Marine Species Monitoring Report For the U.S. Navy's Northwest Training Range Complex

Annual Report 2013

July 1, 2013

[Cover Photo: (January 27, 2013) Photograph of Eastern Pacific gray whale with a SPOT5 satellite tracking tag attached. Photo obtained 148 days after initial tagging in fall of 2012. Photo by Craig Hayslip, Oregon State University and taken under NMFS permit No. 369-1757 issued to Dr. Bruce Mate.]

In Support Of
Letter of Authorization
Under The Marine Mammal Protection Act
For Incidental Harassment of Marine Mammals Resulting From
U.S. Navy Training and Testing Activities
In The Northwest Training Range Complex

Marine Species Monitoring Report

For the U.S. Navy's Northwest Training Range Complex

Annual Report 2013

Prepared in Accordance With
50 C.F.R. §218.115(f)

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Monitoring Team and Performers- The Northwest Training Range Complex Navy funded Compliance Monitoring team is comprised of non-Navy civilian academic and contract scientists.

Marine mammal tagging effort conducted by Cascadia Research Collective, Olympia, Washington, led by Dr. John Calambokidis.

Passive acoustic monitoring conducted by Marine Physical Laboratory, Scripps Institution of Oceanography at University of California San Diego, led by Dr. John Hildebrand

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1.0 INTRODUCTION

The United States Navy (Navy) developed Range Complex-specific Monitoring Plans under the Navy Monitoring Program to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973.

The U.S. Pacific and Atlantic Fleets marine species monitoring programs are composed of a collection of "range-specific" monitoring plans each developed as part of the MMPA/ESA authorization process. The Fleets individual plans establish specific monitoring requirements for each range complex based on a set of effort-based metrics.

This report describes Navy funded monitoring within the Navy's Northwest Training Range Complex (NWTRC) conducted between May 2, 2012 and May 1 2013. This document is an annual report summarizing to the best extent practical monitoring program results, prepared in accordance with 50 CFR §218.115(f).

1.1 Report Overview

This report is comprised of four main sections summarizing key monitoring results from May 2, 2012 to May 1, 2013:

- Introduction
- Compliance Monitoring Summary
- Other Navy Research and Regional Monitoring Summary
- Future Direction for 2014-2015

The "Compliance Monitoring Summary" discusses scientific contribution and major results from U.S Pacific Fleet funded Compliance Monitoring under the MMPA and ESA authorizations for the NWTRC. Fleet funded Compliance Monitoring is directly tied to the monitoring objectives and metrics National Marine Fisheries Service (NMFS) approved in the original NWTRC Monitoring Plan (Department of the Navy 2010a).

The "Other Navy Research and Regional Monitoring Summary" section describes additional concurrent Navy funded research projects within the Pacific Northwest that either increases scientific knowledge on marine mammal and anthropogenic impacts, provides new marine mammal distribution information, or provides for testing and validation of new detection technologies.

Finally, the "Future Direction" section describes the Navy's recommendations for follow-on monitoring within the NWTRC through May 2015.

1.2 NWTRC Monitoring Goals

The NWTRC Range Complex includes the Pacific Northwest (PACNW) Operations Areas (OPAREA) (**Figure 1-1**) which serves as maneuver water space for ships and submarines to conduct training and to use as transit lanes. It extends from the Strait of Juan de Fuca in the north, to approximately 50 nm (92.6 km) south of Eureka, California in the south, and from the coast line of Washington, Oregon, and California westward to 130° West longitude. The southern boundary of the OPAREA is at 40° N latitude, which corresponds to the northern boundary of Mendocino County in Northern California (Department of the Navy 2010c).

For range management and scheduling purposes, the NWTRC is divided into numerous subcomponent training areas, the most important one being Warning Area 237 (W-237). Total surface area of the PACNW OPAREA is 122,400 nm^2 (420,163 km^2). Although this area extends to the coastline of Washington, Oregon, and Northern California, no training that involves live explosives is conducted within 3 nm of shore. Historically, as well as projected for the future, training within 12 nm seldom if ever occurs off the coast of Oregon and Northern California (Department of the Navy 2010c). The Navy's follow-on environmental documentation for the Northwest Training and Testing (NWTT) Draft Environmental Impact Statement/Overseas Environmental Impact Statement formally acknowledges this historic trend with the redesignation of the NWTT study area as seaward of the 12 nm limit off the Oregon and northern California coasts (**Figure 1-1**).

At the beginning of the NWTRC monitoring program in 2010, it quickly became apparent that from a logistics perspective (distances from land, funding, limited amount of Navy in-water training occurring, etc.) and scientific perspective (availability of previous data for comparison), not all parts of the NWTRC could be effectively and safely studied within the time frame of this program (2010-2015). Therefore, the NWTRC monitoring program focused on key Navy training areas off Washington State (**Figure 1-1**).

Initial Monitoring Proposed- Monitoring methods proposed for the NWTRC in 2010 (Department of the Navy 2010a) initially included a combination of the following research elements designed to support both Range Complex specific monitoring and to contribute information to the ICMP (Department of the Navy 2009, 2010b).

These research elements included:

- Marine Mammal Tagging (opportunistically as available)
- Passive Acoustic Monitoring (PAM) (in number of devices deployed)

Current Monitoring- The Navy has maintained the approximate same level of commitment in Compliance Monitoring technologies and resources as was originally established in 2010. Section 3 summaries these efforts. Current May 2, 2012 to May 1, 2013 efforts discussed in this report are therefore similar to previous annual reports.

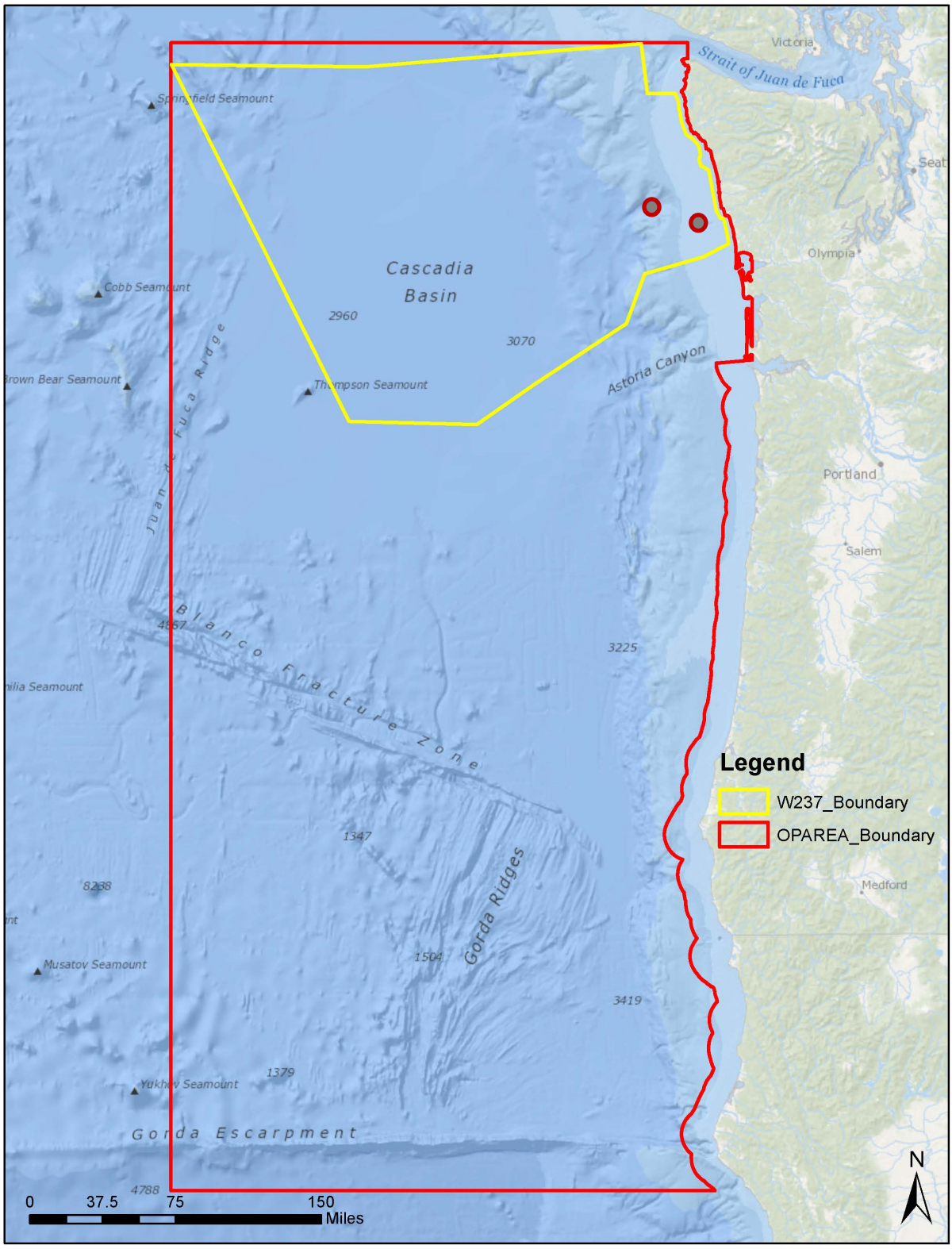


Figure 1-1. NWTRC Complex showing NWTT study area boundaries and W-237 training at-sea training area.
(Approximate location of bottom-mounted Compliance Monitoring passive acoustic devices shown in red circles; graphic courtesy A. Balla-Holden, Naval Facilities Engineering Command Northwest)

2.0 COMPLIANCE MONITORING SUMMARY

This Chapter provides a summary of Navy funded NWTRC compliance monitoring with focus on the scientific contributions and major results from each research element.

From May 2, 2012 to May 1, 2013, Navy maintained compliance and reporting with the annual metrics outlined in the NWTRC monitoring plan (Department of the Navy 2010a).

2.1 Navy Compliance Monitoring Overview

As mentioned in Chapter 1, current NWTRC compliance monitoring consists of the below research elements which has been relatively consistent over the course of the monitoring period (November 2010 to May 2013):

- Opportunistic marine mammal tagging
- Passive Acoustic Monitoring (PAM): two (2) bottom mounted devices deployed offshore of Washington State

Additionally, although not part of the NWTRC Compliance Monitoring, the Navy does summarize efforts from other Navy-funded research or Navy Regional studies within the Pacific Northwest, as information is available.

