

ONDAS: A network of acoustic recorders to remotely monitor marine mammals in CA



Laura J May-Collado, Ph.D.

Associate Professor, Department of Biology, University of Vermont
Research Associate Smithsonian Tropical Research Institute

~30 years studying marine mammals

- *Associate Professor* Department of Biology, University of Vermont
- *Scientific Advisor*, Marine Mammal Commission
- *Chair Committee of Scientific Advisors*, Society for Marine Mammalogy
- *Board member* of the Society for Marine Mammalogy
- *Research Associate*, Smithsonian Tropical Research Institute, Panama
- *Affiliate Researcher*, Gund Institute, University of Vermont
- Co-Founder of Panaceetacea
- Google Scholar: over 60 peer review publications, book chapters, IWC reports; over 20 young scientists trained in US, CR, PA, and South America.



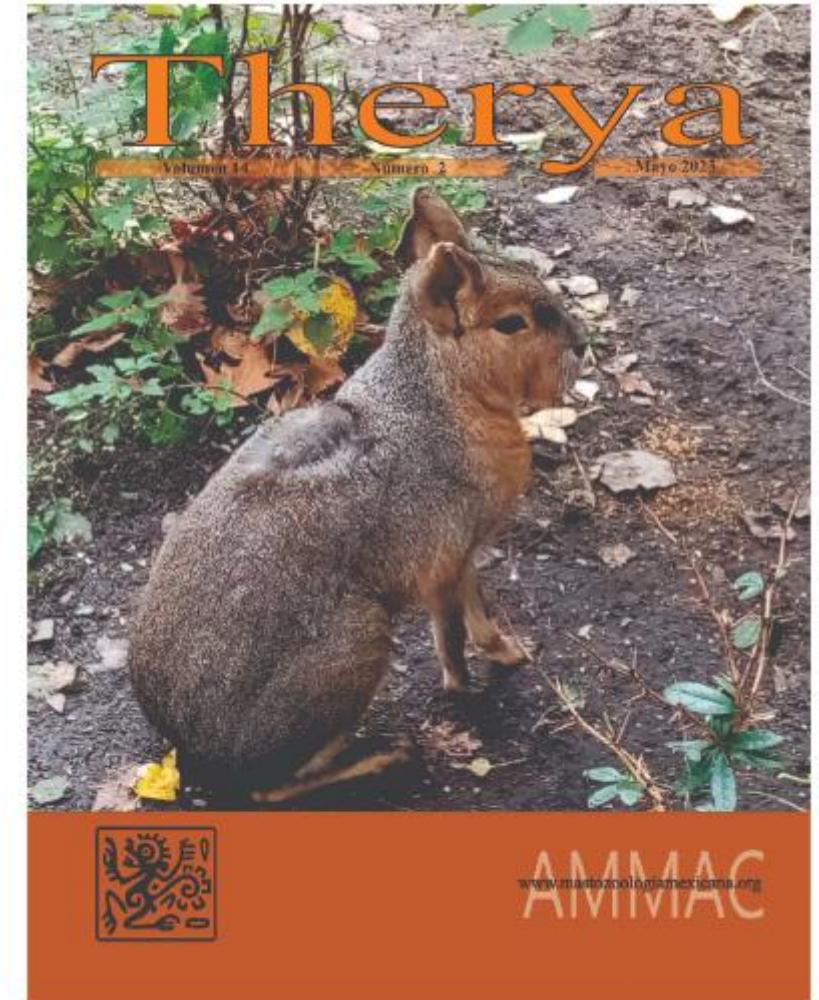


~ 15 CA researchers (not including students) plus multiple international scientists and NGO's



CA Marine mammal community

- Almost three decades ago, marine mammals were not considered an important component of mammal community in Central America.
- By the late 1990s, 14 species were confirmed but believed not to have resident populations.
- By the 2025, we have confirmed the presence of 29 species (excluding sightings of stranded seals) and discovered that most species have year-round populations





Lic. Jose David Palacios



**Vets. Lissette Trejos &
Gabriela Hernandez**



Dr. Betzi Perez

Cetacean strandings in Costa Rica (1966-1999)
Javier Rodríguez-Fonseca y Priscilla Cubero-Pardo¹

Received 22-VI-1999. Corrected 5-VI-2000. Accepted 23-X-2000

Marine Mammal Science



NOTE | Full Access |

Feeding of humpback whales (*Megaptera novaeangliae*) on the Pacific coast of Nicaragua

Joelle De Weerd², Eric A. Ramos³

First published: 21 May 2019 | <https://doi.org/10.1111/mms.12613> | Citations: 1

ORIGINAL RESEARCH ARTICLE

Front. Mar. Sci., 12 September 2018 | <https://doi.org/10.3389/fmars.2018.00316>

Bottlenose Dolphins and Antillean Manatees Respond to Small Multi-Rotor Unmanned Aerial Systems

Eric A. Ramos^{1,2*}, Brigid Maloney^{3,4}, Marcelo O. Magnasco⁴ and Diana Reiss^{1,4}

Perspectivas de investigación sobre los mamíferos silvestres de Guatemala

Research Perspectives on the Wild Mammals of Guatemala



Edición:
Cristian Kraker
Ana Patricia Calderón
Andrea A. Cabrera
AS-GUAMA

Mammal Review



Review | Full Access |

Distribution, feeding habits and morphology of killer whales *Orcinus orca* in the Caribbean Sea

Jaime Bolaños-Jiménez¹, Antonio A. Mignucci-Giannoni², Janice Blumenthal³, Andrea Bogomolni⁴, José Julio Casas⁵, Angiolina Henríquez⁶, Miguel Iñiguez Bessegga⁷, Jalaludin Khan⁸, Nelmarie Landrau-Giovannetti⁹, Caroline Rinaldi¹⁰, Renato Rinaldi¹¹, Grisel Rodríguez-Ferrer¹², Lesley Sutty¹³, Nathalie Ward¹⁴, Jolanda Andrea Luksenburg¹⁵ ... See fewer authors ^

First published: 16 March 2014 | <https://doi.org/10.1111/mam.12021> | Citations: 11

RESEARCH ARTICLE

High genetic structure and low mitochondrial diversity in bottlenose dolphins of the Archipelago of Bocas del Toro, Panama: A population at risk?

Dalia C. Barragán-Barrera^{1,2*}, Laura J. May-Collado^{3,4c}, Gabriela Tezanos-Pinto^{5t}, Valentina Islas-Villanueva^{6t}, Camilo A. Correa-Cárdenas^{7,8t}, Susana Caballero^{1c}

Revista de Biología Tropical

On-line version ISSN 0034-7744 Print version ISSN 0034-7744

Rev. biol. trop vol.53 n.1-2 San José Jun. 2005

Patterns of cetacean sighting distribution in the Pacific Exclusive Economic Zone of Costa Rica based on data collected from 1979-2001

Laura May-Collado^{1,2}, Tim Gerrodette³, John Calambokidis⁴, Kristin Rasmussen⁴ & Irena Sereg⁵

BIOLOGY LETTERS

Restricted access

View Full Text

View PDF

Tools Share

Cite this article

Marine biology

Southern Hemisphere humpback whales wintering off Central America: insights from water temperature into the longest mammalian migration

Kristin Rasmussen, Daniel M Palacios, John Calambokidis, Marco T Saborio, Luciano Dalla Rosa, Eduardo R Secchi, Gretchen H Steiger, Judith M Allen and Gregory S Stone



Marine Pollution Bulletin

Volume 94, Issues 1-2, 15 May 2015, Pages 241-250



$\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in deep-living fishes and shrimps after the Deepwater Horizon oil spill, Gulf of Mexico

Ester Quintana-Rizzo^{1,2,3}, Joseph J. Torres³, Steve W. Ross³, Isabel Romero³, Kathleen Watson³, Ethan Goddard³, David Hollander³

