

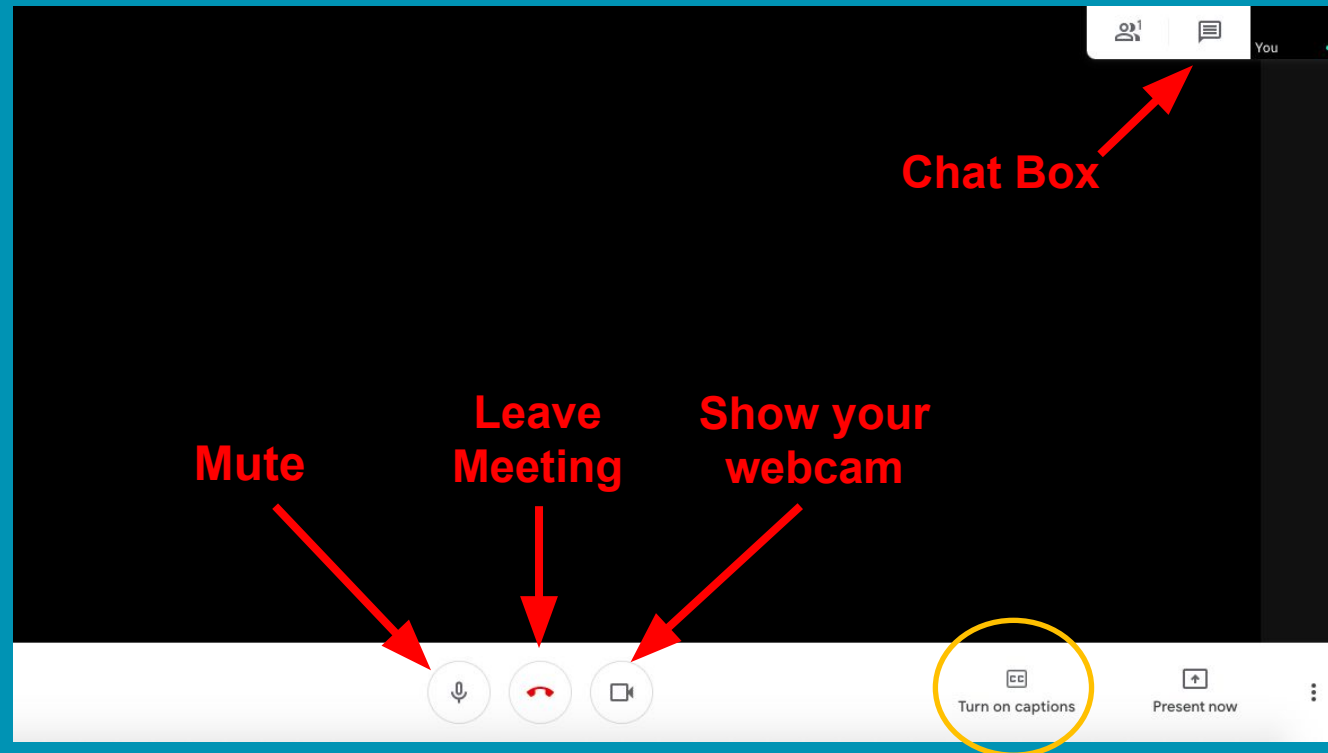
Welcome to the GFNMS Virtual SAC Meeting



**PLEASE MUTE
yourself to reduce
background noise.**

If you are using a
phone for audio:
Use *6 to mute and
unmute.

+1 314-649-9371
PIN: 942 884 181#



Note the option to turn on captions

Roll Call



1. Dominique Richard (Chair), CAL Marin Primary
2. Abby Mohan (Vice Chair), Recreational Activities Primary
3. Barbara Emley (Secretary), Commercial Fishing Primary
4. Sarah Bates, Commercial Fishing Alternate
5. Joe Fitting, CAL SF/SM Primary
6. Kris Lannin Liang, CAL SF/SM Alternate
7. George Clyde, CAL Marin Alternate
8. Cea Higgins, CAL Sonoma/Mendo Primary
9. Nancy Trissel, CAL Sonoma/Mendo Alternate
10. Richard Charter, Conservation Primary
11. Bruce Bowser, Conservation Primary
12. Francesca Koe, Conservation Alternate
13. Kathi George, Conservation Alternate
14. Bibit Traut, Education Alternate
15. John Berge, Maritime Activities Primary
16. Julian Rose, Maritime Activities Alternate
17. Joshua Russo, Recreational Activities Alternate
18. John Largier, Research Primary
19. Jaime Jahncke, Research Alternate
20. Ezra Bergson-Michelson, Youth Primary
21. Owen Youngquist, Youth Alternate

Government Members

23. Mark Gold, CA Natural Resources Primary
24. Michael Esgro, CA Natural Res. Alternate
25. Cicely Muldoon, NPS Primary
26. Ben Becker, NPS Alternate
27. LT Jacob Joseph, USCG Primary
28. LTJG Chris Bell, USCG Alternate
29. Chris Barr, USFWS Primary
30. Gerry McChesney, USFWS Alternate
31. Jennifer Boyce, NFMS Primary
31. Kevin Grant, MBNMS Primary
32. Dawn Hayes, MBNMS Alternate
33. Dan Howard, CBNMS Primary
34. Michael Carver, CBNMS Alternate
35. Chris Mobley, CINMS Primary
36. Michael Murray, CINMS Alternate



Time	Topic	Lead
9:00-9:10	Welcome, Roll Call, Review Agenda	Alayne Chappell, SAC Coordinator
9:10-9:20	SAC Business <ul style="list-style-type: none"> - Approve August meeting highlights (Action Item) - Recruitment update - SAC Workplan, retreat comments incorporated - Subcommittee timeline updates 	Alayne Chappell, SAC Coordinator
9:20-9:40	Greater Farallones National Marine Sanctuary Superintendent's Report <ul style="list-style-type: none"> - Permits - Covid-19 re-entry plans and field operations - Updates on sanctuary program activities 	Maria Brown, GFNMS Superintendent
9:40-9:50	Sanctuary Enforcement Update	Rad Dew, NOAA OLE Jacob Joseph, USCG
9:50-10:20	New Sanctuary Permit Dashboard Demo and Discussion	Max Delaney, GFNMS Sage Tezak, GFNMS Affiliate
10:20-10:30	Monterey Bay National Marine Sanctuary Superintendent's Report	Kevin Grant, MBNMS Acting Superintendent
10:30-10:40	Cordell Bank National Marine Sanctuary Superintendent's Report	Dan Howard, CBNMS Superintendent
10:40-10:55	PUBLIC COMMENT	
10:55-11:05	BREAK	
11:05-12:05	San Francisco-Pacifica Exclusion Zone Subcommittee Recommendations (Action Item) <ul style="list-style-type: none"> - Presentation and SAC Discussion 	Dominique Richard, SAC Chair
12:05-12:20	BREAK	
12:20-12:50	SAC Charter Renewal (Action Item)	Alayne Chappell, SAC Coordinator
12:50-1:30	Acoustic Monitoring in the Sanctuaries: NOAA Ocean Noise Reference Station Results	Samara Haver, Oregon State University
1:30	ADJOURN	

SAC Business



Approve August Meeting Highlights (Action Item)

- Any edits? Please indicate in the Chat Box
- Virtual vote by roll call



SAC Business



- 1. Recruitment update**
- 2. Updated SAC workplan distributed**
- 3. Subcommittee timeline updates**



GFNMS Superintendent's Report

Maria Brown



Operations

- Maximum telework until further notice
- The facilities and Visitor Center remain closed to the public
- Moved to Phase 1 of re-entry



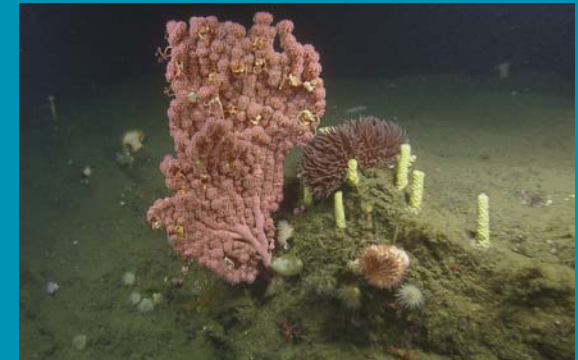
GFNMS Superintendent's Report

Maria Brown



Conservation Science

- GFNMS staff participated in the Oct. *Nautilus* cruise remotely
- 98% of Beach Watch surveys active
- LiMPETS Program Coordinator
Rosemary Romero named the Western Society of Naturalist's Naturalist of the Year!



GFNMS Superintendent's Report

Maria Brown



Online Education

- Fall Online School Programming Full
- Virtual Sharktoberfest (3,000 participants)
- Virtual Humpback Whale Soirée (600 participants)



GFNMS Superintendent's Report

Maria Brown



Ecosystem Protection

- The Seabird Protection Network held another successful virtual event for 400 participants
- Seadrift Lagoon 5,389 green crabs removed
- Kelp UAV surveys completed (34 of 39 sites identified in plan)



Permit Type	Organization	Project	Effect. Date
Research	Stanford University and Oregon State University	Ecology and Population Dynamics of Sharks in the Northeastern Pacific (At multiple sites within MBNMS and GFNMS)	Sept. 2, 2020 to Nov. 30, 2022
Research	Nature Conservancy and Greater Farallones Association	Unmanned Aerial System surveys of bull kelp canopy along Sonoma and Mendocino county coastline (At nine sites within GFNMS NOAA Regulation Overflight Zones 1 and 2 along the Sonoma Coast)	Sept. 9, 2020 to Nov. 1, 2022
Research	Blue Ocean Gear LLC	Developing and Testing of a Smart Crustacean Trap (At various sites within MBNMS and GFNMS)	Sept. 15, 2020 to Nov. 30, 2021
Research	UC Santa Cruz	The Changing Distribution, Ecology, and Population Dynamics of White Sharks in the Northeastern Pacific (At various sites within GNMS and MBNMS)	Sept. 25, 2020 to Sept. 30, 2024
Education	Ocean Safaris LLC	Educational tours to the Gulf of the Farallones and Año Nuevo Island to view White Sharks and filming of White Sharks for documentation ID purposes, educational and commercial usage (Within GFNMS at SEFI and within MBNMS at Ano Nuevo Island)	Sept. 17, 2020 to December. 15, 2025
Letter of Authorization (LOA) under Super's Permit	Jan Roletto (GFNMS) and Chad King (MBNMS) and Nicole Raineault (OET)	West Coast National Marine Sanctuaries Mapping (At various sites within GNMS and MBNMS)	Sept. 30, 2020 to Oct. 31, 2020



Recent Enforcement Activity

1) Capsized Sailing Vessel in Bodega Bay

Date of Incident: 9/20/2020

Status: No further action from GFNMS; Referred case to OLE

2) Panga Grounded at Pescadero State Beach

Date of incident: 11/14/2020

Status: USCG and CA State Parks cleaned up the beach and Homeland Security CBP seized the vessel

USCG D11 Brief to the Sanctuary Superintendent

Greater Farallones National Marine Sanctuary SAC Meeting 19NOV20



Surface Patrol highlights (25AUG-15NOV):

- ~585 WPB LMR patrol hours
- USCGC SOCKEYE issued violation to Rec Salmon Vessel for unauthorized gear – Bolinas Bay
- USCGC SOCKEYE issued violation and seized undersized salmon – Bodega Head



Aviation Patrol highlights (25AUG-15NOV):

- 22 C-27 Flights (Approx. 144 patrol hours).
- 5 Rotary Flights supporting RAMP data collection

Permit Dashboard Demo
Sage Tazek, GFNMS Affiliate
Max Delany, GFNMS

Choose Your Adventure

Status

All Active Expired

Permit Type

- All
- Authorization
- Education
- Letter of Authorization under Superintendent's Permit
- Management
- Research
- Research/Education
- Salvage/Recovery Operations

Applicant Affiliation

All

GFNMS Permit Dashboard

November 19, 2020
Sanctuary Advisory Council

Permit ID: GFNMS-2019-011
Research,
Aerial Surveys for Seabirds and
Waterfowl

Permit ID: GFNMS-2019-011
Research,
Aerial Surveys for Seabirds and
Waterfowl

Permit ID: MULTI-2019-019-A1
Research/Education,
Changing Distribution, Ecology,
and Population Dynamics of
White Sharks in the Northeastern
Pacific

Permit ID: MULTI-2019-019-A1
Research/Education,
Changing Distribution, Ecology,
and Population Dynamics of
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Research/Education,
Changing Distribution, Ecology,
and Population Dynamics of
White Sharks in the Northeastern
Pacific

Permit ID: MULTI-2019-020
Research/Education,
Mooring Installation and
Maintenance for the Long-term
Monitoring Project: Ecology and
Population Dynamics of White
Sharks in the Northeastern Pacific

Permit ID: MULTI-2019-020
Research/Education,
Mooring Installation and
Maintenance for the Long-term
Monitoring Project: Ecology and
Population Dynamics of White
Sharks in the Northeastern Pacific

This dashboard is a resource for staff and Sanctuary Advisory Council members to better understand permits being issued within Greater Farallones National Marine Sanctuary, and the Northern Management Area of Monterey Bay National Marine Sanctuary.

Permits are issued based on seven permit categories*:

Authorization: The notification and review of applications for other Federal, State, or local leases, permits, licenses, approvals, or other authorizations to conduct prohibited activities pursuant to 15 CFR § 922.49.

Research: A type of "general permit" that may be issued for any prohibited activity that is being conducted to further research or monitoring related to Sanctuary resources and qualities.