Table 2-1 highlights NWTRC Compliance Monitoring completed between November 2010 and May 2013 as compared what the Navy committed to for each year.

The following sections describe and summarize results by research element (tagging, passive acoustics).

Table 2-1. Monitoring Plan Metrics Accomplished Annually In The NWTRC 2010 Through 2013.

	Monitoring Year		
Study Type	**Nov 2010 to May 2011***	**May 2011 to May 2012**	**May 2012 to May 2013 (this reporting year)**
Opportunistic Marine Mammal Tagging	Commitment: Purchase up to ten (10) satellite tracking tags Navy funded and conducted: 10 Andrews-style LIMPET (Low Impact Minimally Percutaneous External Transmitter) tags were purchased by the Navy and supplied to the field researchers at Cascadia Research Collective for use within a collaborative study of marine mammal movement patterns within offshore waters of Washington State.	Commitment: Report on tag results Navy funded and conducted: Four (4) tags attached to three fin whales and one humpback whale and a total of approximately 43 days of animal movement obtained. Deployment of remaining tags will continue through rest of 2012 as tagging opportunities arise.	Commitment: Report on additional tag results Navy funded and conducted: Six (6) Navy-funded tags were deployed within offshore waters of Washington State. Satellite tags deployed during field efforts associated with grants research from National Oceanic and Atmospheric Administration /Alaska Regional Office and Southwest Fisheries Science Center, and collaborative project with Washington Department of Fish and Wildlife. In total, over 21 tags were attached (see Schorr et al. 2013, provided in support of this annual report)
Passive Acoustic Monitoring (PAM)	Commitment: Deploy 2 PAM devices Navy funded and conducted: Two high-frequency acoustic recording packages (HARP) from Scripps Institute of Oceanography funded by Navy for deployment at offshore Washington State locations monitored under previous Navy Research funding since 2004	Commitment: Continue 2 PAM devices Navy funded and conducted: Continued two HARPs deployed for entire reporting period. Data included for this year's analysis included 10,617 hours of recordings. Analysis confirmed detection of three baleen whale species (blue whales, fin whales, humpback whales); nine toothed whale species; and anthropogenic sounds dominated by shipping noise.	Commitment: Continue 2 PAM devices Navy funded and conducted: Continued two HARPs deployed for entire reporting period. Data included for this year's analysis included 5,802 hours of recordings. Analysis confirmed detection of four baleen whale species (blue whales, fin whales, gray whales, humpback whales); and seven toothed whale species. Ship noise was common anthropogenic sound at both sites.
Funding This Period	**$398,000**	**$228,000†**	**$210,000† plus $724,000****

Note:
* The NWTRC initial NMFS Letter of Authorization (LOA) established a May to May monitoring periodicity (National Marine Fisheries Service 2010).
† LIMPET tag work did not need Navy funding these years given field work leveraged from NMFS and Washington Department of Fish and Wildlife funded deployments.
** Funding for new U.S. Pacific Fleet Compliance Monitoring project starting in FY13 and intended to supplement NWTRC monitoring through May 2014.

2.2 Tagging

The Navy purchased 10 satellite tracking in the winter of 2010 for 2011-2012 field deployment. Tags were the Andrews-style LIMPET (Low Impact Minimally Percutaneous External Transmitter), which could be set in either the location-only Spot5 configuration or the location/dive data Mk10-A configuration (Wildlife Computers, Redmond, Washington), and programmed based on species-specific transmission schedule-based surfacing behavior and transmission data from previous deployments. The Navy purchased these satellite tracking tags as part of the NWTRC Compliance Monitoring. However, the tags were deployed opportunistically during field efforts associated with a non-Navy Federal grant from the NOAA/Alaska Regional Office for fin whale research, a collaborative project with the Washington Department of Fish and Wildlife (WDFW) addressing marine mammal distribution and habitat use off Oregon and Washington (Schorr et al. 2012 as provided for Department of the Navy 2012).

The tag track history for four tags deployed between February 2011 and September 2011 were detailed in the Navy's 2012 NWTRC annual monitoring report (Schorr et al. 2012, Department of the Navy 2012). Three fin whales and one humpback whale were tagged in 2011 for a total of 43 days.

In continued support of the NWTRC Compliance Monitoring, from 2012 through 2013 Cascadia Research Collective in partnership with the Washington Department of Fish and Game attached additional tracking tags.

For the entire period 2010 through 2013, as summarized by Schorr et al. (2013):

"*During the course of field work associated with the projects mentioned above, a total of 21 tags were deployed on four different species off the Washington coast (one tag was lost), ten of which were Navy-funded under this contract. Sixteen of these tags were location-only and five provided location/depth. Transmission durations ranging from 0–72 days, though one tag deployed in March 2013 is still transmitting (Tables 1, 2). Average species-specific tag duration was 19.2 days (range = 1.3–71.6, n = 11) for fin whales, 4.7 (range = 2.9–6.8, n = 3) for gray whales, 8.1 (range = 2.5–15.6, n = 5) for humpback whales, and 41.5 (range = 6.3–76*, n = 2 with one tag still transmitting) for killer whales.*"

A total of 348 days of tracking was reported, with one killer whale tag still transmitting as of June 2013 (Schorr et al. 2013)(**Table 2-2**).

Biological Observations (Schorr et al. (2013)-

Fin whales- Eleven fin whales were tagged with location only tags. "*Movements obtained from fin whales tagged in 2012–2013 are similar to those described in Schorr et al. 2010 and 2011, with fin whales most commonly using waters associated with the outer shelf edge (grand median distance to shore of 72 km, and 1,326-m depth). Overall, 75 percent of the fin whale locations received were within the NWTRC, with 19 percent occurring within the W-237 warning area.*"

[See **Table 2-2**, **Figure 2-1** and **2-2** or Figure 5 and 6 from Schorr et al (2013)]

Gray whale- "*Three gray whales were tagged near La Push, Washington with location-only tags on 31 May 2012. Tags transmitted for 3–7. Many gray whales preferentially feed on their right side (Woodward and Winn 2006), so all tagging was done on the left side of the dorsal ridge to reduce the risk of tag dislodgment during feeding. While follow up photographs were not obtained directly after transmissions ceased, it is likely that the foraging behavior of gray whales led the tags to be physically removed by contact with the bottom despite left-side placement*."

Humpback whales- "*Five humpback whales were tagged in 2011 and 2012. Median transmission duration was 7 days (range = 3–16). Two tags were deployed offshore of La Push, and three were deployed offshore of Westport. Movement data suggests individuals spent time both on and off the shelf edge. Grand median water depth utilized was 189 m (range = 39–1,916), and distance to shore was 46 km (range = 8–93). Individuals spent between 0 and 79 percent of their time within the Navy's W-237 warning area.*"

Killer whales- "*On 8 March 2013, in coordination with a NOAA Northwest Fisheries Science Center cruise, a group of killer whales from the Eastern North Pacific Offshore stock was encountered in Grays Harbor Canyon, Washington. Two satellite tags were deployed by Cascadia Research during this encounter, with one tag still transmitting at the time of this report.*

While in the NWTRC, tagged (killer) *whales primarily spent their time on the continental slope, or well offshore of the shelf edge. In-shore excursions were made off the central coast of Oregon, and in the west entrance to the straights of Juan de Fuca. Once north of Vancouver Island, movements were associated much more closely with the shelf and near-shore waters. Oo Tag 038 began an inshore track at the south end of Haida Gwaii (Queen Charlotte Islands), and an excursion into inland waters in southeast Alaska before returning to offshore waters. Median water depth utilized was 313 m (range = 4–3,409) and median distance to shore was 49.5 km (range = 0.6–224.8). Cumulative Horizontal displacement for Oo Tag 038 is 8,665 km as of 23 May 2013, with the tag still transmitting at the time of this report's submission*."

Table 2-2. "Deployment summary for LIMPET satellite tags off Washington 2010–2013".
(From: Table 1 from Schorr et al. 2013)

Species	Tag ID	Date Deployed	Transmission Duration (Days)	Latitude Deployed	Longitude Deployed	Tag Type	Deploy Funder
Gray Whale	Er Tag 001	5/31/2012	2.9	47.97	-124.71	L	Navy/WDFW Sec 6
Gray Whale	Er Tag 002	5/31/2012	4.4	47.98	-124.72	L	Navy/WDFW Sec 6
Gray Whale	Er Tag 003	5/31/2012	6.8	47.98	-124.72	L	Navy/WDFW Sec 6
Humpback Whale	Mn Tag 002	9/6/2011	11.4	46.91	-124.75	L	Navy/WDFW Sec 6
Humpback Whale	Mn Tag 003	5/31/2012	2.5	46.50	-124.98	L/D	Navy/WDFW Sec 6
Humpback Whale	Mn Tag 004	5/31/2012	6.8	48.13	-125.15	L/D	Navy/WDFW Sec 6
Humpback Whale	Mn Tag 005	6/15/2012	15.6	47.97	125.39	L/D	Navy/WDFW Sec 6
Humpback Whale	Mn Tag 006	7/19/2012	4.3	46.86	-124.63	L/D	Navy/WDFW Sec 6
Fin Whale	Bp Tag 017	5/6/2010	2.4	46.88	-125.09	L	NOAA
Fin Whale	Bp Tag 018	5/6/2010	71.6	46.81	-124.97	L	NOAA
Fin Whale	Bp Tag 019	5/6/2010	4.9	46.81	-124.99	L	NOAA
Fin Whale	Bp Tag 020	5/9/2010	23.7	46.41	-124.92	L	NOAA
Fin Whale	Bp Tag 023	2/10/2011	27.0	46.49	-124.90	L	NOAA
Fin Whale	Bp Tag 024	2/10/2011	4.1	46.72	-124.94	L	NOAA
Fin Whale	Bp Tag 025	2/10/2011	3.9	46.72	-124.93	L	NOAA
Fin Whale	Bp Tag 044	7/19/2012	23.5	46.95	-124.99	L	Navy/WDFW Sec 6
Fin Whale	Bp Tag 054	3/9/2013	6.7	46.54	-124.78	L	Navy/WDFW Sec 6
Fin Whale	Bp Tag 055	3/9/2013	1.3	46.49	-124.85	L	Navy/WDFW Sec 6
Fin Whale	Bp Tag 056	3/9/2013	42.3	46.50	-124.78	L	Navy/WDFW Sec 6
Killer Whale	**Oo Tag 038**[a]	3/8/2013	**76.0**[a]	46.86	-124.91	L	Navy/WDFW Sec 6
Killer Whale	Oo Tag 041	3/8/2013	6.3	46.91	-124.80	L/D	Navy/WDFW Sec 6

Notes:
[a] Tag is still transmitting. Transmission duration calculated as of 23 May 2013.
[b] Four additional tags purchased under the HDR/Navy Task Order were used in SOCAL in September 2011 for Risso's dolphins, but are not included in this report (Schorr et al. 2013).