Show more

<https://doi.org/10.1016/j.marpolbul.2015.02.002>

Get rights and content

ACCESS MICROBIOLOGY

Volume 1, Issue 1A

Meeting Report | Open Access

Brucella sequence Type 27 isolated from Dwarf Sperm Whale (*Kogia sima*) stranded in the Costa Rican Pacific Coast³

Marcela Suárez-Esquível¹, Nazareth Ruiz-Villalobos¹, Gabriela Hernández-Mora², Rocío González-Barrientos², Jose David Palacios-Alfaró³, Elías Barquero-Calvo^{1,4}, Esteban Chaves-Olarte⁴, Nicholas Thomson⁵, Edgardo Moreno^{1,4}, Caterina Guzman-Verrí^{1,4}

View Affiliations

Marine Biodiversity of Costa Rica, Central America

Ingo S. Wehrtmann
Jorge Cortés
Editors



Coastal Research Library 22

Marcos R. Rossi-Santos
Charles W. Finkl Editors

Advances in Marine Vertebrate Research in Latin America

Technological Innovation and Conservation



ONDAS REMOTE SURVEILLANCE INITIATIVE

Collaborators

Juan Jose Alvarado, CR University of Costa Rica

Frank Garita, Panacetacea-CR

Jose David Palacios Alfaro, Panacetacea-CR

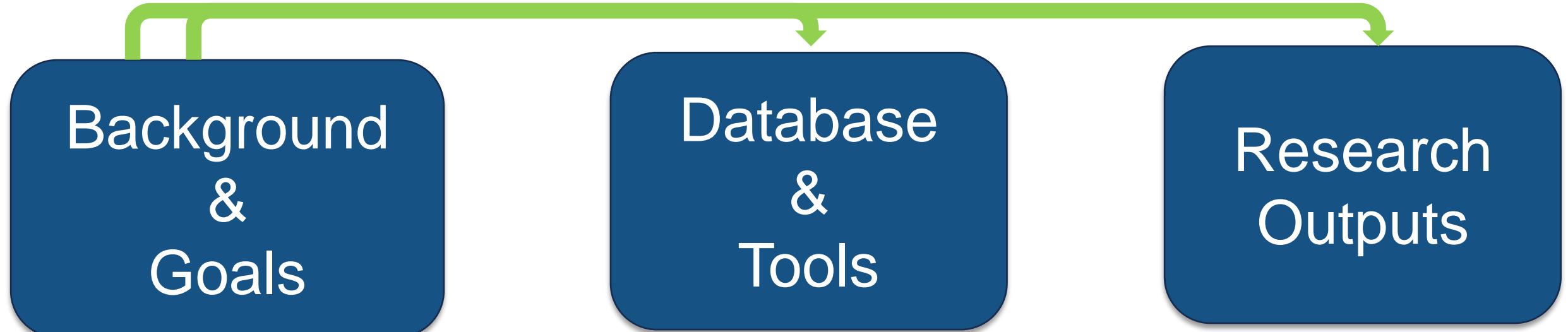
Betzi Perez Ortega, Panacetacea-Panama

Kristin Rasmussen, Panacetacea-USA

Ministry of the Environment of Panama



ONDAS



Background
&
Goals

Database
&
Tools

Research
Outputs



In the face of an accelerated loss of biodiversity due to global warming and other human threats, we urgently need better surveillance tools

Satellites images and GIS technology have improved our understanding on plant community dynamics and to estimate the effect of land use on natural habitats





Fauna biodiversity monitoring is more challenging, costly, and limited in space and time. This is particularly true for marine environments

- Many marine organisms use sound to communicate.
- Many important process produce sound as by product (e.g., photosynthesis, cue for suitable habitat).



Soundscape manipulation enhances larval recruitment of a reef-building mollusk

Ashley Lillis,¹ DeWynne R. Bohnenfleck and David B. Eggleton
Department of Marine, Earth & Atmospheric Sciences, Center for Marine Sciences & Technology, North Carolina State University, Raleigh, NC, USA
Current affiliation: Woods Hole Oceanographic Institution, Woods Hole, MA, USA

ABSTRACT

Marine seafloor ecosystems, and efforts to restore them, depend critically on the influx and settlement of larvae following their pelagic dispersal. Larval dispersal and settlement patterns are driven by a combination of oceanographic and biological cues, including larvae's detection of seismic and physical sounds associated with adult habitats (i.e., the "soundscape").



RESEARCH ARTICLE

Reef Sound as an Orientation Cue for Shoreward Migration by Pueruli of the Rock Lobster, *Jasus edwardsii*

Ivan A. Hinostroza^{1,2,3,4*}, Bridget S. Green¹, Caleb Gardner¹, Jan Hesse⁵, Jenni A. Stanley⁶, Andrew G. Jeffs^{2,4}

¹ Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania, T^{asmania, Australia}
² National Institute of Water and Atmospheric Research, Fisher Road de Courcey Mall Department of Marine, Coquimbo, Chile, ³ Millennium Nucleus for Ecology and Sustainable Management of Islands, Coquimbo, Chile, ⁴ Leigh Marine Laboratory, Institute of Marine Science, University O Box 349, Warkworth, New Zealand

* These authors contributed equally to this work.
† Ivan.Hinostroza@utas.edu.au

Journal of Experimental Marine Biology and Ecology 395 (2010) 85–92

Contents lists available at ScienceDirect

Journal of Experimental Marine Biology and Ecology

journal homepage: www.elsevier.com/locate/jembe

Spatial patterns in reef-generated noise relate to habitats and communities from a Panamanian case study

E.V. Kennedy^{a,b,*}, M.W. Holdereider^b, J.M. Mair^a, H.M. Guzman^c, S.D. Simpson^b

^a Centre for Marine Biodiversity and Biotechnology, Heriot-Watt University, Edinburgh, EH14 4AS, UK
^b School of Biological Sciences, University of Bristol, Woodland Road, Bristol, BS8 1UG, UK
^c Smithsonian Tropical Research Institute, Box 0843-0509, Balboa, Republic of Panama

Sound as an Orientation Cue for the Pelagic Larvae of Reef Fishes and Decapod Crustaceans

John C. Montgomery,^a Andrew Jeffs,^b Stephen D. Simpson,^b Mark Meekan^b and Chris Tindle^b

^a Leigh Marine Laboratory and School of Biological Sciences, University of Auckland, Auckland, New Zealand

^b National Institute of Water and Atmospheric Research, Newmarket, Auckland, New Zealand

