



**HAL**  
open science

## Blue whale acoustic monitoring in the South-West Indian Ocean: an overview from large array of hydrophones

Flore Samaran, Maelle Torterotot, Julie Beesau, Emmanuelle C. Leroy, Guilhem Barruol, Sara Bazin, Jean-Yves Royer

### ► To cite this version:

Flore Samaran, Maelle Torterotot, Julie Beesau, Emmanuelle C. Leroy, Guilhem Barruol, et al.. Blue whale acoustic monitoring in the South-West Indian Ocean: an overview from large array of hydrophones. EMSO Time Series Conference: Observing Ocean Sound, Oct 2020, Canary Islands, Spain. hal-03582700

**HAL Id: hal-03582700**

**<https://hal.science/hal-03582700>**

Submitted on 21 Feb 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Blue whale acoustic monitoring in the South-West Indian Ocean: an overview from large array of hydrophones

Flore Samaran<sup>1</sup>, Maëlle Tarterotot<sup>1</sup>, Julie Béseau<sup>1</sup>, Emmanuelle Leroy<sup>2</sup>, Guilhem Barruol<sup>3</sup>, Sara Bazin<sup>4</sup>, Jean-Yves Royer<sup>4</sup>

<sup>1</sup> ENSTA Bretagne and CNRS Lab-STICC, Brest-29200, France

<sup>2</sup> Globice Réunion, Saint Pierre-97410, Réunion Island, France

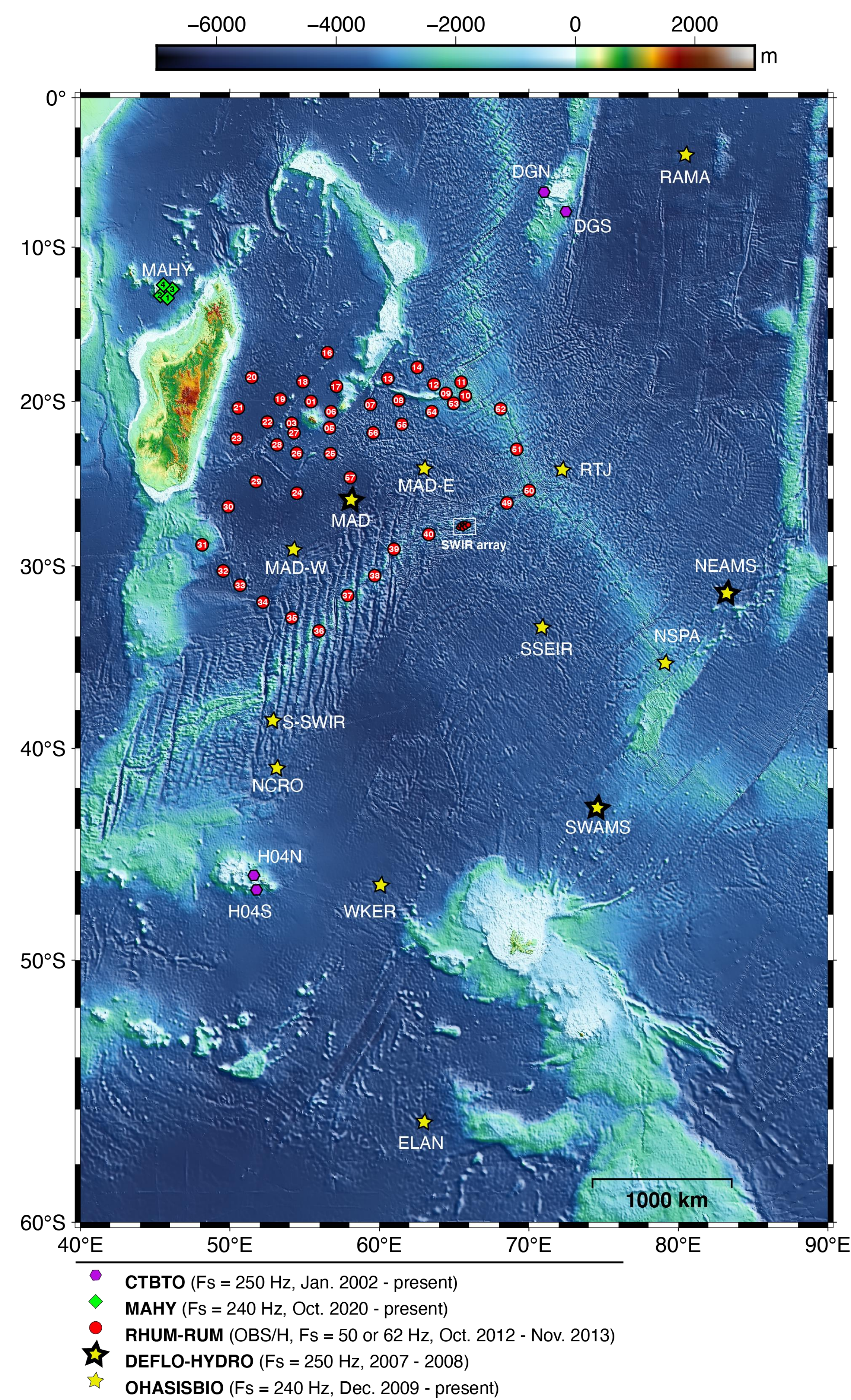
<sup>3</sup> Grenoble Alpes University, CNRS, IRD, Grenoble INP, IGE, Grenoble-38000, France

