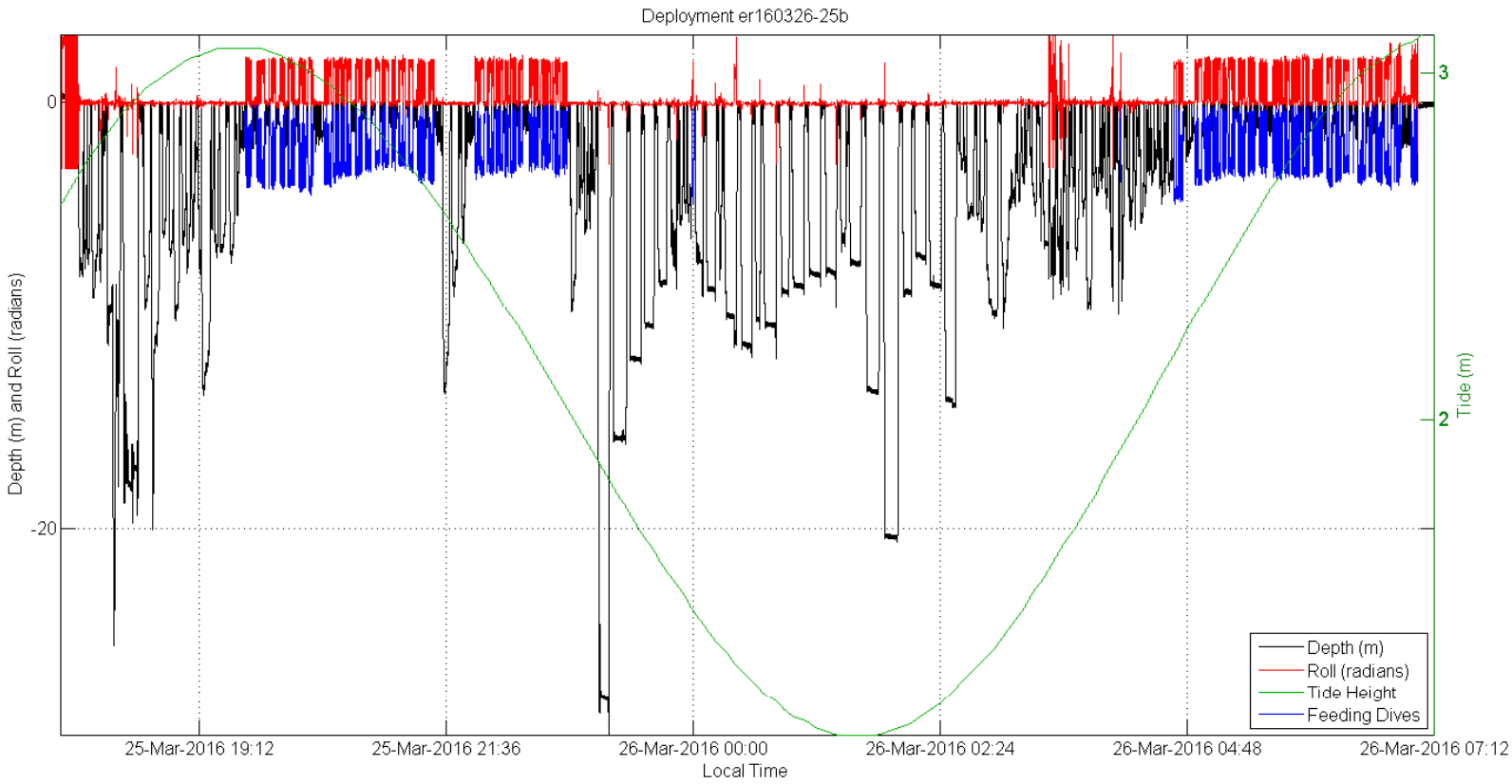
25 March 2016 Tag 22 – ID 723

- Tag deployed at 0831 and recorded 23 h data
- One of two deployments on this individual, Lucyfer
- A male that joined this group in 2000



25 March 2016 – ID 383

- Deployed at 18:01 and recorded 13 h of data
- Just discovered this year was a Male from biopsy sample



Feeding event summary

File Name	Feeding event	Feeding event start time	Feeding event end time	Number of rolls in event	Duration of event	CRC-ID	Animal sex	Comments
er20150417-3-ID22	1	4/17/2015 13:37	4/17/2015 19:06	182	5:29	22	Female	
er20150417-3-ID22	2	4/17/2015 23:52	4/18/2015 3:39	89	3:31	22	Female	
er20160325-22	1	3/25/2016 16:33	3/25/2016 22:42	117	6:09	723	Male	
er20160325-22	2	3/26/2016 4:40	3/26/2016 7:34	47	2:54	723	Male	Data ends mid feeding event
er20160325-25b	1	3/25/2016 19:38	3/25/2016 21:29	76	3:08	383	Male	
er20160325-25b	2	3/25/2016 21:52	3/25/2016 22:46	47	0:54	383	Male	
er20160325-25b	3	3/26/2016 4:40	3/26/2016 7:02	100	2:22	383	Male	Data ends mid feeding event
er20160406-22	1	4/6/2016 14:45	4/6/2016 17:50	170	3:05	21	Male	
er20160406-22	2	4/7/2016 1:32	4/7/2016 6:33	249	5:01	21	Male	
er20160406-22	3	4/7/2016 8:26	4/7/2016 8:39	11	0:13	21	Male	Data ends mid feeding event
er20160406-21	1	4/7/2016 1:21	4/7/2016 6:54	95	5:33	723	Male	
er20160406-21	2	4/7/2016 15:59	4/7/2016 19:38	57	3:39	723	Male	
er20160406-21	3	4/8/2016 2:57	4/8/2016 5:30	37	2:33	723	Male	Data ends mid feeding event

Conclusions

- For the N Puget Sound whales (Sounders), they appear to have discovered this off-migration feeding area as a result of food stress.
- Sounders feed almost exclusively on ghost shrimp in an near the intertidal zone at high tide.
- Snohomish Delta the most important of the feeding areas in recent years though their use appears to change over time.
- Gray whales are highly social and interactive underwater.

Recommendations

1. Examine tidal height difference between harvest and whale feeding area and whether this could be used to more clearly separate these uses.
2. Snohomish Delta most important feeding area for whales in 2015-16 and not a target of harvest so protecting that area from future harvest and easy way to reduce conflict
3. A robust inexpensive experiment would be to split sites that have had historical harvest and whale feeding into two groups allowing harvest on one and not on another and test for future changes in whale use of these areas.
4. Important to integrate evaluation and management with tribes since tribal harvest a significant part of the picture.