Education: A type of "general permit" that may be issued for any activity that is being conducted to further the

Permit Application

QUICK STATS ON GFNMS PERMITS

Current Permit Status, 2014-2019

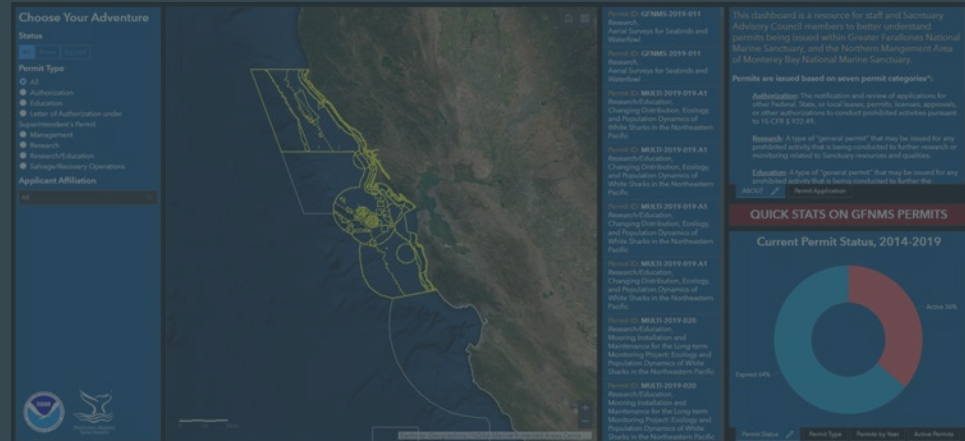


Permit Status Permit Type Permits by Year Active Permits



Permit Dashboard

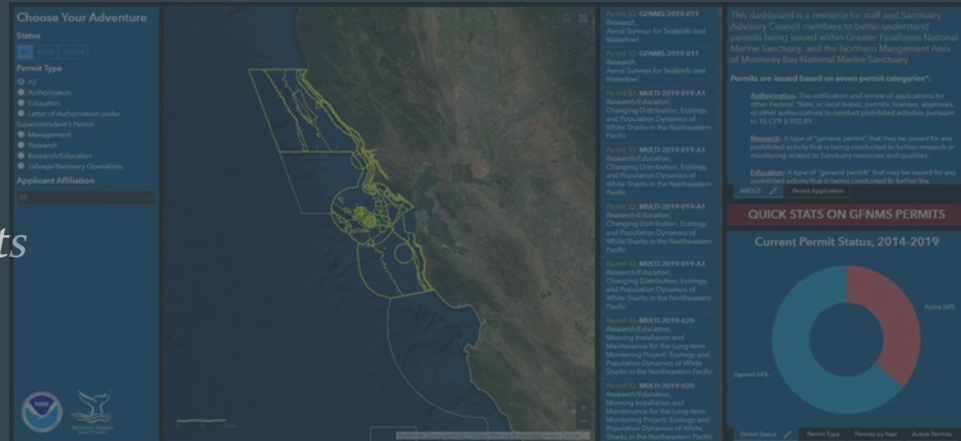
- Permit dashboard & project parameters
- Demonstration
- Product discussion



Permit Dashboard

- A tool used to visualize locations of permitted actions issued within Greater Farallones National Marine Sanctuary, and the Northern Portion of Monterey Bay National Marine Sanctuary
- A tool used to measure number and type of permits issued per quarter/annually
- An assessment tool to evaluate how many and what type of permits have been issued for a specific area

This is a qualitative tool and does not quantitatively measure cumulative impacts



Project Parameters

- Target audience: SAC members & GFNMS staff
- Updated quarterly, just prior to Sanctuary Advisory Council meetings
- Initial build includes permits between 2014-2019
- Permit denials, withdrawals and permit applications under review are not included in the dashboard
- Mapped areas are based on permitted locations - not reported activities
- MULTI permits included in the dashboard show permitted activities **only in** GFNMS and the Northern Portion of MBNMS
- Amendments are included
- Approximate permitted shipwreck explorations are included in the dashboard



MBNMS Report

Kevin Grant, Acting Superintendent



GFNMS Advisory Council meeting November 17, 2020

Report by: Kevin Grant, Acting MBNMS Superintendent



MBNMS Report

Kevin Grant, Acting Superintendent



Education

- MBNMS Staff hosted live distance learning programs featuring the 2020 *Nautilus Expedition* with 387 students participating
- Kick off of virtual distance learning programs. Five programs have been developed:
 - Protect your Watershed
 - Plankton Exploration
 - Dive into Kelp Forests
 - Deep Sea Discovery
 - Sounds in the Sanctuary



Photo: The Distance Learning Setup at the Sanctuary Exploration Center, Chelsea Prindle

MBNMS Report

Kevin Grant, Acting Superintendent



Research

- Staff completes deep-sea research expedition in MBNMS with E/V *Nautilus*
 - Data gathered to characterize and identify sensitive seafloor areas of Pioneer Canyon off the San Mateo coast
 - Observed thousands of octopus brooding eggs near Davidson Seamount
 - Whale fall discovered in 2019 revisited



MBNMS Report

Kevin Grant, Acting Superintendent



Resource Protection

- Open Farm Tour virtual presentation on plastic in agriculture.
- Team OCEAN hits the water with new COVID precautions
- Whale Entanglement Risk Assessment & Mitigation Program (RAMP) begins for upcoming crab fishing season



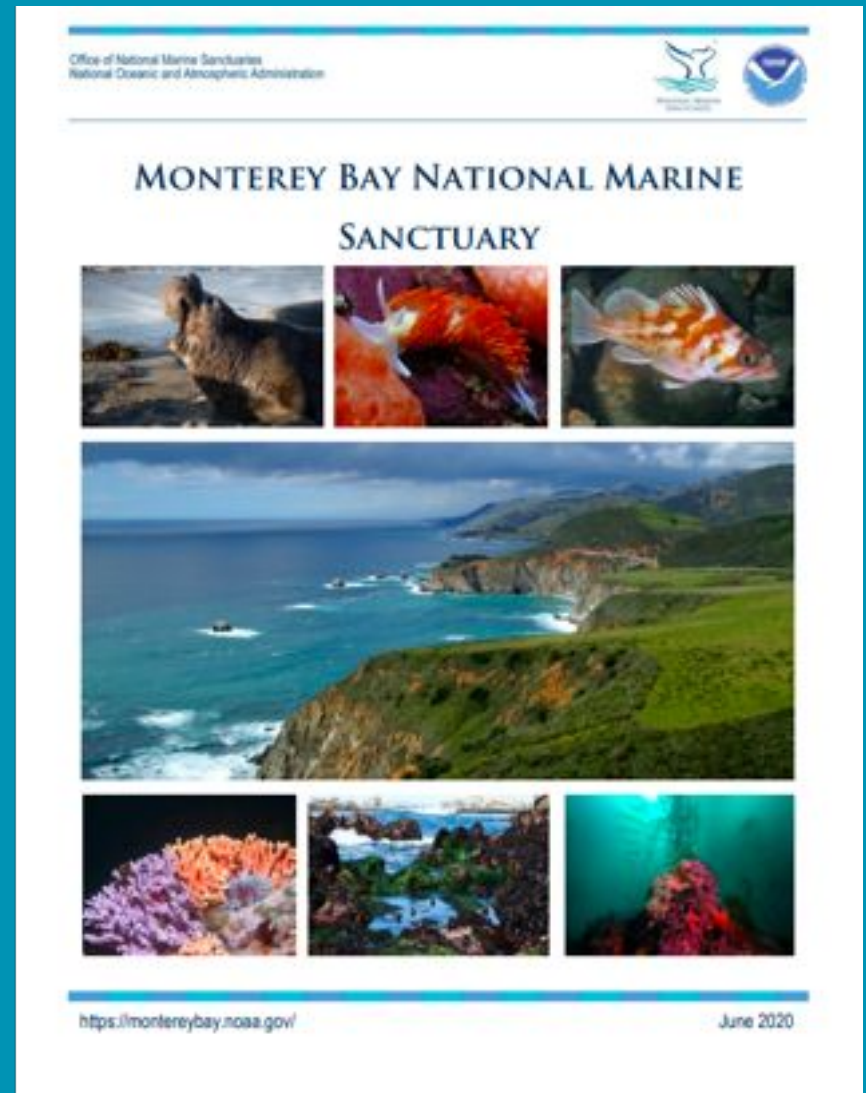
MBNMS Report

Kevin Grant, Acting Superintendent



Operations and Administration

- MPR Process Continues:
 - Formulating response to Comments document
 - Conducting agency consultations
 - Making edits to the draft management plan, DEA and proposed rule



CBNMS Superintendent's Report

Dan Howard

PUBLIC COMMENT 10:40-10:55am

Please unmute yourself when called on to provide your verbal comment.

If you are having trouble unmuting, please let us know in the Chat Box or text 415-531-3266

We are also accepting written comments until 1:30pm today. Email your comment to alayne.chappell@noaa.gov

10-min BREAK



Bob Wilson, GFA

LOCAL SANCTUARIES

	Denomination	Expansion	Acreage (Sqmi)
GFNMS	1981	2015	3,295
CBNMS	1989	2015	1,286
MBNMS	1992	2008	6,094



San Francisco Pacifica Exclusion Area (SFPEA)



Ship Traffic



Dredging



Storm Water Discharges

2013



BREN SCHOOL OF
ENVIRONMENTAL SCIENCE & MANAGEMENT
UNIVERSITY OF CALIFORNIA SANTA BARBARA

Dredging:

Placement of dredged material occurs in other sanctuaries and the material dredged from the Main Shipping Channel (MSC) is considered “free” of toxins.

Water treatment Run off

The annual number of times that water quality standards were exceeded has declined since the creation of the Exclusion Area in 1992.

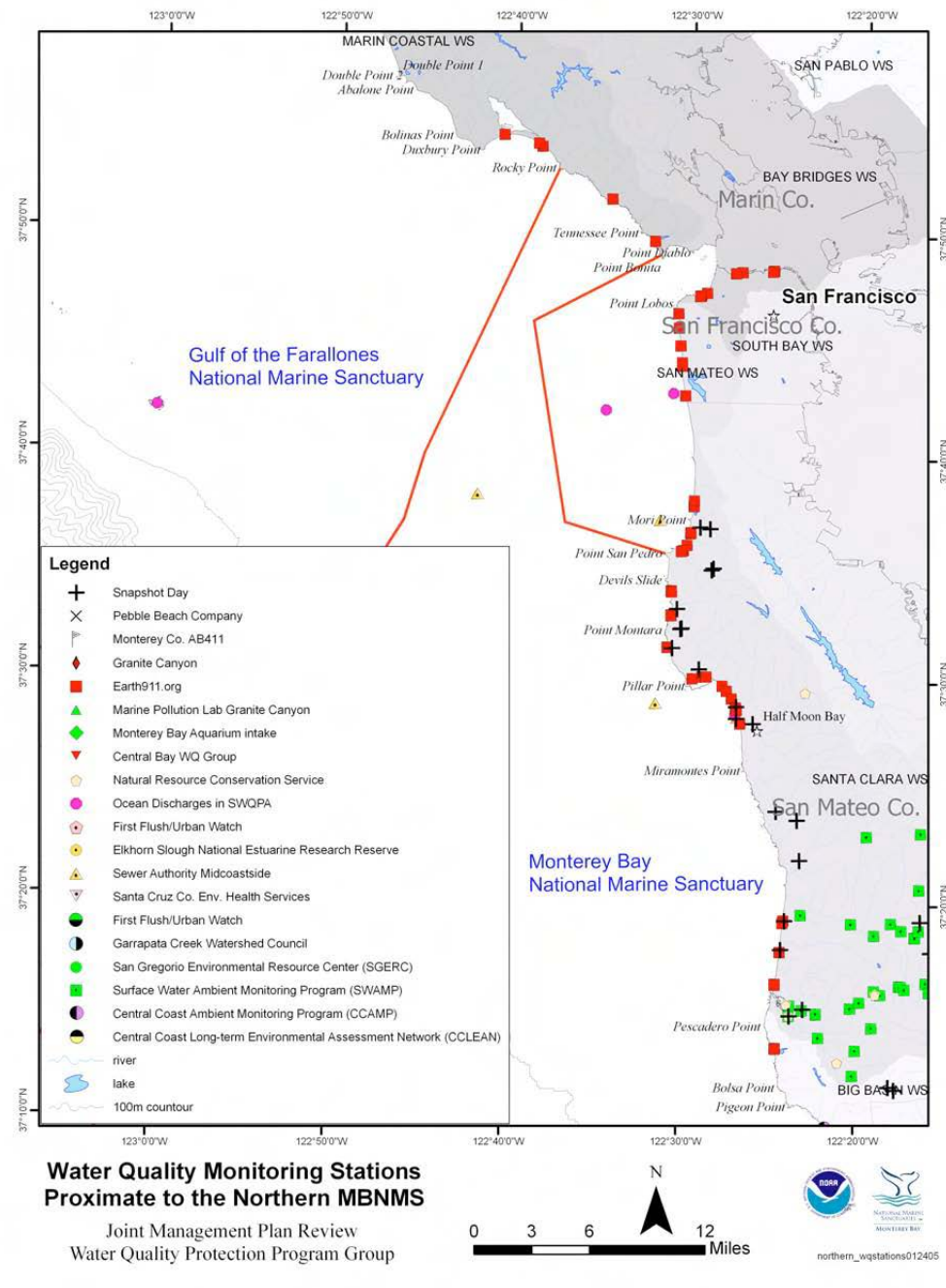
In addition, the installation of new infrastructure in the years following MBNMS designation has significantly decreased the number of CSD (Combined Sewer Discharge) events.

