

Escuchando el océano en vivo: bioacústica marina, contaminación sonora y tecnología de monitoreo en tiempo real

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Investigadora Invitada, Woods Hole Oceanographic Institution, EE.UU.

- Ministerio del Medio Ambiente y el Departamento de Ruido, Lumínica y Olores
- SUBPESCA, SERNAPESCA y SHOA
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- Dr. Néstor Becerra, Universidad de Chile
- Dr. Rodrigo Hucke-Gaete, Universidad Austral de Chile
- Laura Gutiérrez, Camila Calderón, Nadin Ramírez, Oscar Pizarro, Renato Quiñones, Maritza Sepúlveda, Marcel Ramos, Giovanni Daneri, Barbara Galletti, Luke Rendell, ONG Centro Ballena Azul, Comprehensive Test Ban Treaty Organization, Universidad de St Andrews, y muchos mas...

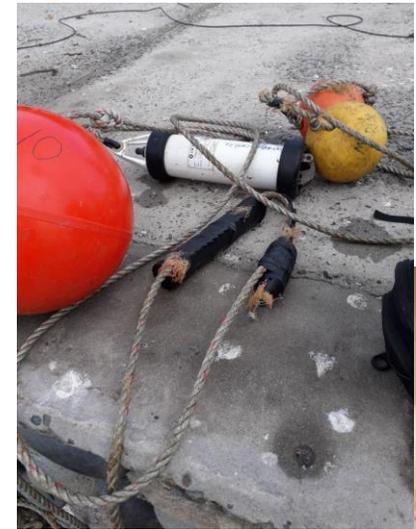
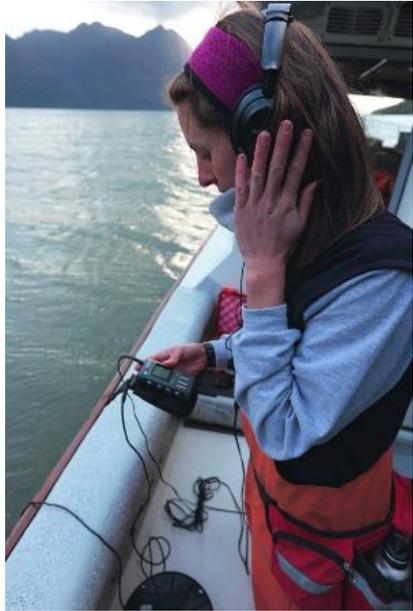
Bioacústica

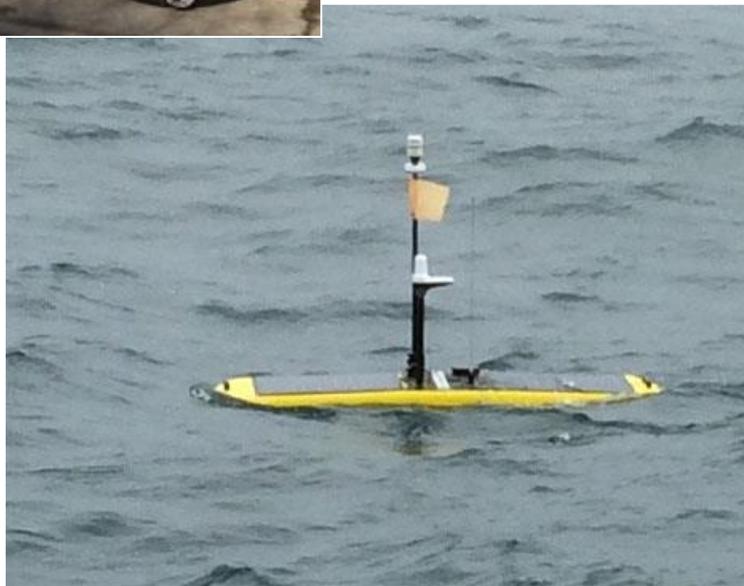
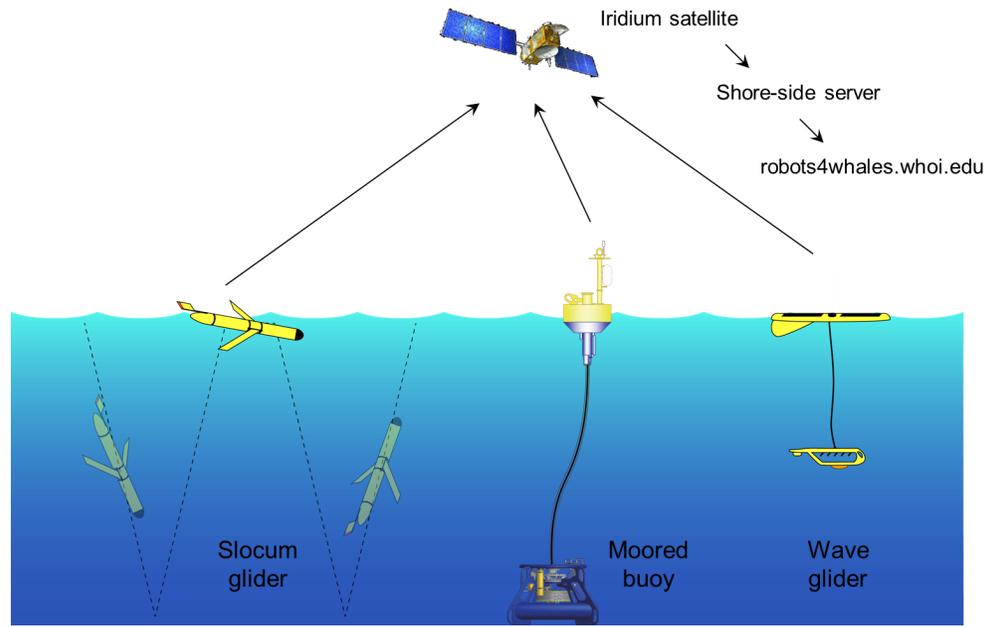
- La bioacústica: el estudio de sonidos biológicos
- El monitoreo acústico pasivo: el método que ocupamos para escuchar y grabar el paisaje acústico

Acústica pasiva	Acústica activa
Hidrófonos	Ecosondas
	Sonares
	Perfiladores de corrientes (ADCP), Perfiladores de zooplancton (AZFP)

Escuchando el Océano en Vivo

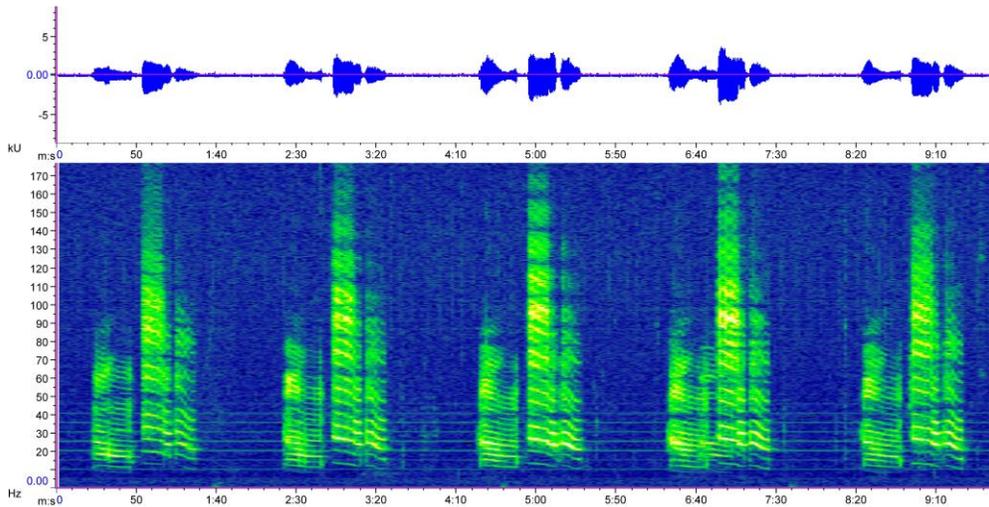






Monitoreo Acústico Pasivo

- No-invasivo
- 24 h/día, 365 días/año
- Todos los mamíferos marinos producen sonido
- Sonidos específicos a nivel de especie o subespecies
- PERO: solo detectamos animales que vocalizan



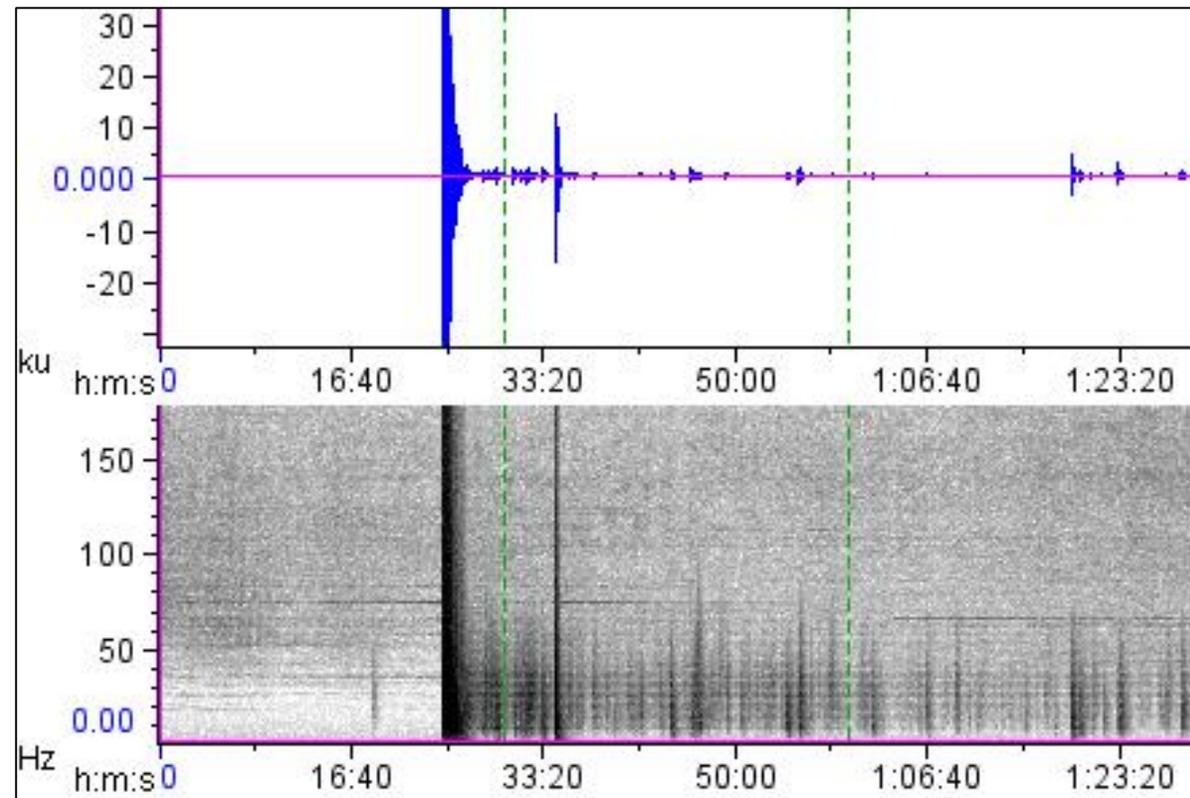
Cantos de ballena azul chilena







- Motores y ecosondas 
- Terremoto (x5) 

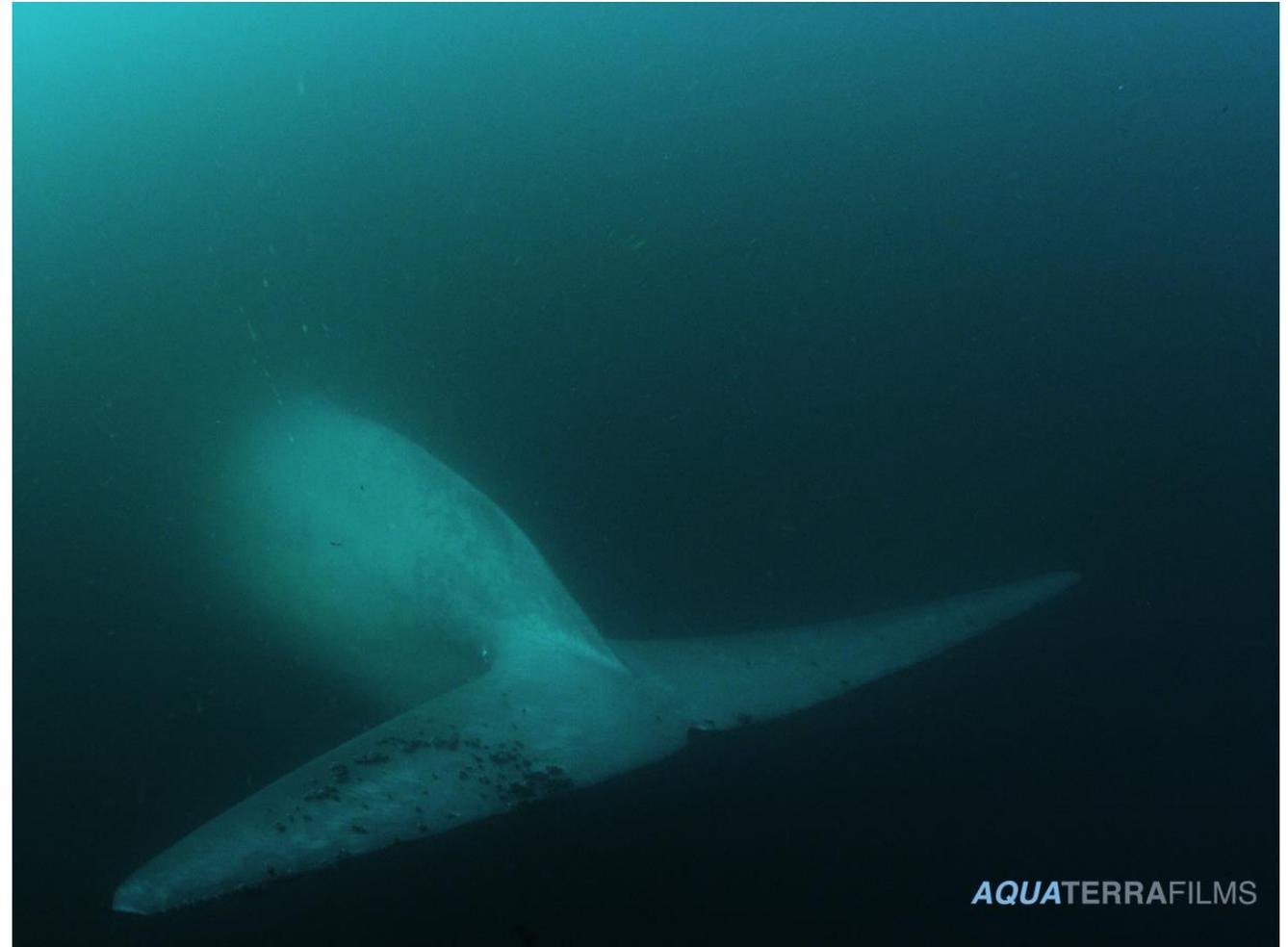


Paisaje acústico

- Sonidos biológicos:
 - Mamíferos marinos
 - Peces
 - Crustáceos
 - Otros organismos que faltan estudiar...
- Sonidos geofísicos:
 - Viento
 - Oleaje
 - Terremotos
- Sonidos humanos:
 - Motores
 - Sonares
 - Hincado de pilotes
 - Explosiones
 - Etc...