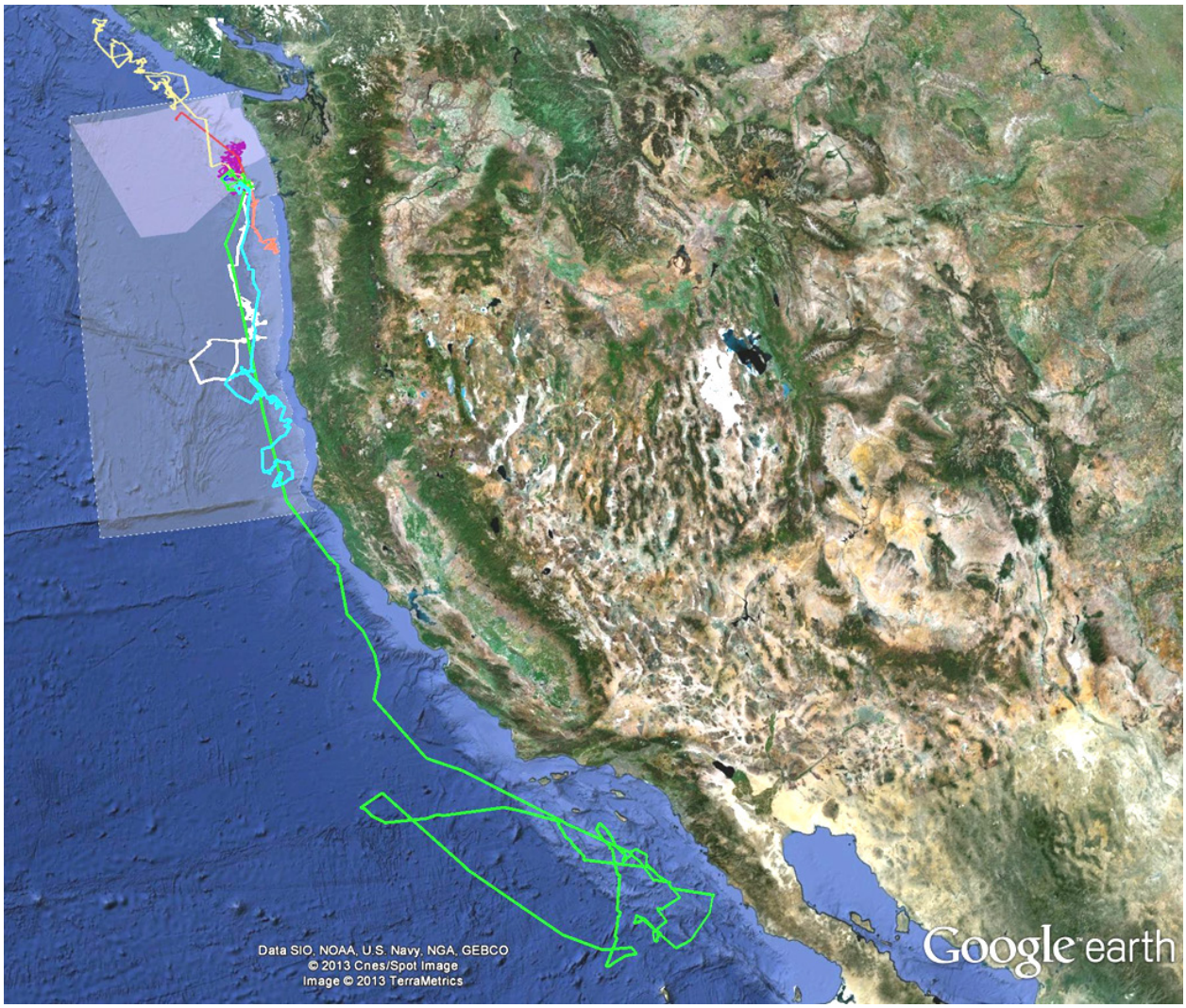


Figure 2-1. "Map showing the full extent of movements by tagged fin whales".

"Deployment locations of tags are displayed in Figure 5. Track Legend: Bp Tag 017 = Blue, Bp Tag 018 = Green, Bp Tag 020 = Light Blue, Bp Tag 023 = Tan, Bp Tag 025 = Red, Bp Tag 044 = White, Bp Tag 054 = Orange, Bp Tag 055 = Pink, Bp Tag 056 = Maroon. Note that tracks from individuals with short transmission durations (Table 1) are generally hidden behind other tracks. NWTRC is outlined in white, W-237 warning area is shaded pink."

(From: Figure 5 in Schorr et al. 2013)

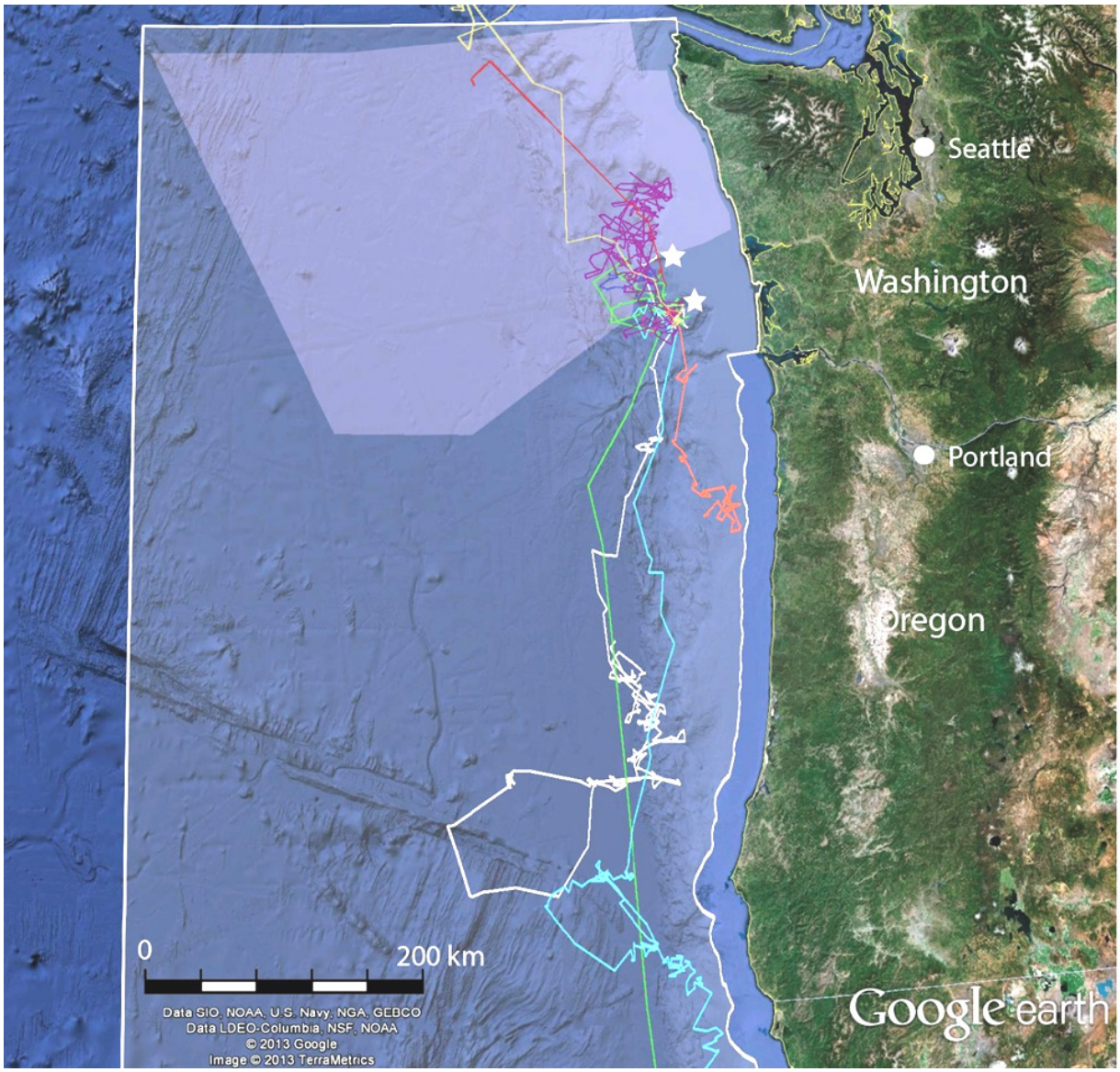


Figure 2-2. "Map showing movements by tagged fin whales from northern Washington to Southern Oregon."

"All tags were deployed in the vicinity of the two white stars. Track Legend: Bp Tag 017=Blue, Bp Tag 018=Green, Bp Tag 020=Light Blue, Bp Tag 023=Tan, Bp Tag 025=Red, Bp Tag 044 = White, Bp Tag 054 = Orange, Bp Tag 055=Pink, Bp Tag 056=Maroon. Note that tracks from individuals with short transmission durations (Table 1) are generally hidden behind other tracks. NWTRC is outlined in white, W-237 warning area is shaded pink".