Ship traffic

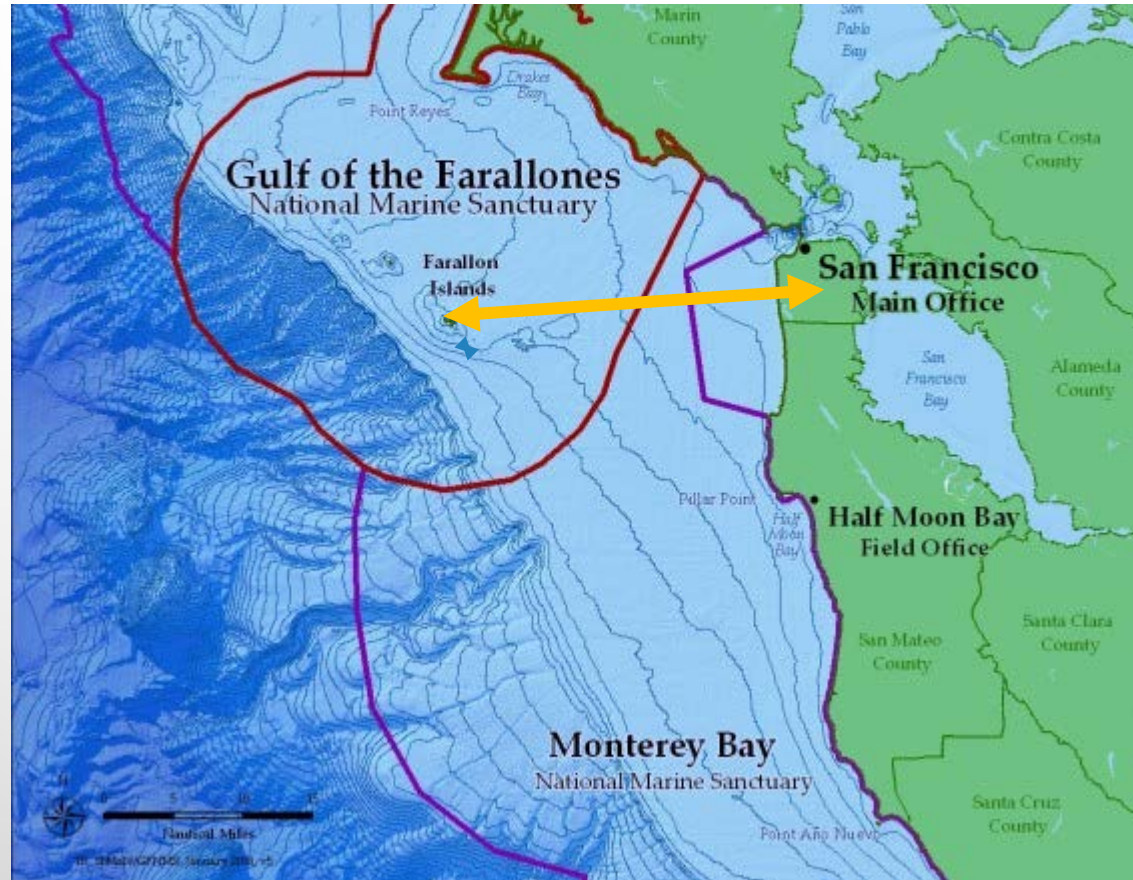
Vessel traffic entering and exiting the San Francisco Bay along the MSC does not pose a barrier to the proposed sanctuary expansion. The level of vessel traffic in the Exclusion Area is comparable to the level of traffic in existing other National Marine Sanctuaries, including Stellwagen Bank, Channel Islands, and Monterey Bay.

Note: vessel traffic has been further improved with the new Traffic Separation Scheme (TSS) and voluntary speed reduction program

Northern Management Area (NMA) Under GFNMS supervision



Degree Zero: Administrative Reality



Hydrologic argument:

The plume from San Francisco Bay flows north toward the Point Reyes Peninsula

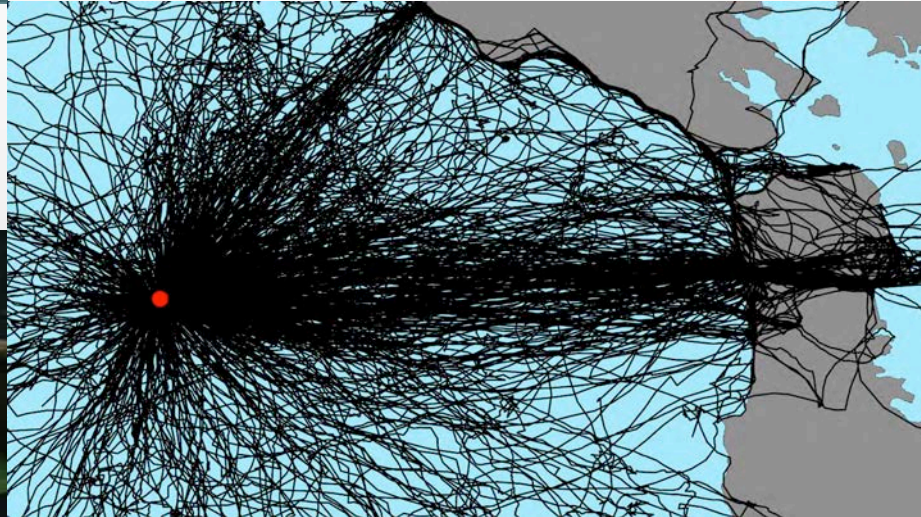


The zone of impact of the San Francisco Bay outflow
John Largier (2016)



BMW Oracle catamaran debris
The Coastodian (2012)

Ecological Argument: Wildlife transits between the Farallones Island and the bay



Cultural argument: Muwekma Ohlone band relation to the Islands

The Muwekma Ohlone tribes view the Shellmounds located in Berkeley as a portal for the dead. Starting at “the midpoint of the Eagle’s tail” the soul of the deceased travel west in a straight sightline that runs from the middle of the Eagle’s body, through its beak and to the Farallones... their “Heaven”



**Location Argument:
GFNMS Headquarter & visitor center,
located near the San Francisco scenic drive,
faces the waters of SFPEA**



Tourism Outreach Argument:

30 million visitors annually!

AMBASSADORS

SF Zoo & Garden

California Academy of Science

Marin Mammal Center

Bonitas Point lighthouse

Golden Gate Raptor Observatory

Golden Gate Welcome center

Crissy field & GFNMS visitor center

Lands End Trail

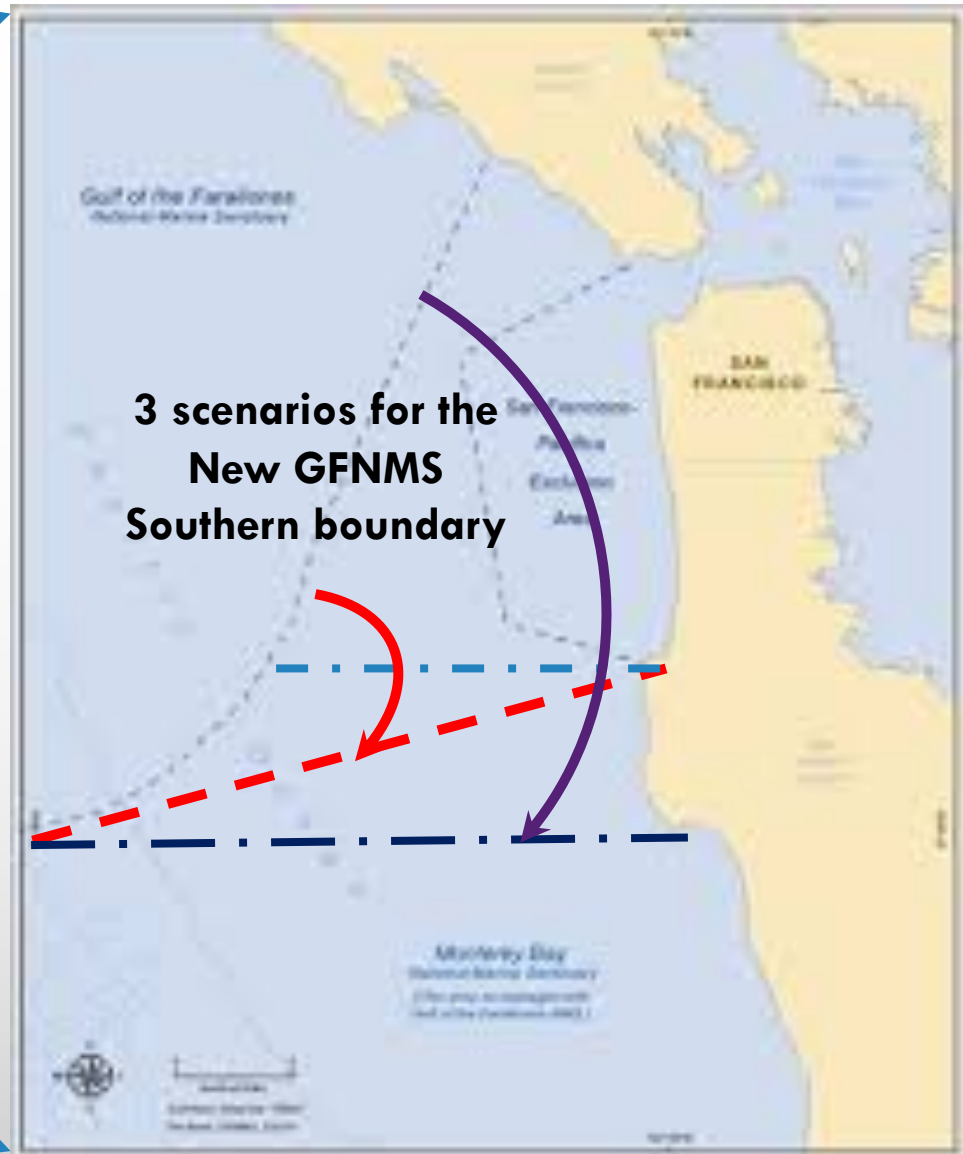
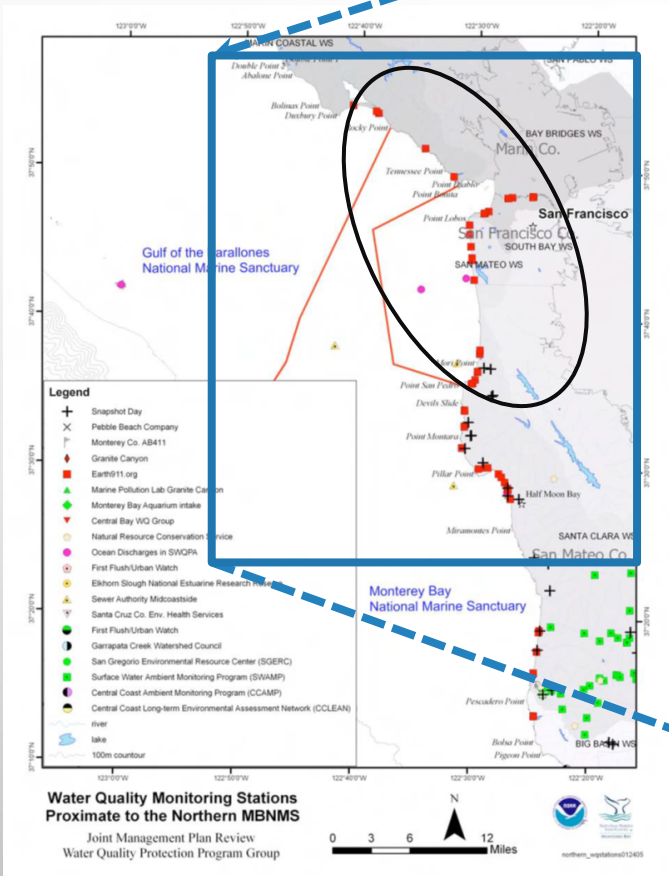
Legion of Honor

Shipwreck Museum

Cliff House



Proposal: Inclusion of SFPEA in GFNMS





PENDING ISSUES

Management of water quality sites included in GFNMS

Responsibility for beach warning or closure in GFNMS

Responsibility for cruise ship discharge monitoring

Complication in establishing boundary changes

Others ...



Resolution of the GFNMS Advisory council to recommend the integration of the Pacifica Exclusion Zone in the sanctuary system

Whereas in 1992 the San Francisco Pacifica Exclusion area (SFPEA) was carved out from the initially proposed footprint of the Monterey Bay National Marine Sanctuary (MBNMS) because of storm water discharges, dredging and ship traffic incompatible with sanctuary regulations,

Whereas by 2013, these problems have been mitigated,

Whereas The SFPEA is an integral part of the San Francisco coastline and the Golden Gate entrance to the bay,

Whereas the Farallones Islands, the namesake of GFNMS, are an iconic site for local indigenous tribes as well as part of the City and County of San Francisco,

Whereas the hydrography & ecology of the San Francisco Bay is directly linked to the Gulf of Farallones,

Whereas the geographical location of SFPEA provides an ideal seascape for the interpretation of the sanctuary waters by (1) GFNMS headquarters & visitor center located on Crissy field, (2) the San Francisco Zoo (which is in the immediate proximity of ocean beach), (3) The California Academy of Sciences (in Golden Gate park), (4) The Lands-End trail and (5) other potential partners or “ambassadors” of GFNMS,

Be it resolved to incorporate the northern end of the MBNMS Northern management area, which includes SFPEA, in the Greater Farallones National Marine Sanctuary (GFNMS), by substituting the current GFNMS southern boundary line which ends at Rocky Point by a line connecting Point San Pedro to the offshore southernmost point of the GFNMS boundary.

The image features a light gray gradient background with several realistic water droplets of various sizes scattered in the corners. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text 'DISCUSSION & EDITS' is centered in a bold, black, sans-serif font.

DISCUSSION & EDITS

Berkeley



Frederick Billings, Trustee of
the College of California



In happy climes, the seat of innocence,
Where nature guides and virtue rules,

Where men shall not impose for truth and sense
The pedantry of courts and schools:

There shall be sang another golden age
The rise of empire and of arts,

The good and great inspiring epic rage,
The wisest heads and noblest hearts.

15-min BREAK



Bob Wilson, GFA

SAC Charter Renewal



ONMS SAC Handbook: Revising a Charter (pg. 55)

- ❖ GFNMS SAC Charter expires and must be renewed every 5 years (last renewed Feb 2016)

Process:

1. About 6 months before the expiration date, the SAC will review the current Charter and make any recommendations for amendments (these amendments should address existing problems or needs of the council).
2. The sanctuary superintendent and council coordinator will discuss recommendations with appropriate sanctuary staff on-site and at the national office.
3. Any ONMS-wide new legal or programmatic requirements will also be incorporated through guidance from the National Council Coordinator.
4. Once all of the changes have been determined, a new draft charter will be prepared and sent for final approval by the ONMS Director.
5. A final version will be distribute to SAC and posted to the GFNMS website.

Presentation:

Acoustics Monitoring in the Sanctuaries

Samara Haver, Nancy Foster Scholar



Acoustic Monitoring in the Sanctuaries: NOAA Ocean Noise Reference Station Results

Samara M. Haver



Project collaborators: Zoe Rand, Leila T. Hatch, Danielle Lipski, Robert P. Dziak, Jason Gedamke, Joseph Haxel, Scott Heppell, Jaime Jahncke, Megan McKenna, David K. Mellinger, William Oestreich, Lauren Roche, John Ryan, Sofie Van Parijs

Hello!