→ Cada ambiente tiene un paisaje acústico distinto

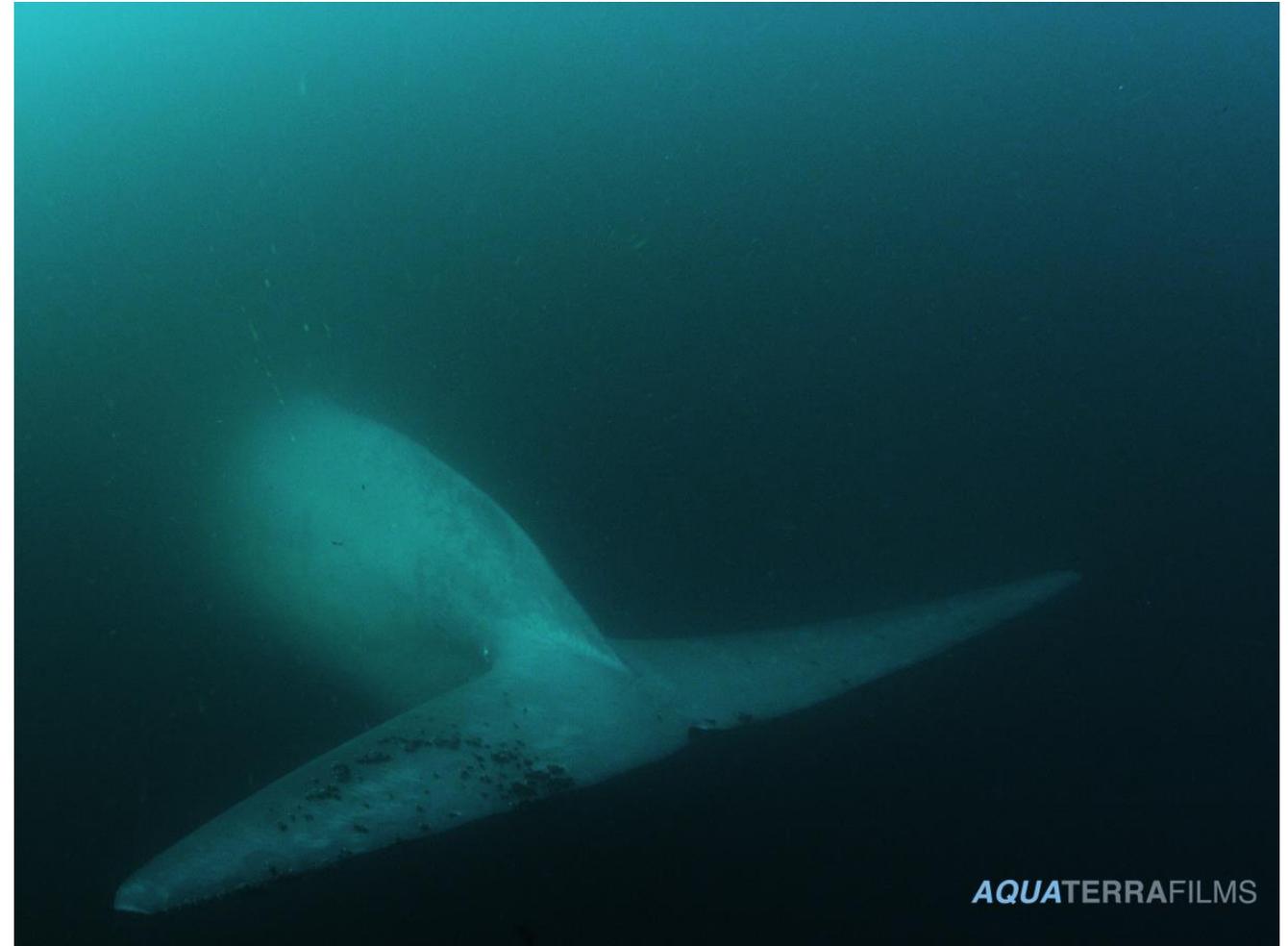
El Sonido en el Océano



AQUATERRAFILMS

El Sonido en el Océano

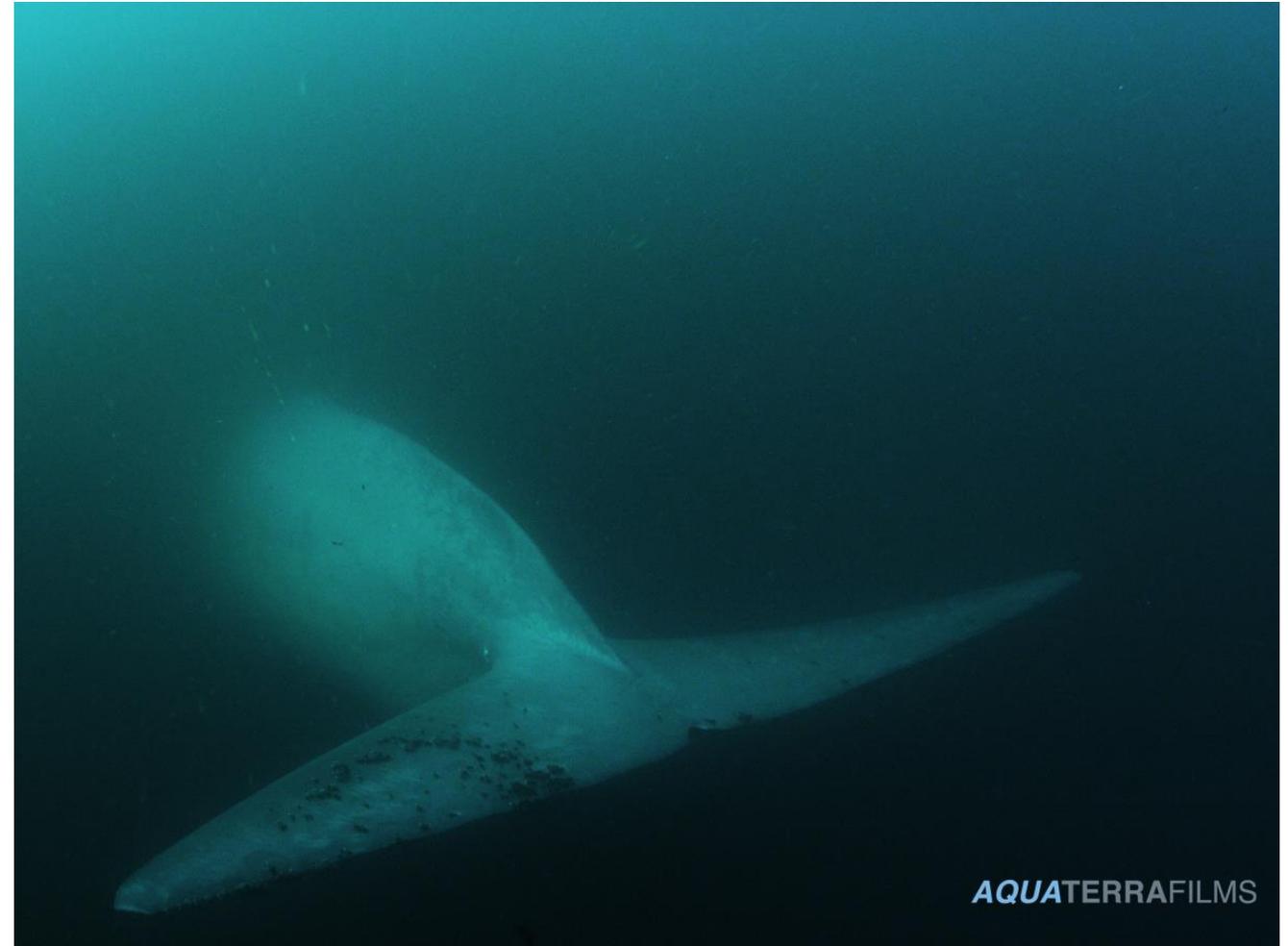
- Velocidad sonido en aire:
343 m/s
- Velocidad sonido en agua
dulce: 1,484 m/s
- **Velocidad de sonido en
agua de mar: 1,560 m/s**
→ 4,5 mas rápido



El Sonido en el Océano

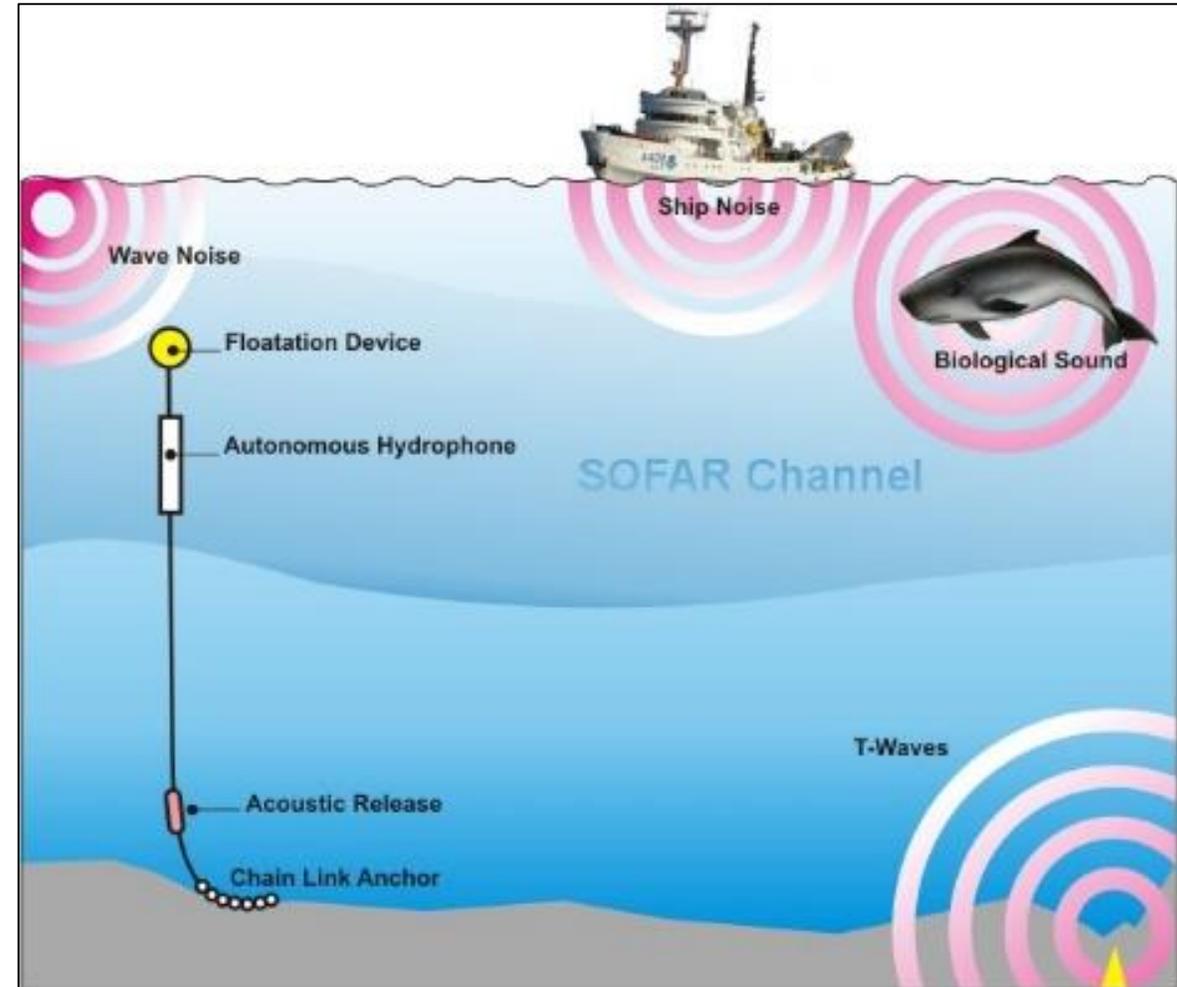
Evolución de uso del sonido (producción y recepción) en los mamíferos marinos para:

- Comunicación a larga distancia
 - Reproducción
 - Marcar territorio
 - Mantener la estructura del grupo social
- Comunicación a corta distancia
 - Interacciones sociales
 - Agresión
 - Madre-cría
 - Identificación individual
- Ecolocalización para caza y navegación
- → Animales sociables

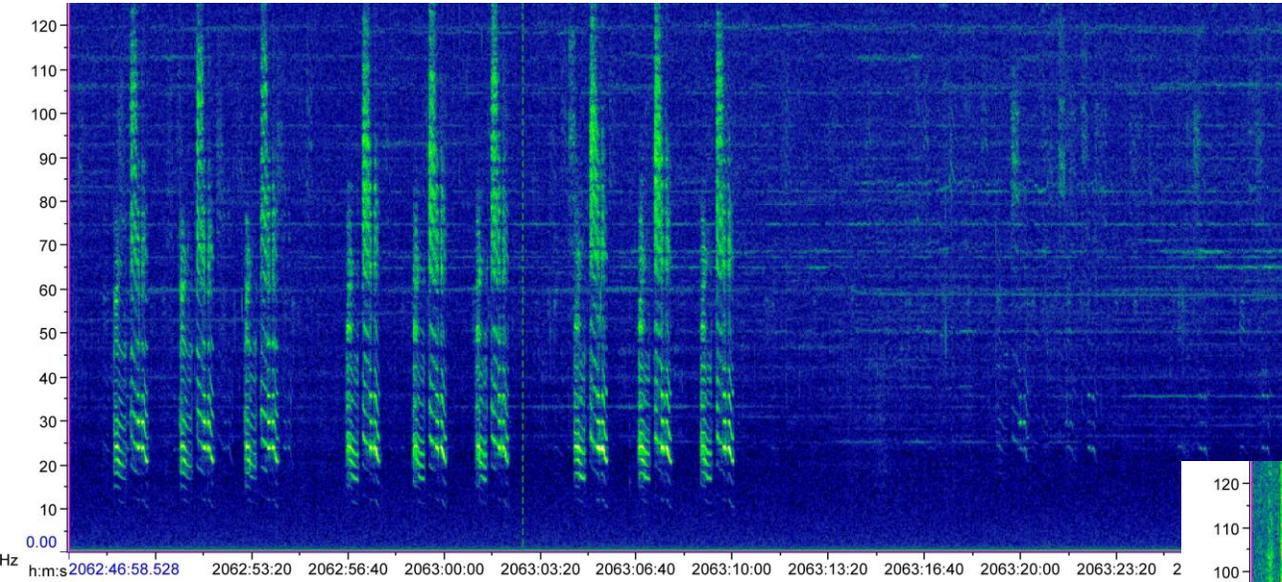


El Sonido en el Océano

- Sound Fixing and Ranging Channel (SOFAR)
- o Canal Sonoro Profundo (Deep Sound Channel)
- Particularmente las bajas frecuencias

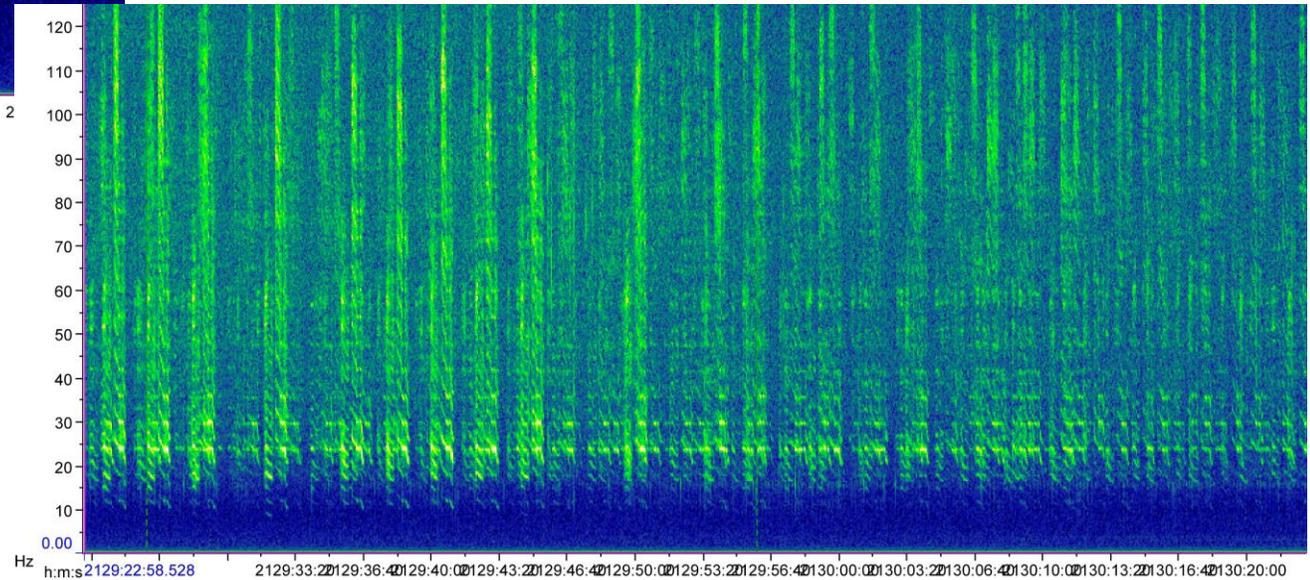


Monitoreando las ballenas azules chilenas

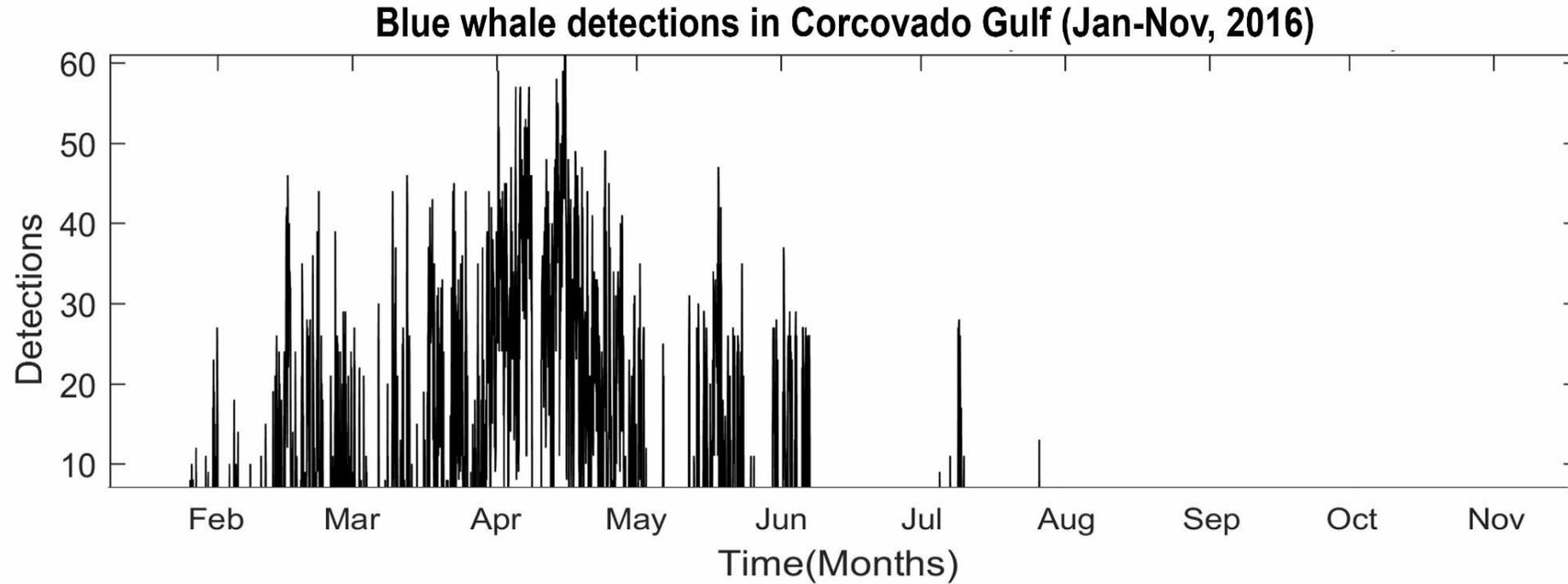


Diciembre-enero

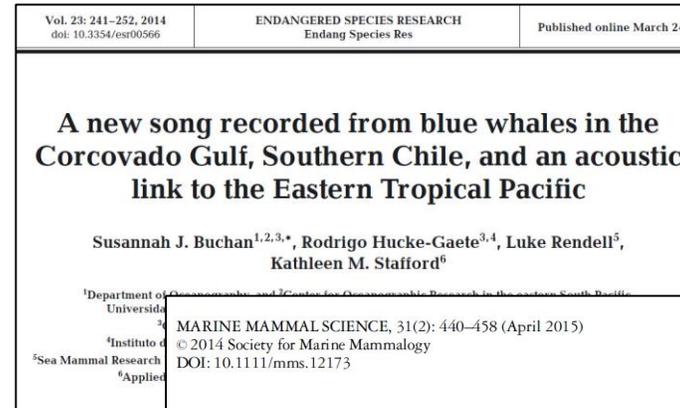
Abril



Monitoreando las ballenas azules chilenas

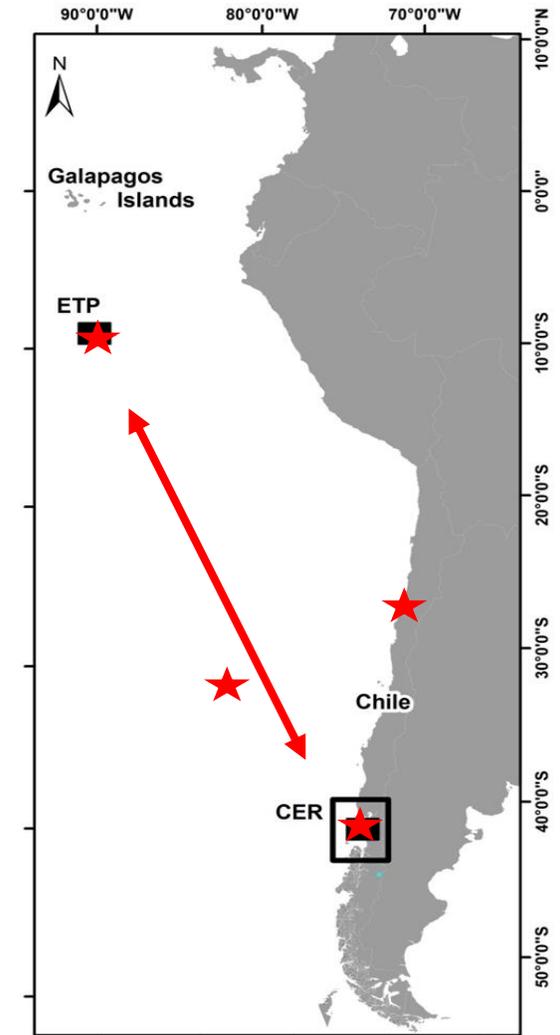


Monitoreando las ballenas azules chilenas



Seasonal occurrence of southeast Pacific blue whale songs in southern Chile and the eastern tropical Pacific

SUSANNAH J. BUCHAN,¹ Graduate Program in Oceanography and COPAS Sur-Austral program, Edificio Departamento de Oceanografía Piso 2 Barrio Universitario s/n, Universidad de Concepción, Concepción, Chile; KATHLEEN M. STAFFORD, Applied Physics Laboratory, University of Washington, 1013 NE 40th Street, Box 355640, Seattle, Washington 98105, U.S.A.; RODRIGO HUCKE-GAETE, Instituto de Ciencias Marinas y Limnológicas, Universidad Austral de Chile, Campus Isla Teja, Valdivia, Chile.