(From: Figure 6 in Schorr et al. 2013)

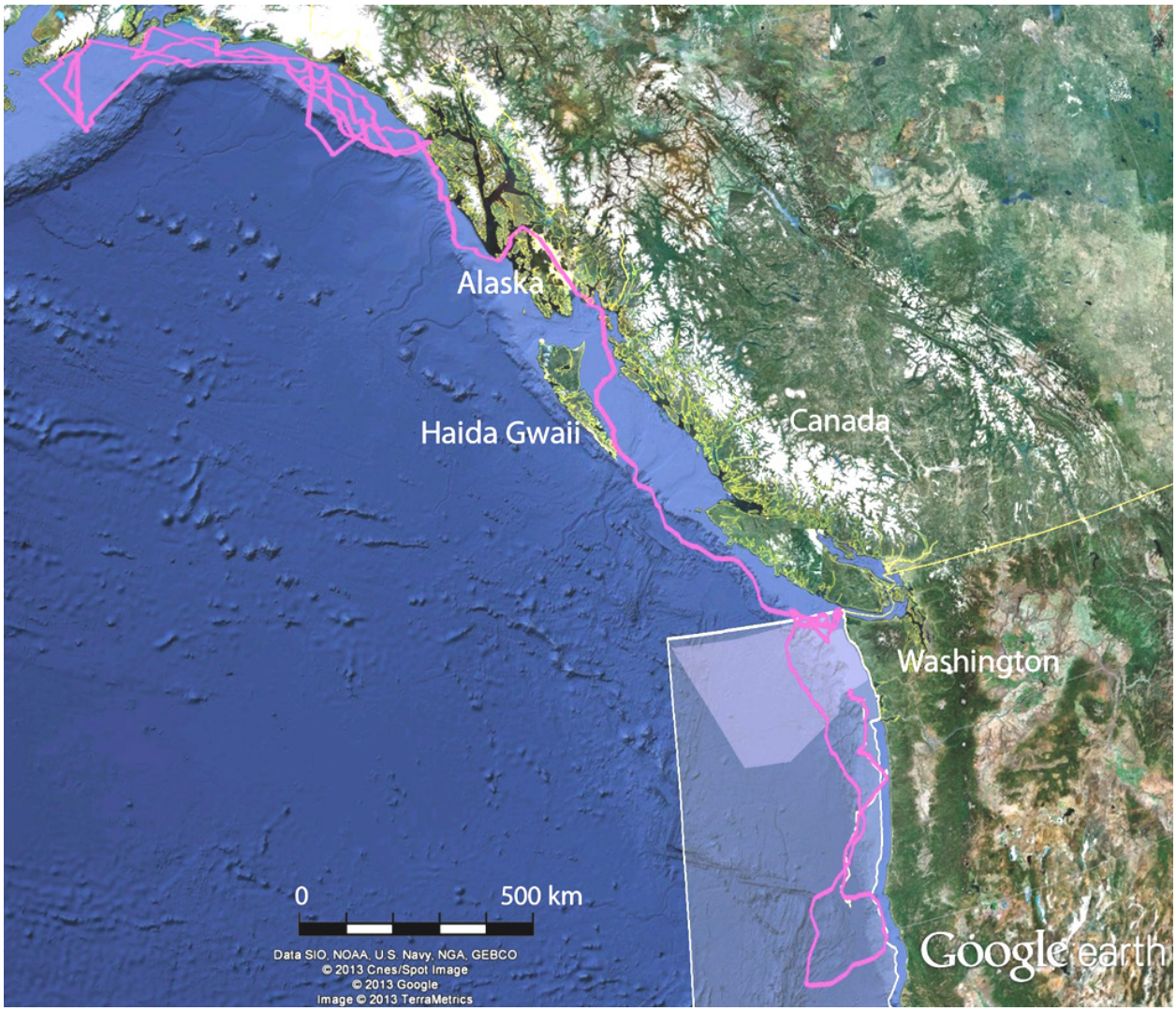


Figure 2-3. "Map showing movements of two tagged killer whales."

"Oo Tag 038 (pink) is still transmitting at the time of this report; the track represents movements through 23 May 2013. Note the 6.3 day track of Oo Tag 041 (beige) is mostly hidden behind the track of Oo Tag 038. While in the NWTRC, whales utilized the near-shore shelf waters (represented by the lighter blue bathymetry) as well as offshore waters (darker blue bathymetry). White outlined area indicates the NWTRC and the lighter pink area is the W-237 warning area."

(From: Figure 7 in Schorr et al. 2013)

2.3 Passive Acoustic Monitoring

Background- The Marine Physical Laboratory, Scripps Institution of Oceanography, University of California San Diego designs, fabricates, calibrates, deploys, and analyzes data from bottom-deployed high frequency acoustic recording packages (HARP).

In general, a HARP records marine mammal vocalizations, echolocation clicks, and anthropogenic sounds between 10 Hz-100 kHz. The length of deployment has increased over the years with improvements to battery design and storage capacity. Currently, a typical deployment can last for up to eight months on continuous duty cycle.

A more detailed discussion of HARP technical specification is available at: http://cetus.ucsd.edu/technologies_AutonomousRecorders.html

As part of Navy funded Compliance Monitoring, two HARPs were deployed starting in 2010 (**Figure 2-4**). These locations have been part of previous Navy research funded HARP deployments from July 2004 through 2009 (Oleson et al. 2009, Oleson and Hildebrand 2012)

One HARP is in deeper water on the shelf slope within Quinault Canyon (QC) at a depth of 2,132 ft (650 m) and a second on the continental shelf off Cape Elizabeth (CE) at a depth of 387 ft (118 m)(**Figure 2-4**). For the NWTRC deployments, the HARPs were located on the seafloor with their hydrophone suspended 33 ft (10 m) above the seafloor. Each HARP was calibrated in the laboratory to allow a quantitative analysis of the received sound field.

Over 5,802 hours of passive acoustic data were collected and analyzed by Scripps Institute of Oceanography for this annual monitoring report. Given the need to deploy the HARPs for periods up to 8-10 months, there is corresponding a lag in the data available for analysis for the NWTRC annual reports, and when the HARPs are next field serviced with data retrieved for future analysis.

The period covered in this report (see Kerosky et al. 2013) was December 2011 through July 2012 with 4,830 hours recorded by HARP QC and 972 hours recorded by HARP CE. Higher than anticipated underwater current velocities at HARP CE are suspected to have resulted in excessive flow noise from cable strumming. The degree of noise limited the usefulness of collected data for analysis. HARP CE therefore, only recorded usable data from December 2011 through February 2012.

HARP QC recorded usable data from December 2011 through July 2012. The HARPs were field serviced last in September 2012 with additional modifications to hopefully harden cabling from motion effects and improve instrument reliability. The next HARP field service is scheduled for July or August 2013.

Biological Observations- Kerosky et al. 2013 summarizes all the technical information for their most recent NWTRC HARP analysis described in the report. The authors' overall summary is below:

> "*Four baleen whale species were recorded: blue whales, fin whales, gray whales, and humpback whales* (see **Figures 2-5** and **2-6**). *All four species were recorded at both sites, though fin whales were more common at QC, and gray whales were more common at CE. Seasonal pattern of all three species was similar, with calls most commonly detected during the winter and early spring. Few fin whale calls were detected between May and July and blue whale calls were rarely detected between April and July. Signals from at least seven known odontocete species were recorded at these two sites. Risso's dolphin echolocation clicks occurred only at site QC primarily from May until and July, and less during January and February, but always during the night. Pacific white-sided dolphins were detected in high numbers at site CE in December and January, and only sporadically at site QC between January and July, also displaying nighttime preference. Killer whale signals were detected at both sites throughout the deployment periods, but they were much more common at site CE. Sperm whale echolocation clicks were detected consistently throughout the deployment period at the slope site QC as well as at site CE* (**Figure 2-6**). *Stejneger's beaked whales were the most consistently recorded beaked whale, with all their detections occurring only at the slope site QC between December and June. Baird's beaked whale clicks were detected at both sites, though were much more common at site QC, and most abundant in late January and June. While overall they were not detected as frequently as Stejneger's beaked whales, in the winter at CE and the summer at QC, their echolocations were more common than any other beaked whale signals recorded during this monitoring period off Washington. Cuvier's beaked whales were detected sporadically and only at the slope site QC. Narrow-bandwidth high frequency clicks from porpoises were commonly detected at the shelf site CE*."

Anthropogenic Observations- Ship noise was a common anthropogenic sound at both the nearshore CE and offshore QC. At site HARP CE, ship noise decreased slightly between late December and early January, but it was largely constant at HARP QC (Kerosky et al. 2013).

Major shipping lanes heading south from Puget Sound to the Columbia River, and to other major ports in California, and Central and South America run adjacent and near to locations where the NWTRC HARPs are deployed (**Figure 2-7**). This level of shipping traffic influences anthropogenic sound levels in the vicinity of the HARPs.

Mid-frequency active sonar (MFAS) events were rare during the deployment from December 2011 through July 2012 and were recorded for four separate events on four different days, all exclusively detected at the offshore site QC. A total of 2 hours and 19 minutes of MFAS was cumulatively detected at HARP QC which represented 56 pings, between 2-4 KHz with received levels ranging from 108 to 127 dB pp re 1 μPa (Kerosky et al 2013).