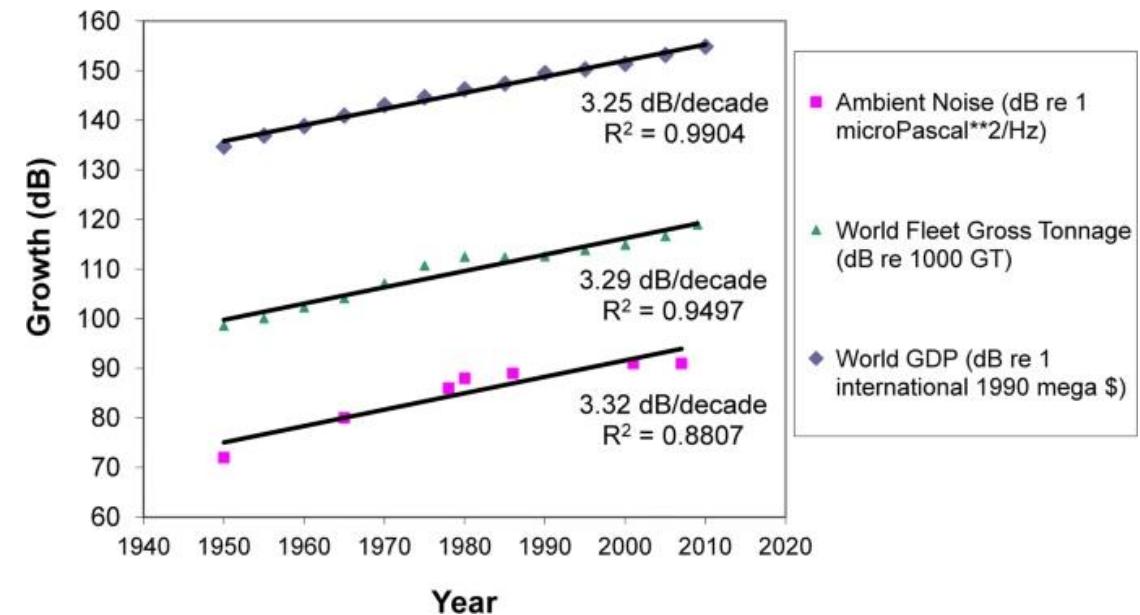
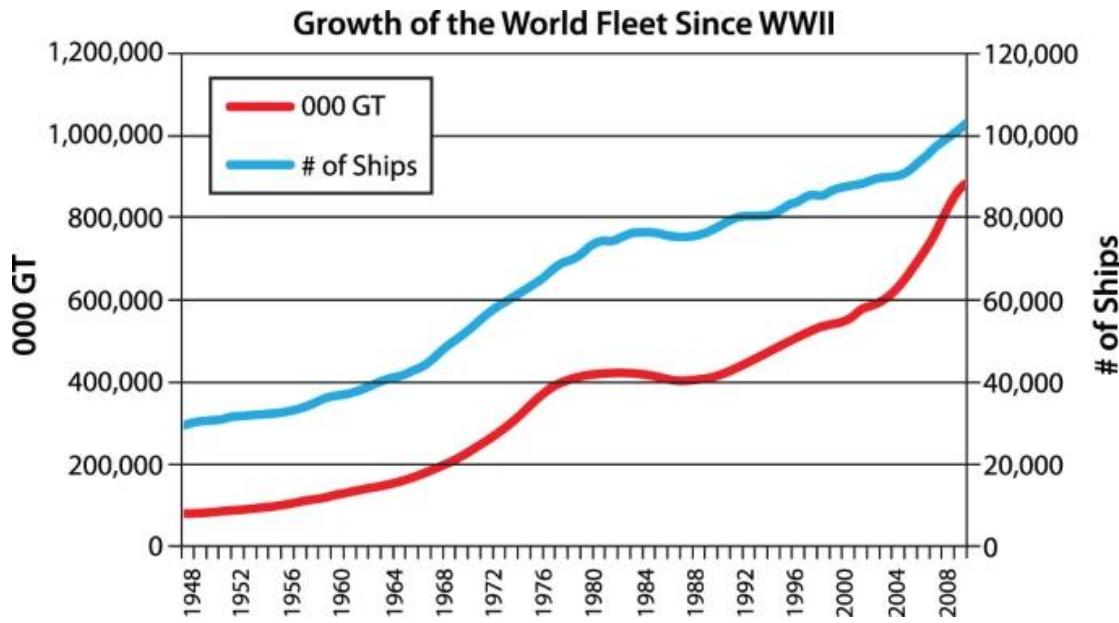
^c School of Biological Sciences, University of Edinburgh, Edinburgh, UK

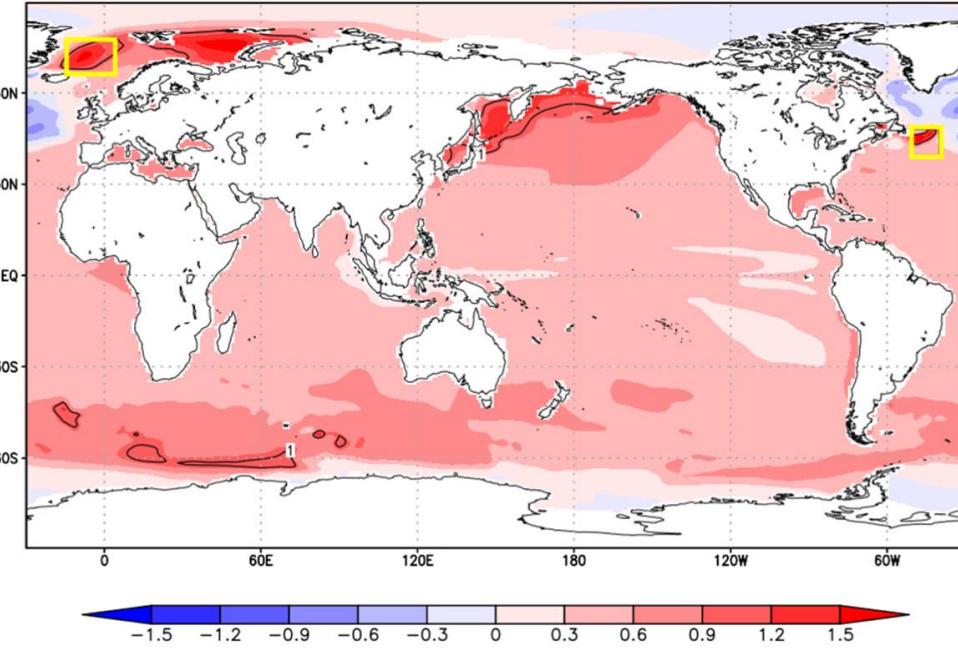
There is growing evidence that the biological and physical sounds associated with adult habitats (i.e., the “soundscape”) influence larval settlement and habitat selection



“naturally” noisier marine communities are healthier

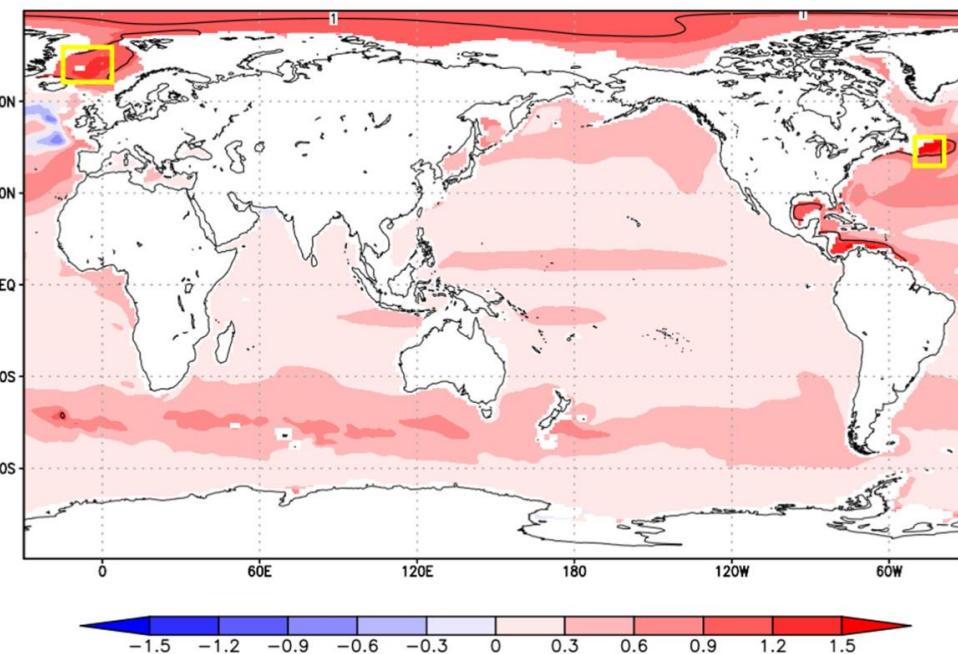
An increasingly noisier ocean since WWII





An increasingly warmer and noisier ocean

[Ocean Sound Propagation in a Changing Climate: Global Sound Speed Changes and Identification of Acoustic Hotspots - Affatati - 2022 - Earth's Future - Wiley Online Library](#)



Passive Acoustic Monitoring (PAM) provides a novel, cost effective, and long-term opportunity to surveillance **soundscapes and **biodiversity** at various temporal and geographical scales**