- PhD candidate at Oregon State University
- Dr. Nancy Foster Scholar (2017-2021)



Seasonal trends and primary contributors to the low-frequency soundscape of the Cordell Bank National Marine Sanctuary

The Journal of the Acoustical Society of America 148, 845 (2020); <https://doi.org/10.1121/10.0001726>

[Samara M. Haver^{1,b\)}](#), [Zoe Rand¹](#), [Leila T. Hatch²](#), [Danielle Lipski³](#), [Robert P. Dziak⁴](#), [Jason Gedamke⁵](#), [Joseph Haxel⁶](#), [Scott A. Heppell¹](#), [Jaime Jahncke⁷](#), [Megan F. McKenna⁸](#), [David K. Mellinger⁶](#), [William K. Oestreich⁹](#), [Lauren Roche⁶](#), [John Ryan¹⁰](#), and [Sofie M. Van Parijs¹¹](#)

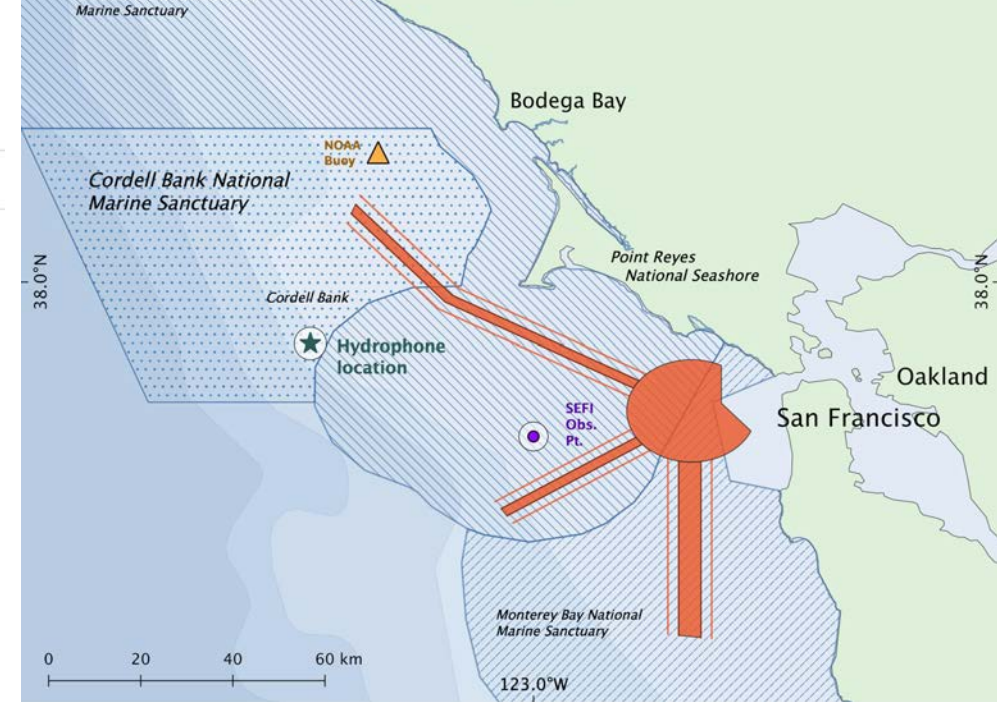
View Affiliations

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- TOPICS**
- Acoustic noise
 - Acoustic ecology
 - Acoustic modeling, simulation and analysis
 - Bioacoustics of mammals
 - Oceanography
 - Signal processing
 - Anthropogenic
 - Aquatic ecology
 - Vocalization
 - Animal sounds

ABSTRACT

Passive acoustic monitoring of ocean soundscapes can provide information on ecosystem status for those tasked with protecting marine resources. In 2015, the National Oceanic and Atmospheric Administration (NOAA) established a long-term, continuous, low-frequency (10 Hz–2 kHz) passive acoustic monitoring site in the Cordell Bank National Marine Sanctuary (CBNMS), located offshore of the central United States of America (U.S.) west coast, near San Francisco, CA. The California Current flows southward along the coast in this area, supporting a diverse community of marine animals, including several baleen whale species. Acoustic data analysis revealed that both large vessels and vocalizing baleen whales contribute to the ambient soundscape of the CBNMS. Sound levels fluctuated by month with the highest levels in the fall and lowest levels in the summer. Throughout the year, very low-frequency (10–100 Hz) sound levels were most variable. Vessels and whales overlap in their contributions to ambient sound levels within this range, although vessel contributions were more omnipresent, while seasonal peaks were associated with vocalizing whales. This characterization of low-frequency ambient sound levels in the CBNMS establishes initial baselines for an important component of this site's underwater soundscape. Standardized

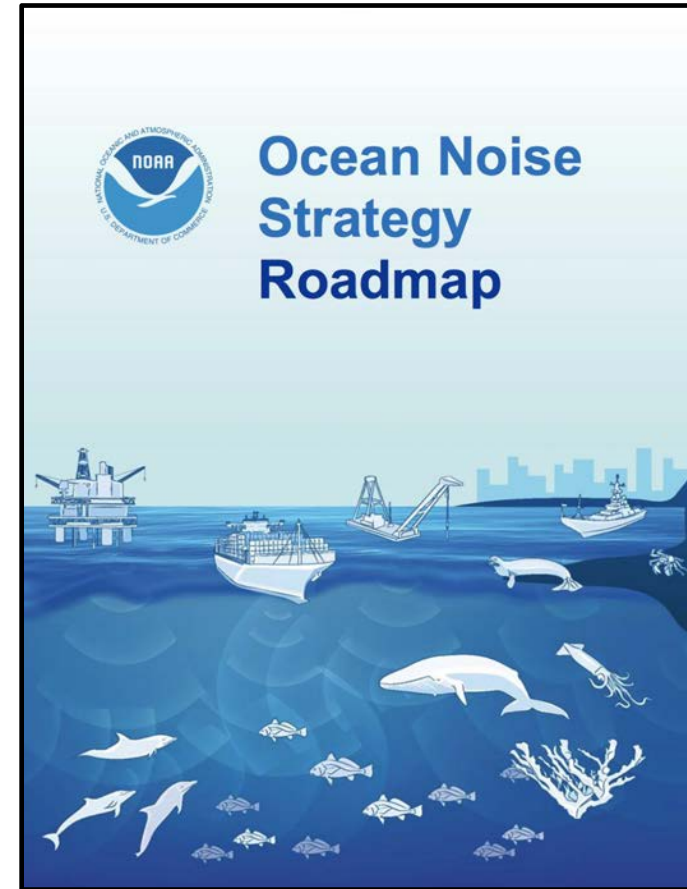


Guest Editors:
 Kent L. Gee,
 Alan T. Wall,
 Phillip J. Morris,
 Tim Colonius,
 K. Todd Lowe

Submit Today!



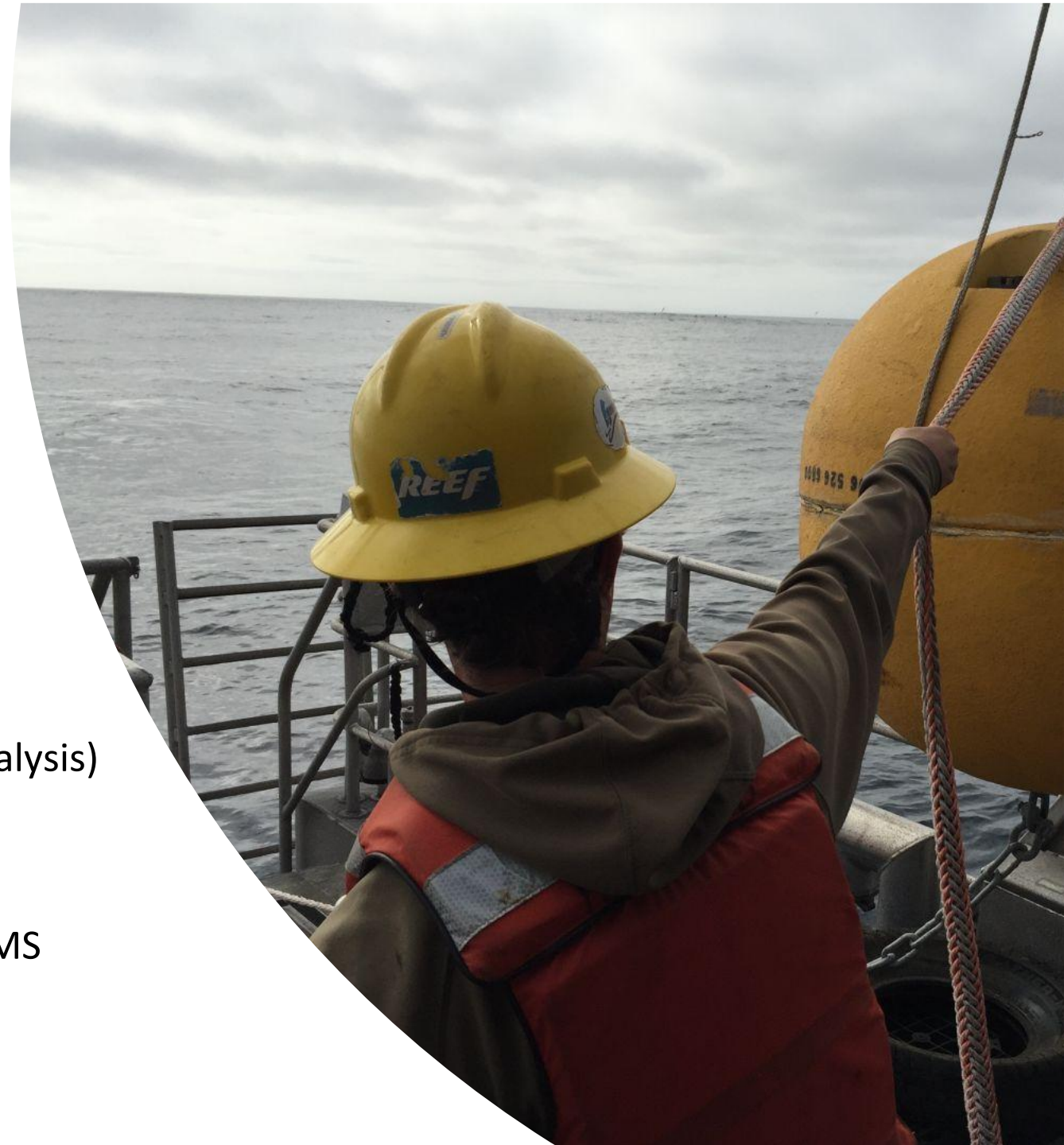
NOAA Underwater Noise Monitoring



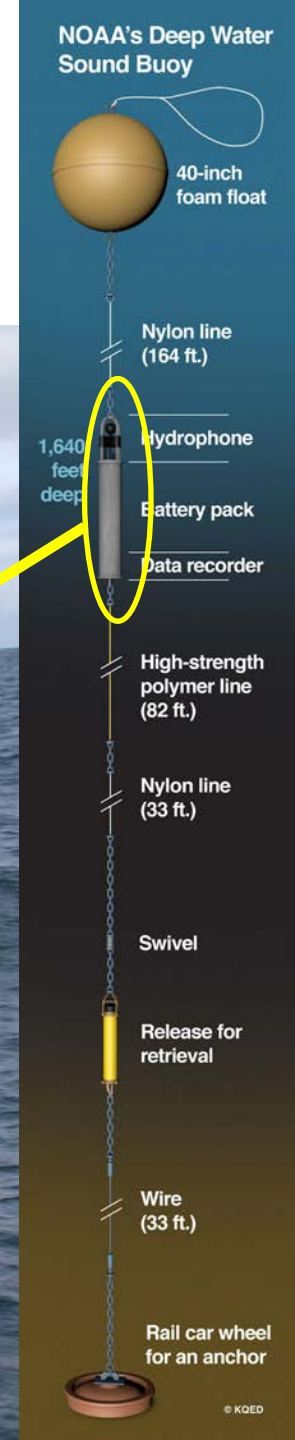
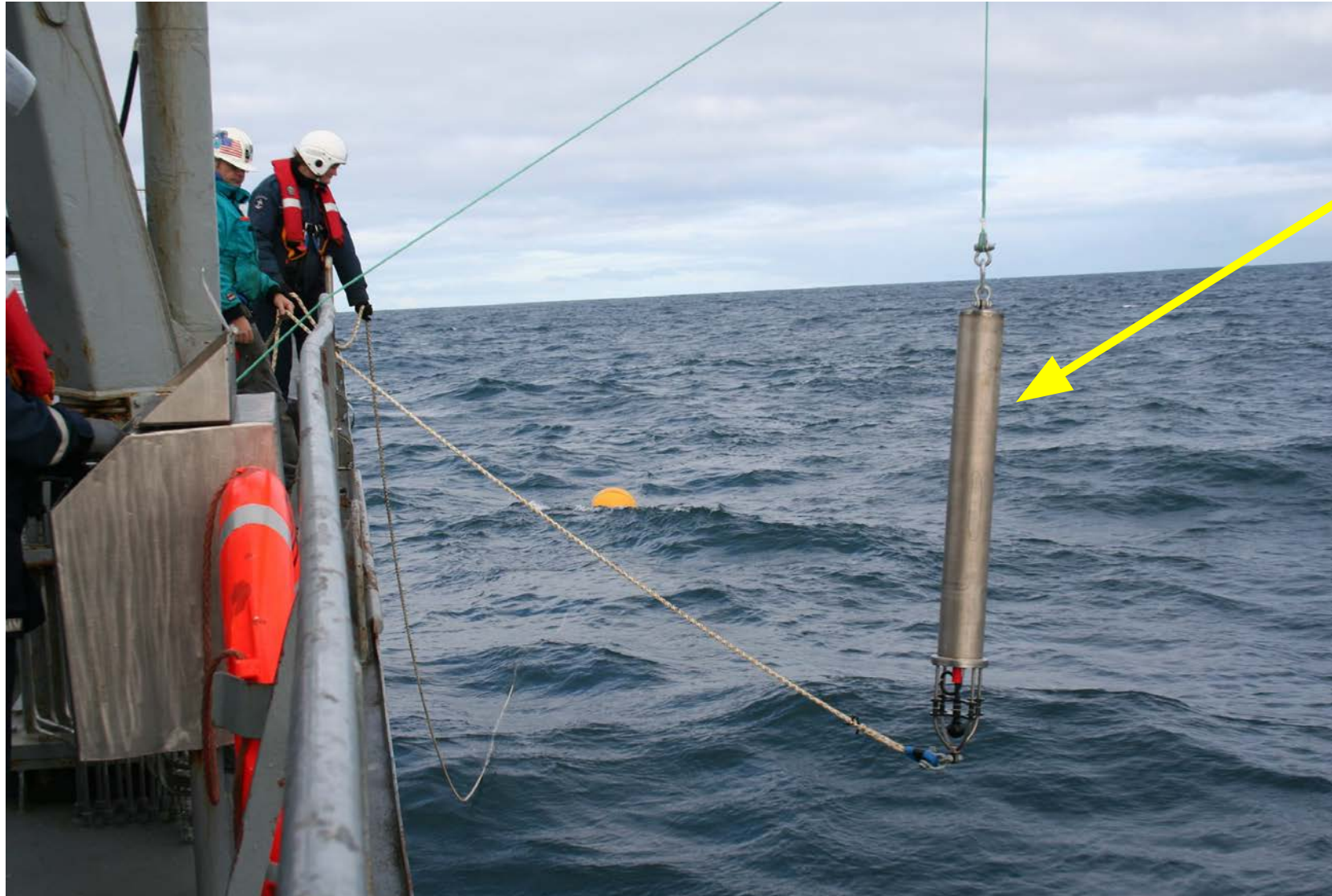
Map: cetsound.noaa.gov
Animal images: cetus.ucsd.edu