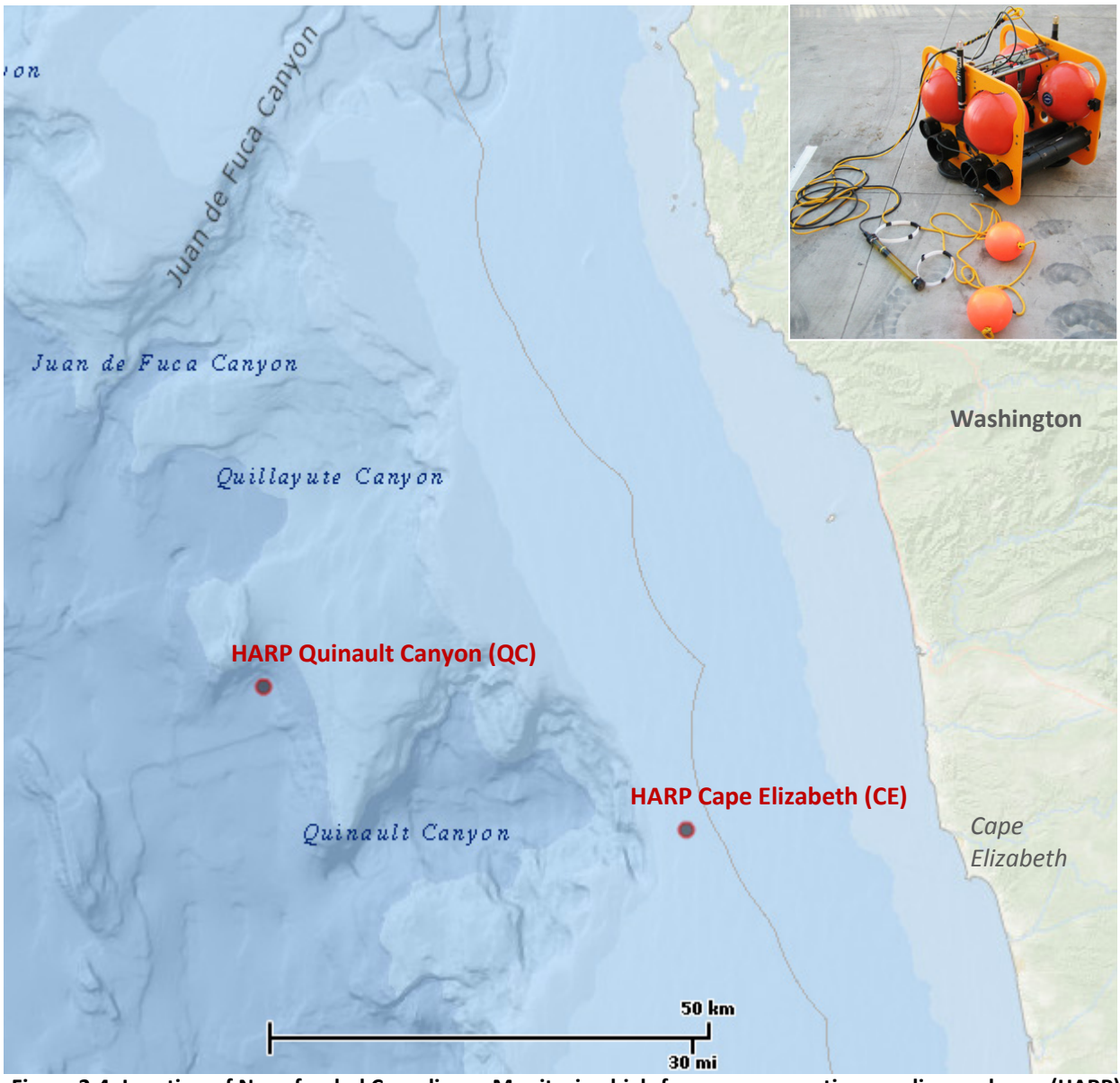


Figure 2-4. Location of Navy funded Compliance Monitoring high-frequency acoustic recording packages (HARP) off Washington State.

(Upper right picture courtesy of Scripps Institute of Oceanography)

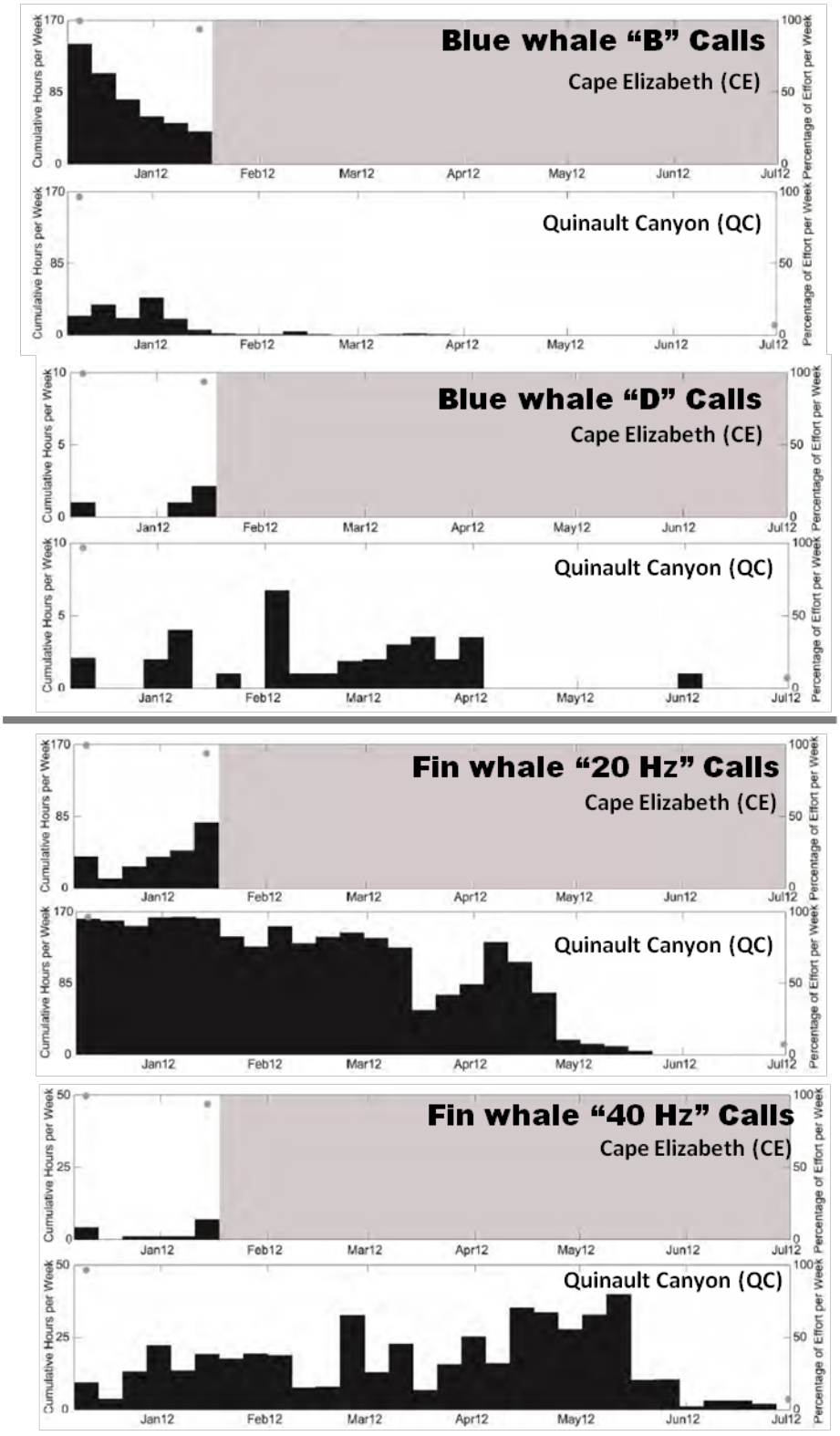


Figure 2-5. Blue whale and fin whale call detections at HARPs Cape Elizabeth (CE) and Quinault Canyon (QC) Dec 2011-Jul 2012.

(From: Kerosky et al. 2013)

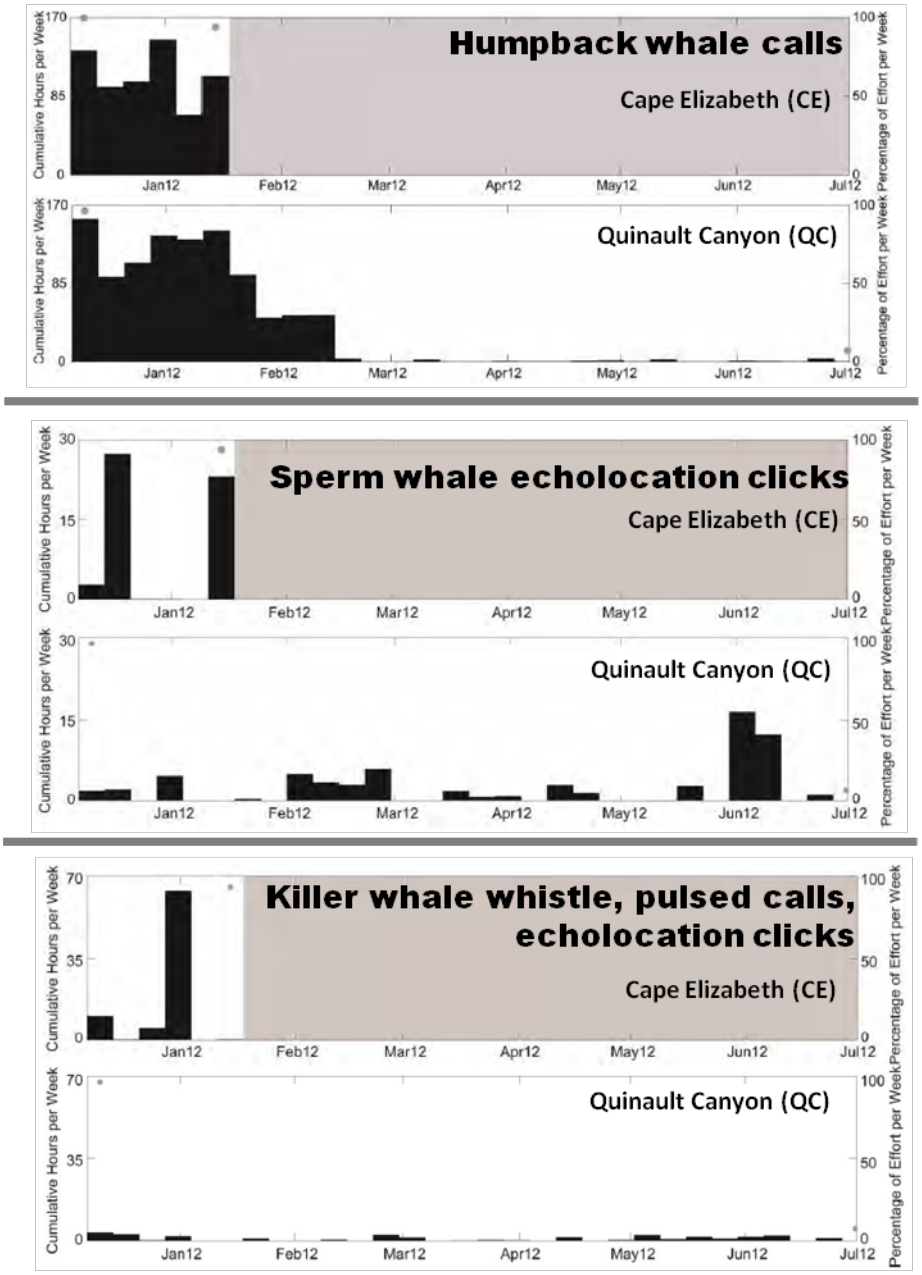


Figure 2-6. Humpback whale, sperm whale, and killer whale detections at HARPs Cape Elizabeth (CE) and Quinault Canyon (QC) Dec 2011-Jul 2012.