<sup>4</sup> University of Brest and CNRS, Laboratoire Géosciences Océan, Plouzané-29280, France

## Introduction

In 1979, the International Whaling Commission established the Indian Ocean whaling sanctuary, protecting a breeding area where baleen whales were heavily hunted during the 20<sup>th</sup> century. Until 2010, knowledge on blue whale presence in this area was mostly inferred from whaling log books and sparse visual observations. Since then, the Southwest Indian Ocean has been instrumented with multiple hydrophone arrays dedicated to geophysical or nuclear explosion monitoring (sampling frequency < 250 Hz). In this soundscape the low-frequency, high-intensity, stereotyped songs of multiple blue whale populations are predominant. The record analysis highlights a great diversity of whale populations in this area (fin whales, 3 pygmy blue whale acoustic populations and Antarctic blue whales) and revealed new unattributed large whales' songs. Such wide range and long-term monitoring is thus worth pursuing as it provides invaluable information to design and implement conservation and management measures and to assess the effects of global environmental changes for these endangered whale species.

## Acoustic observatories



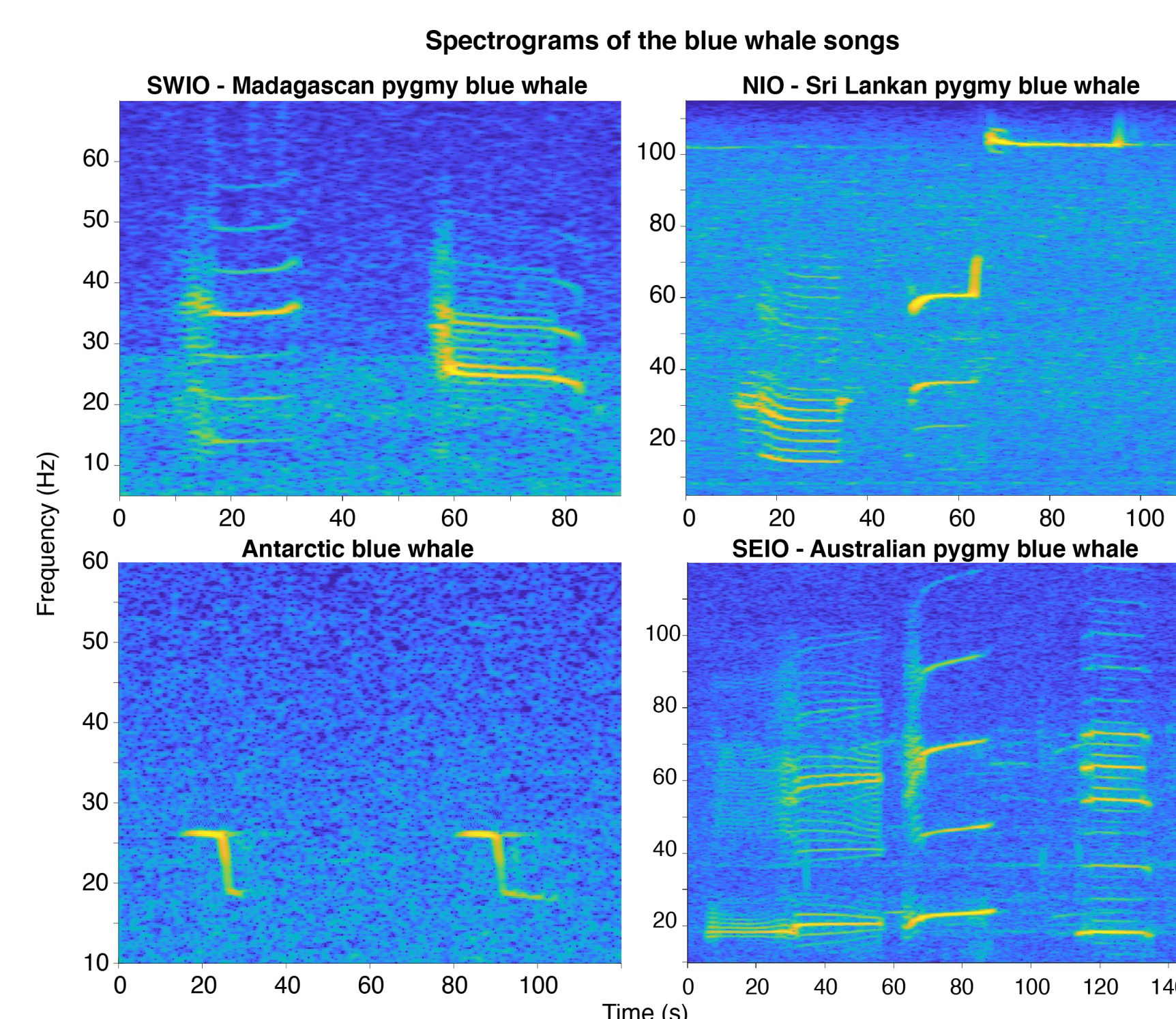
## Conclusion

Hydro-acoustic observatories primarily dedicated to geophysical or nuclear explosion monitoring can be used to improve knowledge on elusive large baleen whales. They also show the high potential of collaborations between researchers from multiple disciplines to collect and analyze data. For example, a decade of recordings in the Southwestern Indian Ocean primarily dedicated to geophysical research greatly improved the knowledge about blue whale presence and helped assessing the conservation status of this threatened species.

The work presented here focuses on blue whales, but other acoustic events from biologic, anthropogenic and geophysical sources can also be studied using these large and long-term acoustic arrays. Sharing existing datasets is therefore encouraged to broaden the scope of applications.