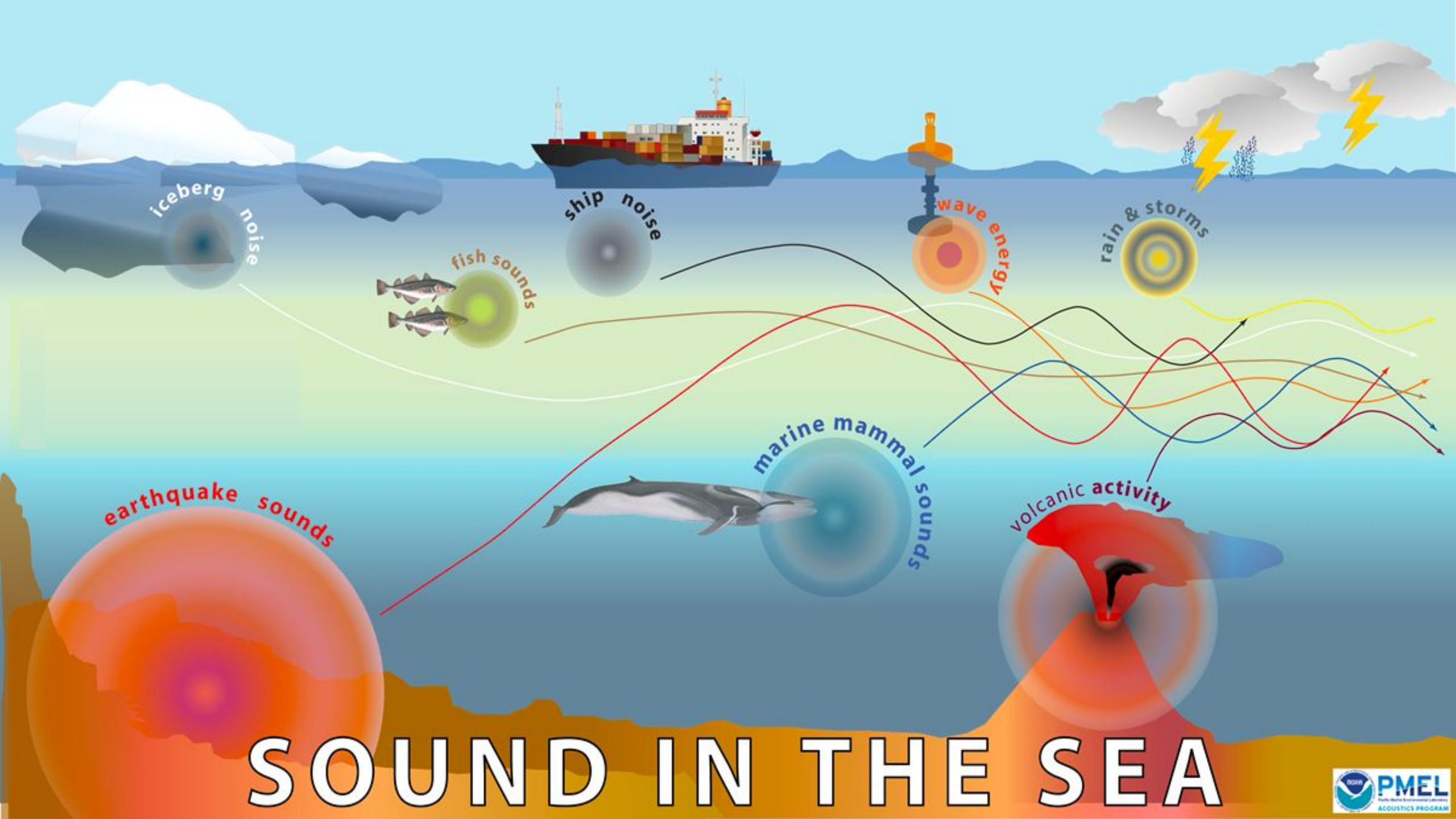
Why Passive Acoustic Monitoring?

- Year-round effort
- Not limited by weather or daylight
- Minimal disturbance to environment
 - Only during deployment and retrieval
 - No surface expression
- Long-term data collections
 - Initial data download in 2017 (focus of this analysis)
 - Instrument swapped again in October 2019
- Comparisons to calibrated network
 - Including 3 other NMS - OCNMS, CINMS, SBNMS



NRS Instrumentation





iceberg noise

ship noise

fish sounds

wave energy

rain & storms

earthquake sounds

marine mammal sounds

volcanic activity

SOUND IN THE SEA

Soundscape analysis = acoustics + more!

- **Establish baseline sound levels**

- **Quantify** sound levels (at hydrophone) at each frequency in hourly time windows (MATLAB)
- Calculate monthly and 2-year **averages**
- Use **percentiles** to indicate potential influence of chronic vs transient sources

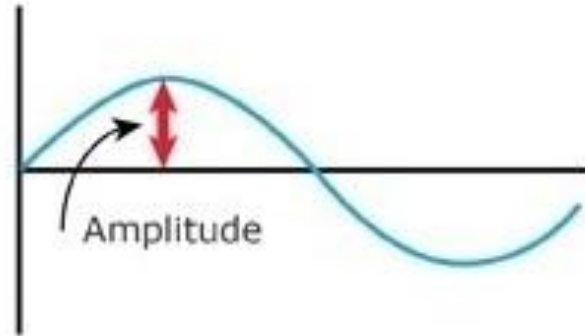
- **Analyze recordings for presence of baleen whale vocalizations**

- **Automatic** detector indices – simpler, consistent vocalizations
- **Manual** analysis – for species with large repertoire of call types or possible masking conditions (automatic detector cannot separate from background noise)

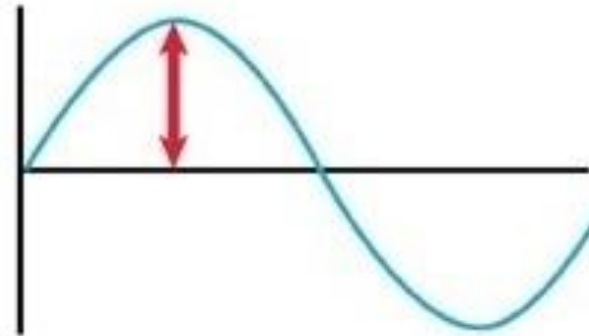
- **Comparison to other types of data**

- **Shipping** activity (AIS)
- **Visual whale sighting data** (SEFI/ACCESS)
- **Wind** speed (NOAA weather buoy)
- **Rainfall** measurement (Bodega Marine Lab)
- **Earthquakes** (USGS)

Measuring Sound



Quieter



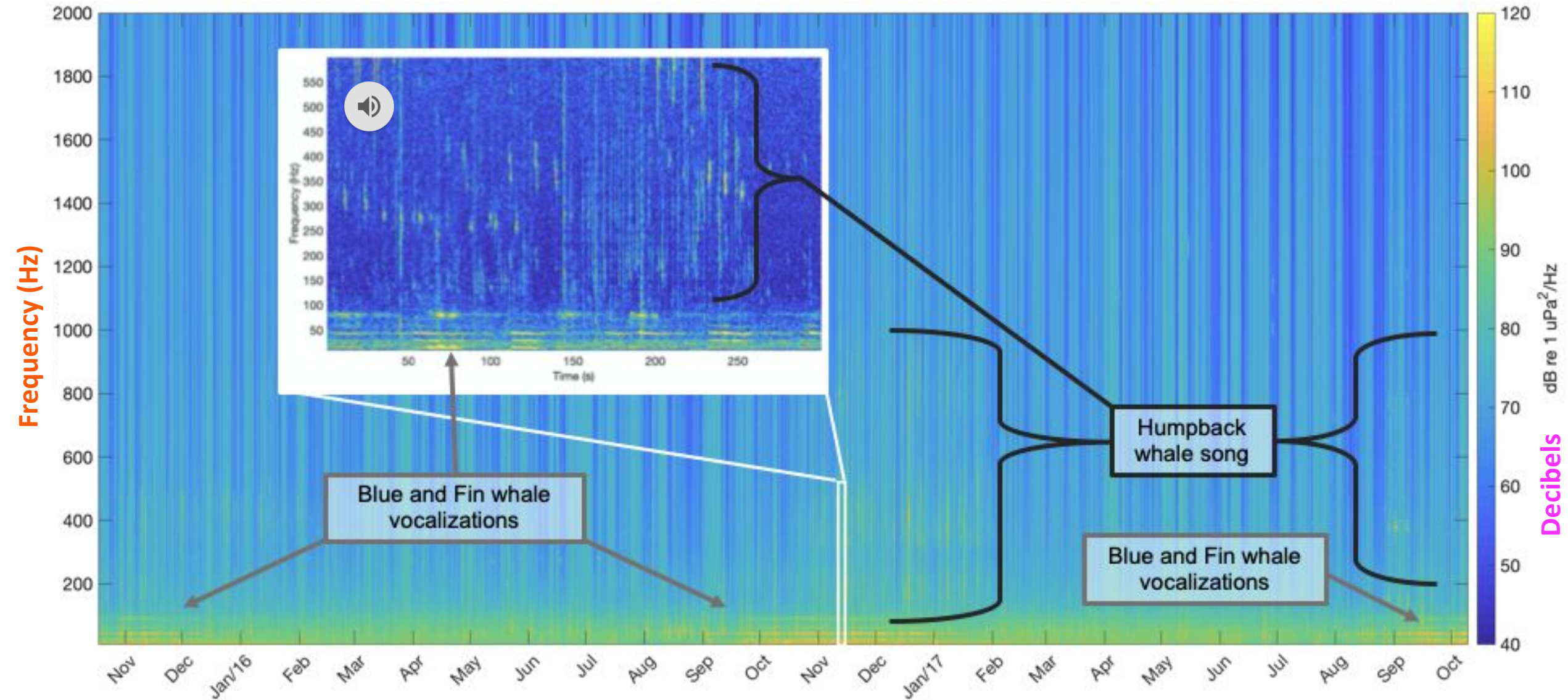
Louder

What did we hear?

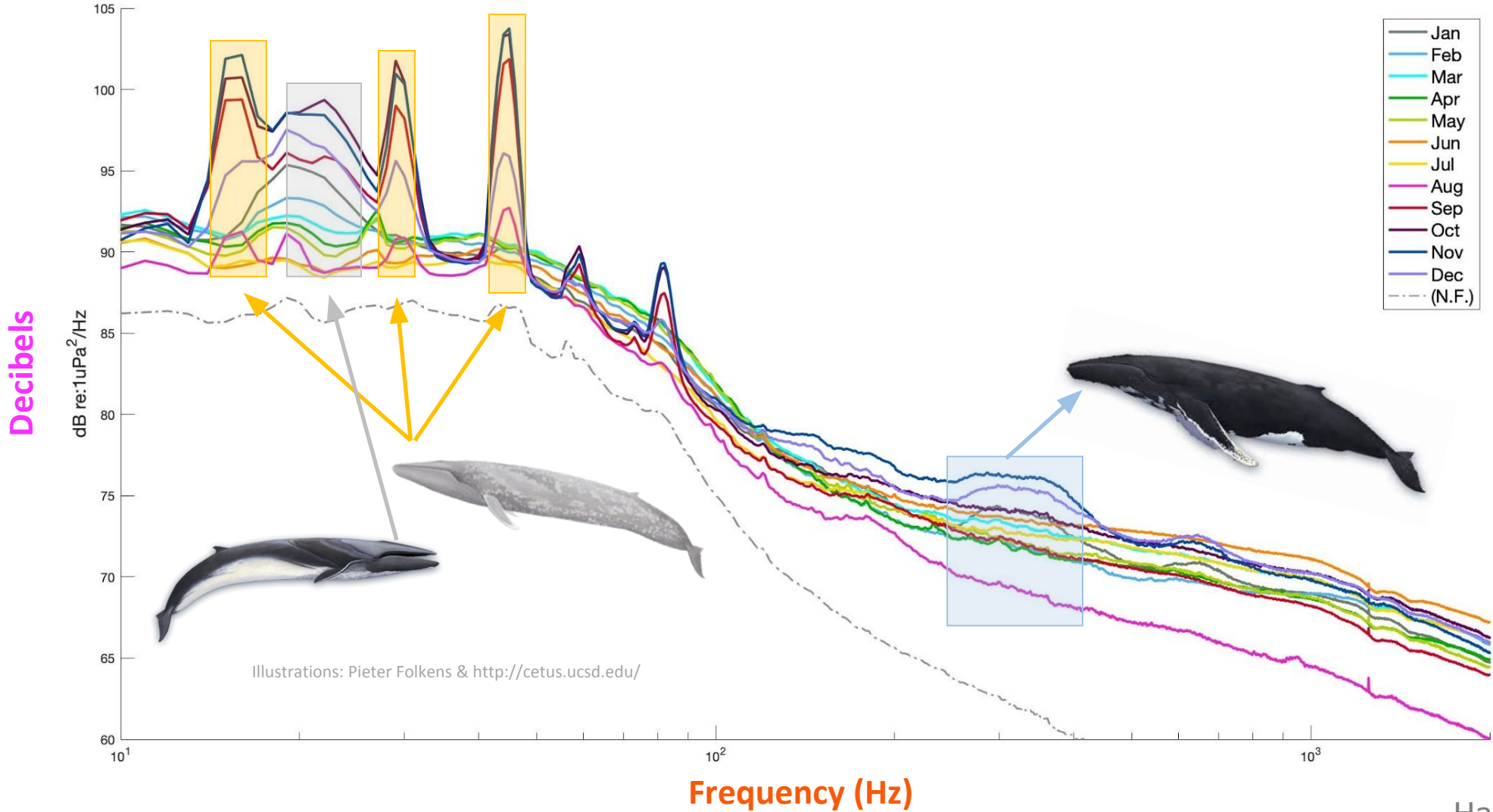
1. Low-frequency soundscape dominated by whales
 - Seasonal patterns of blue and fin whales
 - Humpback whales detected year-round
 - Visual survey and acoustic monitoring detections are not the same
2. Vessel noise is consistent year-round
 - Matches results from AIS
3. Ambient sound levels similar to S. CA
 - Expected because of similar whale habitat and large ports
 - Different sound propagation environments