(From: Kerosky et al. 2013)

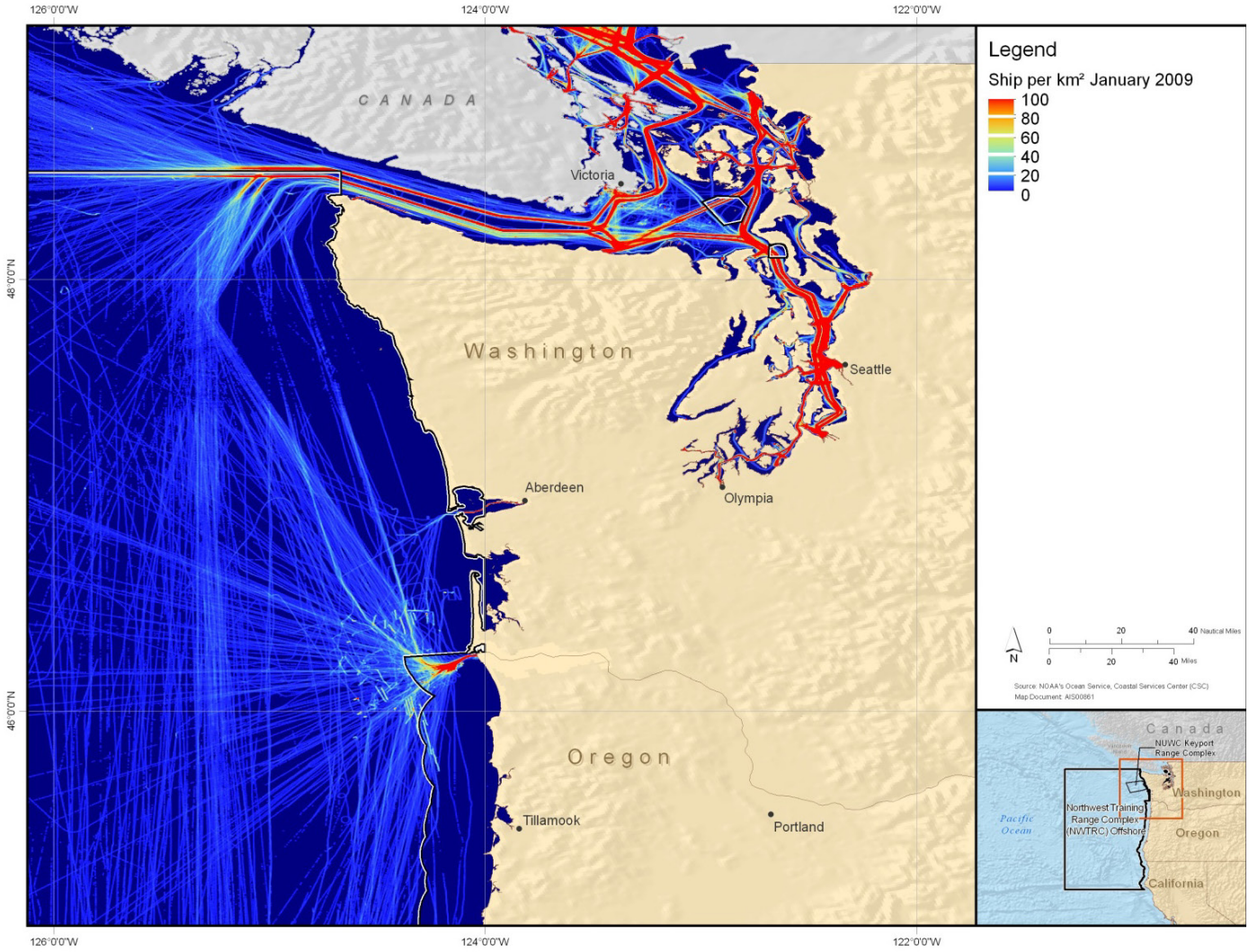


Figure 2-7. Commercial shipping density in the Pacific Northwest.

[Graphic courtesy of ManTech International Corporation and represents plot of commercial ship tracks for January 2009 derived for Automated Information System (AIS) data].

3.0 NAVY FUNDED RESEARCH AND REGIONAL SUMMARY

Marine mammal research projects at various locations around the United States are funded by the Office of Naval Research (ONR) under its Marine Mammals & Biological Oceanography Program (basic research) and the Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) under its Marine Species Research Program (applied research). From 2012-2013, the OPNAV N45 program underwent a formal revision to become the Living Marine Resources Program with administration of the program passing from OPNAV N45 to Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, CA.

There were no significant ONR or Living Marine Resources Research funded field projects within the NWTRC this reporting year. There were Navy funded marine mammal projects associated with regional Navy studies from Naval Facilities Engineering Command Northwest.

Regional Navy initiated studies over the last year include:

Offshore Large Whale Satellite Tagging in NWTRC
(B. Mate, Oregon State University)

In the fall of 2012, 11 Pacific Coast Feeding Group gray whales were tagged with satellite tracking tags to determine their overall movement patterns within the Pacific Northwest. Two types of satellite tags were used: the Telonics ST-15 ultra-high frequency location only tags described in Mate et al. (2007) and Wildlife Computer Spot-5 tags. While manufactured differently, the Spot-5 tags were functionally identical to the ST-15 tags, having the same physical configuration (size, shape, and external components) and providing the same form of data. Three ST-15 and 8 SPOT5 tags were attached to Pacific Coast Feeding Group gray whales from October to November 2012 (**Table 3-1**).

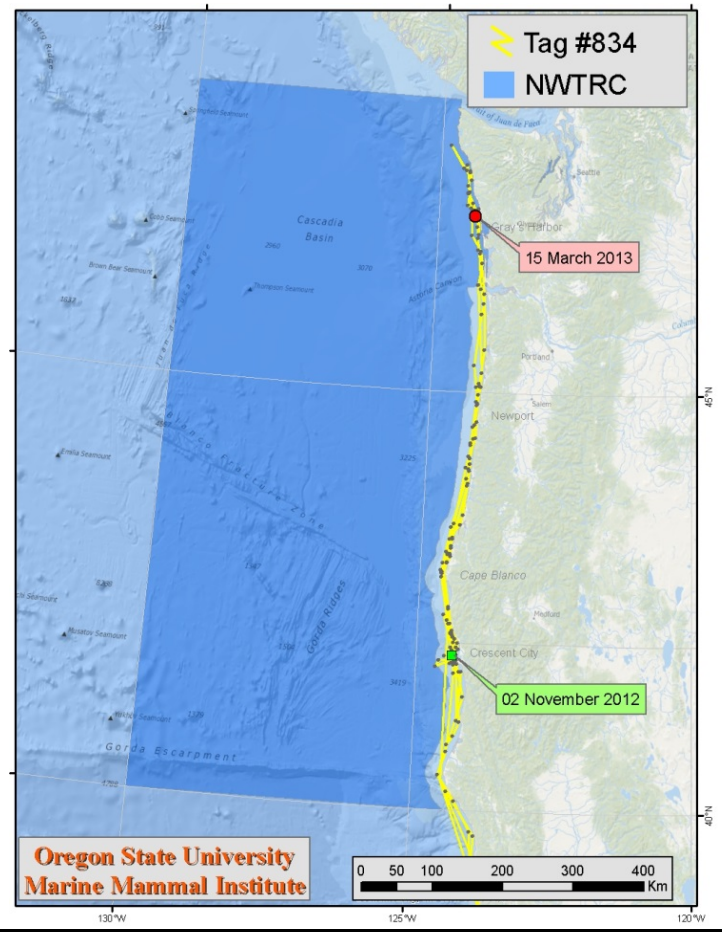
Mate's (2013) biological summary concluded:

> "*Because the tags were deployed in the fall, movements of the whales near the NWTRC were relatively limited prior to migration. Migration was recorded for seven of the tagged whales and was characterized by continuous near-shore movement southward until the whales had left the NWTRC boundary area. We received locations from six of the tags in the NWTRC the following spring. Northward migratory travel followed a similar pattern to the southerly migration with the whales remaining close to shore and moving continuously until reaching various areas off the Oregon and Washington coastline.*
>
> *Gray whales that were tagged showed very strong preference for shallow, near-shore habitat and never ventured far from shore. They did not appear to use any canyons or underwater features preferentially, and were rarely, if ever, found in the NWTRC more than 10 nm (19 km) from shore*."

Table 3-1. Satellite tag deployment dates and tracking duration as of 12 April 2013 for Pacific Coast Feeding Group gray whales tagged in the fall of 2012.

(Table 1 from Mate 2013)

PTT	Tag Type	Date Deployed	Most Recent Transmission	# Days Tracked	# Transmission Used	Dist.(km)
00832	SPOT5	14-Nov-12	*tag unresponsive*	0	*n/a*	*n/a*
00834	SPOT5	2-Nov-12	15-Mar-13	132.7	327	10,396
00841	SPOT5	3-Nov-12	20-Dec-12	46.6	150	1,497
00848	SPOT5	2-Nov-12	still transmitting as of 12 April 2013	160.1	177	5,821
05650	SPOT5	14-Nov-12	*tag unresponsive*	0	*n/a*	*n/a*
05801	SPOT5	3-Nov-12	still transmitting as of 12 April 2013	159.3	20	5,115
23033	SPOT5	3-Nov-12	17-Mar-13	133.3	90	5,609
23041	SPOT5	3-Nov-12	still transmitting as of 12 April 2013	159.2	33	4,483
		SPOT5	*Subtotal*	*791.2*	*797*	*32,922*
05726	ST-15	4-Oct-12	still transmitting as of 12 April 2013	189.4	262	6,963
05736	ST-15	15-Nov-12	23-Feb-13	99.7	102	3,158
05746	ST-15	8-Oct-12	20-Oct-12	11.5	12	87
		ST-15	*Subtotal*	*300.6*	*376*	*10,207*
			Total	**1091.8**	**1,173**	**43,129**



(left) "Movements near the NWTRC of a pacific coast feeding group (PCFG) gray whale tagged with satellite transmitter #834". (From: Figure Mate 2013).