## What does long-term basin scale acoustic monitoring tell us about blue whales ?

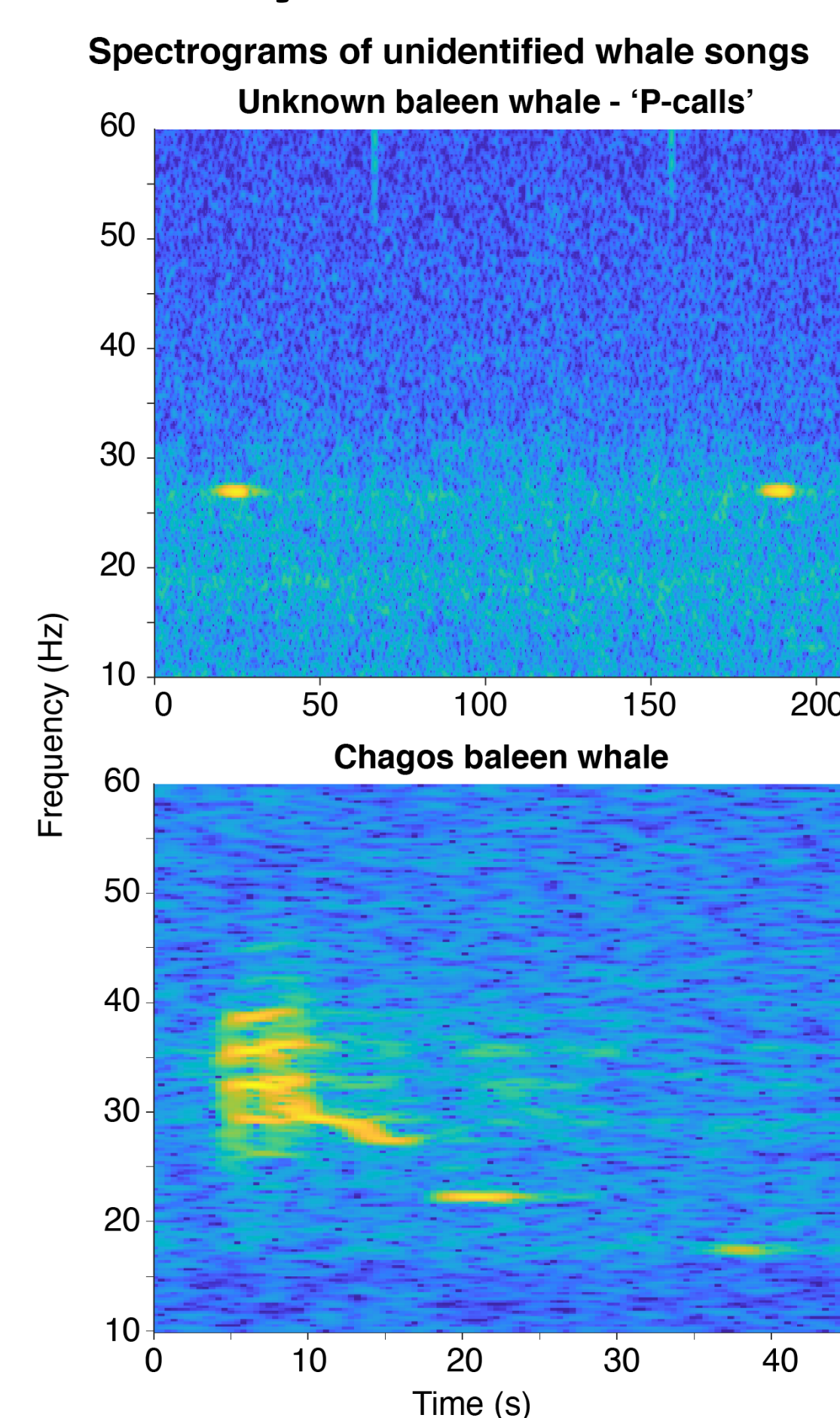
### 1- Population diversity



The acoustic recordings reveal the sympatric presence of multiple blue whale acoustic populations and highlight the importance of the area for these sub-species.