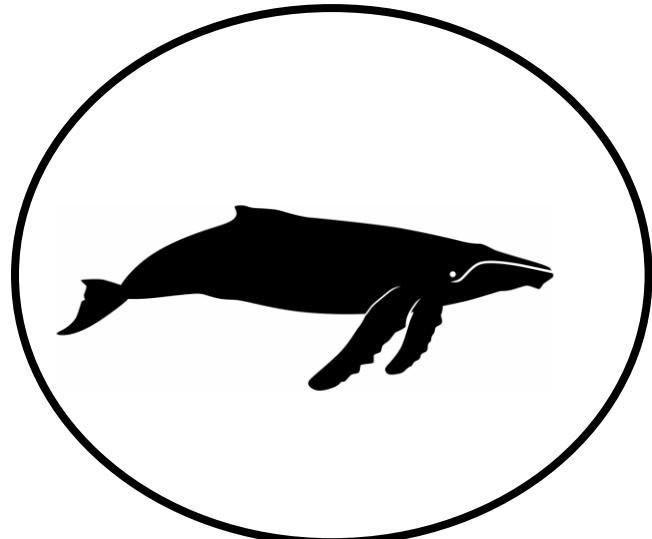




Goals of the ONDAS Lab

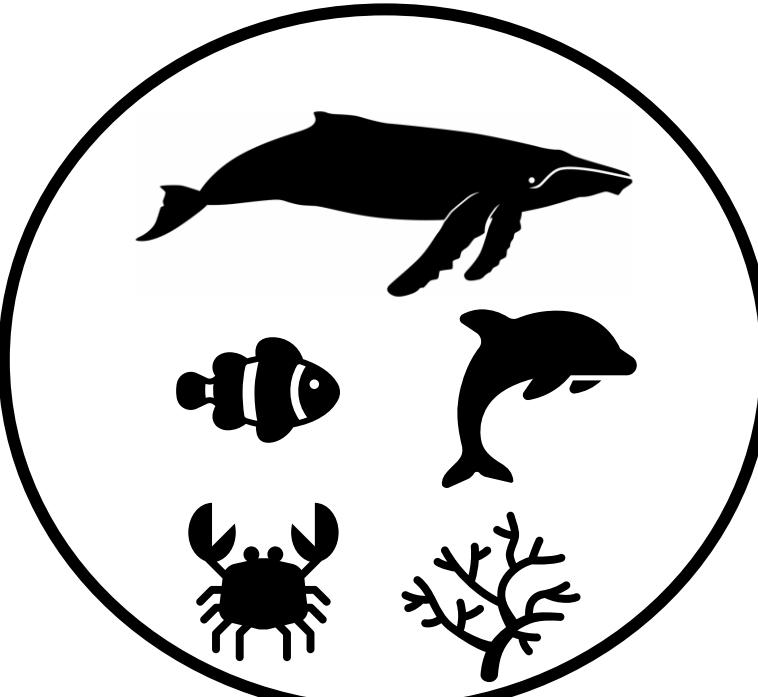
1. Use PAM for the surveillance of marine communities and specific species using bioacoustics and soundscape ecology tools.
2. Create a historical record of marine soundscapes for Central America that allows researchers to understand the impact of an increasing warmer and noisier ocean.
3. Support local researchers in their research and ocean conservation awareness efforts.





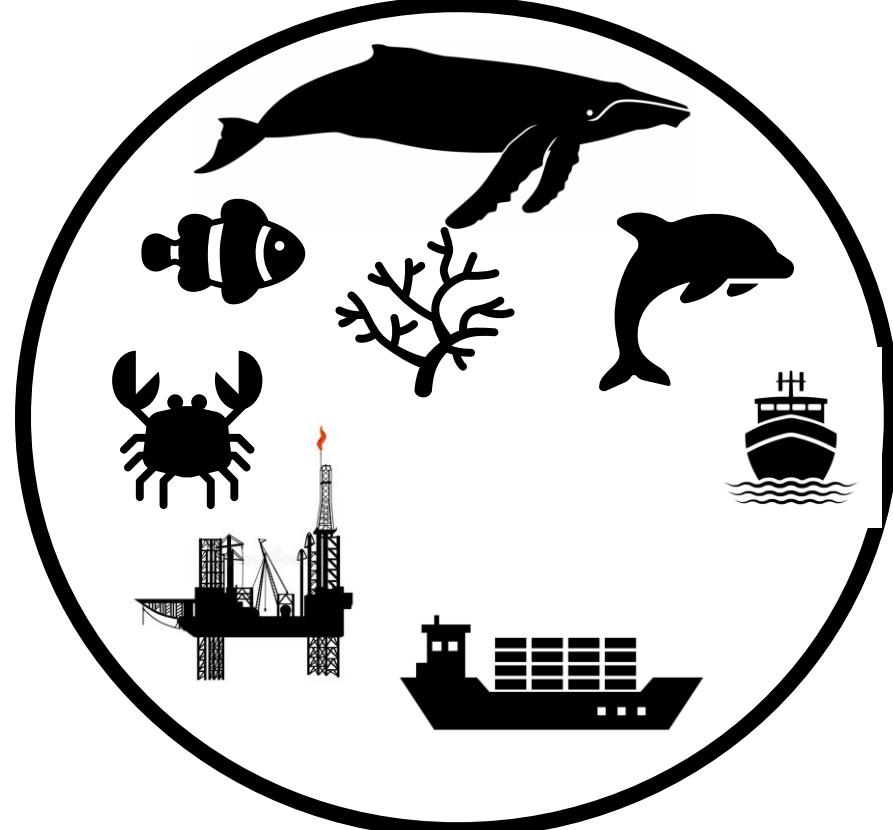
Species

Global Warming
impacts soundscapes
(i.e., sound
transmission)

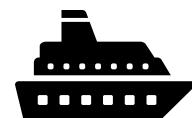


Acoustic community

Impact the communication space



Soundscape



Anthropogenic noise
Impacts soundscapes
(e.g., signal detection)

ONDAS-Marine Communities of Central America

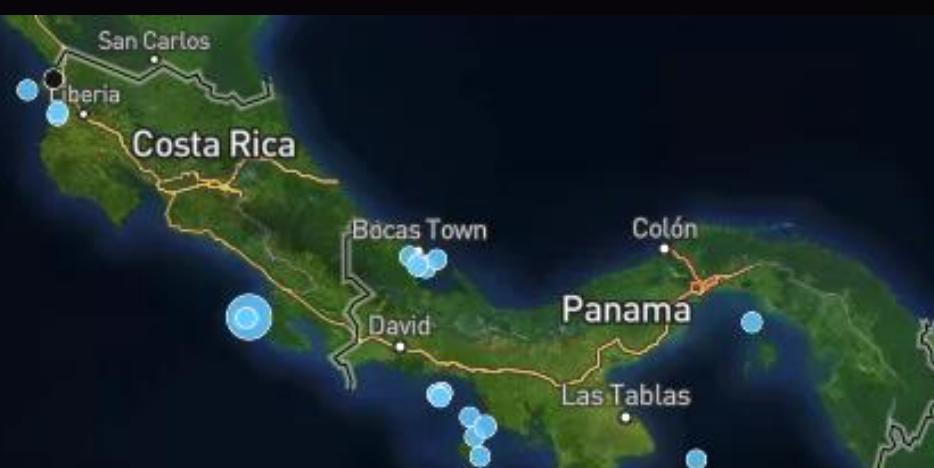
Overview

Sites created (29)
29 [Create new sites](#)

Recordings uploaded (322.2k)
322.2k [Upload new recordings](#)

Playlists created (271)
271 [Create new playlist](#)