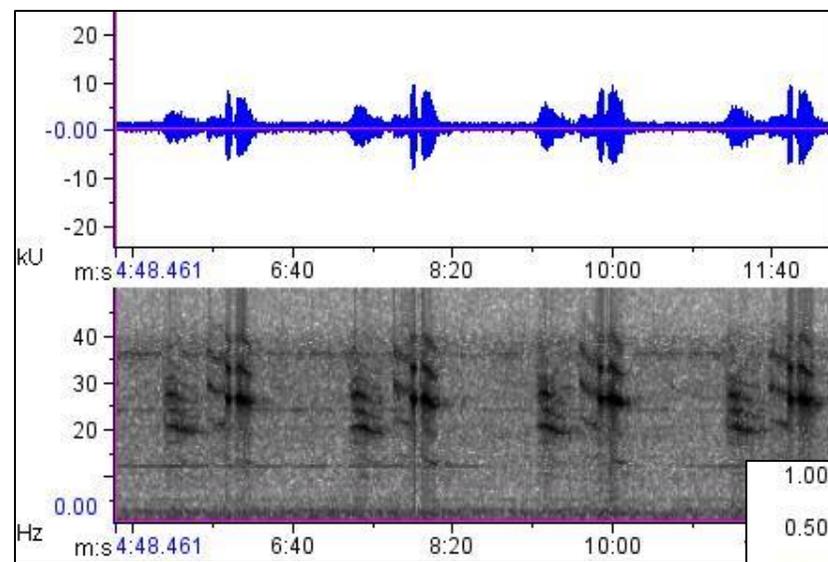


Buchan et al. 2014, 2015

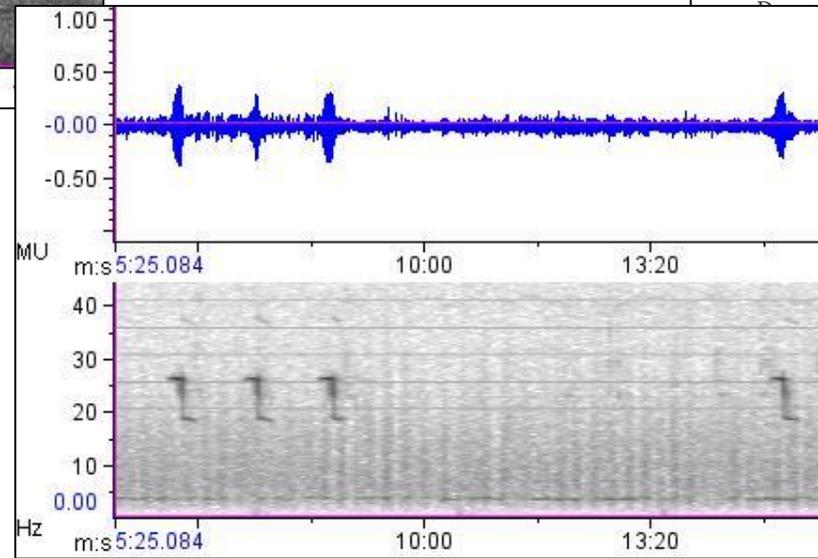
Lo que aprendimos con el estudio del “canto chileno”

- Migración parcial entre la Patagonia y Pacifico tropical
- Presencia en el norte de Chile
- Presencia en Juan Fernández

Monitoreando las ballenas azules antárticas



Canto chileno

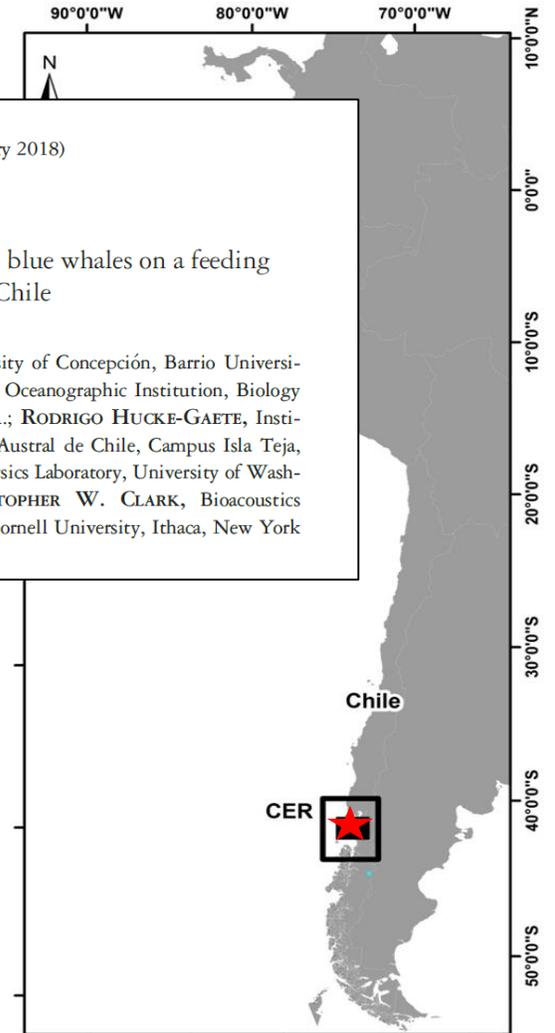


Canto antártico

MARINE MAMMAL SCIENCE, 34(1): 220–228 (January 2018)
© 2017 Society for Marine Mammalogy
DOI: 10.1111/mms.12441

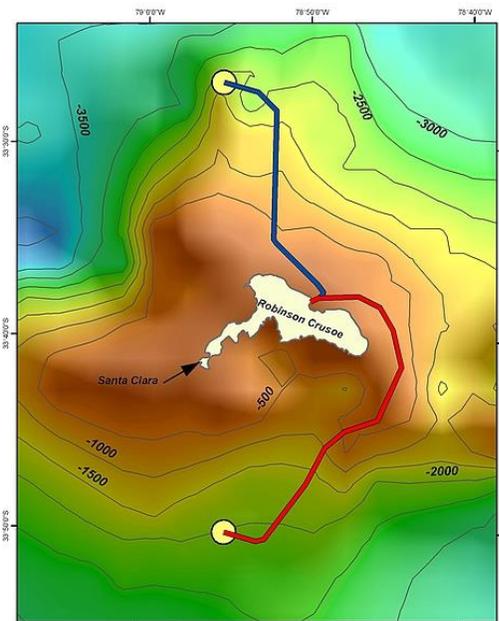
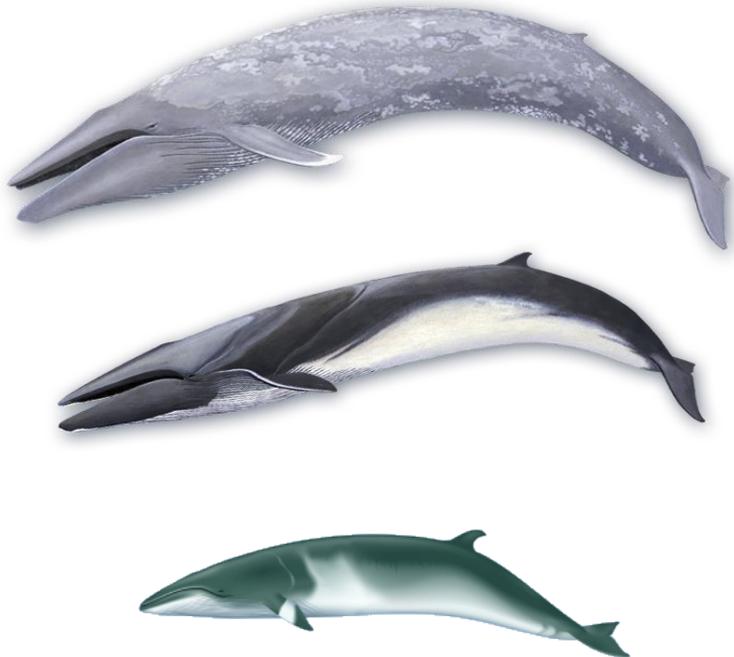
Occasional acoustic presence of Antarctic blue whales on a feeding ground in southern Chile

SUSANNAH J. BUCHAN,¹ COPAS Sur-Austral, University of Concepción, Barrio Universitario s/n, Concepción 4030000, Chile and Woods Hole Oceanographic Institution, Biology Department, Woods Hole, Massachusetts 02543, U.S.A.; RODRIGO HUCKE-GAETE, Instituciones Marinas y Limnológicas, Universidad Austral de Chile, Campus Isla Teja, Chile; KATHLEEN M. STAFFORD, Applied Physics Laboratory, University of Washington, Seattle, Washington 98105, U.S.A.; CHRISTOPHER W. CLARK, Bioacoustics Program, Cornell Laboratory of Ornithology, Cornell University, Ithaca, New York U.S.A.



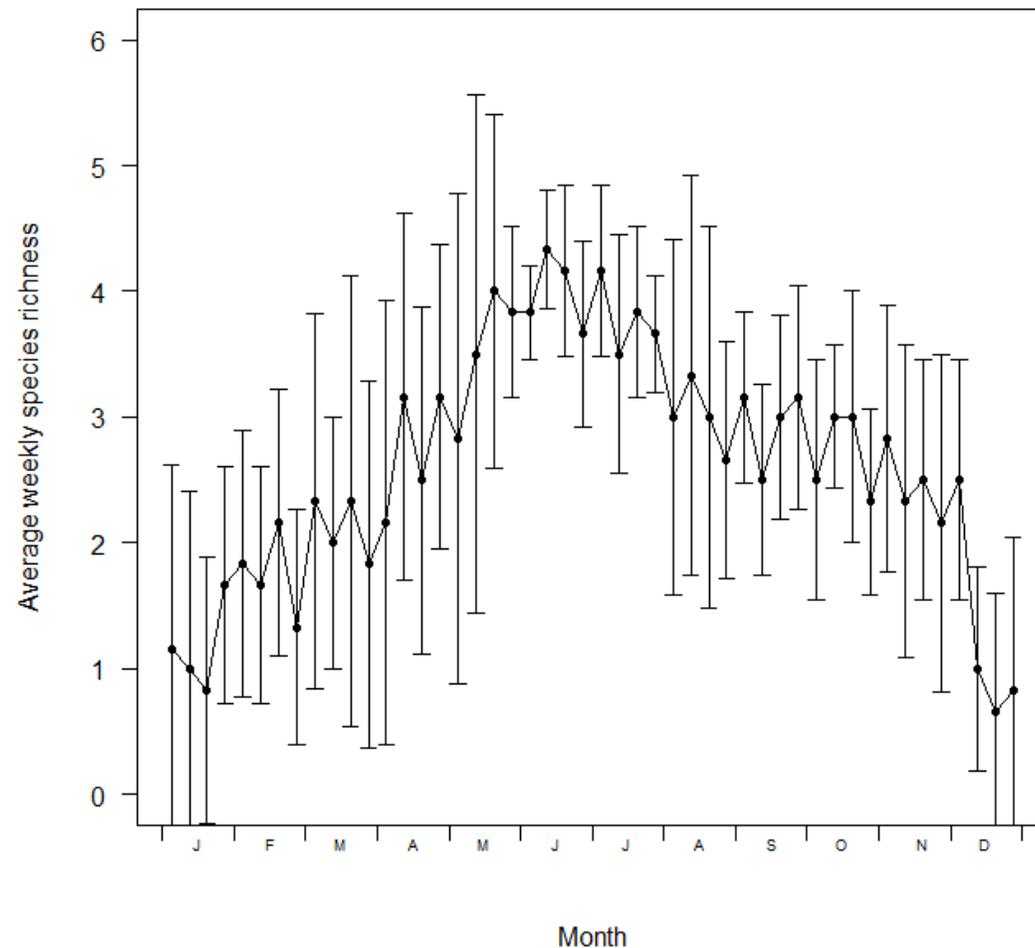
Monitoreando ballenas en Juan Fernandez

- 4 dialectos de ballenas azules
- Ballena fin
- Ballena minke

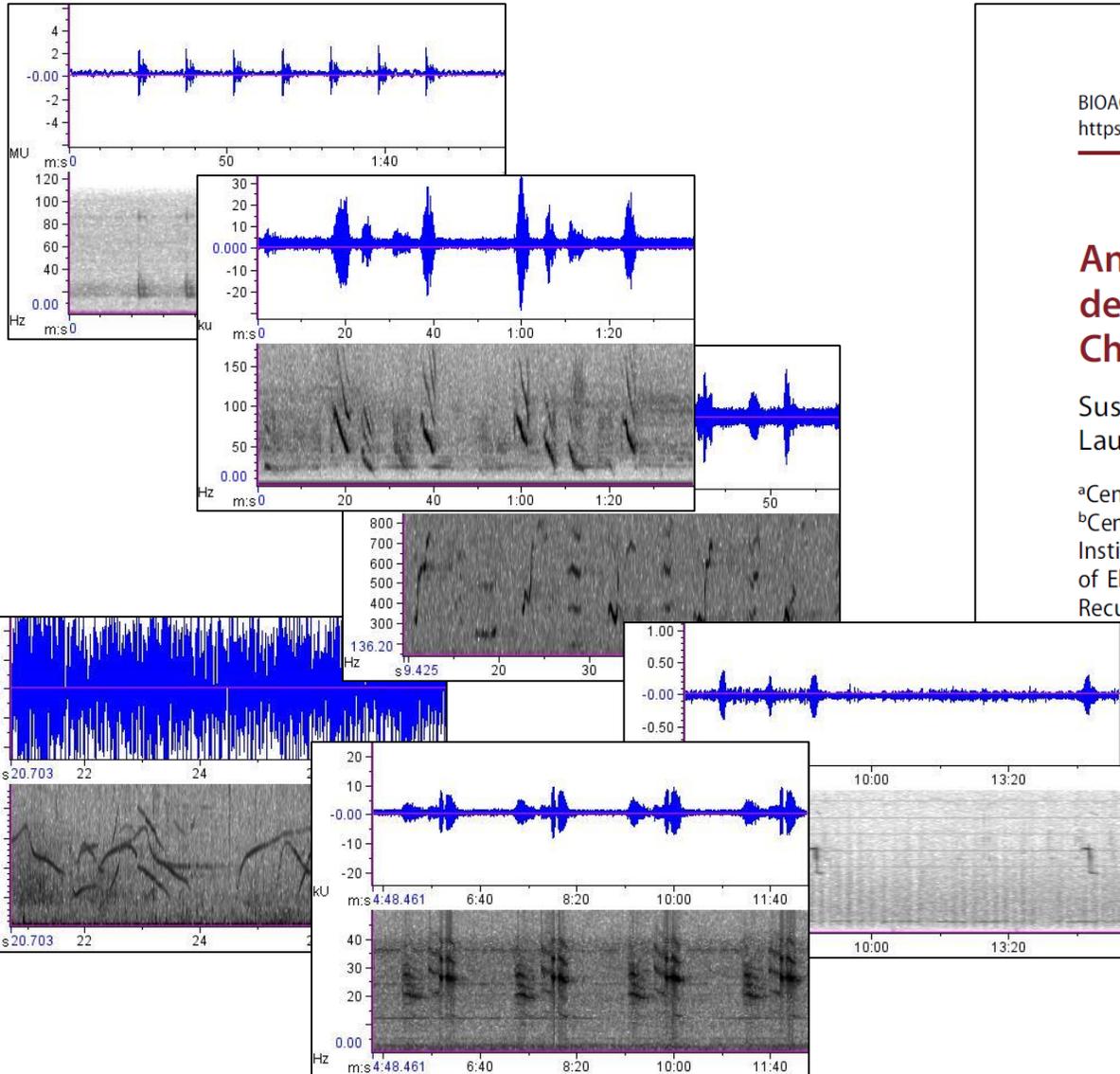


CTBTO
PREPARATORY COMMISSION
preparatory commission for the
comprehensive nuclear-test-ban
treaty organization

Species richness per week off Juan Fernandez, 2007-2009 & 2014-2016



Técnicas analíticas avanzadas



BIOACOUSTICS
<https://doi.org/10.1080/09524622.2018.1563758>



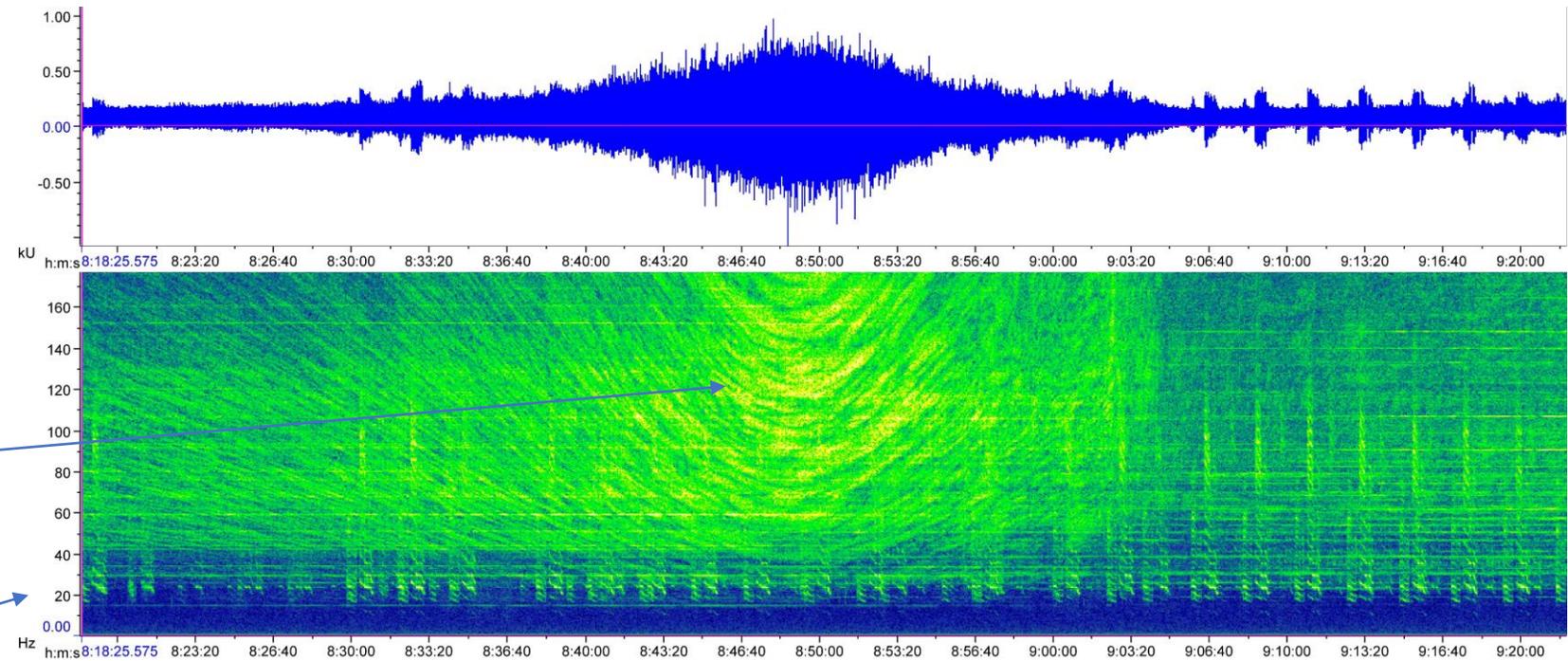
Check for updates

An unsupervised Hidden Markov Model-based system for the detection and classification of blue whale vocalizations off Chile

Susannah J. Buchan^{a,b,c}, Rodrigo Mahú^d, Jorge Wuth^d, Naysa Balcazar-Cabrera^a, Laura Gutierrez^e, Sergio Neira^a and Néstor Becerra Yoma^d

^aCenter for Oceanographic Research COPAS Sur-Austral, University of Concepción, Concepción, Chile; ^bCentro de Estudios Avanzados en Zonas Áridas (CEAZA), Coquimbo, Chile; ^cWoods Hole Oceanographic Institution, Biology Department, Woods Hole, MA, USA; ^dSpeech and Processing Transmission Lab., Dept. of Electrical Engineering, Universidad de Chile, Santiago, Chile; ^eCentro de Investigación y Gestión de Recursos Naturales (CIGREN), Universidad de Valparaíso, Valparaíso, Chile