Samaran et al. 2010, Leroy et al. 2018 (b), Tarterotot et al. 2020

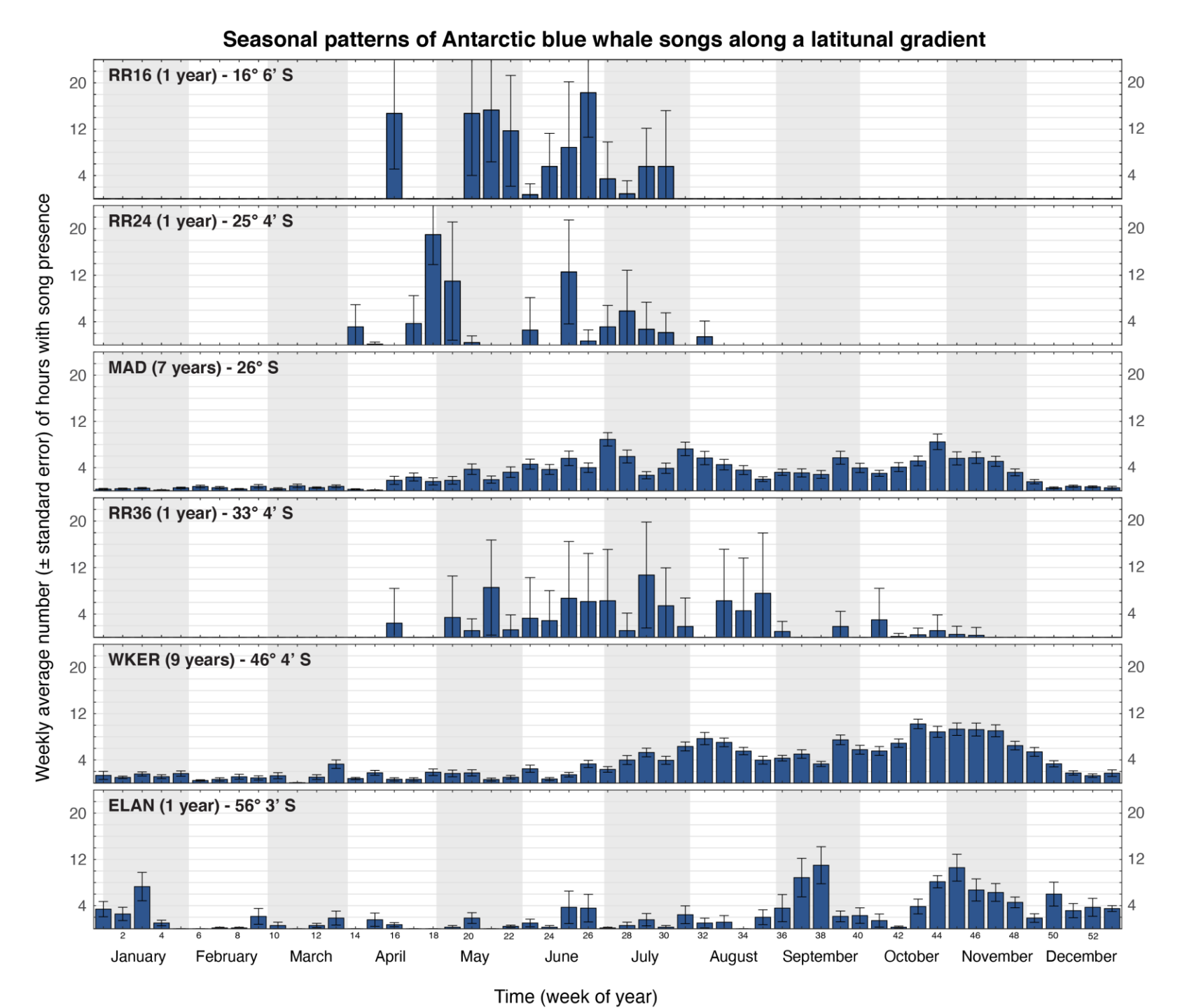
### 3- Discovery of new sounds



Passive acoustic monitoring is blind, and unknown biological sounds can be discovered. Assumptions can be made about their source, but their precise identification will require further investigation.