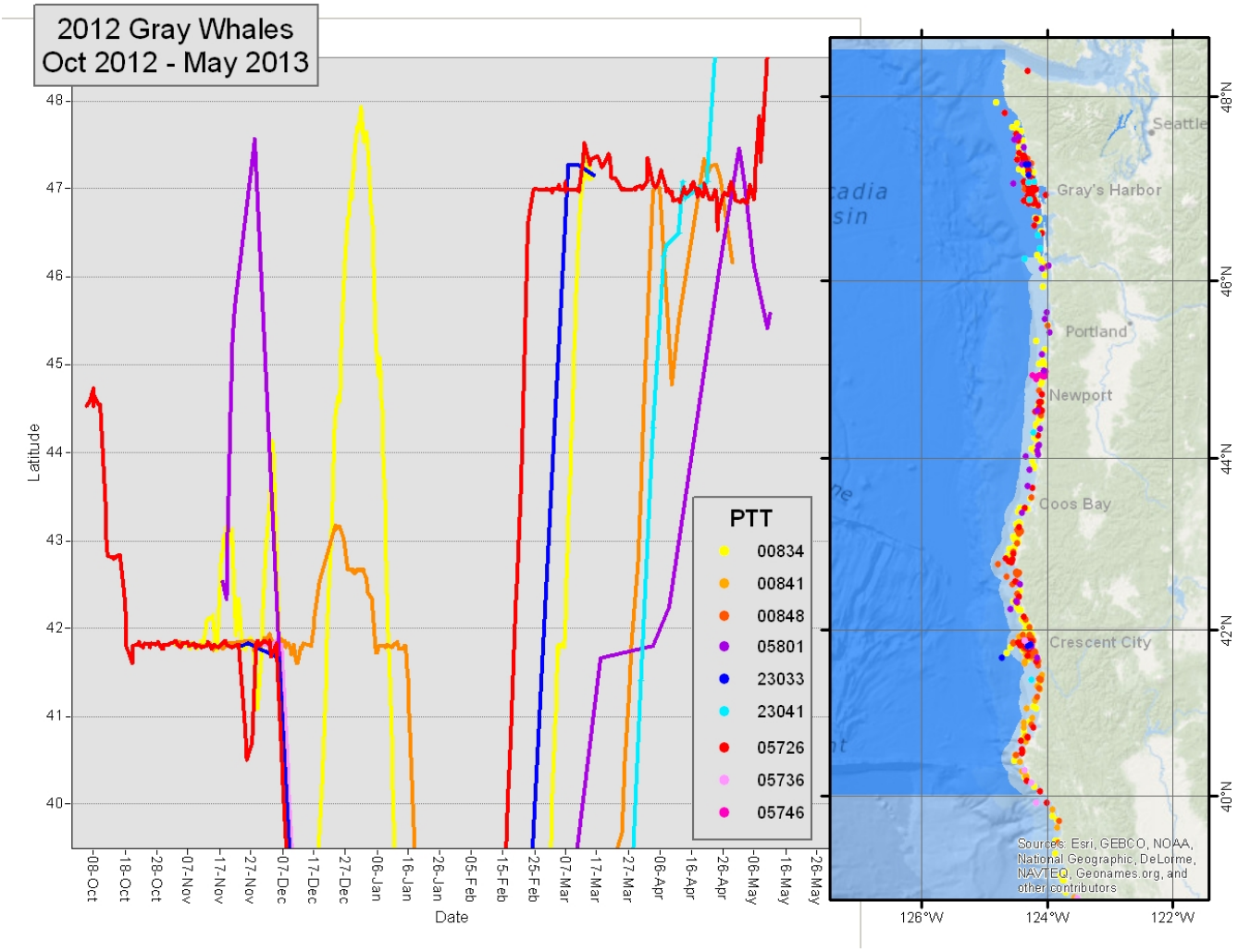


Figure 3-1. "Latitude of locations from Pacific coast feeding group (PCFG) gray whales tagged with satellite transmitters plotted vs. date (map of the locations shown on right side of figure)".
(Figure 2 from Mate 2013)

Aerial Surveys of Pinniped Haulout Sites in the Pacific Northwest Inland Waters
(S. Jeffries, Washington State Department of Fish and Wildlife)

"*The Washington Department of Fish and Wildlife (WDFW), under subcontract to HDR, Inc., conducted Navy-funded aerial surveys of pinniped haulout sites in the inland waters of Washington state. Aerial surveys being conducted represent the first pinniped assessments to be done in the region of activity over all four seasons, and will therefore provide much-needed information about seasonal variation of harbor seal, California sea lion and Steller sea lion distribution and abundance in the inland waters of Washington.*

The objectives are to conduct aerial surveys of the study area in order to: 1) provide estimates of seasonal abundance for seals and sea lions, 2) identify seasonal distribution patterns for seals and sea lions, 3) collect data to determine seal and sea lion densities, and 4) provide harbor seal abundance data needed by NMFS to prepare a Stock Assessment Report (SAR) for the Washington inland waters harbor seal stock. Additionally, the atlas showing pinniped haulouts for these waters (Jeffries et al. 2000) has not been updated in 13 years and will be revised as well.

The National Marine Fisheries Service, Northwest Region has partially funded the current effort by supporting summer-only aerial surveys in the U.S. waters of the Strait of Juan de Fuca (Cape Flattery to Port Angeles) as well as the San Juan Islands. This collaborative approach between the Navy and NMFS will allow NMFS to update the SAR for the Pacific harbor seal (Washington Inland Waters Stock).The current SAR is derived from population estimates from 1999, and abundance information from current surveys will provide NMFS with required data to revise this outdated stock assessment."

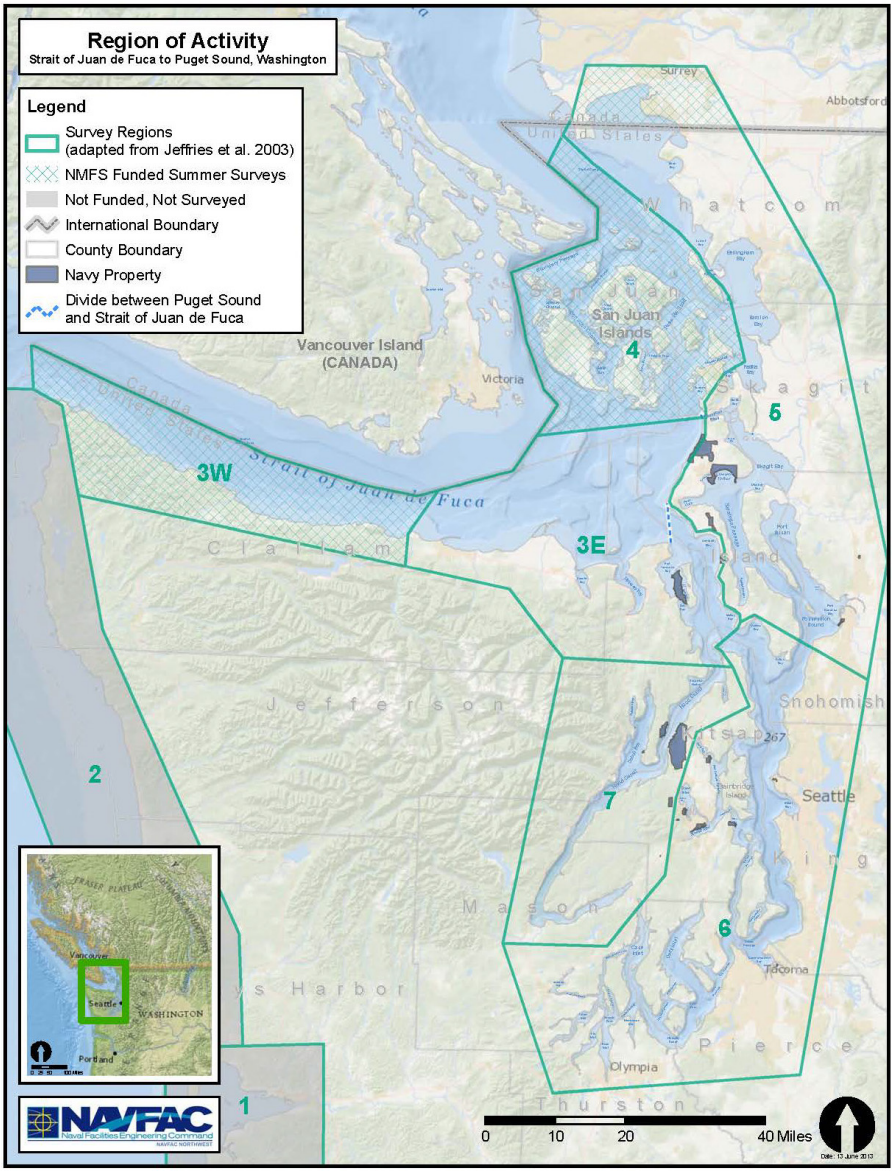


Figure 3-2. "Survey Area (adapted from Jeffries at al. 2003)."
(Figure 1 from Jeffries 2013)

4.0 FUTURE DIRECTION

4.1 Revised Monitoring Program Approach

Originally, five study questions were developed between NMFS and the Navy as guidance for developing monitoring plans, and all existing range-specific monitoring plans attempted to address each of these study questions (Department of the Navy 2009). However, the state of knowledge for the various Range Complexes is not equal, and many factors, including level of existing information, amount of training activity, accessibility, and available logistics resources all contribute to the ability to perform particular monitoring activities. In addition, the Navy monitoring program has historically been compartmentalized by Range Complex and focused on effort-based metrics (survey days, devices deployed, trackline covered, etc.).