Contaminación acústica

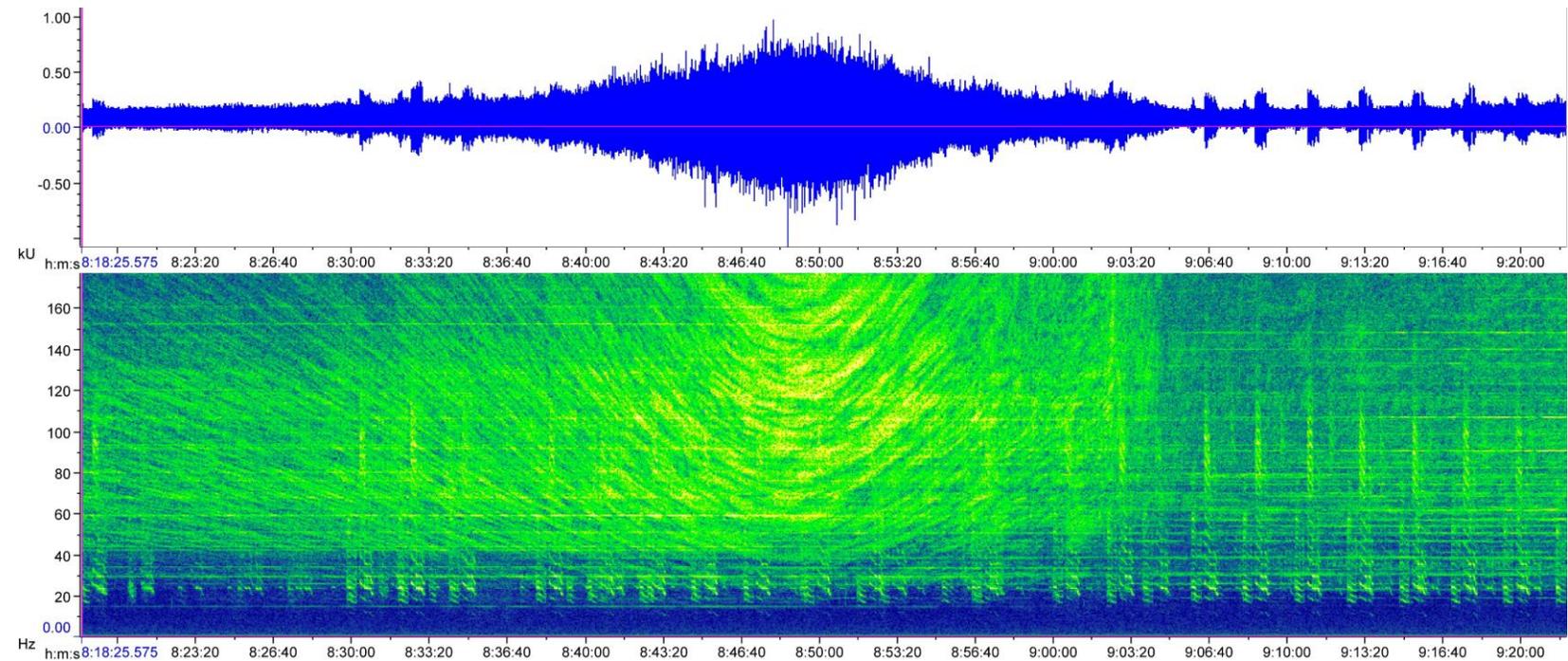


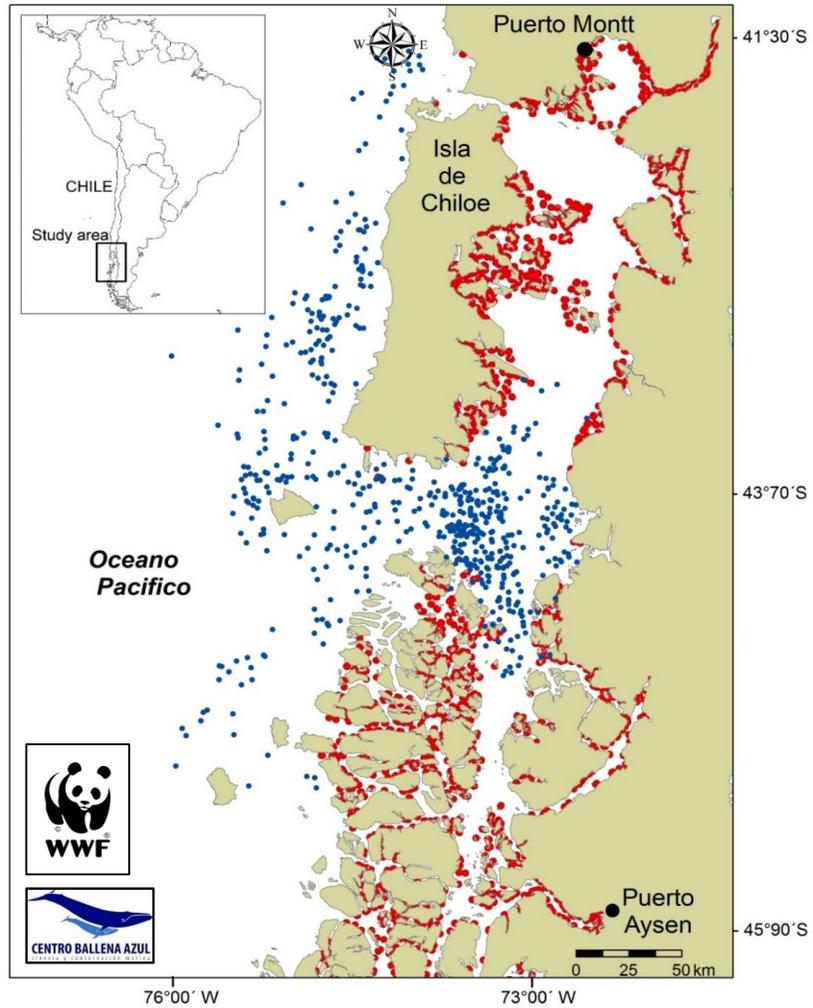
Paso de embarcación

Cantos de ballenas azules

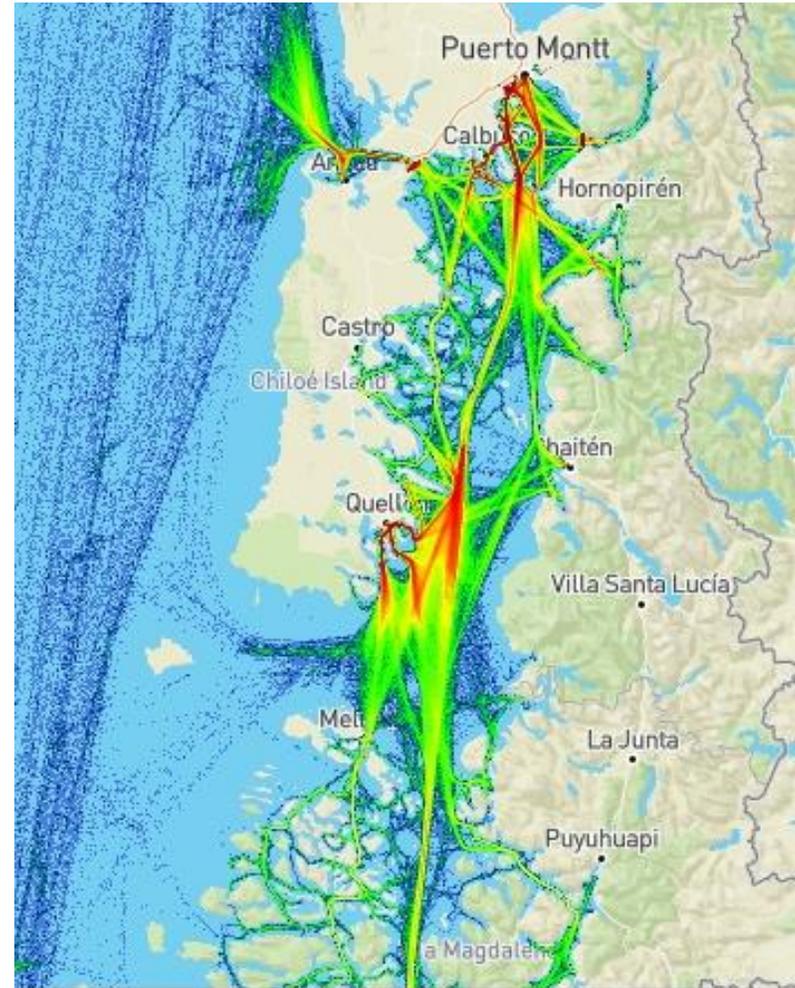
- Con el paso de una embarcación, se estima un aumento de 6 dB en promedio, representando un aumento de un 100% en niveles de ruido
- Escuchamos dos veces mas embarcaciones en verano cuando las ballenas están en el área

Contaminación acústica

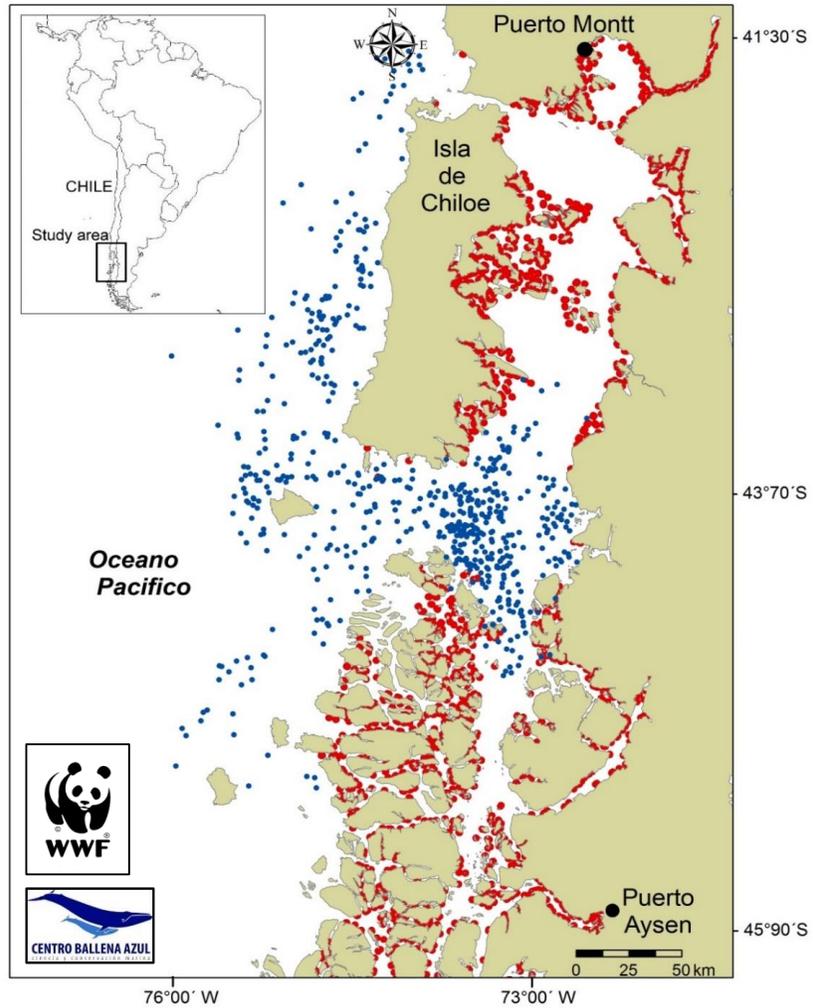




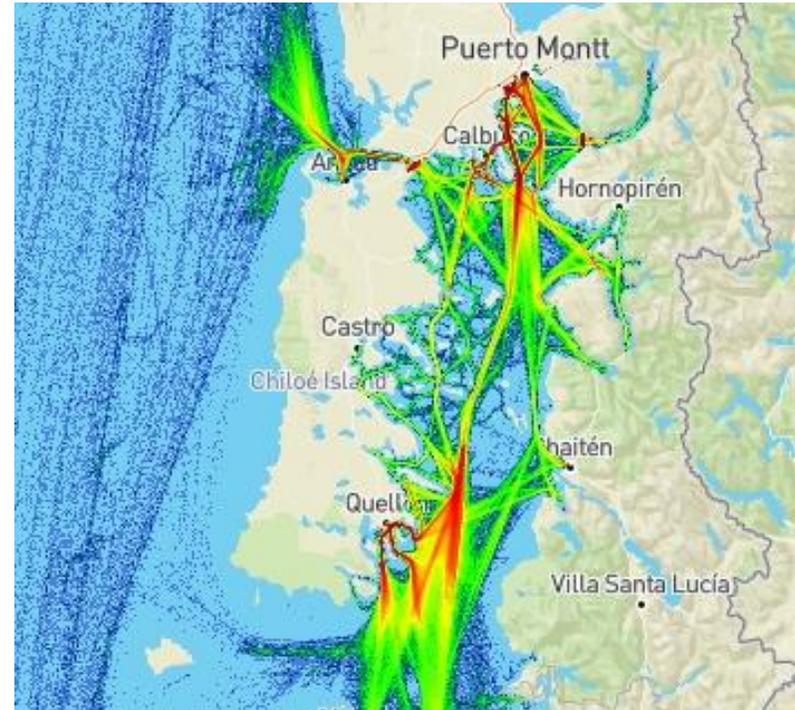
- Avistamientos de ballenas azules
- Concesiones acuícolas



marinetraffic.com



- Avistamientos de ballenas azules
- Concesiones acuícolas



Fuente: NOAA

Evidencia de impactos en mamíferos marinos

Vol. 395: 201–222, 2009 doi: 10.3354/meps08402	MARINE ECOLOGY PROGRESS SERIES Mar Ecol Prog Ser	Published December 3
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Contribution to the Theme Section 'Acoustics in marine ecology'

Acoustic masking in marine ecosystems: intuitions, analysis, and implication

Christopher W. Clark^{1,*}, William T. Ellison², Brandon L. Southall^{3,4}, Leila Hatch⁵,
Sofie M. Van Parijs⁶, Adam Frankel², Dimitri Ponirakis¹

¹Bioacoustics Research Program, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850, USA
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³Southall Environmental Associates, 911 Center Street, Suite B, Santa Cruz, California 95060, USA
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Vol. 32: 153–167, 2017 doi: 10.3354/esr00797	ENDANGERED SPECIES RESEARCH Endang Species Res	Published February 23
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Contribution to the Theme Section '21st century paradigms for measuring and managing the effects of anthropogenic ocean noise'

Assessing the risk of chronic shipping noise to baleen whales off Southern California, USA

Jessica V. Redfern^{1,*}, Leila T. Hatch², Chris Caldwell³, Monica L. DeAngelis⁴,
Jason Gedamke⁵, Sean Hastings³, Laurel Henderson⁶, Megan F. McKenna⁷,
Thomas J. Moore¹, Michael B. Porter⁶

¹Marine Mammal and Turtle Division, Southwest Fisheries Science Center, NOAA Fisheries, 8901 La Jolla Shores Drive, La Jolla, CA 92037, USA
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⁶Heat, Light, and Sound Research, 1625 High Bluff Drive, Suite 211, San Diego, CA 92130, USA
⁷Natural Sounds and Night Skies Division, National Park Service, 1201 Oakridge Drive, Fort Collins, CO 80525, USA

PROCEEDINGS
— OF —
THE ROYAL SOCIETY **B**

Proc. R. Soc. B (2012) **279**, 2363–2368
doi:10.1098/rspb.2011.2429
Published online 8 February 2012

Evidence that ship noise increases stress in right whales

Rosalind M. Rolland^{1,*}, Susan E. Parks^{2,†}, Kathleen E. Hunt¹,
Manuel Castellote³, Peter J. Corkeron^{4,‡}, Douglas P. Nowacek⁵,
Samuel K. Wasser⁶ and Scott D. Kraus¹

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²Applied Research Laboratory, The Pennsylvania State University, State College, PA 16804, USA
³Alaska Fisheries Science Center, NOAA National Marine Mammal Laboratory, Seattle, WA 98115, USA
⁴Bioacoustics Research Program, Cornell Lab of Ornithology, Ithaca, NY 14850, USA
⁵Nicholas School of the Environment and Pratt School of Engineering, Duke University Marine Laboratory, Beaufort, NC 28516, USA
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Vol. 30: 171–186, 2016 doi: 10.3354/esr00722	ENDANGERED SPECIES RESEARCH Endang Species Res	Published May 31
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Contribution to the Theme Section '21st century paradigms for measuring and managing the effects of anthropogenic ocean noise'

Can you hear me here? Managing acoustic habitat in US waters

Leila T. Hatch^{1,*}, Charles M. Wahle², Jason Gedamke³, Jolie Harrison⁴,
Benjamin Laws⁴, Sue E. Moore⁵, John H. Stadler⁶, Sofie M. Van Parijs⁷

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⁴Office of Protected Resources, NOAA Fisheries, 1315 East West Highway, Silver Spring, MD 20910, USA
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⁶Oregon-Washington Coastal Area Office, West Coast Region, NOAA Fisheries, 510 Desmond Dr SE, Lacey, WA 98503, USA
⁷Northeast Fisheries Science Center, NOAA Fisheries, 166 Water Street, Woods Hole, MA 02543, USA

Impactos acústicos encontrados

- Estrés
- Enmascaramiento y reducción de espacio de comunicación
- Cambios conductuales
- Daños auditivos temporarios y permanentes
- Casos mas severos: muerte



Bahamas, 2000, <https://www.whoi.edu>

Evidencia de impactos en peces e invertebrados

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN Validation of trophic and anthropic underwater noise as settlement trigger in blue mussels

Received: 26 October 2015
Accepted: 31 August 2016
Published: 20 September 2016

Aurélie Jolivet^{1,2}, Rejean Tremblay³, Frédéric Olivier^{3,4}, Cédric Gervaise⁵, Rémi Sonier^{3,6}, Bertrand Genard³ & Laurent Chauvaud⁴

ICES Journal of Marine Science

ICES
CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

ICES Journal of Marine Science (2017), 74(3), 635–651. doi:10.1093/icesjms/fsw205

Quo Vadimus

A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates

Anthony D. Hawkins^{1,*} and Arthur N. Popper²

nature COMMUNICATIONS

ARTICLE

Received 23 Jul 2015 | Accepted 23 Dec 2015 | Published 5 Feb 2016

DOI: 10.1038/ncomms10544 OPEN

Anthropogenic noise increases fish mortality by predation

Stephen D. Simpson¹, Andrew N. Radford², Sophie L. Nedelec², Maud C.O. Ferrari³, Douglas P. Chivers⁴, Mark I. McCormick⁵ & Mark G. Meekan⁶

biology letters

rsbl.royalsocietypublishing.org

Global change biology

Size-dependent physiological responses of shore crabs to single and repeated playback of ship noise

Matthew A. Wale¹, Stephen D. Simpson² and Andrew N. Radford¹

Research

CrossMark
click for updates

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²Biosciences, College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4QD, UK

Cite this article: Wale MA, Simpson SD

Evaluación y mitigación

- Impactos acústicos:
 - Agudos
 - Crónicos o cumulativos

Evaluación y mitigación

- Impactos acústicos:
 - Agudos
 - Crónicos o cumulativos
- Umbrales para evitar daños temporarios y permanentes

**2018 Revision to:
Technical Guidance for Assessing the
Effects of Anthropogenic Sound on
Marine Mammal Hearing (Version 2.0)**

**Underwater Thresholds for Onset of Permanent
and Temporary Threshold Shifts**

Office of Protected Resources
National Marine Fisheries Service
Silver Spring, MD 20910



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

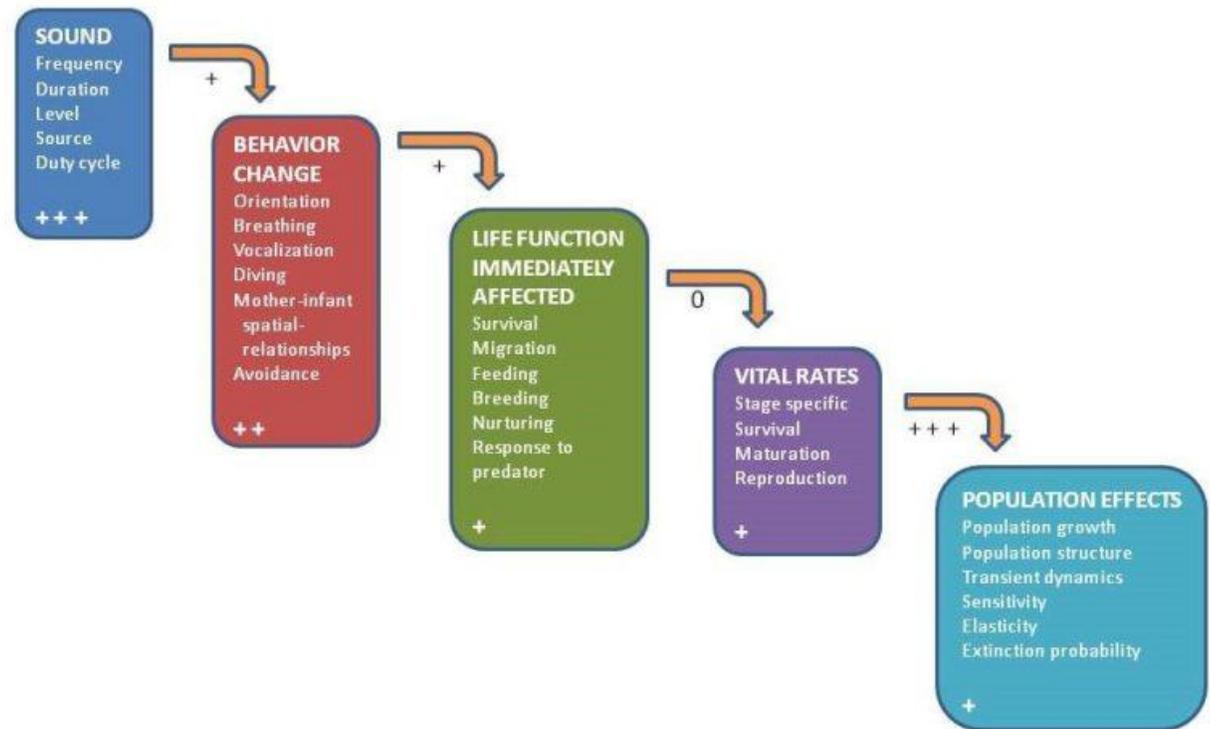
NOAA Technical Memorandum NMFS-OPR-59
April 2018