Leroy et al. 2017, 2021

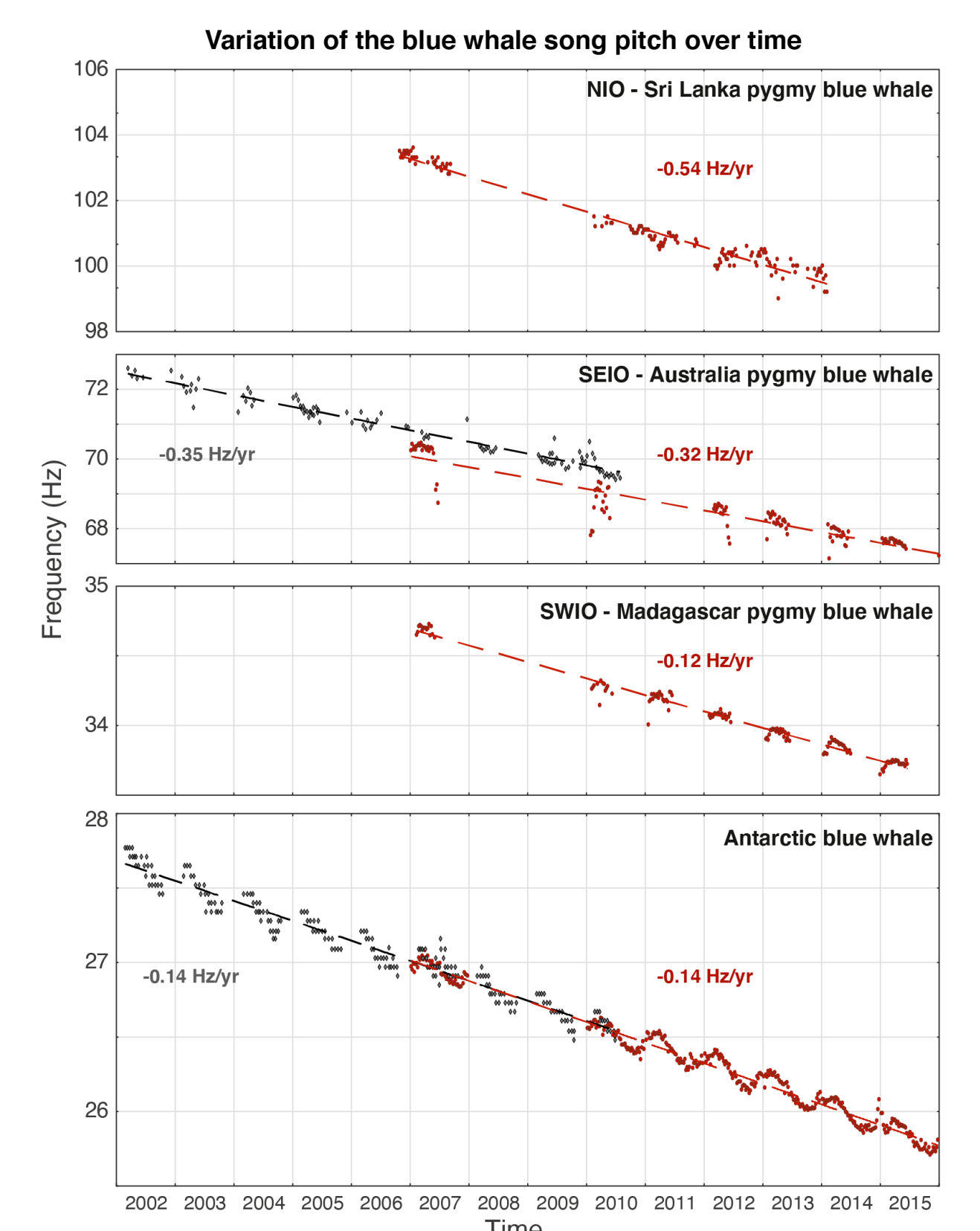
### 2- Large scale movements



Blue whale songs are recorded during different seasons over the wide-spread area covered by the hydrophones, revealing the distribution and migration patterns of the sub-species.

Samaran et al. 2013, Leroy et al. 2016, Dréo et al. 2019, Tarterotot et al. 2020

### 4- Long-term and seasonal song pitch variations



The pitch of blue whale songs is consistently decreasing over the years and varies seasonally. The reason of these changes are still to be unveiled.

Leroy et al. 2018 (a)

## References

- Dréo, R. et al. (2018). *Deep-Sea Research Part II: Topical Studies in Oceanography*
- Leroy, E. C. et al. (2016). *PLoS ONE*
- Leroy, E. C. et al. (2017). *The Journal of the Acoustical Society of America*
- Leroy, E. C. et al. (2018a). *Journal of Geophysical Research: Oceans*
- Leroy, E. C. et al. (2018b). *Endangered Species Research*
- Leroy, E. C. et al. (2021). *Scientific Reports*
- Samaran, F. et al. (2010). *Endangered Species Research*
- Samaran, F. et al. (2013). *PLoS ONE*
- Tarterotot, M. et al. (2020). *Deep-Sea Research Part II: Topical Studies in Oceanography*

## Acknowledgments

Thanks to the captains and crews of RV Marion Dufresne for the successful deployments and recoveries of the instruments of the DEFLOHYDRO, OHASISBIO, MAHY and RHUM-RUM arrays. Cruises were funded by the French Polar Institute and the French Oceanographic Fleet, with additional support from INSU-CNRS. The RHUM-RUM project was funded by project ANR-11-BS56-0013 and by DFG grants SI1538/2-1 and SI1538/ 4-1. Additional support was provided by CNRS, TAAF, IPEV and AWI. The 57 bottom OBS were provided by DEPAS, GEOMAR and INSU-IPGP. Access to the hydroacoustic data from the CTBTO hydrophone station HA08 was made available to T.L.Rogers through a virtual Data Exploitation Centre - vDEC Contract - with the UNSW and the CTBTO Preparatory Commission for the Project entitled 'Blue Whales in the Southern Hemisphere'.