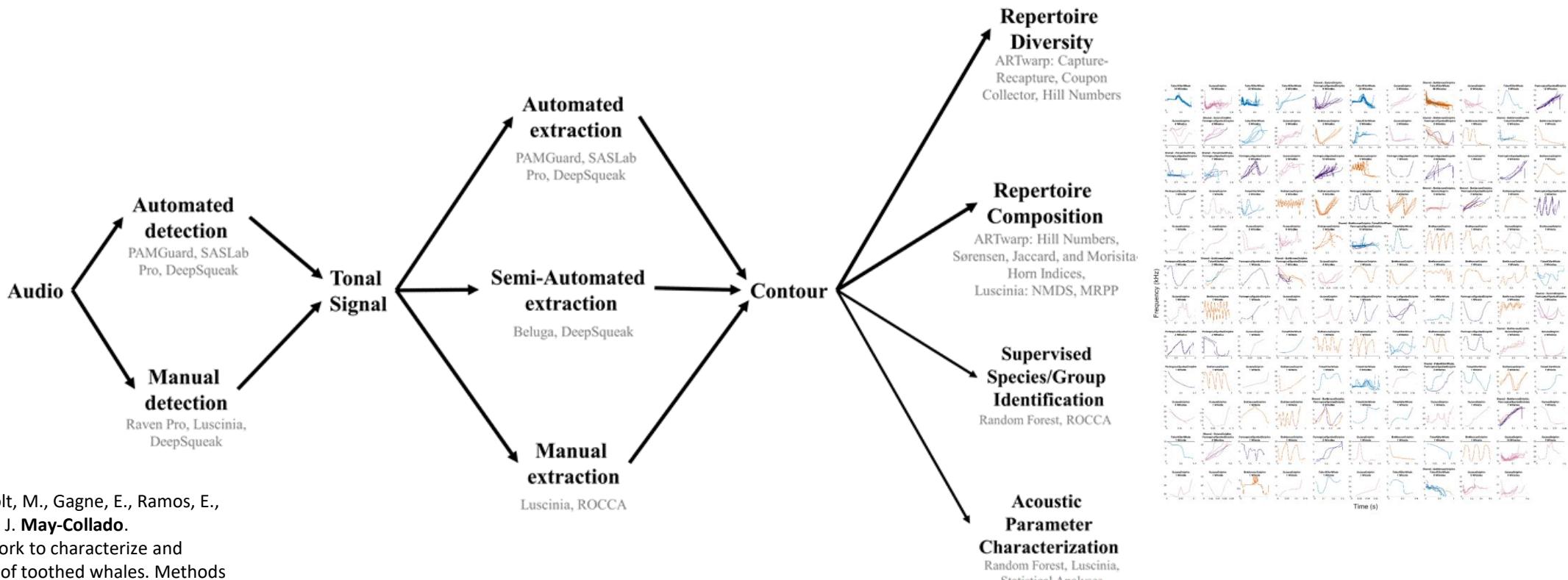
Species added (8)
8 [Add new species](#)



**~6,000,000 minutes of recordings
between 2016 and 2025**

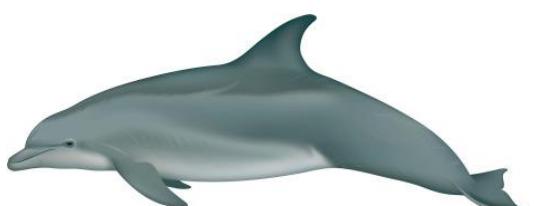


Decisions detection, classification, categorization, and methods for repertoire size



Austin, M., Oswald, J. N., Rege-Colt, M., Gagne, E., Ramos, E., De Weerdt, J., Ransome, N. and L. J. May-Collado.

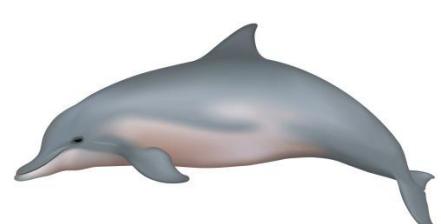
In press. A computational framework to characterize and compare the acoustic repertoires of toothed whales. Methods in Ecology and Evolution.



Bottlenose dolphins



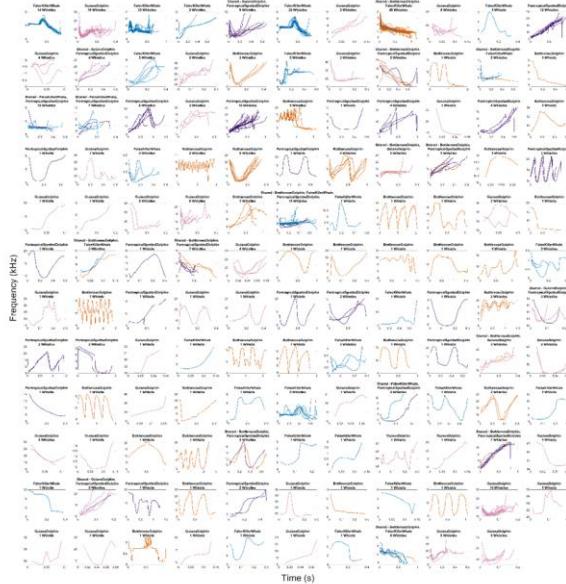
Pantropical spotted dolphin



Guiana dolphins



False-killer whales

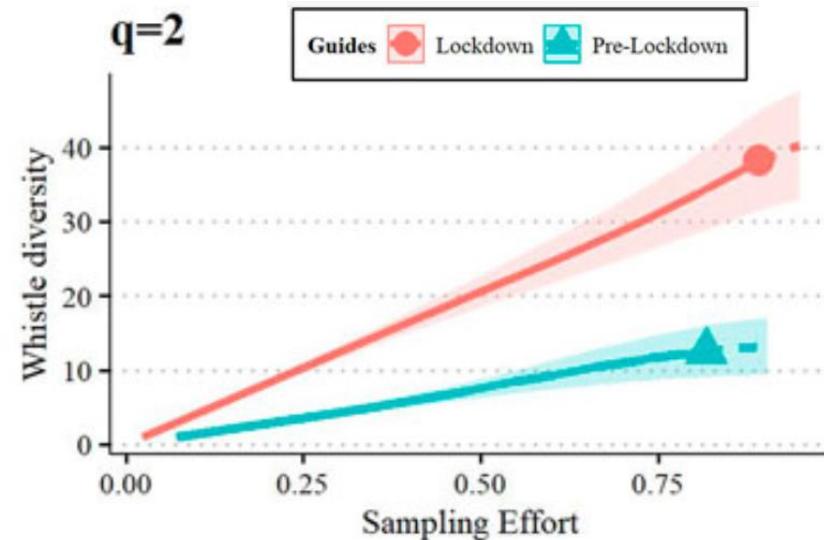
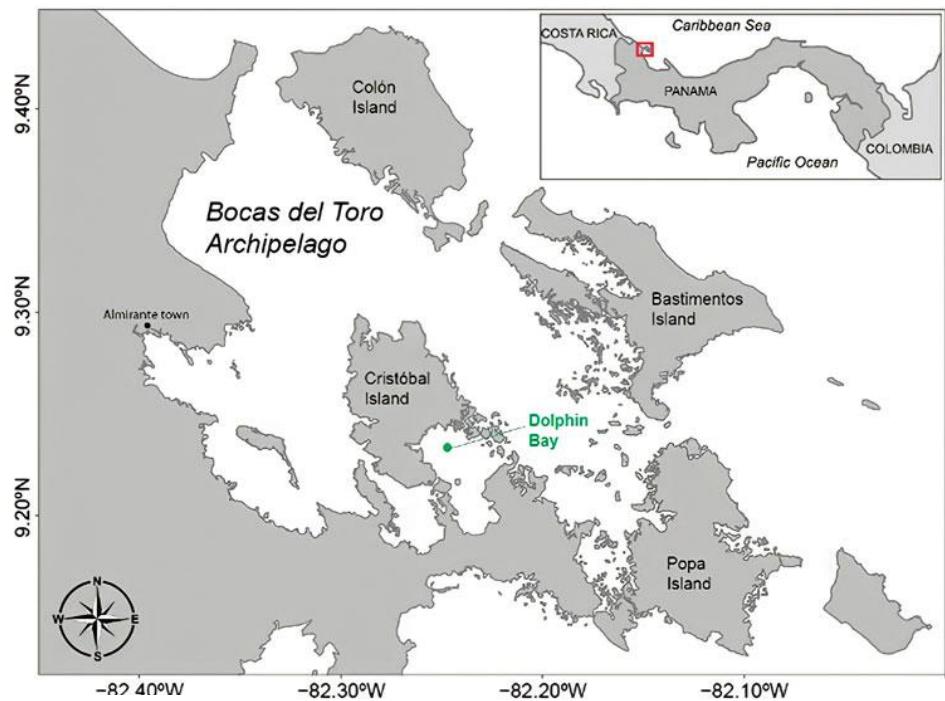