Evaluación y mitigación

- Impactos acústicos:
 - Agudos
 - Crónicos o cumulativos
- Umbrales para evitar daños temporarios y permanentes
- Modelos para evaluar efectos crónicos y cumulativos

Potential Consequences of Disturbance PCoD



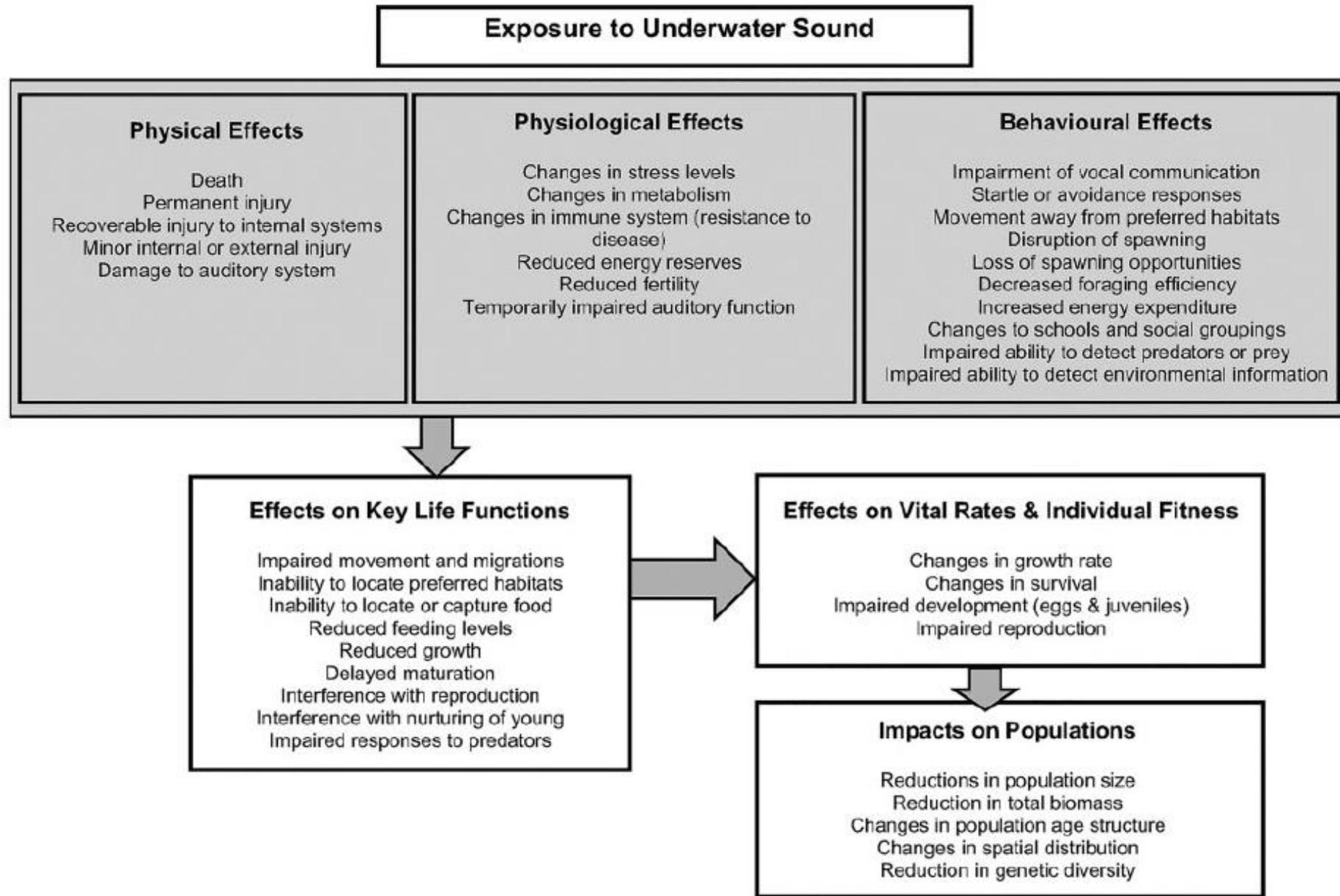


Figure 2. Effects of exposure to underwater sound on fishes (and possibly invertebrates) with respect to impact on key life functions, vital rates, and population parameters

Estrategias de gestión



Marine soundscape planning: Seeking acoustic niches for anthropogenic sound

Original paper

Ilse Van Opzeeland^{1,2,*}, Olaf Boebel¹

Article history:
Received: 1 November 2017
Accepted: 9 February 2018
Published: 29 March 2018

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²Helmholtz Institute for Functional Marine Biodiversity (HIFMB), Carl von

- Reducción de emisiones de ruido
- Reducción de velocidades de embarcaciones
- Sistemas de alerta acústica
- Estrategias especiales en Áreas Protegidas y especies vulnerables
- Programas de evaluación y monitoreo de impactos
- Estrategias al largo plazo

Our Vision: Clean Air And Safer Whales

Santa Barbara County Air Pollution Control District

Ventura County Air Pollution Control District

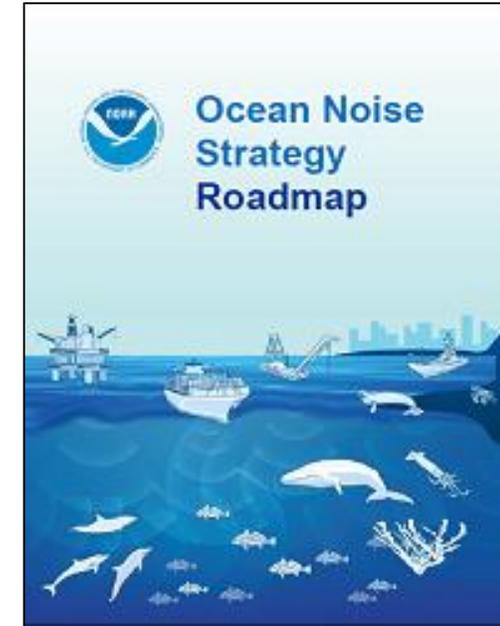
environmental DEFENSE CENTER

NATIONAL MARINE SANCTUARY FOUNDATION

FOR IMMEDIATE RELEASE
September 6, 2017
(PDF)

Contacts:
Mary Byrd, Santa Barbara County Air Pollution Control District, 805-961-8833
Mike Villegas, Ventura County Air Pollution Control District, 805-645-1440
Kristen Hislop, Environmental Defense Center, 805-963-1622
Marcus Reamer, National Marine Sanctuary Foundation, 305-496-4555

Blue Whales & Blue Skies Act Introduced in Congress
National Recognition Program for Companies that Slow Ships in Region



En Chile...

- Licitación Ministerio del Medio Ambiente 608897-55-LE18 “Elaboración de Guía Técnica para el Evaluación de Impacto por Ruido Subacuático”.
- Pensado para responder a los proyectos que entran al Servicio de Evaluación de Impacto Ambiental

GUÍA TÉCNICA PARA LA PREDICCIÓN Y EVALUACIÓN
DE IMPACTOS POR SONIDO ANTROPOGÉNICO EN
FAUNA MARINA

Investigador Principal

Dra. Susannah Buchan (Centro COPAS Sur-Austral, Universidad de Concepción)

Co-investigadores

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Asesor Internacional

Dra. Julie Patris (Universidad de Toulon)



Universidad de Concepción



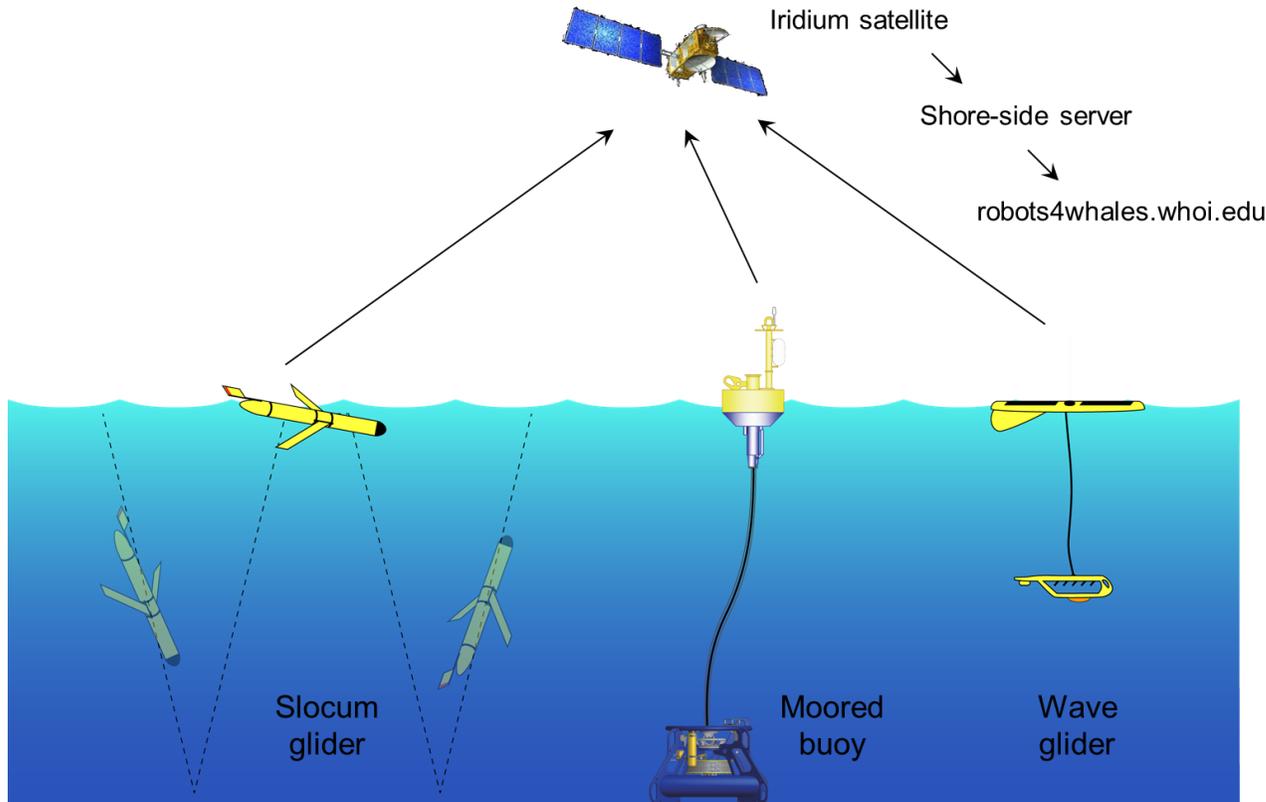
DICIEMBRE DE 2018

Monitoreo acústico en tiempo real

- Permite tomar decisiones de manejo en el momento
- Monitoreo de presencia de animales
- Monitoreo de niveles de ruido
- Apoyo a la planificación de actividades humanas
- Apoyo a la investigación ej. para muestrear animales

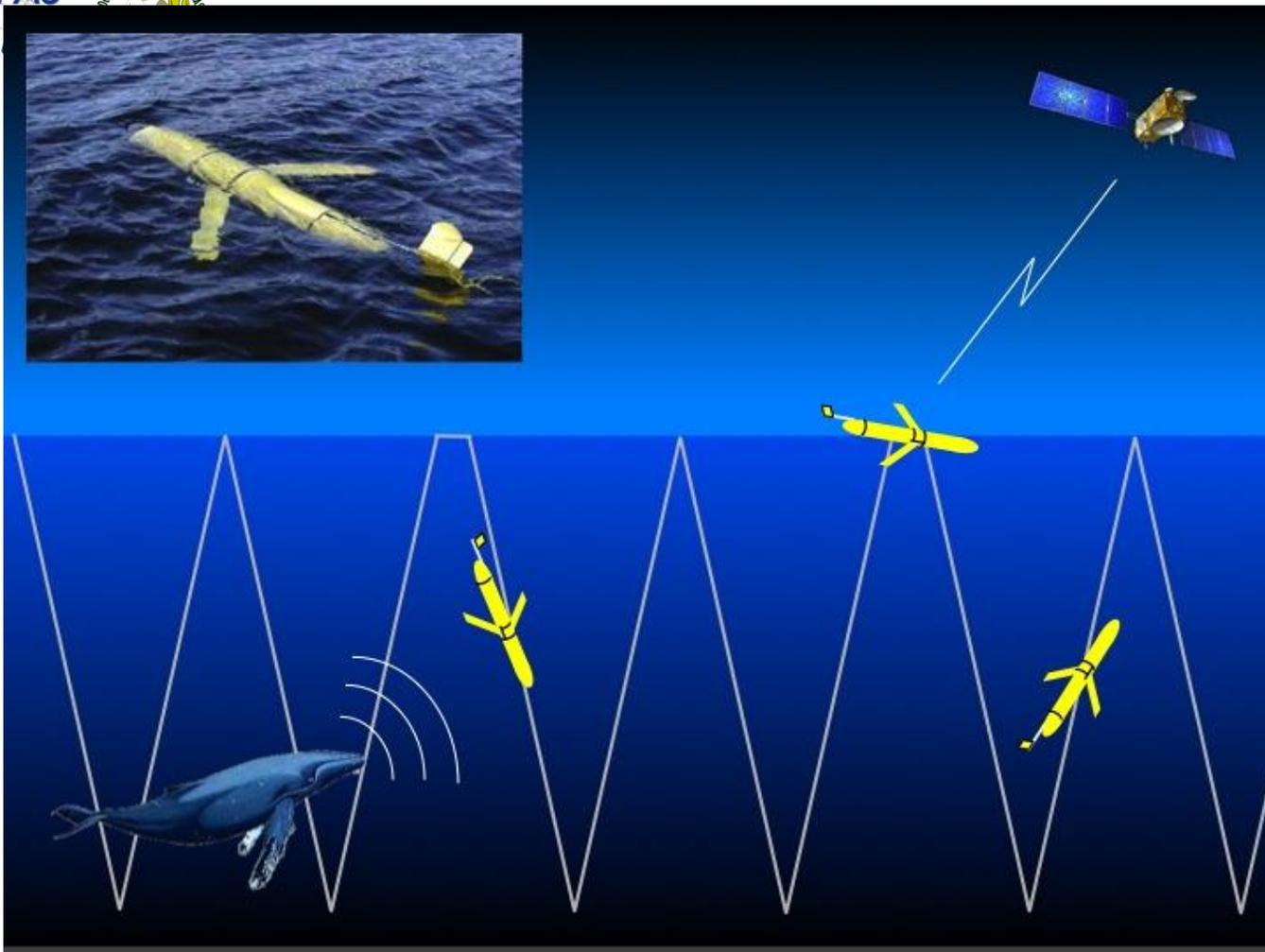


Monitoreo acústico en tiempo real



Baumgartner et al. 2013.

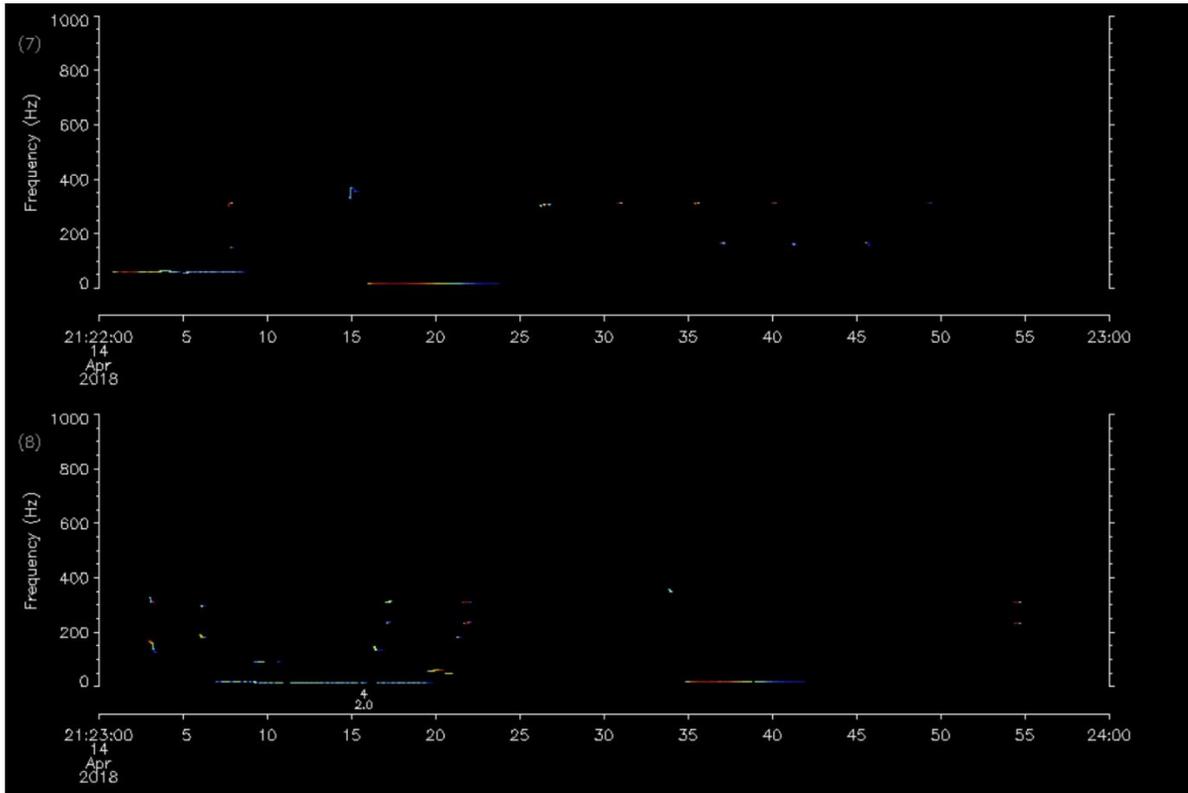
- Envío de las detecciones por satélite al servidor
- Validación por un analista de detecciones (confirmadas o posibles)
- Visualización de presencia de ballenas en la pagina web (robots4whales.who.edu)
- Comunicación por email



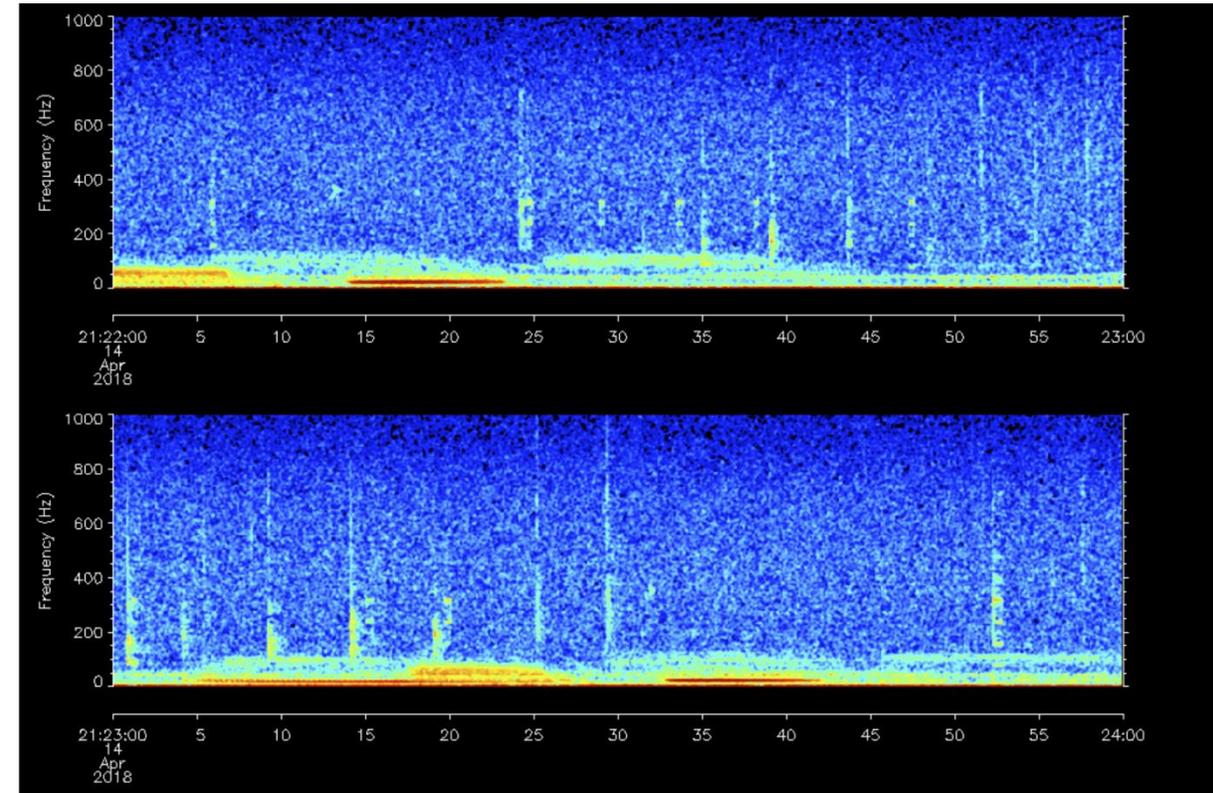
Digital Acoustic Monitoring Instrument (DMON)