A 2010 Navy-sponsored monitoring meeting in Arlington, Virginia initiated a process to critically evaluate the current Navy monitoring plans and begin development of revisions/updates to both existing region-specific plans and the ICMP. Discussions at that meeting, and at the Navy/NMFS annual adaptive management meeting in October 2010, established a way forward for continued refinement of the Navy's monitoring program. This process included establishing a Scientific Advisory Group (SAG) composed of leading marine mammal scientists, with the initial task of developing recommendations that would serve as the basis for a Strategic Planning Process for marine species monitoring.

In June 2011, the U.S. Navy hosted a Marine Mammal Monitoring Workshop with guidance and support from NMFS, which included scientific experts and representatives of environmental non-governmental organizations (Department of the Navy 2011). The purpose of the workshop was to present a consolidated overview of monitoring activities accomplished in 2009 and 2010 pursuant to the MMPA Final Rules currently in place, including outcomes of selected monitoring-related research and lessons learned, and to seek feedback on future directions. An outcome of this workshop was to continue consolidating monitoring efforts from individual Range Complex plans in order to improve the return on investment by focusing on specific objectives and projects which can most efficiently and effectively be addressed throughout the Navy's Range Complexes.

Scientific Advisory Group- The SAG was established in 2011 with the initial task of evaluating current naval monitoring approaches under the ICMP and existing authorizations to develop objective scientific recommendations (Science Advisory Group 2011). While recommendations were fairly broad from a geographic perspective, the SAG did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the Navy Marine Species Monitoring Program.

Notable keystone recommendations from the SAG include:

In addition to broader programmatic and conceptual recommendations, the SAG evaluated each range complex for a series of factors including level of Navy activity, diversity and density of marine mammals, need for information on basic occurrence, presence of species of concern, and ability to most effectively address questions related to exposure, response, and consequences.

Adaptive Management and Strategic Planning Process (>2013)- The objective of the Strategic Planning Process is to continue the evolution of Navy marine species monitoring towards a single integrated program, incorporating expert review and recommendations, and establishing a more transparent framework for evaluating and implementing monitoring work across the Navy range complexes and study areas.

The Strategic Planning Process is intended to be a primary component of the ICMP and provide a "vision" for Navy monitoring across geographic regions - serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address ICMP top-level goals and satisfy MMPA LOA regulatory requirements.

The Strategic Planning Process has five major implementation steps:

1. Identify overarching intermediate scientific objectives
2. Develop individual monitoring project concepts
3. Evaluate, prioritize, and select monitoring projects
4. Execute selected monitoring projects
5. Report and Evaluate progress and results

These steps serve three primary purposes: 1) facilitate the Navy in developing specific projects addressing one or more intermediate scientific objectives; 2) establish a more structured and collaborative framework for developing, evaluating, and selecting monitoring projects across all areas where the Navy conducts training and testing activities; and 3) maximize the opportunity for input and involvement across the research community, academia, and industry.

This Strategic Planning Process will serve as the single marine species monitoring requirement for all Navy testing and training activities under the future Pacific Northwest authorizations beginning in 2015. Along with the ICMP it clearly identifies the goals and objectives of the Navy monitoring program, presents the guidance and expert review that will be used to direct efforts, and defines the process for evaluating and selecting how the Navy's marine species monitoring program budget is invested.

4.2 NWTRC Lessons Learned May 2, 2010 to May 2013

Below is a broad assessment of accomplishments and applicability to addressing ICMP objectives resulting from all Navy monitoring (Compliance and Research) conducted from 2010-2013 specifically within the offshore waters of the NWTRC:

-Long-term fixed passive acoustic monitoring (i.e., HARP) is an effective way to determine seasonal species-specific occurrence of vocalizing and potentially foraging animals. It does not account for non-vocalizing animals. Passive acoustic monitoring can also be used to record natural and anthropogenic sounds leading to better assessment of ambient noise conditions. Passive acoustic monitoring via HARP has now been underway off of Washington State for close to 10 years by the summer of 2014. Future NMFS and Navy adaptive management should be conducted with an eye toward reviewing the relevance of continued data collection.

-There is insignificant Navy anthropogenic sounds, such as MFAS, indentified from NWTRC passive acoustic monitoring in order to attempt any statistically meaningful impact analysis. Passive acoustic monitoring has the potential via expanded analysis to begin addressing potential impacts of anthropogenic sources on marine mammal vocalization and echolocation, with the assumptions that changes in vocalizations and echolocation rates are indicative of behavioral changes. However, this kind of analysis is better suited for those areas where the Navy in-water training occurs more frequently such as Southern California or Hawaii vice the more limited Navy in-water training within the NWTRC.

-Satellite tracking tags can be an effective indicator of marine mammal distribution and movement patterns at short (days-weeks) and long time scales (months). Longer term tag tracks are needed in order to better determine baleen whale distributions in terms of bathymetric features, and to determine what percentage of time individuals spend within the NWTRC and outside of the NWTRC. In particular, certain Navy sub-areas such as offshore portions of W-237 (**Figure 1-1**) are much more likely to have in-water Navy training events as compared to the rest of the NWTRC. Therefore, comparisons of baleen whale residence times and area restricted searches (potential foraging metric) in sub-areas of the NWTRC can be valuable in comparing the potential for baleen whale interactions or lack of interactions with Navy training events.

4.3 2014-2015 Navy Compliance Monitoring For the NWTRC

Built into the ICMP and NMFS authorization process is an annual adaptive management component to review previous compliance monitoring results and lessons learned to see if appropriate modifications to monitoring are warranted based on results obtained.

For the fourth year of Navy Compliance Monitoring within the NWTRC (May 2, 2013 to May 1, 2014), the Navy would propose beginning restructuring of the NWTRC monitoring metrics, so that by the end of Year 4 and going into the final 5th year of monitoring (May 2, 2014 to May 1, 2015) there is an end focus on marine mammal tagging vice continued passive acoustic data collection. Table 4-1 outlines this process.

Table 4-1. Navy Proposed NWTRC Compliance Monitoring For Year 4 And Year 5.

Monitoring Technique	Implementation and Transition	
	Year 4 (May 2, 2013-May 1, 2014	Year 5 (May 2, 2014-May 1, 2015)
Marine Mammal Tagging	Focus on baleen whale tagging to prioritize on blue whales, fin whales, humpback whales, and possibly gray whales. Report results on FY13 funded study and resulting tagging through May 2014. (A variation of work described in Chapter 3 has been funded by the Navy under U.S. Pacific Fleet Compliance Monitoring with estimated start date in late summer or fall 2013)	Purchase additional tags and continue collecting tag track data on blue whales, fin whales, humpback whales, and possibly gray whales. Final summary report of all 2013 and 2014 tagging results. [estimated expenditure $300,000]
Passive Acoustic Monitoring	Present last data analysis from two Navy funded offshore passive acoustic monitoring devices. End period could be through July-August 2013 or other suitable 2013-2014 end date (but not to extend past May 2014)	No passive acoustic monitoring planned

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APPENDIX A- Integrated Comprehensive Monitoring Program

The Integrated Comprehensive Monitoring Program (ICMP) is intended for use as a planning tool to focus Navy monitoring priorities pursuant to ESA and MMPA requirements. Top priority will always be given to satisfying the mandated legal requirements across all ranges. Once legal requirements are met, any additional monitoring-related research will be planned and prioritized using guidelines outlined by the ICMP, consistent with availability of both funding and scientific resources.

As a planning tool, the ICMP is a "living document" and will be routinely updated, as needed. The initial area of focus for improving Navy marine species monitoring in 2011 and 2012 was on development of a Strategic Plan to be incorporated as a major component of the ICMP to guide investments and help refine specific monitoring actions to more effectively and efficiently address ICMP goals and objectives. This strategic plan is scheduled for inclusion in the 2013 update to the ICMP.

The ICMP is evaluated through the Adaptive Management Review process to: (1) assess progress, (2) provide a matrix of goals and objectives for the following year, and (3) make recommendations for refinement and analysis of the monitoring and mitigation techniques. This process includes conducting an annual adaptive management meeting at which the Navy and NMFS jointly consider the prior-year goals, monitoring results, and related scientific advances to determine if modifications to monitoring plans are warranted to more effectively address program goals.

Modifications to the ICMP that result from adaptive management review discussions are incorporated into a revision to the ICMP and submitted to NMFS.

The Navy's Energy and Environmental Readiness Division (OPNAV N45) in Washington D.C. is responsible for maintaining and updating the ICMP, as necessary, reflecting the results of regulatory agency rulemaking, Adaptive Management Reviews, best available science, improved assessment methodologies, and more effective protective measures. This is done as part of the Adaptive Management process, in consultation with Navy technical experts, Fleet program managers, and other Navy commands as appropriate. The ICMP is authored by OPNAV N45 with inputs from the Fleets and Naval Facilities Engineering Commands. OPNAV N45 is tasked with coordinating integration of the ICMP with ongoing Navy funded monitoring programs.

ICMP Goals- Under the ICMP, monitoring measures prescribed in range-specific monitoring plans and Navy-funded research relating to the effects of Navy activities on protected marine species should be designed to accomplish one or more of the following top-level goals as prescribed in the current revision of the ICMP (Department of the Navy 2010b):

(a) An increase in our understanding of the likely occurrence of marine mammals and/or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and/or density of species).

(b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammals and/or ESA-listed species to any of the potential stressors associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: (1) the nature of the action and its surrounding environment (e.g., sound-source characterization, propagation, and ambient noise levels); (2) the affected species (e.g., life history or dive patterns); (3) the likely co-occurrence of marine mammals and/or ESA-listed marine species with the action (in whole or part); and/or (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and/or ESA listed marine species (e.g., age class of exposed animals or known pupping, calving, or feeding areas).

(c) An increase in our understanding of how individual marine mammals or ESA-listed marine animals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

(d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

(e) An increase in our understanding of the effectiveness of mitigation and monitoring measures, including increasing the probability of detecting marine mammals to better achieve the above goals (through improved technology or methodology), both generally and more specifically within the mitigation zone (thus allowing for more effective implementation of the mitigation). Improved detection technology will be rigorously and scientifically validated prior to being proposed for mitigation, and should meet practicality considerations (engineering, logistic, and fiscal).

(f) A better understanding and record of the manner in which the authorized entity complies with the MMPA incidental take authorization and ESA incidental take statement.