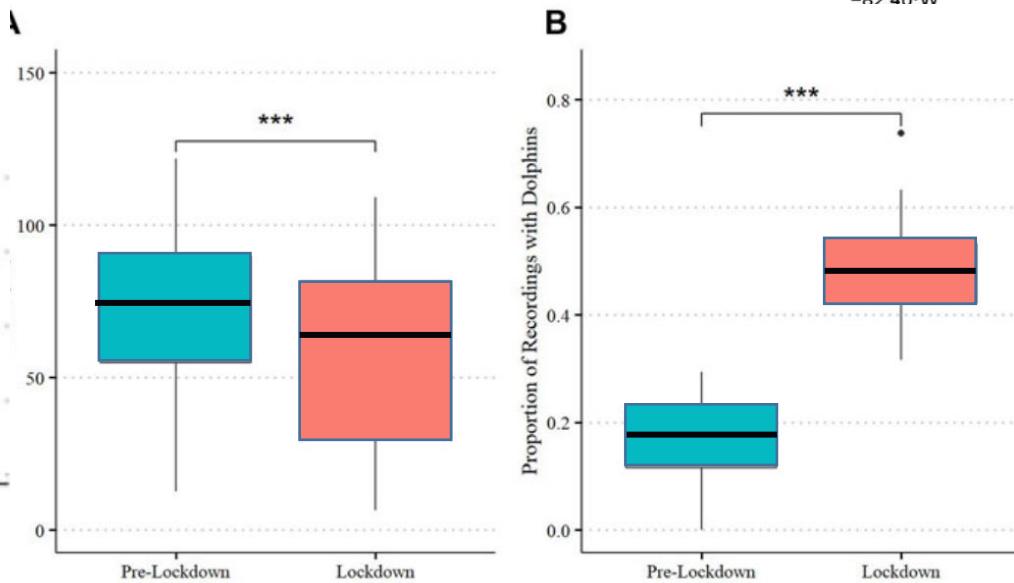
ORIGINAL RESEARCH article
Front. Remote Sens., 17 August 2022
Sec. Acoustic Remote Sensing
Volume 3 - 2022 |
<https://doi.org/10.3389/frsen.2022.934608>

Dolphin communication during widespread systematic noise reduction-a natural experiment amid COVID-19 lockdowns

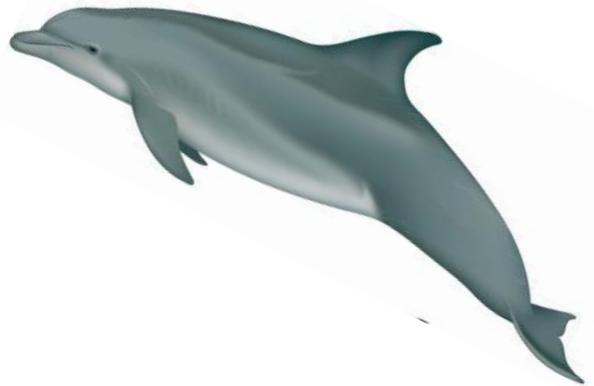
This article is part of the Research Topic
Acoustic Remote Sensing of Cetacean and Pinniped
Populations
[View all 13 Articles >](#)



Sample size-based rarefaction and extrapolations curves showing diversity estimates for period (82.5% sample coverage)



Broadband ambient noise levels (RMSdB) (A) and proportion of recordings containing dolphin (B), modulation (D)



Southern Hemisphere humpback whales (*Megaptera novaeangliae*) (Artiodactyla: Balaenopteridae) singing activity at Caño Island Biological Reserve, Costa Rica before, during, and after COVID-19 lockdowns

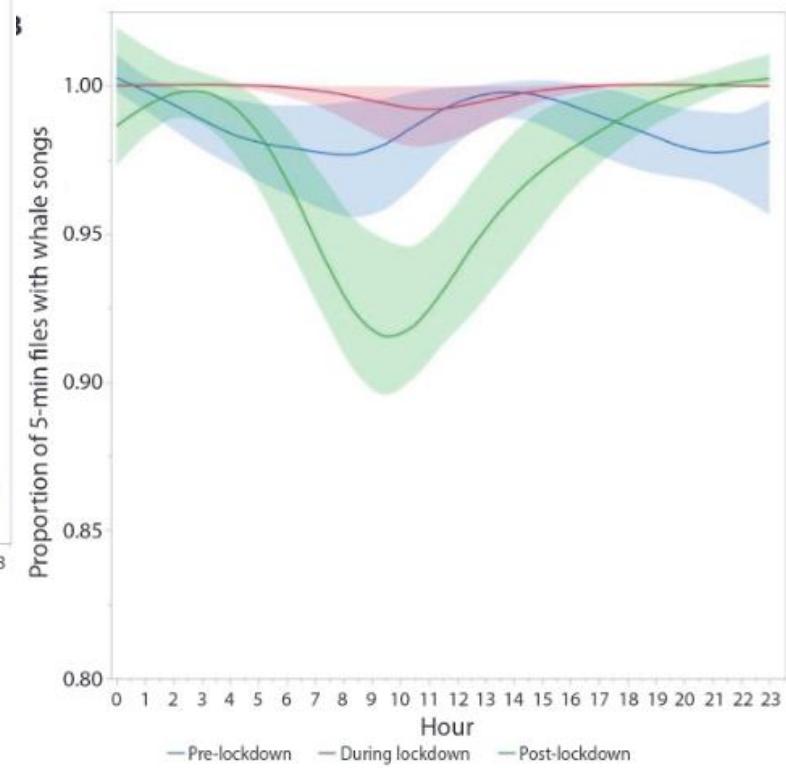
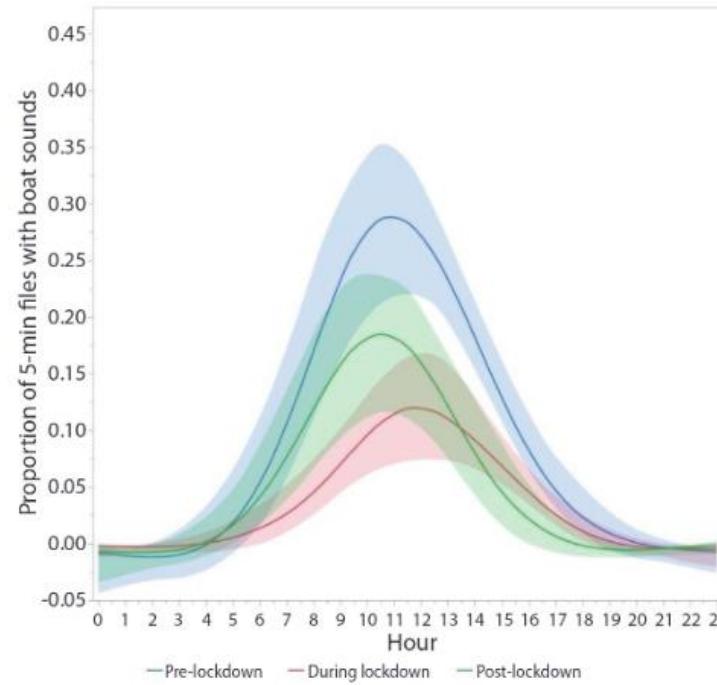
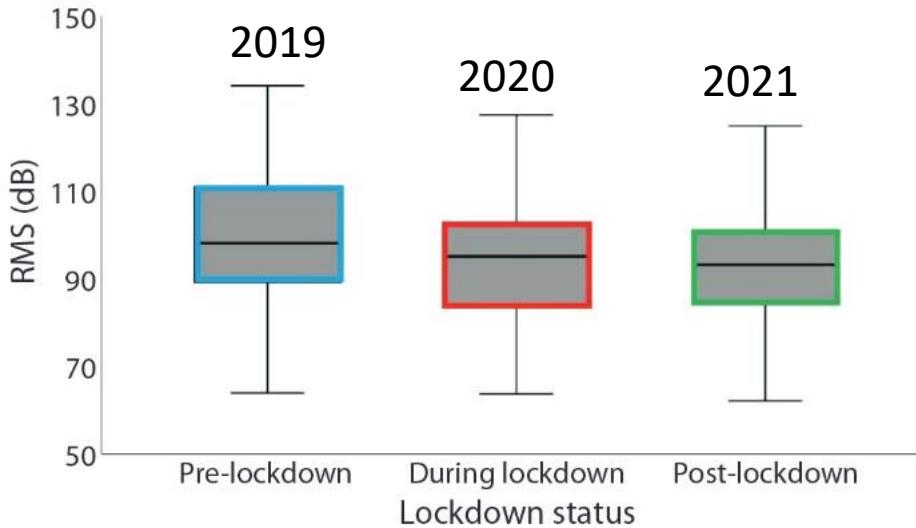
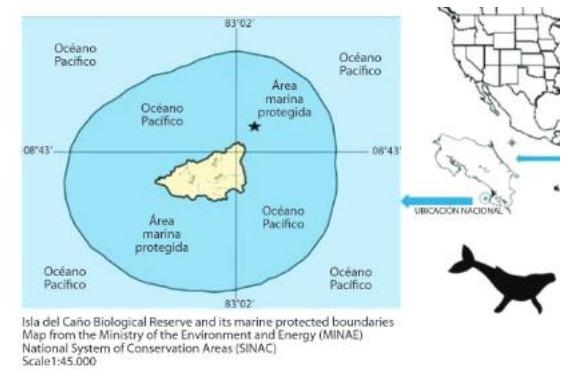
Laura J. May-Collado^{1, 2*};  <https://orcid.org/0000-0002-4790-9524>