Validación por analista

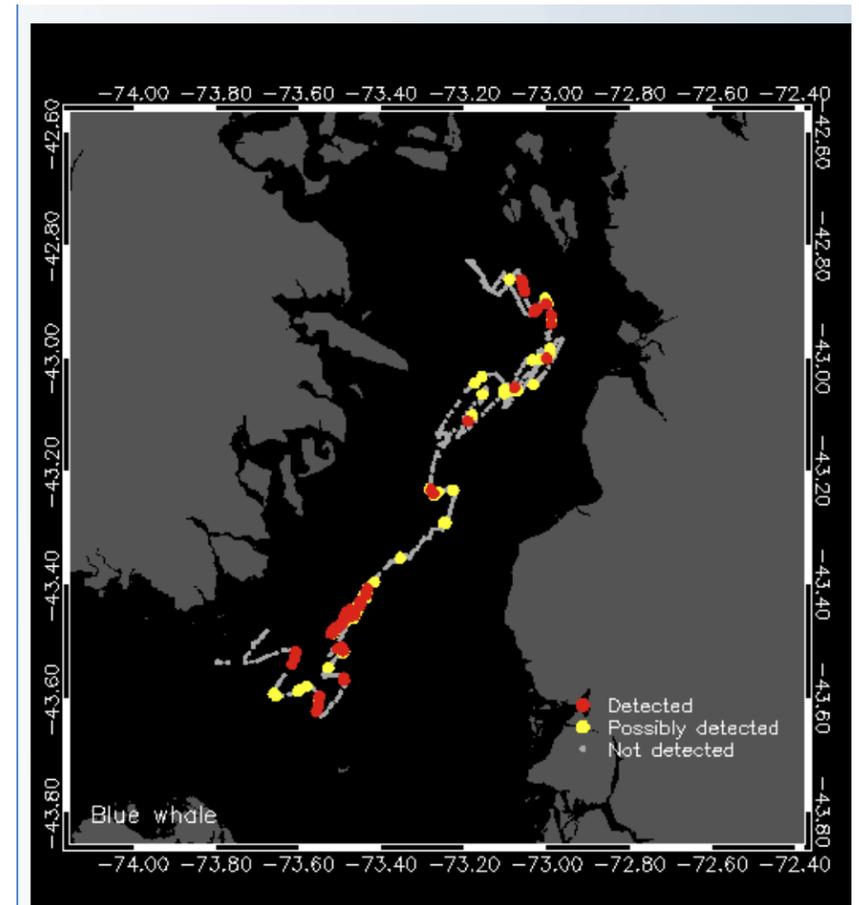
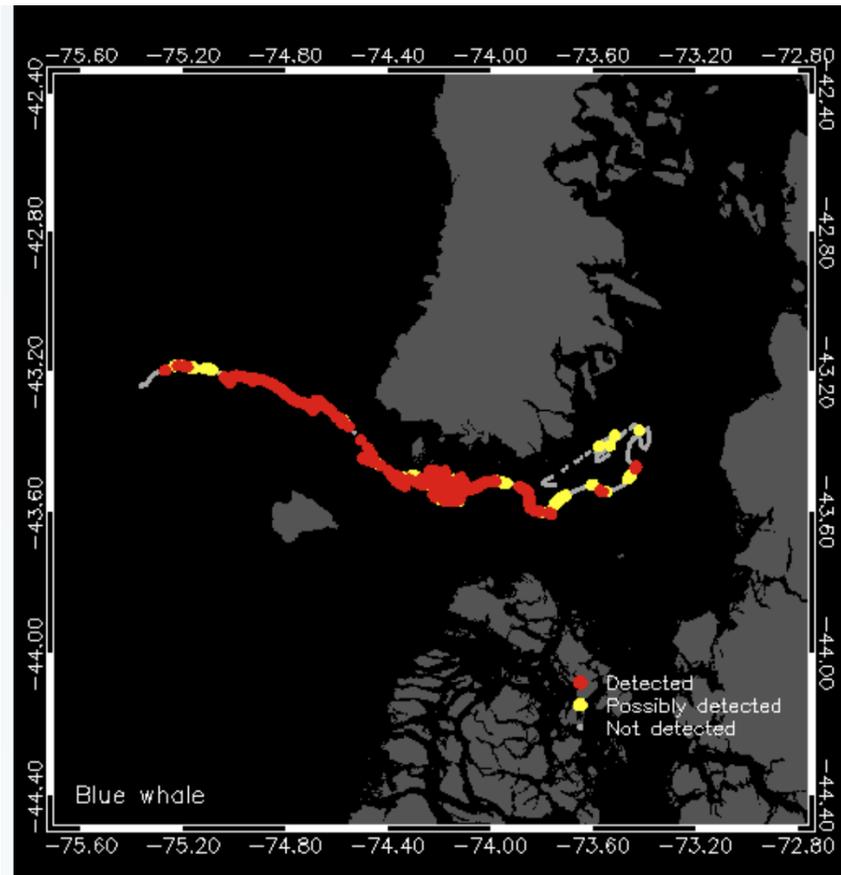
Detecciones en tiempo real revisadas por un analista



Data acústica almacenada en el glider



Mapa de presencia acústica de ballenas



- Abril 2018
- Abril-mayo 2019

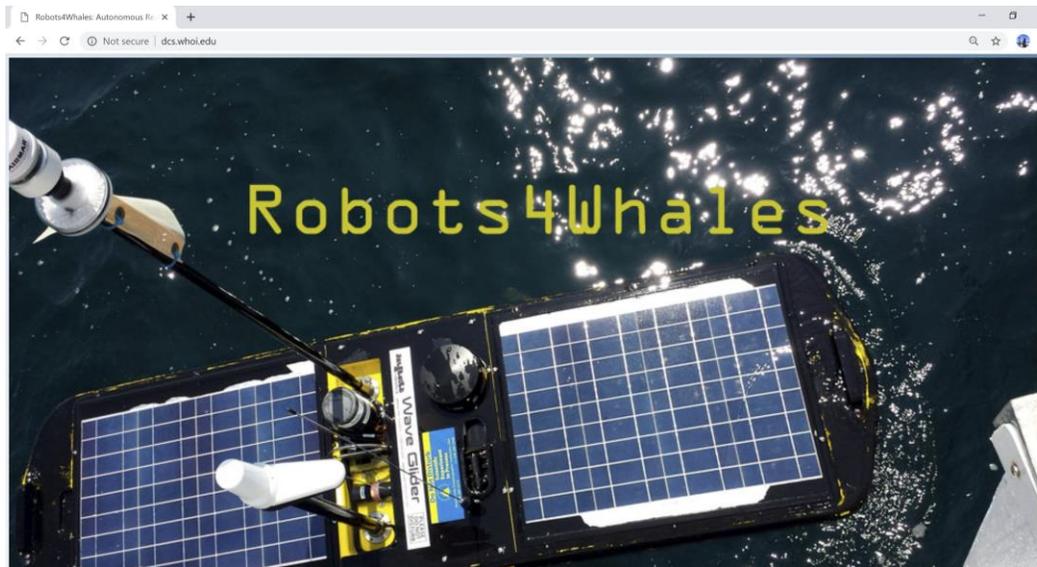
Rojo: detecciones de ballenas azules; Amarillo: detección posible

Daily analyst review:

Date	Blue whale	Humpback whale	Sei whale	Other
05/01/2019	Detected	Not detected	Not detected	Not detected
04/30/2019	Detected	Detected	Not detected	Not detected
04/29/2019	Detected	Detected	Not detected	Not detected
04/28/2019	Detected	Detected	Not detected	Not detected
04/27/2019	Detected	Detected	Possibly detected	Not detected
04/26/2019	Detected	Detected	Not detected	Possibly detected
04/25/2019	Detected	Detected	Not detected	Not detected
04/24/2019	Detected	Not detected	Not detected	Not detected
04/23/2019	Detected	Possibly detected	Not detected	Not detected
04/22/2019	Detected	Not detected	Possibly detected	Not detected
04/21/2019	Detected	Possibly detected	Possibly detected	Not detected
04/20/2019	Detected	Detected	Possibly detected	Not detected
04/19/2019	Detected	Possibly detected	Not detected	Not detected
04/18/2019	Detected	Detected	Not detected	Not detected
04/17/2019	Detected	Detected	Possibly detected	Possibly detected
04/16/2019	Detected	Not detected	Detected	Not detected
04/15/2019	Detected	Detected	Not detected	Not detected
04/14/2019	Detected	Detected	Possibly detected	Detected
04/13/2019	Detected	Not detected	Not detected	Not detected
04/12/2019	Detected	Not detected	Possibly detected	Not detected
04/11/2019	Detected	Not detected	Not detected	Not detected
04/10/2019	Possibly detected	Not detected	Not detected	Not detected
04/09/2019	Possibly detected	Not detected	Not detected	Not detected
04/08/2019	Not detected	Not detected	Not detected	Not detected

■ Detected
■ Possibly detected
■ Not detected

robots4whales.who.edu



Follow @Robots4Whales

Welcome to Robots4Whales, the website for the autonomous platform operations of marine ecologist [Mark Baumgartner](#) at the [Woods Hole Oceanographic Institution](#). We provide information on the characteristics of the sounds, and report which species have been heard to scientists on shore via satellite in near real time. Visit any of the

Projects

- Active studies**
- [Slocum Glider G1, Chiloé Island, Gulf of Corcovado, Chile](#) (April 2019)
 - [Slocum Glider G1, Chiloé Island, Inner Sea, Chile](#) (April 2019)
 - [Moored Buoy, New York Bight](#) (February 2019)
- Archived studies**
- [Slocum Glider G2, Gulf of Maine](#) (December 2018)
 - [Slocum Glider G3, Northern Mid-Atlantic Bight](#) (January 2019)
 - [Slocum Glider G3, Southern Mid-Atlantic Bight](#) (January 2019)
 - [Slocum Glider G3, Scotian Shelf \(Halifax Line\), Canada](#) (March 2019)
 - [Moored Buoy, New York Bight](#) (February 2018)
 - [Moored Buoy, Mount Desert Rock](#) (October 2018)
 - [Slocum Glider G3, Gulf of St. Lawrence \(Shediac Valley\), Canada](#) (November 2018)
 - [Slocum Glider G2, Gulf of St. Lawrence \(Orpheline Trough\), Canada](#) (October 2018)

[Robots4Whales] Blue and humpback whales detected on the Gulf of Corcovado Slocum glider



Recibidos x



Mark Baumgartner

para ▾

16:30 (hace 5 horas)



Time now: 05/01/19 16:30 EDT

Blue and humpback whales detected on the Gulf of Corcovado Slocum glider! Latest detections: 4.1 hours ago for blue whales and 27.1 hours ago for humpback whales.

Blue whale detections:

04/28/19 18:38 EDT at 43 34.89 S, 073 52.43 W (69.9 hr ago)
04/28/19 19:23 EDT at 43 34.88 S, 073 51.58 W (69.1 hr ago)
04/28/19 19:38 EDT at 43 34.89 S, 073 51.16 W (68.9 hr ago)
04/28/19 20:23 EDT at 43 34.98 S, 073 50.34 W (68.1 hr ago)
04/28/19 20:38 EDT at 43 35.00 S, 073 50.06 W (67.9 hr ago)
04/28/19 20:53 EDT at 43 35.03 S, 073 49.79 W (67.6 hr ago)
04/28/19 21:16 EDT at 43 35.09 S, 073 49.24 W (67.2 hr ago)
04/28/19 21:38 EDT at 43 35.09 S, 073 49.06 W (66.9 hr ago)
04/28/19 22:23 EDT at 43 35.36 S, 073 48.83 W (66.1 hr ago)
04/28/19 22:38 EDT at 43 35.44 S, 073 48.76 W (65.9 hr ago)
04/28/19 22:53 EDT at 43 35.53 S, 073 48.68 W (65.6 hr ago)
04/28/19 23:23 EDT at 43 35.71 S, 073 48.53 W (65.1 hr ago)
04/28/19 23:35 EDT at 43 35.79 S, 073 48.46 W (64.9 hr ago)
04/29/19 00:38 EDT at 43 35.97 S, 073 48.65 W (63.9 hr ago)
04/29/19 01:23 EDT at 43 36.14 S, 073 48.92 W (63.1 hr ago)
04/29/19 01:38 EDT at 43 36.20 S, 073 49.00 W (62.9 hr ago)
04/29/19 02:38 EDT at 43 36.35 S, 073 49.39 W (61.9 hr ago)
04/29/19 02:53 EDT at 43 36.31 S, 073 49.48 W (61.6 hr ago)
04/29/19 03:23 EDT at 43 36.27 S, 073 49.38 W (61.1 hr ago)
04/29/19 03:38 EDT at 43 36.25 S, 073 49.33 W (60.9 hr ago)
04/29/19 04:23 EDT at 43 36 19 S, 073 49 17 W (60.1 hr ago)

Humpback whale detections:

04/28/19 19:23 EDT at 43 34.88 S, 073 51.58 W (69.1 hr ago)
04/28/19 19:38 EDT at 43 34.89 S, 073 51.16 W (68.9 hr ago)
04/28/19 23:23 EDT at 43 35.71 S, 073 48.53 W (65.1 hr ago)
04/29/19 02:38 EDT at 43 36.35 S, 073 49.39 W (61.9 hr ago)
04/29/19 02:53 EDT at 43 36.31 S, 073 49.48 W (61.6 hr ago)
04/29/19 10:38 EDT at 43 35.16 S, 073 43.60 W (53.9 hr ago)
04/30/19 13:23 EDT at 43 31.94 S, 073 33.83 W (27.1 hr ago)

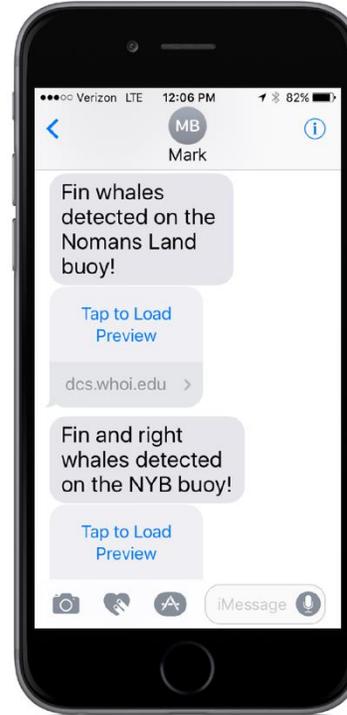
See http://dcs.whoi.edu/chiloe0419/chiloe0419_we04.shtml for more information

robots4whales.who.edu

Daily analyst review:

Date	Sei whale	Fin whale	Right whale	Humpback whale
09/04/2015	Red	Red	Red	Grey
09/03/2015	Yellow	Red	Red	Grey
09/02/2015	Yellow	Red	Red	Grey
09/01/2015	Red	Red	Yellow	Grey
08/31/2015	Yellow	Red	Grey	Grey
08/30/2015	Yellow	Red	Grey	Grey
08/29/2015	Red	Red	Grey	Red
08/28/2015	Red	Red	Grey	Grey

Text message



Email message

Mark Baumgartner

To: undisclosed-recipients;;

Fin whales detected on the Nomans Land buoy

Time now: 12/13/16 12:00 EST

Fin whales detected on the Nomans Land buoy! Latest detections: 2.8 hours ago.

Fin whale detections:

- 12/12/16 18:09 EST (17.8 hr ago)
- 12/12/16 19:09 EST (16.8 hr ago)
- 12/12/16 20:09 EST (15.8 hr ago)
- 12/12/16 21:09 EST (14.8 hr ago)
- 12/12/16 23:09 EST (12.8 hr ago)
- 12/13/16 00:09 EST (11.8 hr ago)
- 12/13/16 01:09 EST (10.8 hr ago)
- 12/13/16 02:09 EST (9.8 hr ago)
- 12/13/16 02:24 EST (9.6 hr ago)
- 12/13/16 03:09 EST (8.8 hr ago)
- 12/13/16 05:09 EST (6.8 hr ago)
- 12/13/16 06:09 EST (5.8 hr ago)
- 12/13/16 07:09 EST (4.8 hr ago)
- 12/13/16 08:09 EST (3.8 hr ago)
- 12/13/16 09:09 EST (2.8 hr ago)

See <http://dcs.who.edu/nomans0916/nomans>

AIS (future)