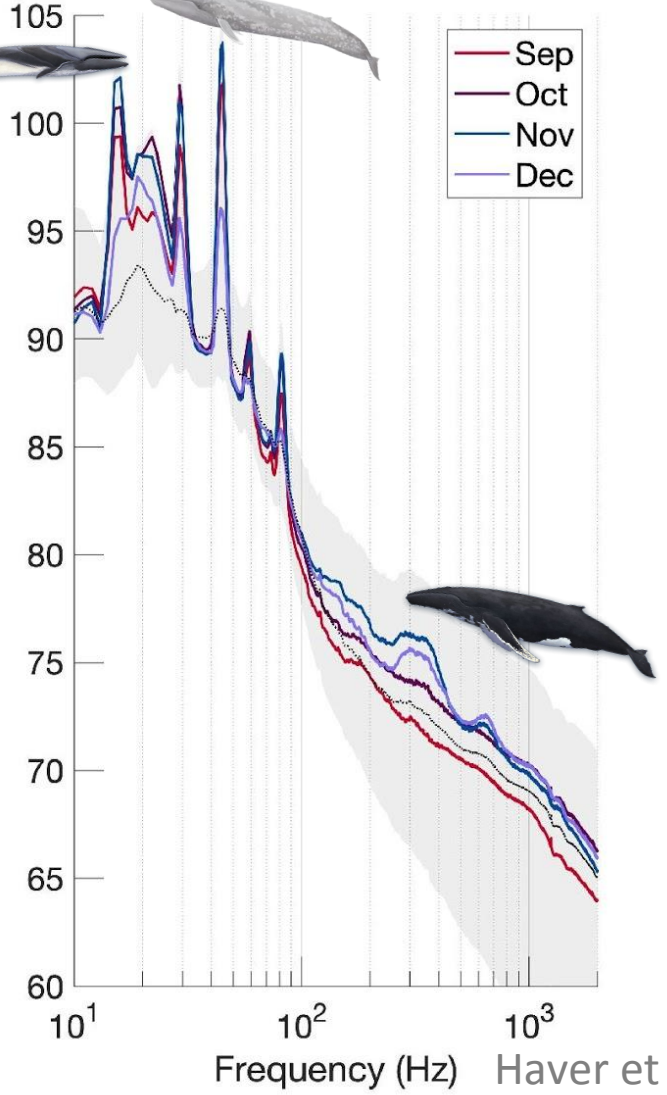
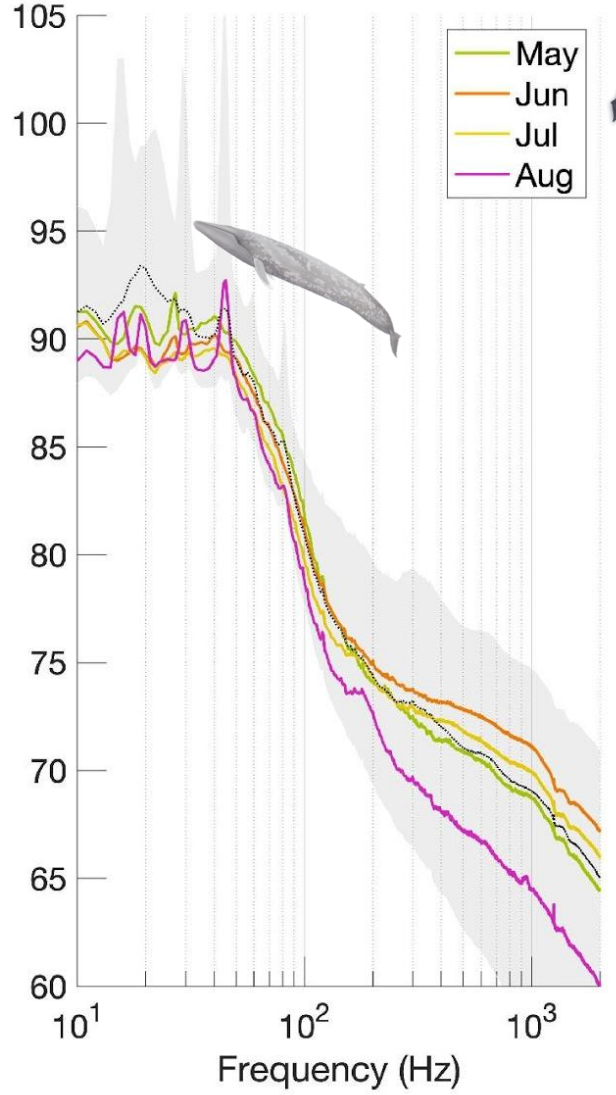
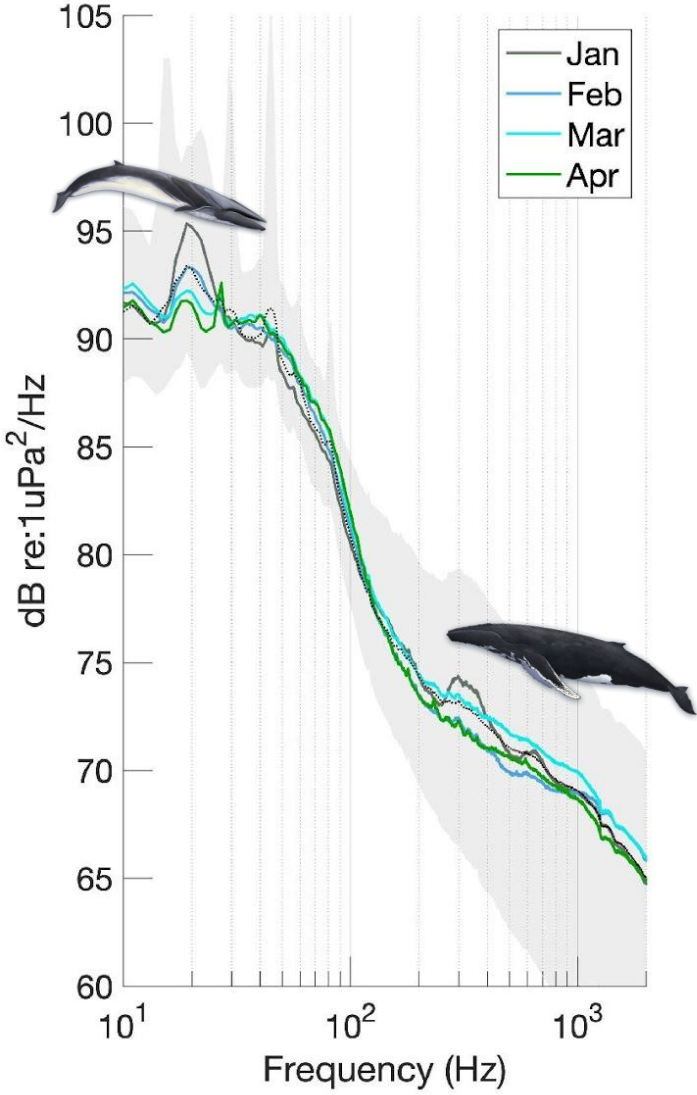
Biophony (whale vocalizations)



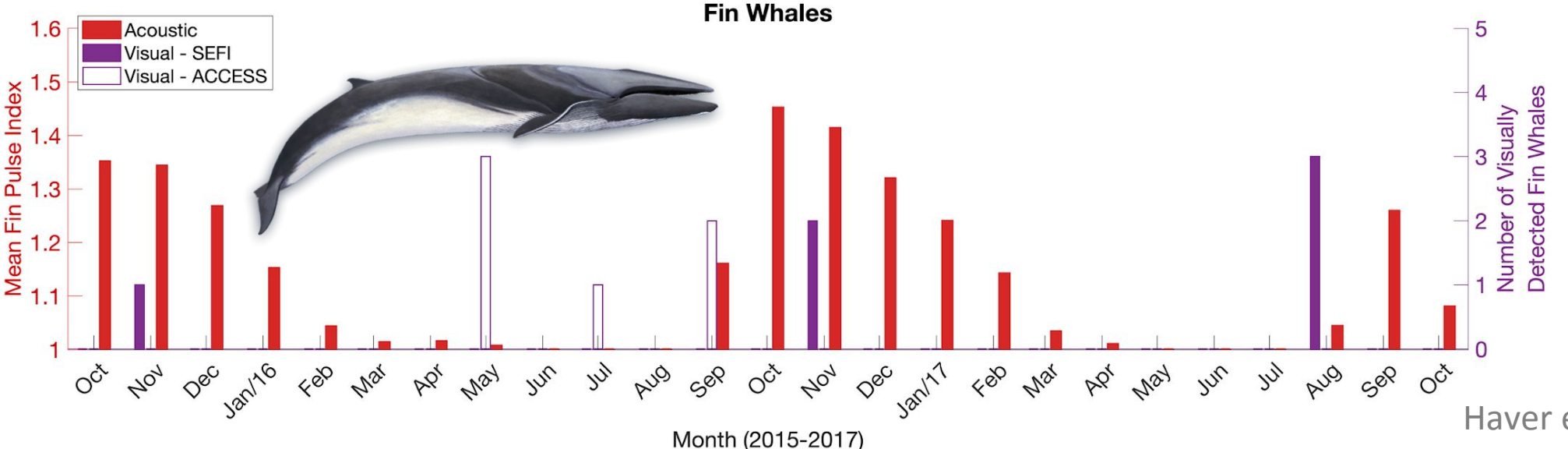
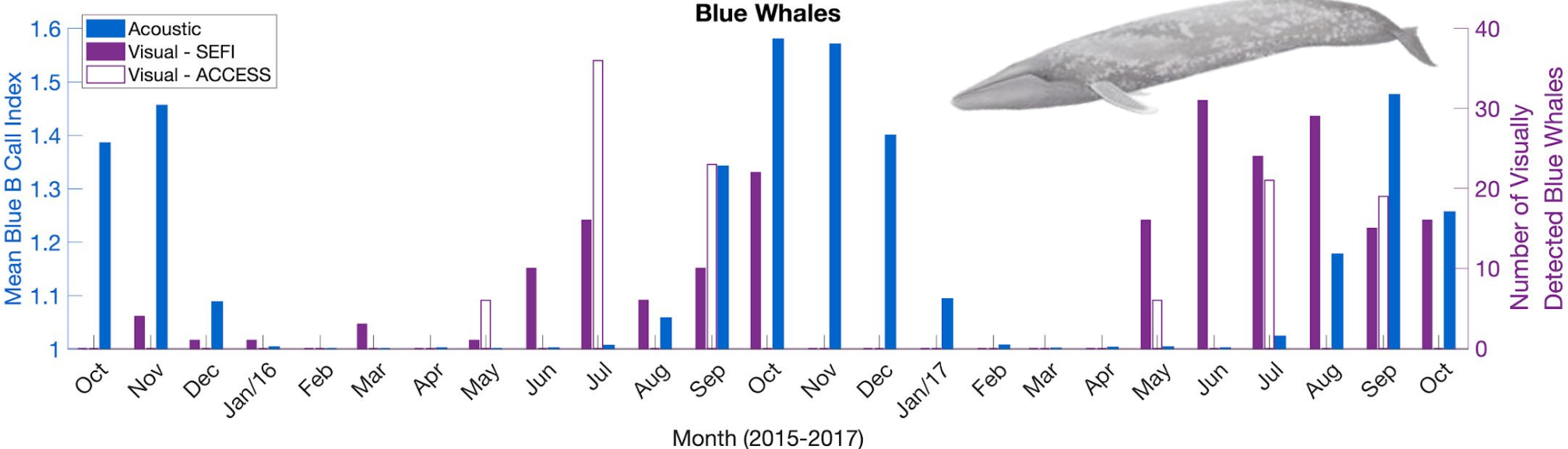
Whales Affected Monthly Sound Levels