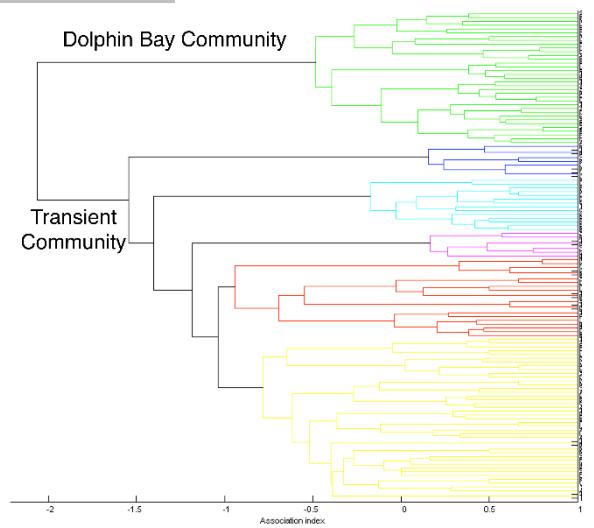
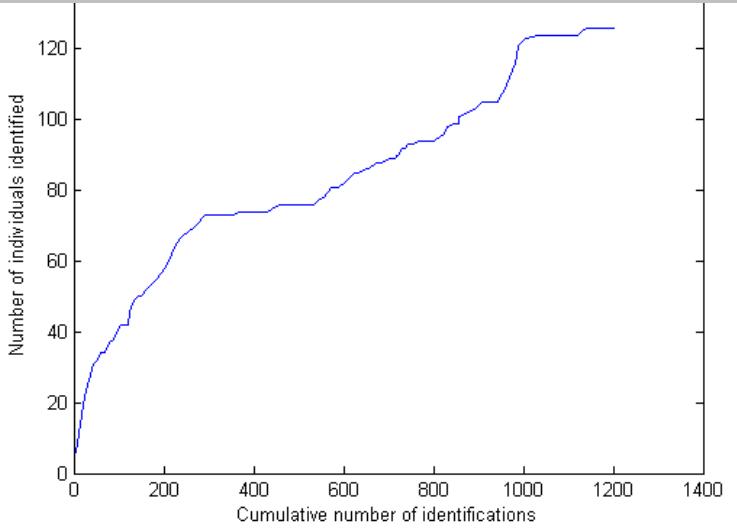
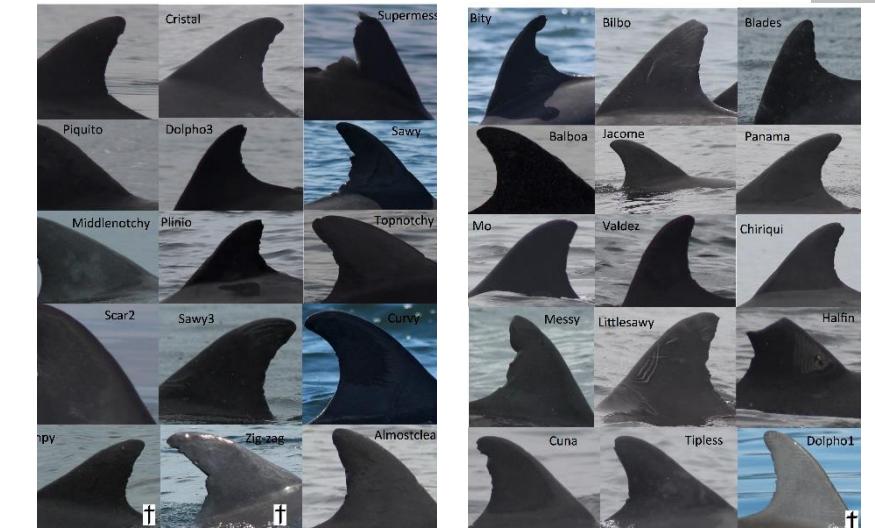
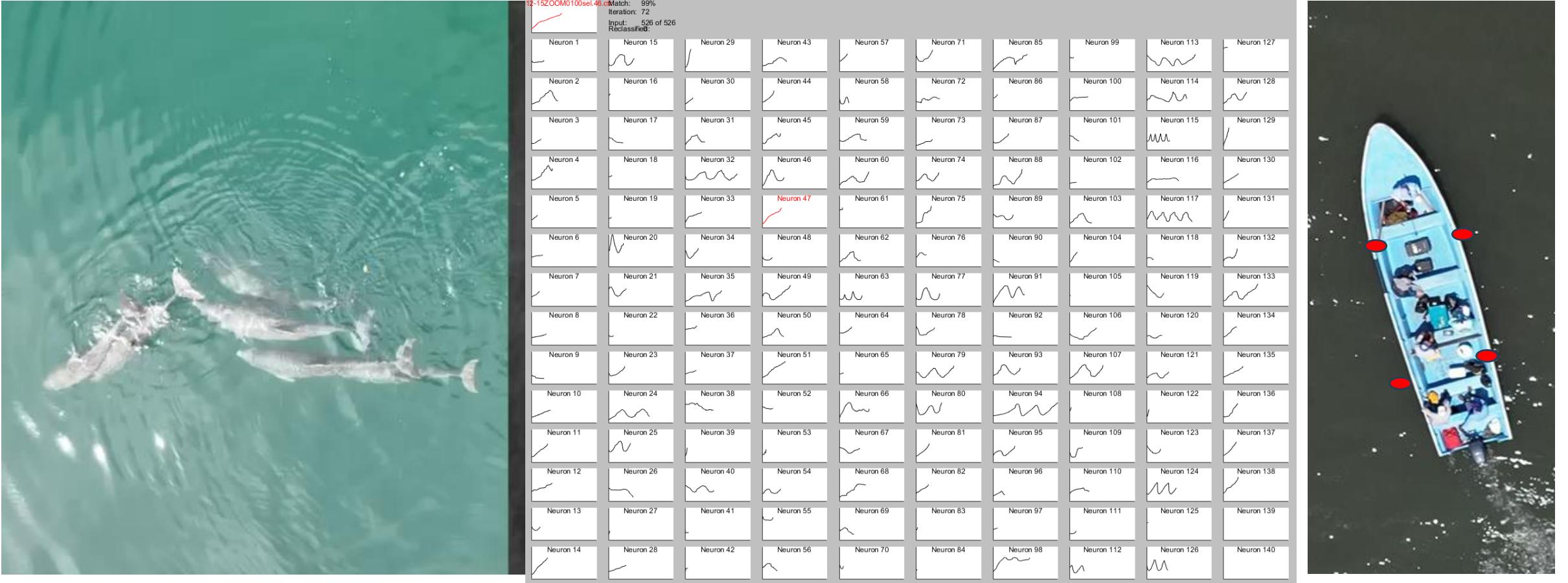
Sawyer Bottoms¹;  <https://orcid.org/0000-0002-8821-7348>