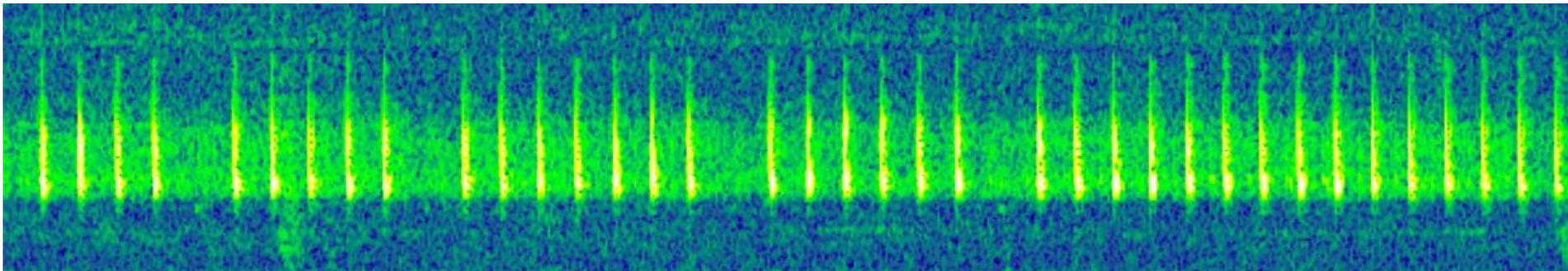
Whale Alert
app

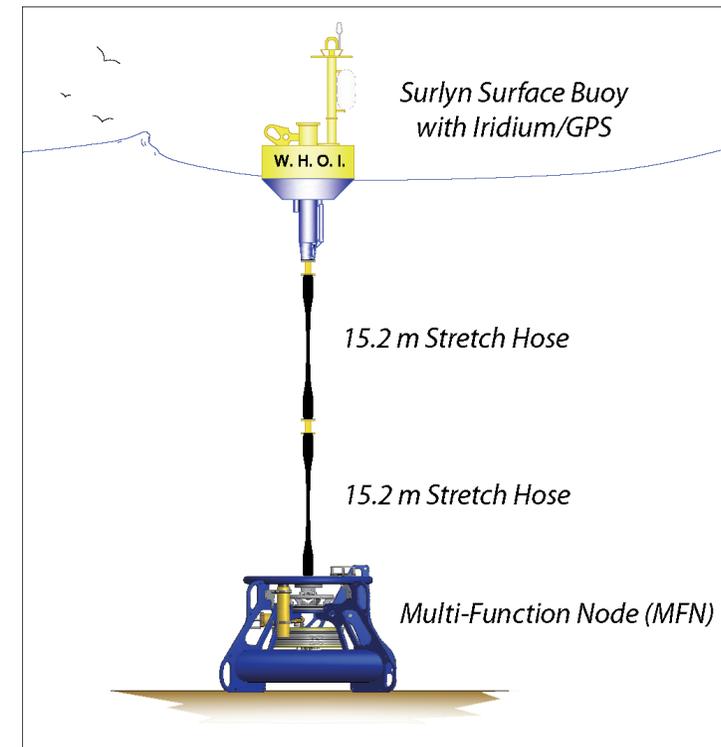
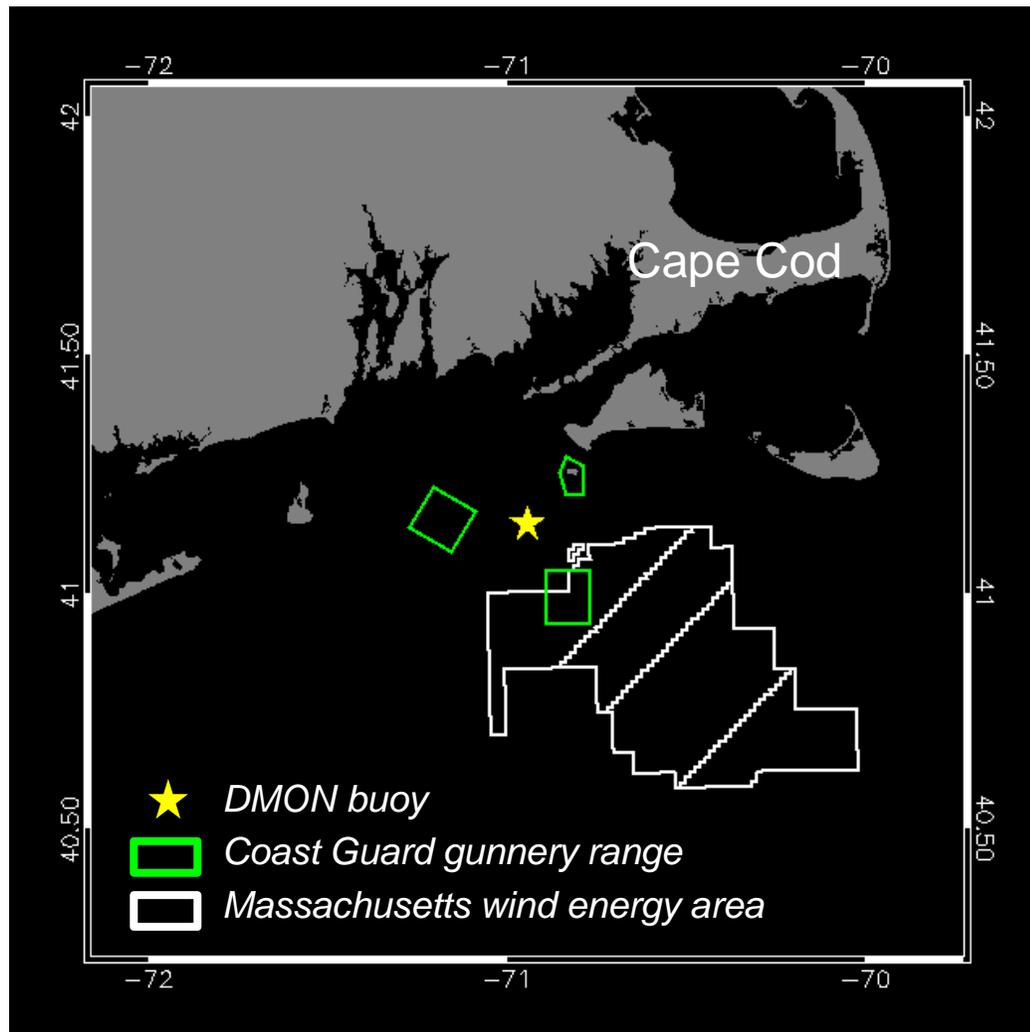
Coast Guard:
CG1View



El camino hacia un sistema de alerta acústico

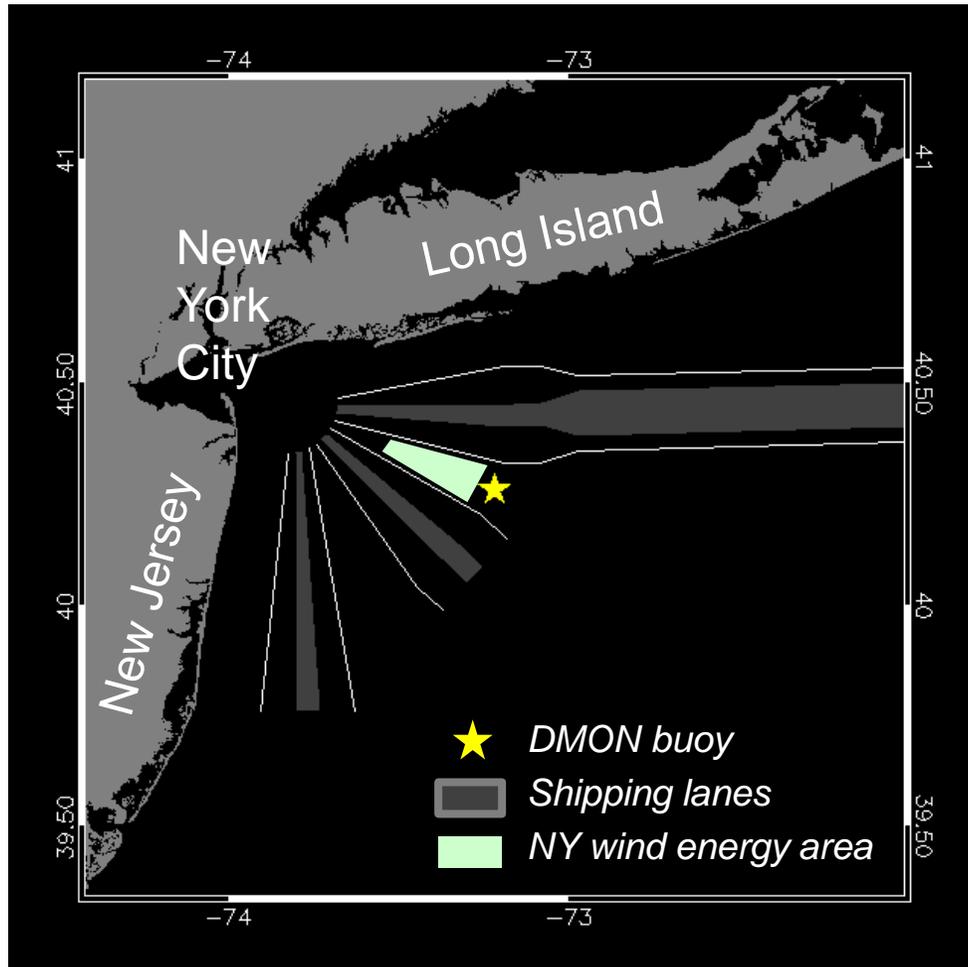
- ✓ Tecnología (DMON) implementada y funcionando
- ✓ Biblioteca de vocalizaciones para detectar especies del Pacífico Suroriental establecida
- ✓ Experiencia en anclajes del COPAS Sur-Austral en anclajes en la Patagonia y con el apoyo de WWF Chile, estamos afinando un diseño de anclaje para implementar una boya de alerta acústica en tiempo real en el Golfo Corcovado.
- A futuro, lo ideal sería una red de boyas en tiempo real y que podamos traspasar la capacidad de análisis a una agencia del estado.





- Además de restricciones legales estacionales en velocidad de embarcaciones en “Seasonal Management Areas”

Trabajo de Mark Baumgartner (WHOI) con Tim Cole, Peter Corkeron, y Sofie Van Parijs (NOAA NEFSC), y Andy Stokes (Coast Guard SE New England)



Chile, líder en conservación marina

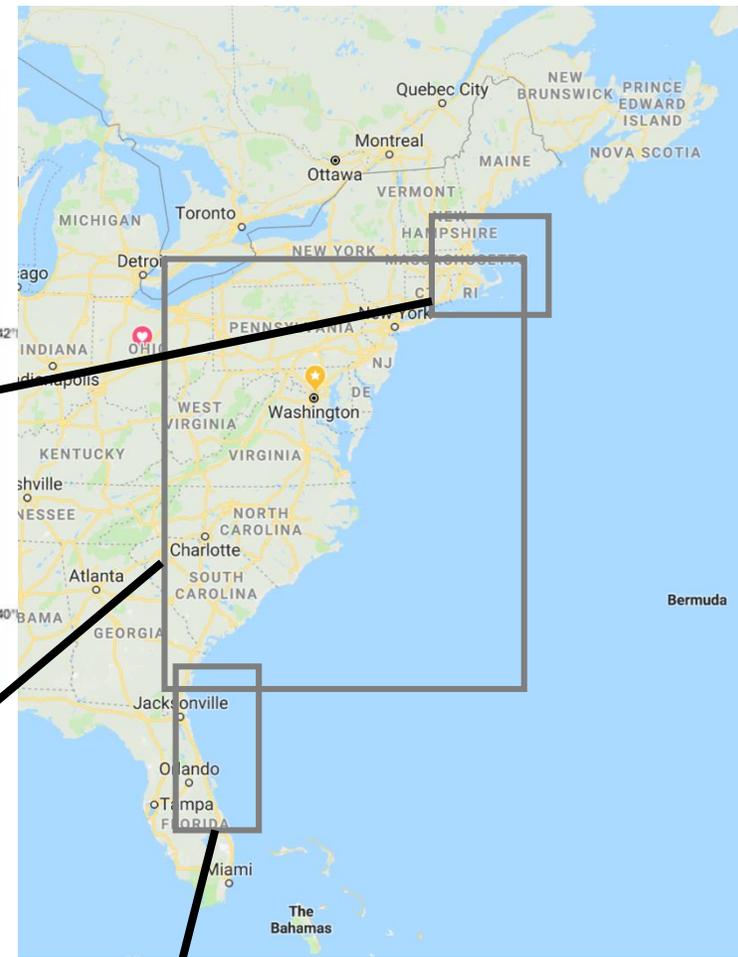
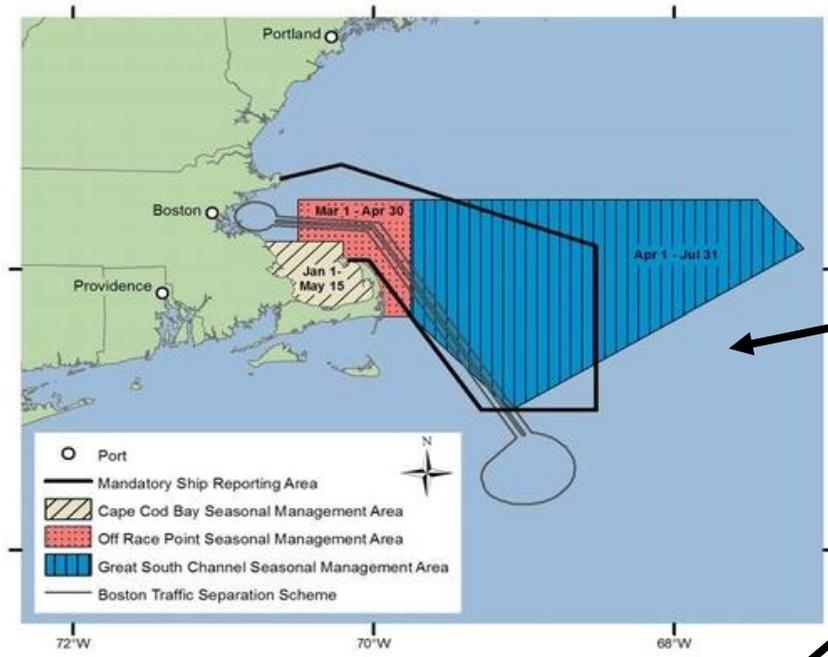
- Chile es líder en conservación marina a nivel Latinoamericano
 - Gran riqueza de recursos hidrobiológicos & 50% de las especies de cetáceos en el mundo, muchas vulnerables o en peligro
 - Administrar Áreas Marinas Protegidas implica monitoreo y protección de hábitat (acústico) de las especies objetivo
 - El aumento de actividades humanas implica mayor sobreposición con los cetáceos
 - Mayor exigencia de evaluar los impactos acústicos en los proyectos que ingresan al Servicio de Evaluación de Impacto Ambiental
- Futuro desarrollo de estrategias de mediano y largo plazo para reducir el ruido marino, y evaluar y mitigar sus impactos



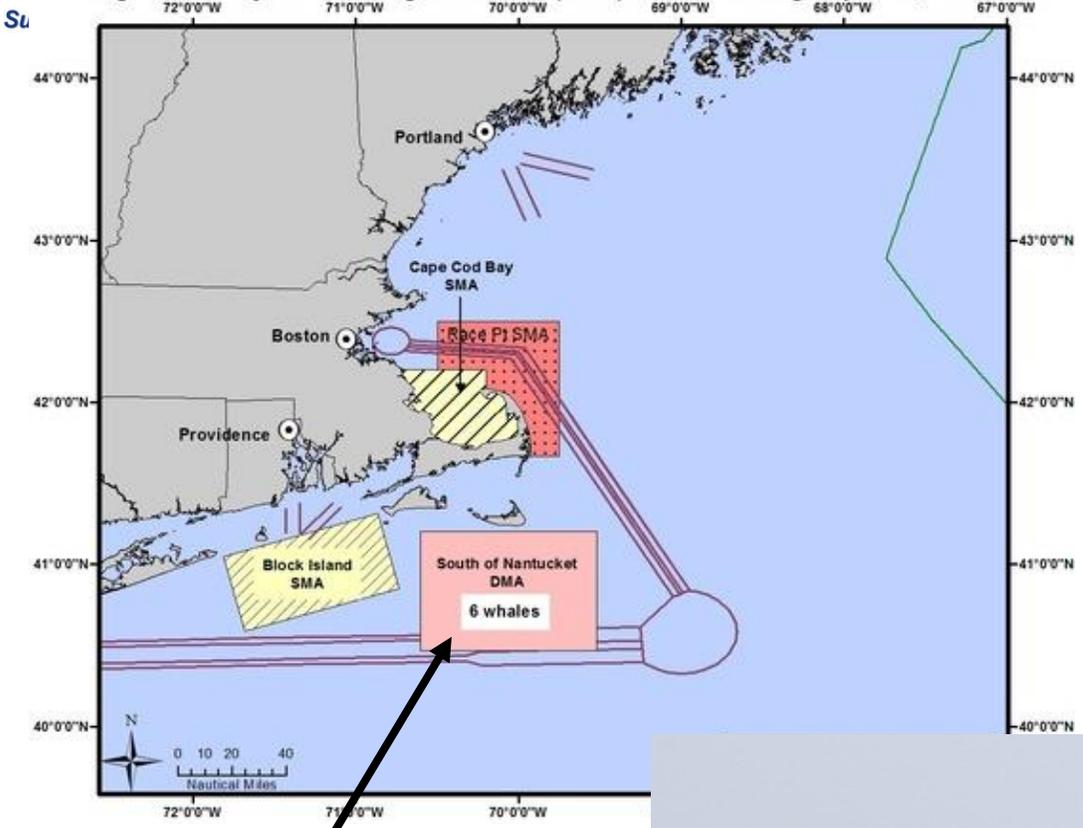
Gracias

Areas de Manejo Estacional (“Seasonal Management Areas – SMA”)

- Para proteger la Ballena franca del norte de colisiones fatales
- Embarcaciones sobre 19.8 m (65 ft) deben navegar a 10 nudos o menos
- Restricción estacional



Trabajo de Mark Baumgartner (WHOI)



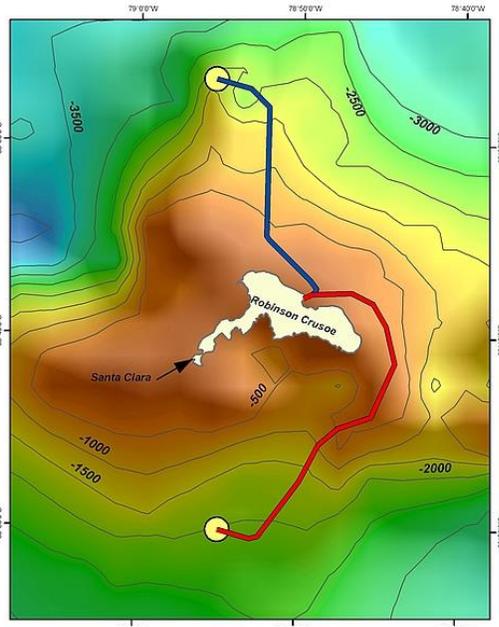
Current DMA



Areas de Manejo Dinamico ("Dynamic Management Areas - DMA")

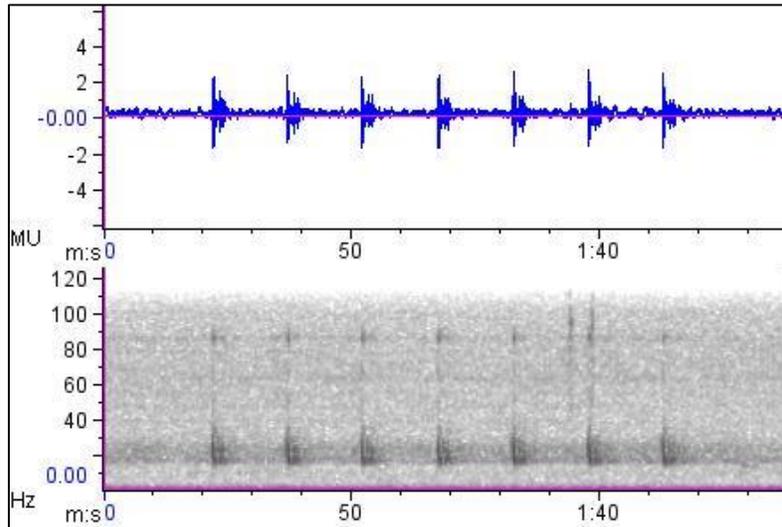
- Establecidos por observadores visuales
- Embarcaciones sobre 19.8 m (65 ft) deben navegar a 10 nudos o menos
- Voluntario
- *Se incorpora el monitoreo acústico pasivo para establecer la DMA*
- *Y el Coast Guard se contactara con las embarcaciones por VHF*

Monitoreando de ballenas en Juan Fernandez

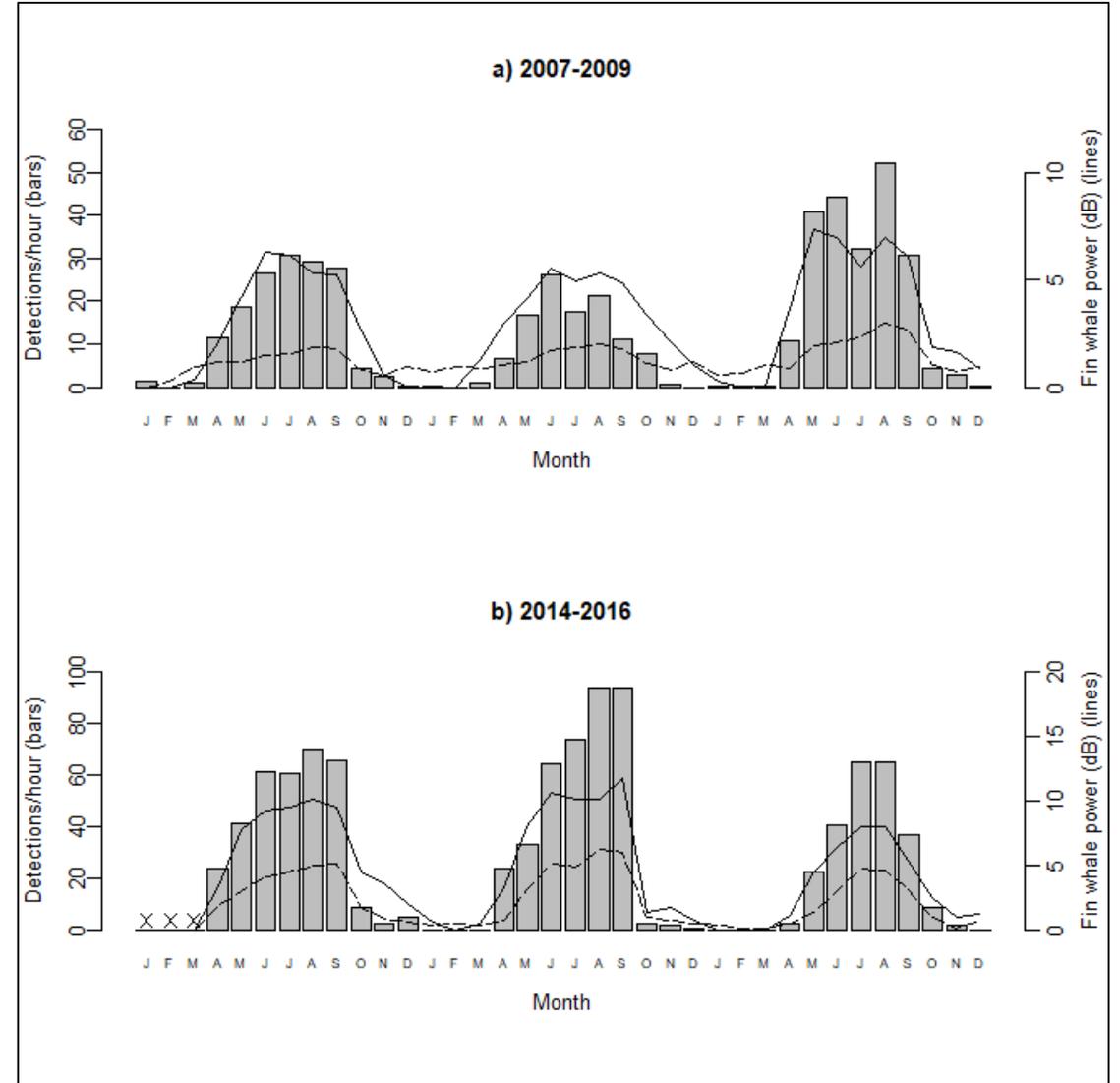


CTBTO
PREPARATORY COMMISSION

preparatory commission for the
comprehensive nuclear-test-ban
treaty organization