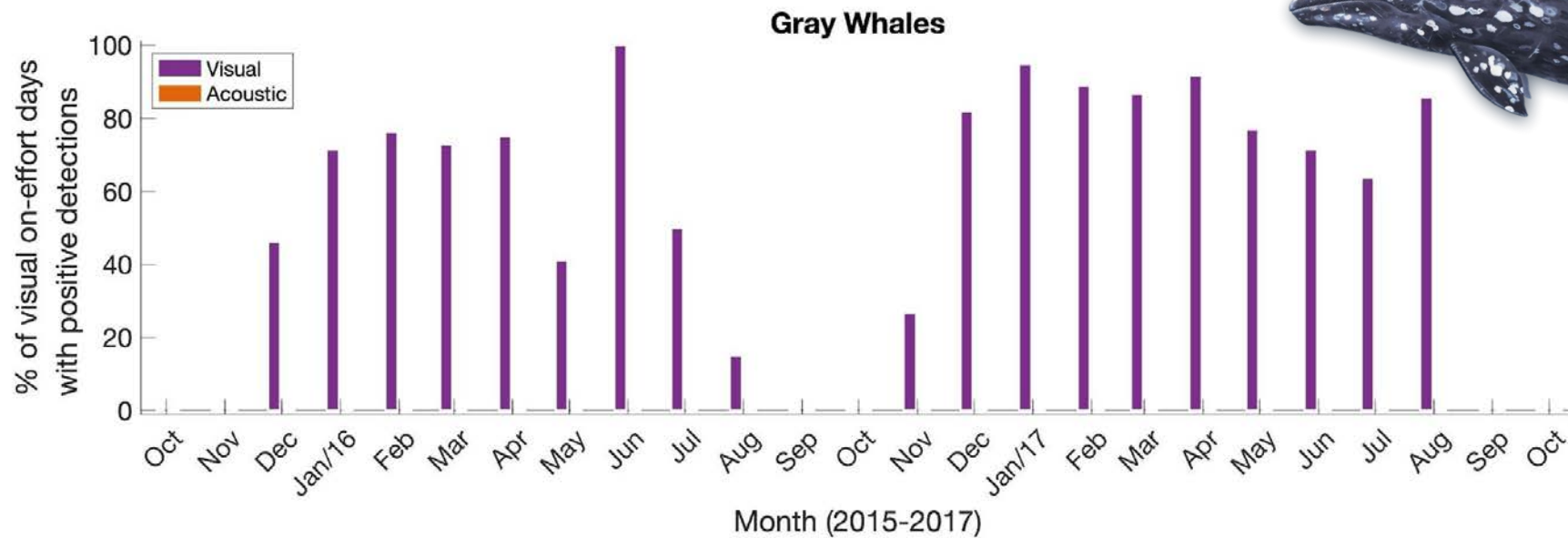
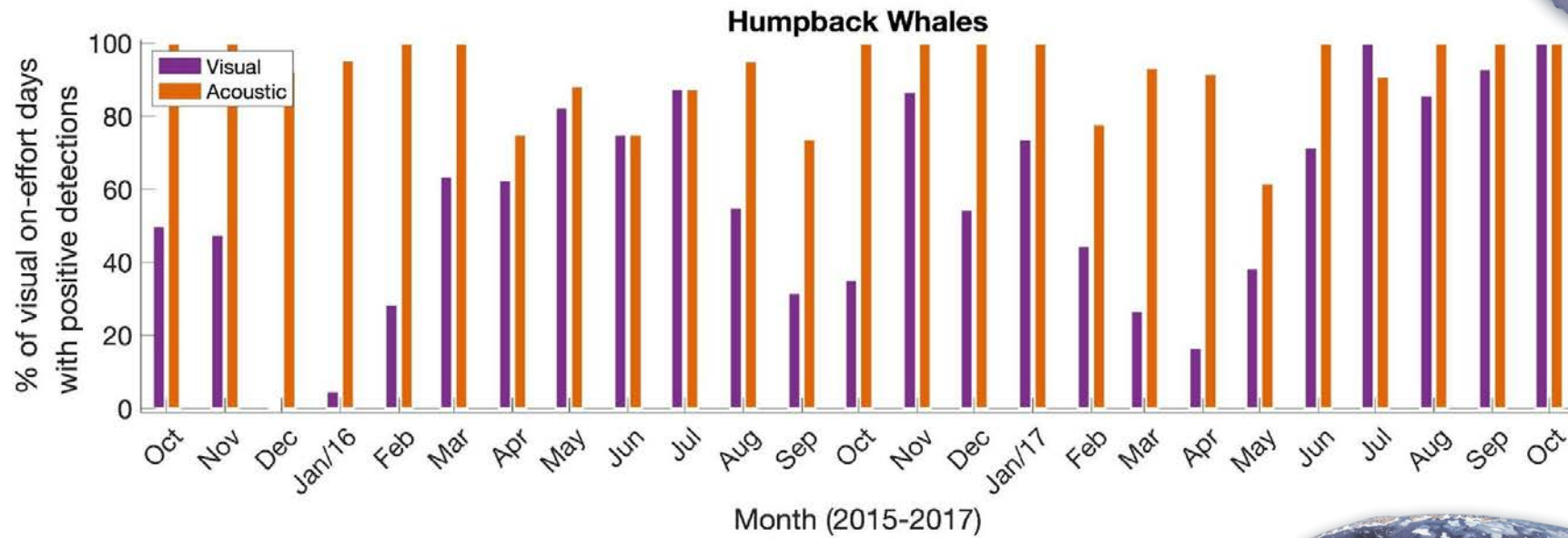
Seasonality of Ambient Sound Levels



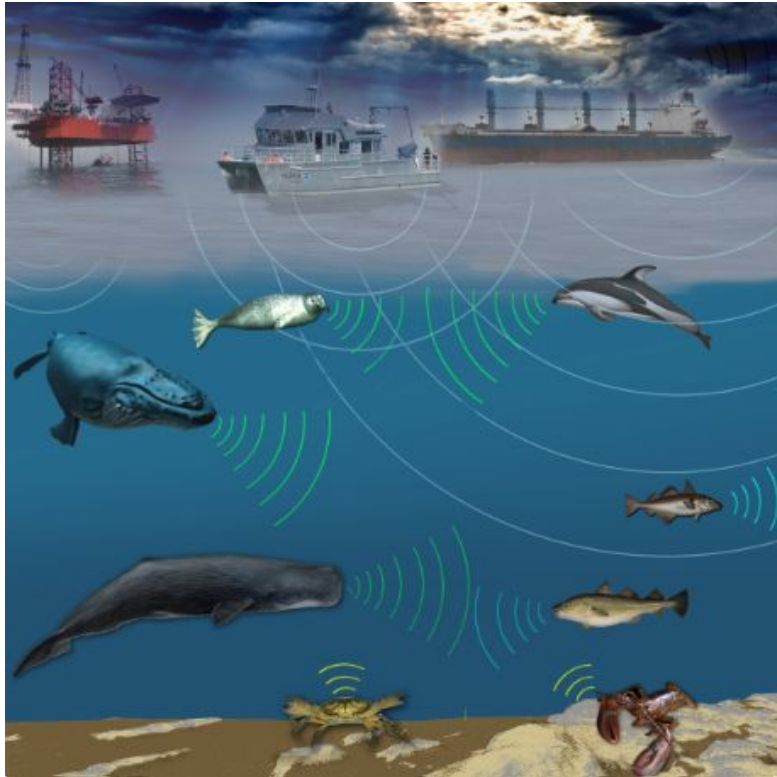
Visual vs. Acoustic Detections



Visual vs. Acoustic Detections

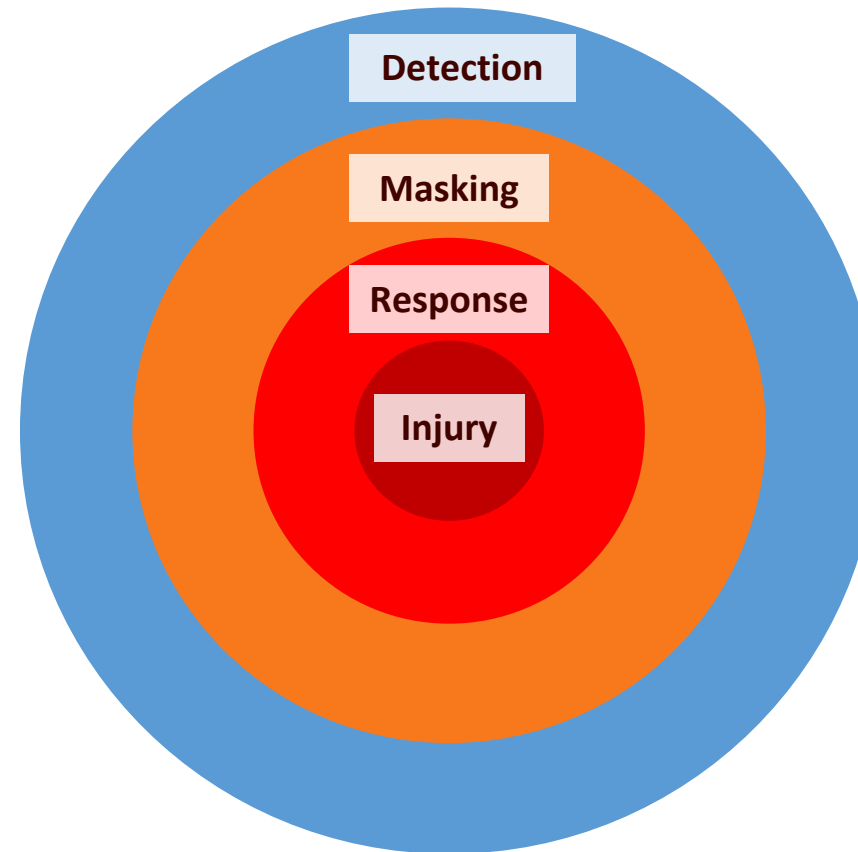


Whales and Ocean Noise



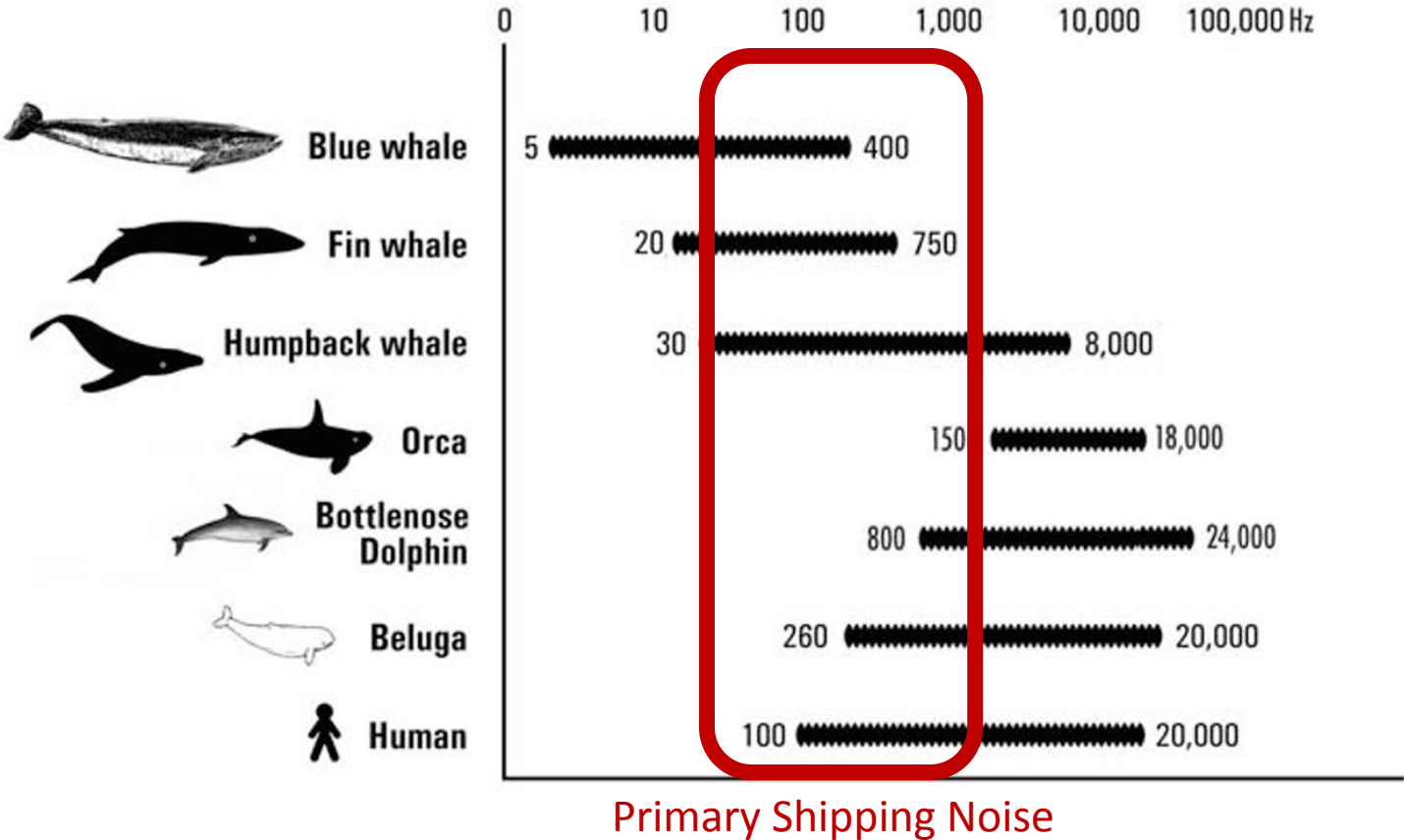
Van Parijs et al., 2015

Theoretical Zones of Influence



Adapted from Richardson et al, 1995

Whales and Vessel Noise



Graphic: D. Rothenberg, Thousand Mile Song: Whale Music in a Sea of Sound, Perseus Books Group, 2010.