Grace Durant¹;  <https://orcid.org/0000-0002-1896-3900>

Jose David Palacios-Alfaro³;  <https://orcid.org/0000-0002-0315-094X>

Juan Jose Alvarado^{4, 5, 6};  <https://orcid.org/0000-0002-2620-9115>





Current and Future work

- Using machine learning tools for detection and classification and categorization of signals
- Adapt community ecology approaches to study beta and alpha diversity using acoustic signals
- Estimate noise levels across time and space to reveal the contribution of boat traffic on marine habitats.
- CNN models for cetacean detectors to study temporal and spatial patterns in occurrence
- CNN models and MANTA analysis for soundscape classification, to reveal patterns in temporal and spatial soundscape acoustic data

World Oceans Passive Acoustic Monitoring Day

Listening in for World Oceans Day



 **Global Library of
Underwater
Biological Sounds**



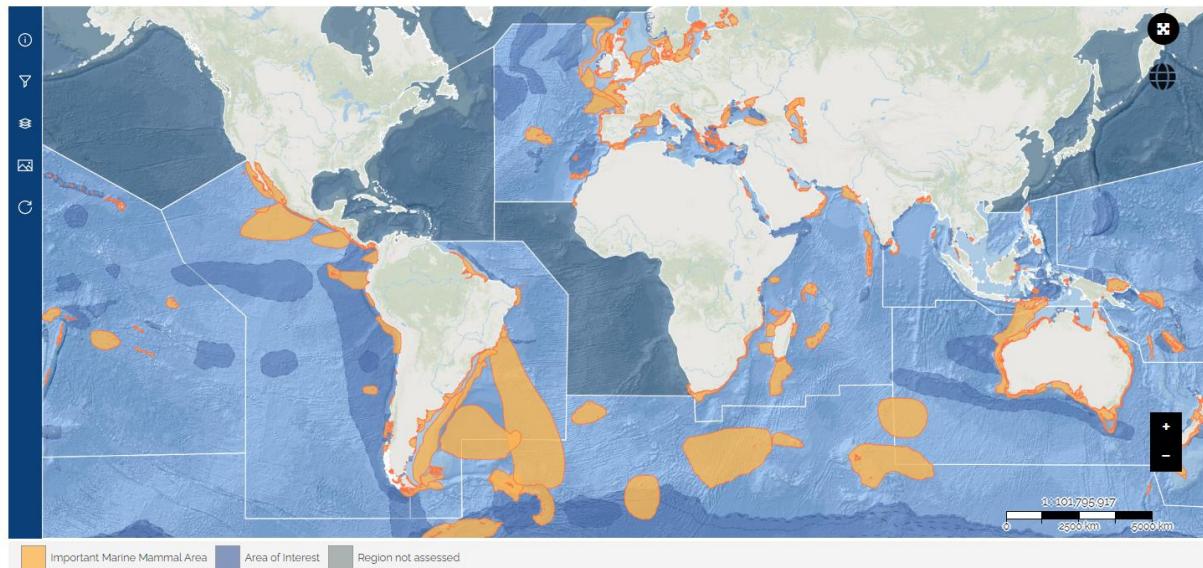
GloNoise Partnership



UNIVERSIDAD DE
COSTA RICA



IMMA E-ATLAS



CMP PROPOSAL

A CONSERVATION MANAGEMENT PLAN FOR
SOTALIA GUIANENSIS – GUIANA DOLPHIN



NOAA Technical Memorandum NMFS

MAY 2022

ABUNDANCE OF HUMPBACK WHALES (*MEGAPTERA NOVAEANGLAE*) WINTERING IN CENTRAL AMERICA AND SOUTHERN MEXICO FROM A ONE-DIMENSIONAL SPATIAL CAPTURE-RECAPTURE MODEL

K. Alexandra Curtis¹, John Calambokidis², Katherine Audley³, Melvin G. Castaneda⁴, Joëlle De Weerdt⁵, Andrea Jacqueline García Chávez³, Frank Garita⁶, Pamela Martínez-Loustalet⁷, Jose D. Palacios-Alfaro⁶, Betzi Pérez⁶, Ester Quintana-Rizzo⁸, Raúl Ramírez Barragan⁹, Nicola Ransome^{4,9}, Kristin Rasmussen⁶, Jorge Urbán R.⁷, Francisco Villegas Zurita¹⁰, Kirsten Flynn², Ted Cheeseman¹¹, Jay Barlow¹, Debbie Steel¹², and Jeffrey Moore¹

SCIENCE CITATION INDEX
GOOGLE SCHOLAR
SCOPUS
BIOLOGICAL ABSTRACTS

ISSN electrónico: 2215-2075

UNIVERSIDAD DE COSTA RICA
VICERRECTORÍA DE INVESTIGACIÓN
EDITORIAL UCR
Escuela de Biología

REVISTA DE Biología Tropical

INTERNATIONAL JOURNAL OF TROPICAL BIOLOGY AND CONSERVATION
www.biologiatropical.ucr.ac.cr Volumen 71(Supl. 4) • noviembre, 2023 • San José, Costa Rica

Mamíferos acuáticos de Centroamérica
Aquatic Mammals of Central America

Laura J. May Collado & Ester Quintana-Rizzo • Editoras científicas • Scientific editors



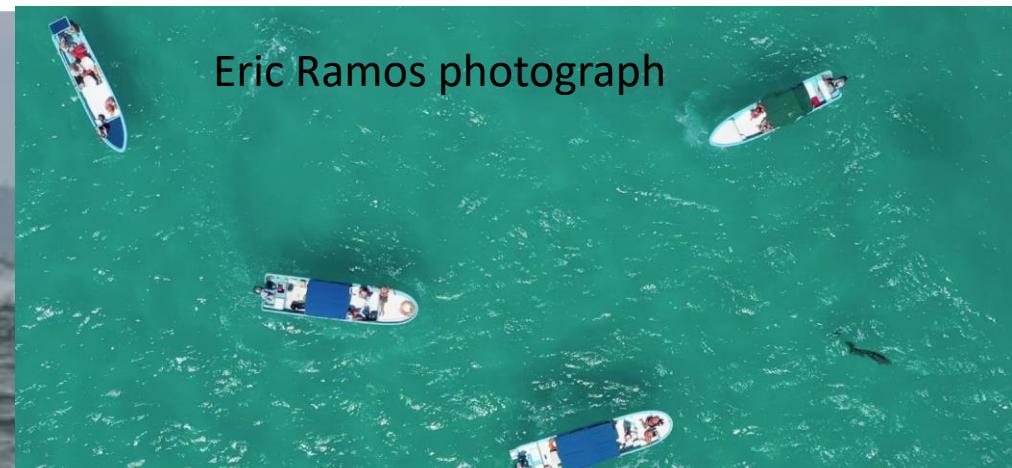
CASE STUDY

PANAMA: BOCAS DEL TORO

Can Tourists and community members turn the tide for dolphins?

SHARE 

Regulations and Community based strategies for sustainable WW and Regulations for underwater noise



Eric Ramos photograph



Laura J. May-Collado, Ph.D.

<http://www.lauramay-collado.com/>

Email: lmaycoll@uvm.edu