Canto ballena fin



Marine soundscape planning: Seeking acoustic niches for anthropogenic sound

Original paper

Article history:

Received: 1 November 2017

Accepted: 9 February 2018

Published: 29 March 2018



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Peer review:

Double blind

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²*Helmholtz Institute for Functional Marine Biodiversity (HIFMB), Carl von Ossietzky University, Oldenburg, Ammerländer Heerstrasse 231, 26129, Oldenburg, Germany*

Abstract

Both marine mammals and hydroacoustic instruments employ

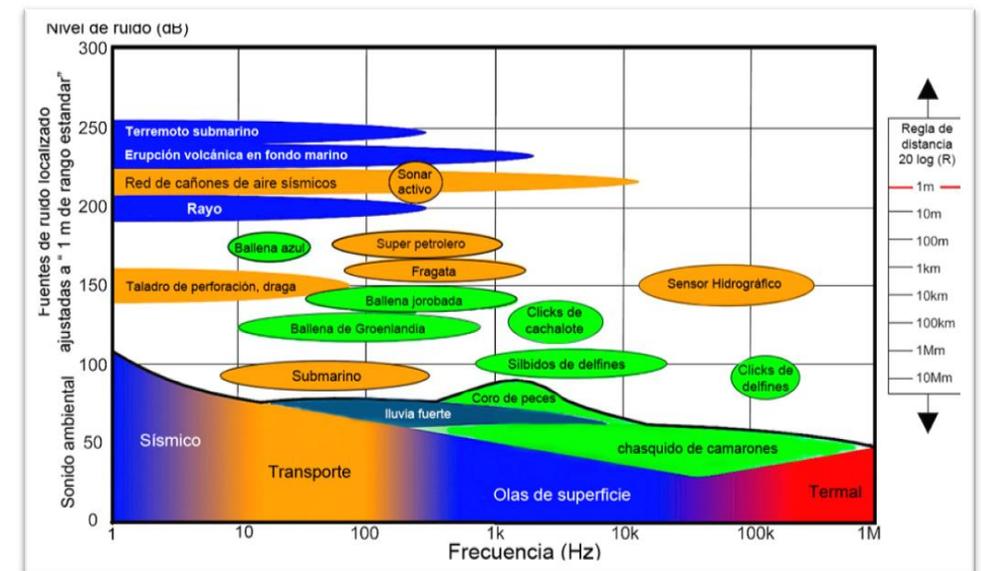
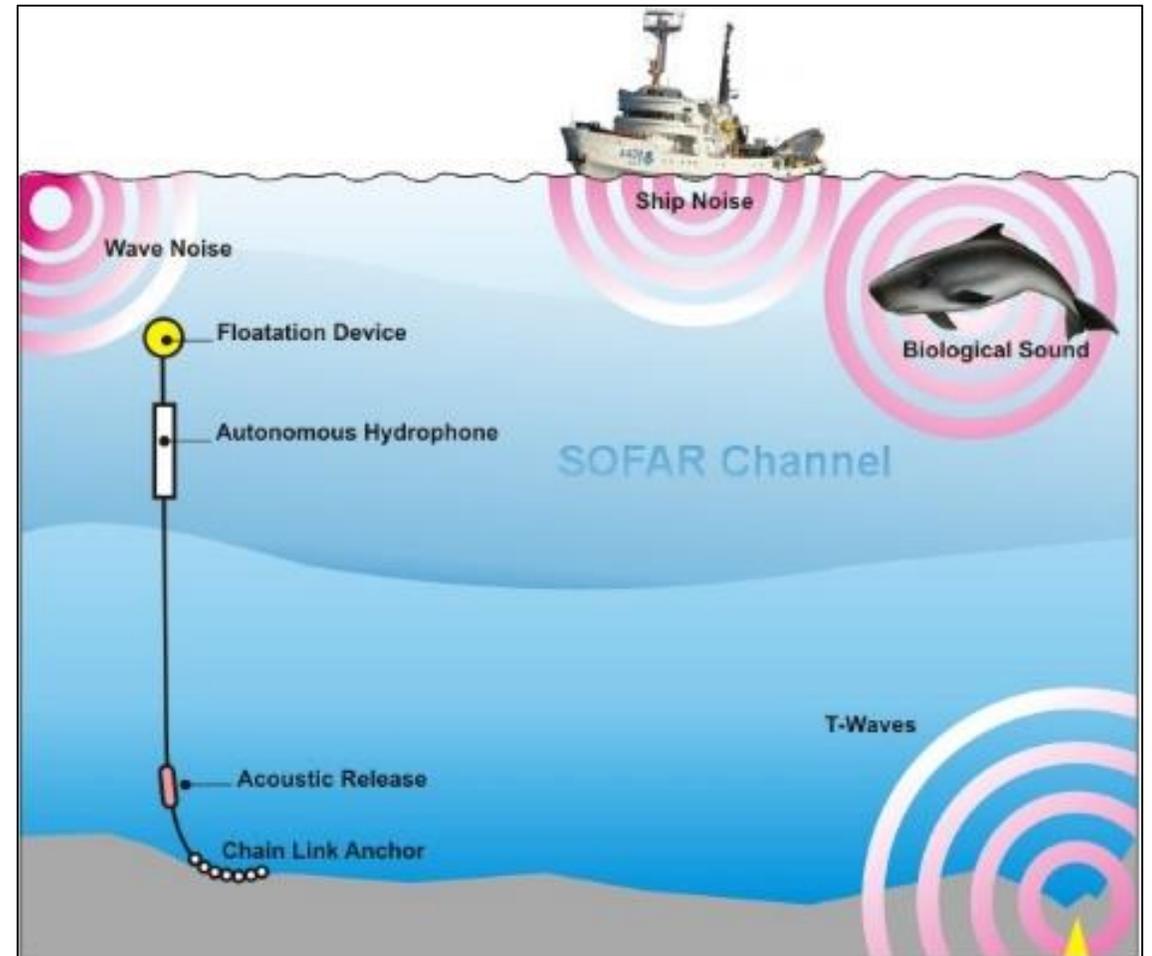


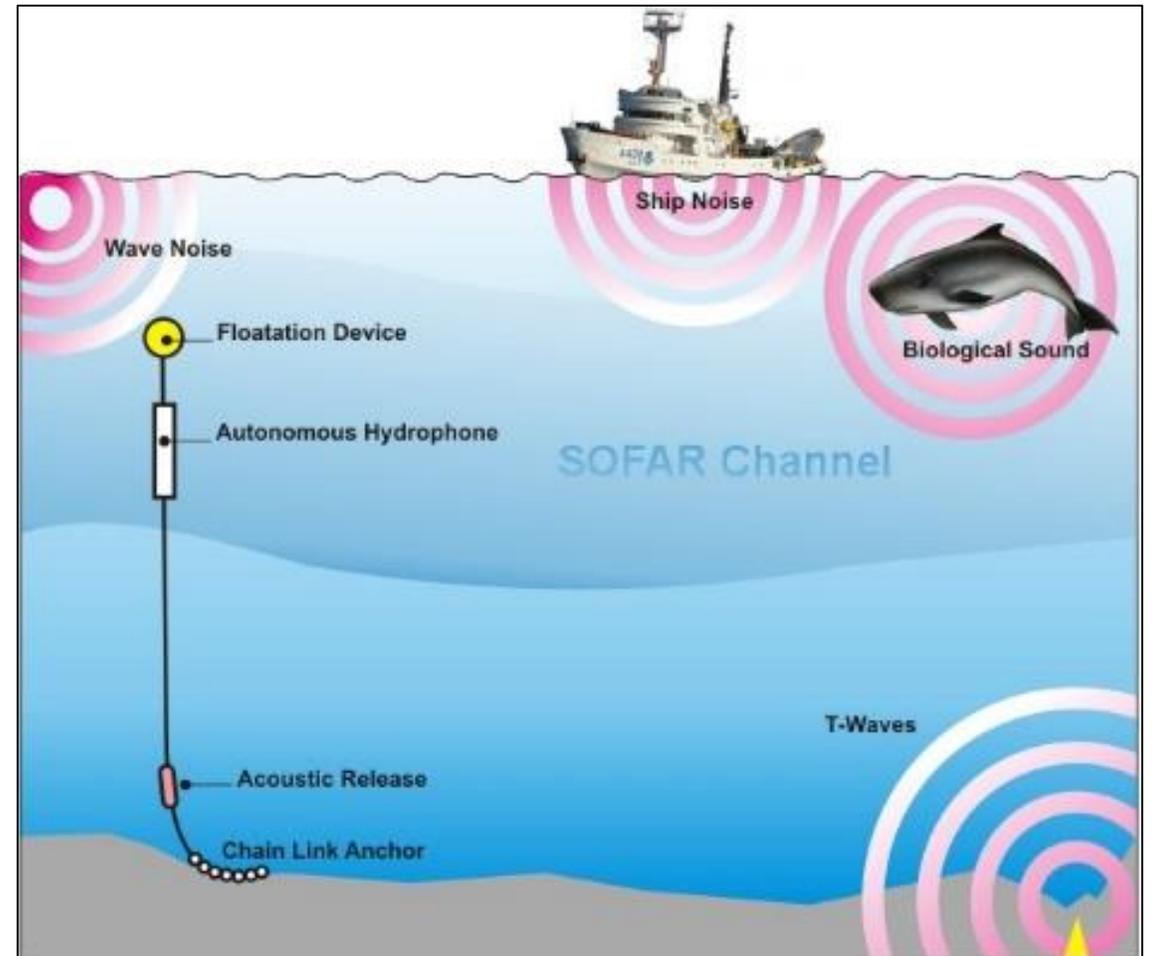
Figura 3. Niveles de energía y frecuencias de señales acústicas antropogénicas y naturales en el ambiente marino. Nivel de Fuente (presión acústica en dB; para niveles de fuentes localizados sería en dB $_{ref} 1\mu Pa @ 1m$) versus Frecuencia (Hz) para fuente: Ospar Comisión, disponible en <http://www.ospar.org/work-areas/EIHA/NOISE>.

- Biofonía:

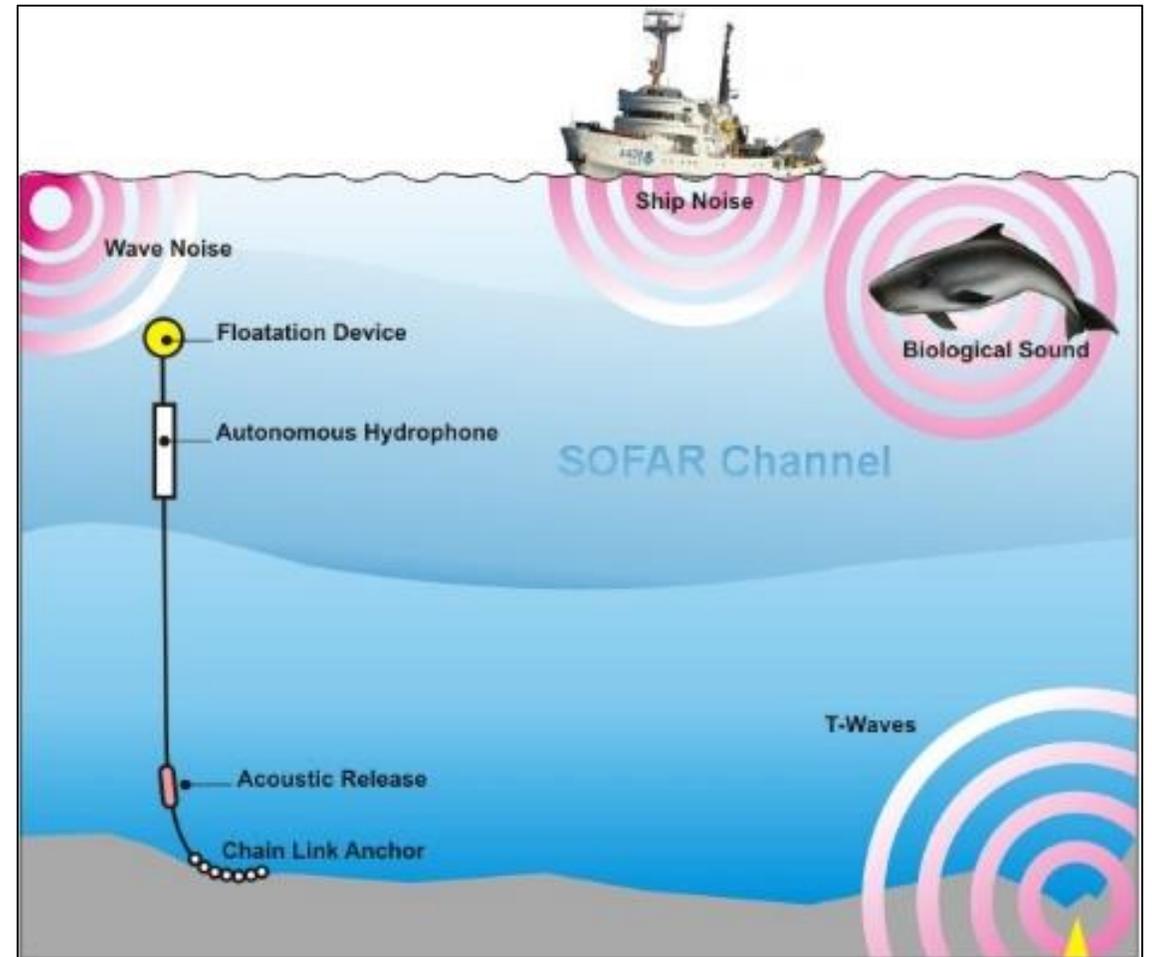
- Mamíferos marinos
- Peces
- Crustáceos
- Otros organismos que faltan estudiar...



- Biofonía:
 - Mamíferos marinos
 - Peces
 - Crustáceos
 - Otros organismos que faltan estudiar...
- Geofonía:
 - Viento
 - Oleaje
 - Terremotos



- Biofonía:
 - Mamíferos marinos
 - Peces
 - Crustáceos
 - Otros organismos que faltan estudiar...
- Geofonía:
 - Viento
 - Oleaje
 - Terremotos
- Antropofonía:
 - Motores
 - Sonares
 - Hincado de pilotes
 - Explosiones
 - Etc...



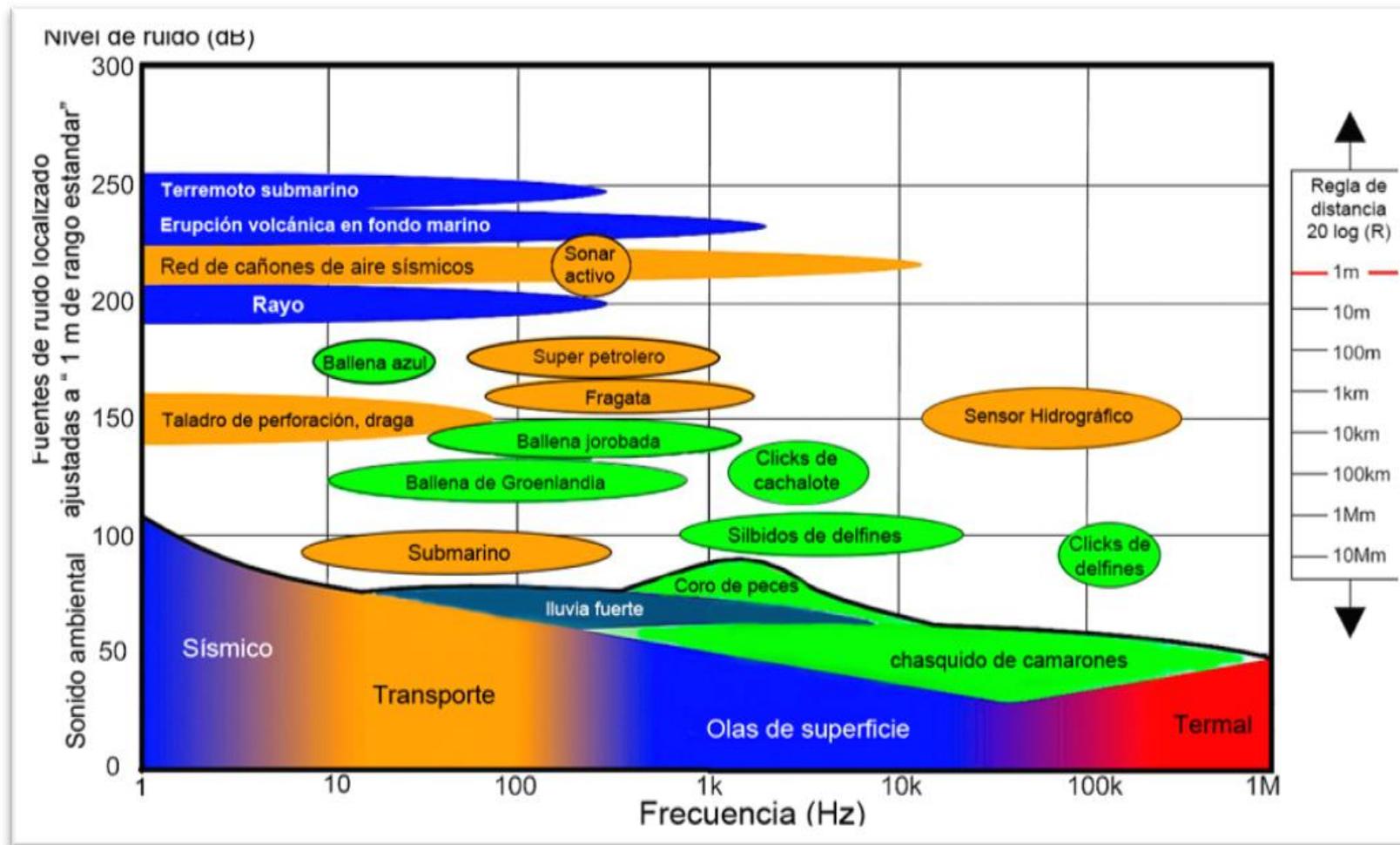


Figura 3. Niveles de energía y frecuencias de señales acústicas antropogénicas y naturales en el ambiente marino. Nivel de Fuente (presión acústica en dB; para niveles de fuentes localizados sería en dB ref $1\mu\text{Pa}$ @ 1m) versus Frecuencia (Hz) para fuente: Ospar Comission, disponible en <http://www.ospar.org/work-areas/EIHA/NOISE>.