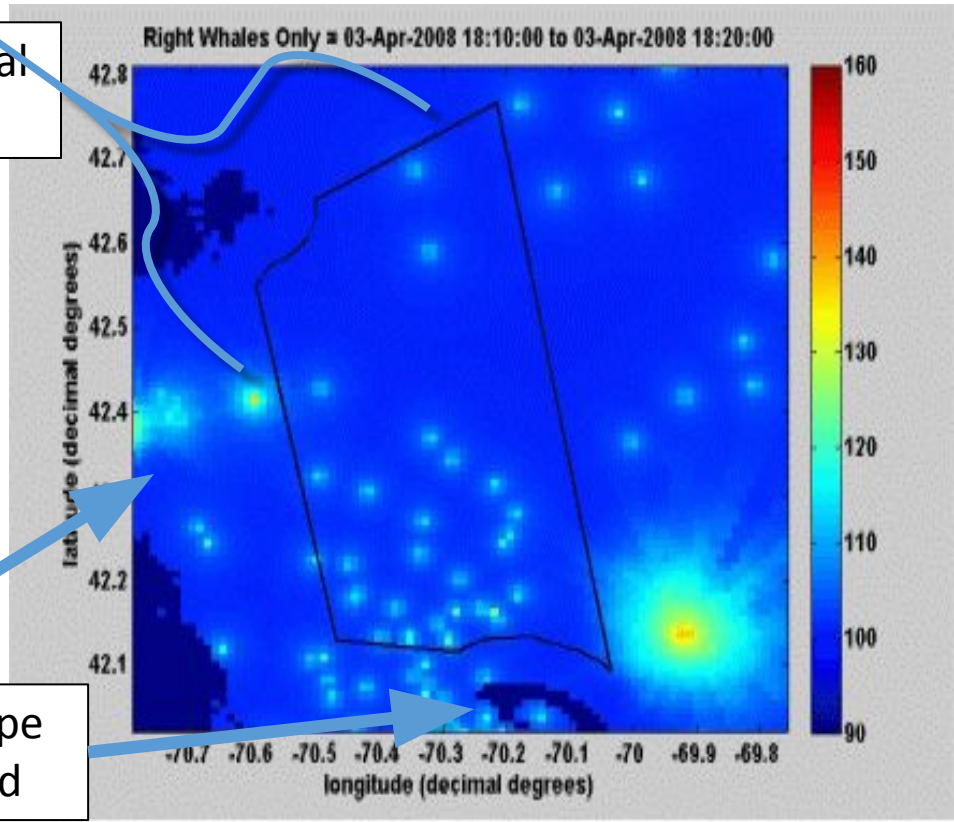


Ghostfishing.org

Stellwagen Bank National Marine Sanctuary

Boston Harbor

Cape Cod



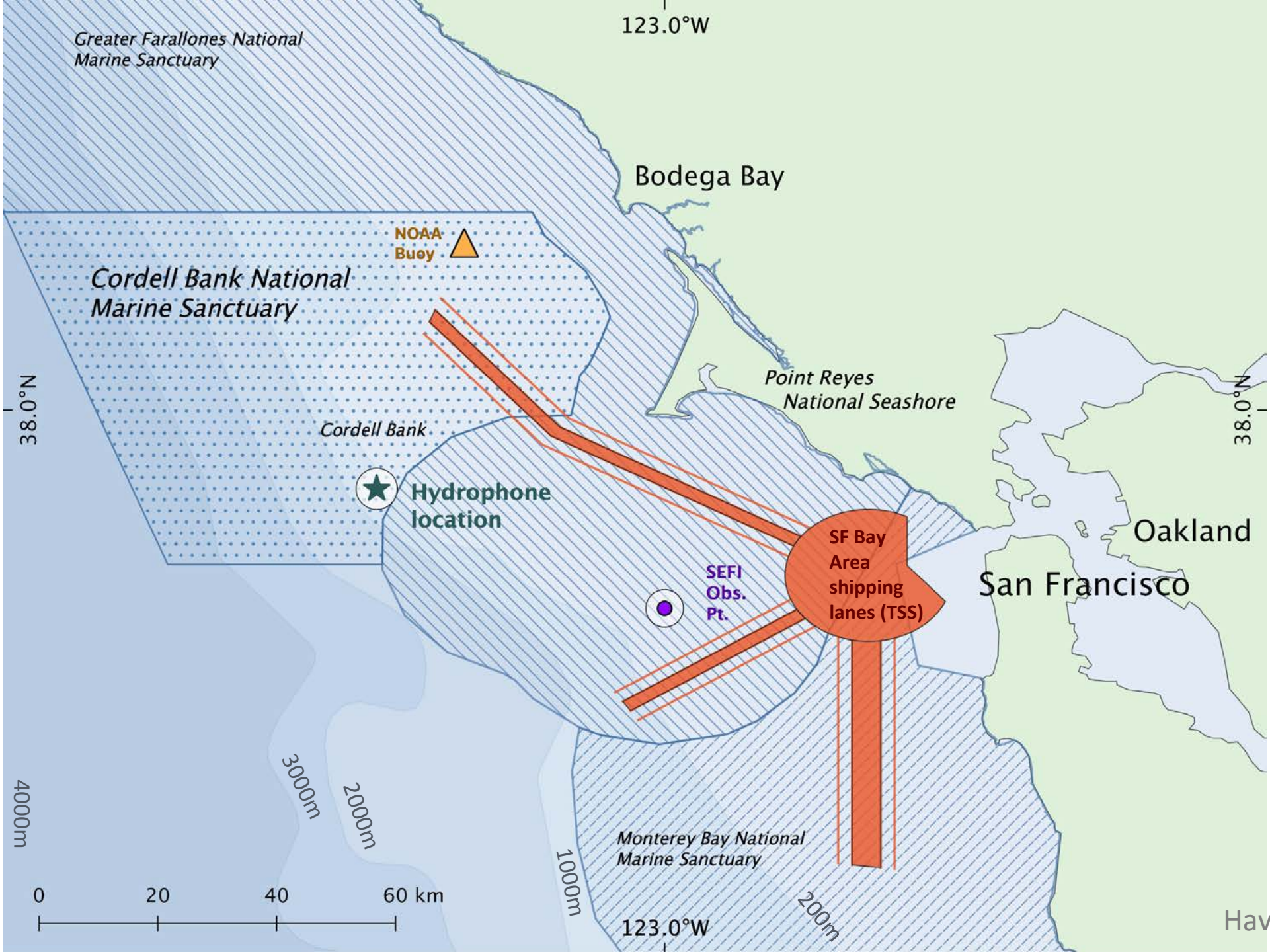
Graphic: Christopher Clark

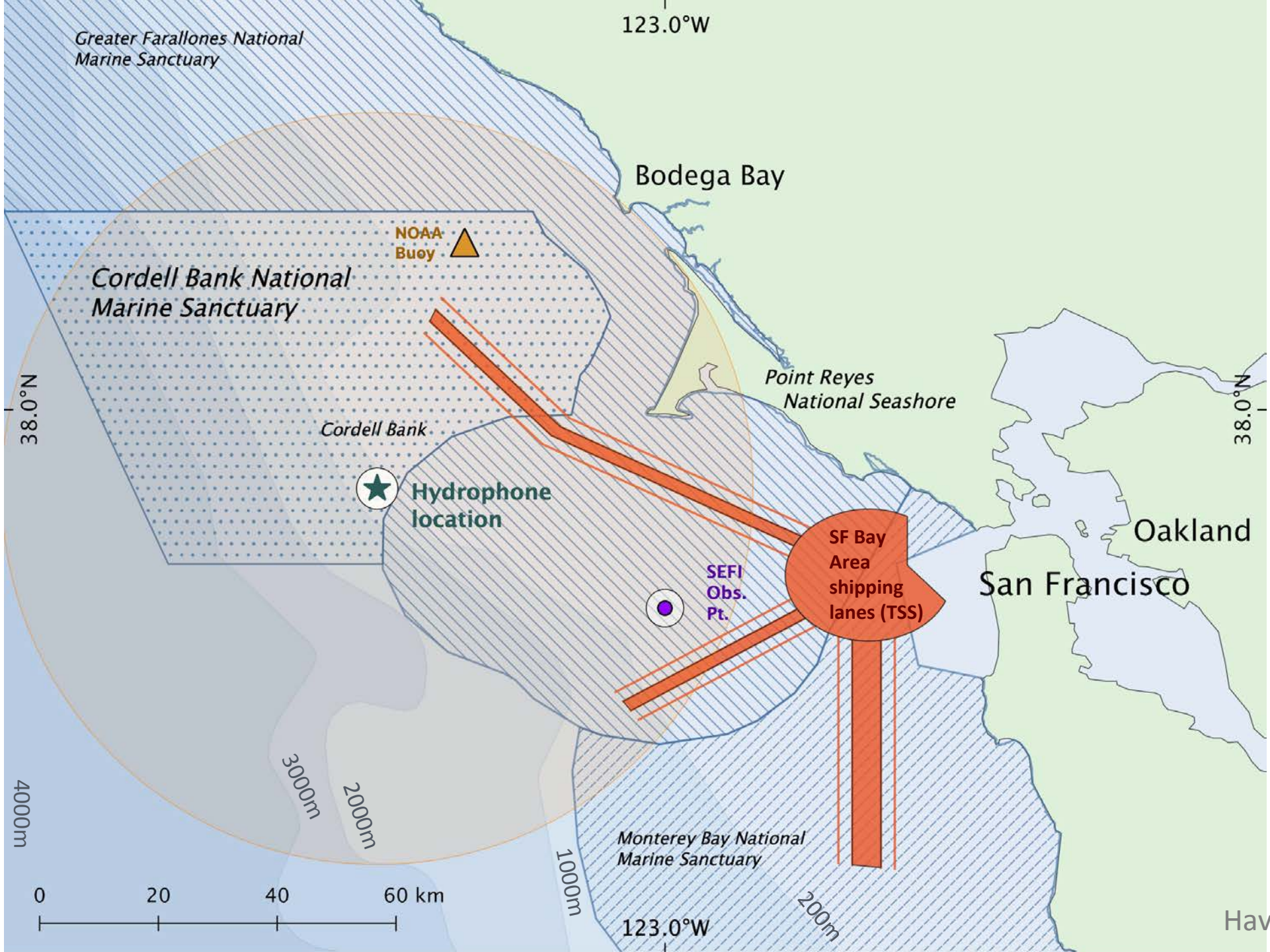


What did we hear?

1. Low-frequency soundscape dominated by whales
 - Seasonal patterns of blue and fin whales
 - Humpback whales detected year-round
 - Visual survey and acoustic monitoring detections are not the same
2. Vessel noise is consistent year-round
 - Matches results from AIS
3. Ambient sound levels similar to S. CA
 - Expected because of similar whale habitat and large ports
 - Different sound propagation environments



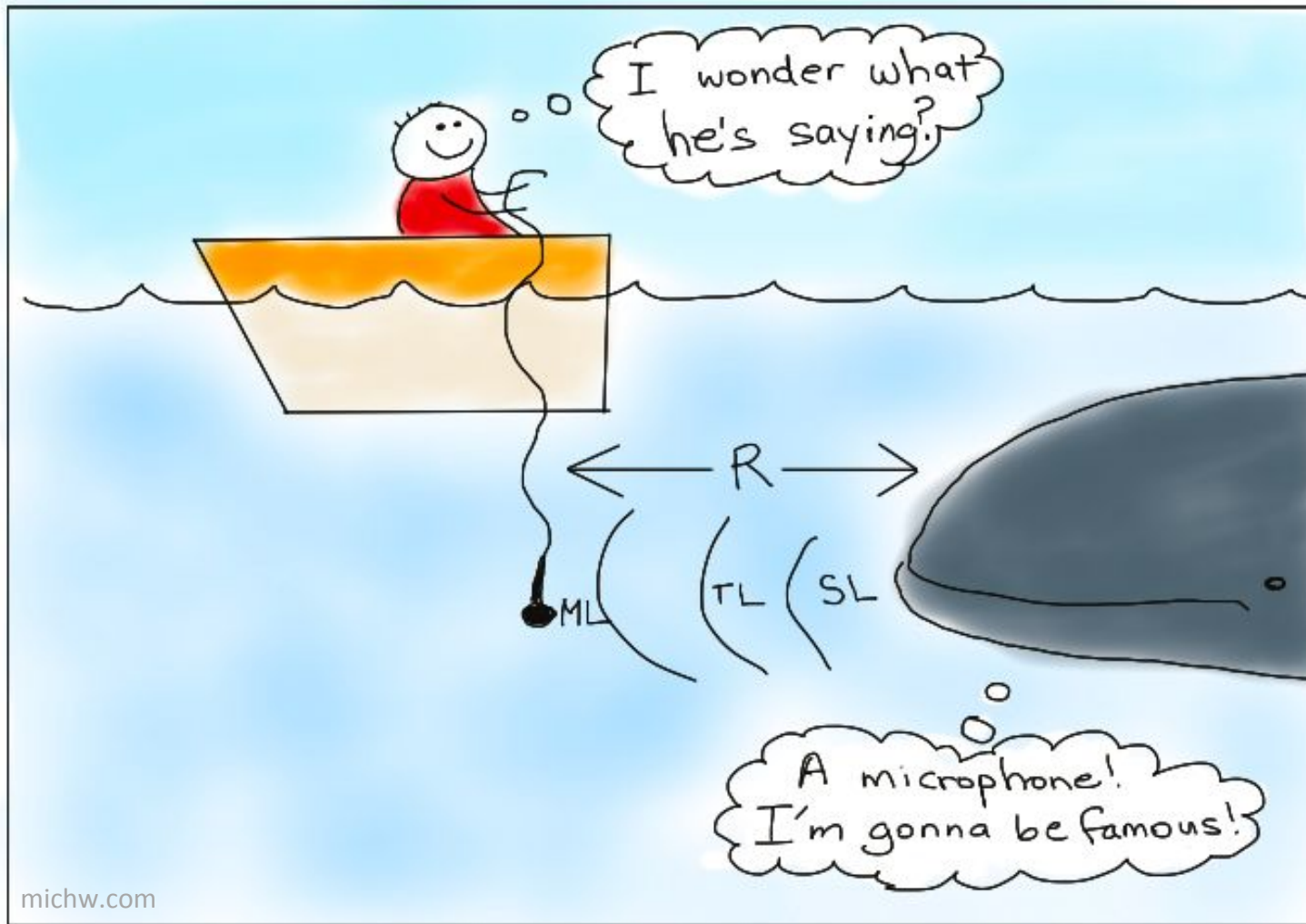




Implications for Management

- Whale conservation
 - PAM reveals species nearby through the year
- Vessel noise vs. whales
 - Blue and fin whale chorusing detected above ambient, but unknown impact to other species (e.g. grey whales)
- Need more information about where whales are when we are able to hear them





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Adjourn