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Progress report on Passive Acoustic Monitoring of the Eastern South Pacific southern right whales, a key to improve Conservation Management Plan outputs: May 2018-April 2019

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INTERNATIONAL
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ABSTRACT

Little is known about the Critically Endangered Eastern South Pacific southern right whale. In 2012, the IWC adopted a Conservation Management Plan for this population and since 2016 the Scientific Committee has supported a Passive Acoustic Monitoring (PAM) project to facilitate the identification of potential breeding areas along the coast of Chile and Peru. First deployment successfully occurred in July 2018 and planning to deploy the second equipment is underway. Further details on advances of the PAM project from May 2018 to April 2019 are reported here.

INTRODUCTION

The Eastern South Pacific (ESP) southern right whale (*Eubalaena australis*) population is Critically Endangered and since 2012, a Conservation Management Plan (CMP) for this population has been implemented through the International Whaling Commission (IWC) and it includes both Range States, Chile and Peru (Galletti Vernazzani *et al.* 2016).

Over the years, most sightings of ESP southern right whales were made on a single day and no breeding area has been yet identified (Galletti Vernazzani *et al.* 2011). Until a breeding ground is found many priority actions can hardly being implemented (CMP 2016).

The IWC Scientific Committee decided in 2016 to support the project “Acoustic Monitoring of the Eastern South Pacific population of southern right whales, a key to increase the results of the CMP”, with the aim to facilitate the identification of potential breeding areas along the coast of Chile and Peru (IWC 2017).

Over the past years, the Passive Acoustic Monitoring (PAM) project on ESP southern right whales has been focused on the establishment of steering group; selection of deployment sites; selection and acquisition of acoustic devices; and logistical planning for first location site, among others (Galletti Vernazzani *et al.* 2017, 2018). In 2018, the Scientific Committee “commends the scientific work and international co-operation being undertaken for the PAM project and looks forward to receiving the results of the acoustic studies such that future sighting surveys will be more informed and baseline information on the location of breeding grounds will be available.” (IWC 2018)

To date, the PAM project already started data collection and this report summarizes the progress made between May 2018 to April 2019.

FIRST DEPLOYMENT AND MAINTENANCE OF EQUIPMENTS

After careful planning, northwestern Isla de Chiloe was selected as the first deployment site. Recent scientific findings have shown several sightings and reproductive behavior off Isla de Chiloe, southern Chile, and it has been proposed that the area has a strong likelihood to be part of a breeding area (Galletti Vernazzani *et al.* 2014).

The first deployment successfully occurred on 02 July 2018 off northwestern Isla de Chiloe (41°56' S - 74°07' W), at about 70m depth (Figure 1). This would allow at least 30km radio of acoustic detection from deployment site. This is consistent with previous distance recorded on the area (Jacobs *et al.* 2019).

The hydrophone used was the Sound Trap model ST300 STD by Ocean Instruments, programmed to record continuously from 20Hz to 24KHz. With this sample rate it is possible to cover approximately 15 days of continuous recordings however, with the battery pack (ST300B External Battery Pack), the battery life is extended and in turn recording period should increase to approximately 76 days. A special frame was designed and built to attach the hydrophone and battery pack system to the rope in order to minimize possible sources of errors and lost of the equipment (Figure 2). Due to strong currents present in west coast of Isla de Chiloe, iXBlue OCEANO 500 acoustic release equipment (Figure 3) was selected. Deck Unit from iXBlue will be contributed by University of Concepcion.

Due to the lack of mooring available at northwestern Isla de Chiloe, it was decided to build the moorings. Two 50kg weights are used for each deployment to ensure the proper fixing of the equipment at the sea bottom (Figure 4). A set of three buoys from up to 400m depth were used in order to have the line and hydrophone floating appropriately. Therefore the line includes the buoys, the hydrophone and battery pack, the acoustic release and the mooring (Figure 5).

Safety equipment for crew is also considered on board.

Although the recording period was estimated on 76 days, during the first retrieving of the hydrophone it was noted that the battery was already almost full before the recording period ended, probably due to cold water temperatures. To avoid any data lost, it was decided to schedule maintenance each 60 days as safety time window for data recovery.

To date, 10 months of continual acoustic data from northwestern Isla de Chiloe has been collected and backed-up on three different external hard drives. Next maintenance will occur mid May 2019 and final retrieval is schedule during July 2019, after completion of one year of data recording.

Centro de Conservacion Cetacea contributed with ship time to deploy and retrieve acoustic equipment off Isla de Chiloé. Dr. Ivan Perez-Santos, oceanographer from the Centro i-Mar from University of Los Lagos is actively collaborating in the installation and maintenance of the hydrophones at first location and will continue to be responsible of this task for future sites.

SELECTION OF FUTURE DEPLOYMENT SITES AND LOGISTICAL PLANNING

The PAM project seeks to obtain temporal coverage over a complete annual cycle and spatial coverage depending on the number of sites selected, to identify/confirm areas with high seasonal presence, and in the best scenario, the presence of reproductive vocalizations. This will facilitate to concentrate survey efforts where breeding areas are more likely to occur.

Hydrophones will be deployed along the distribution range of the southern right whale. Due to limited budget to cover operational costs and equipments, efforts are planned to be focused on two locations per year.

It was previously suggested as possible second location site the area off Valparaiso-San Antonio (central Chile) (Galletti Vernazzani *et al.* 2018), due to the occurrence of several southern right whale sightings (Galletti Vernazzani *et al.* 2011). However, after carefully consideration, it was considered that Valparaíso area is probable a migratory connections of whales.

On the other hand, Talcahuano-Arauco Gulf, a former whaling area of southern right whales, is more likely a breeding area and thus was selected as the second location site. Logistics should also be facilitated by the presence of University of Concepcion that has frequent maintenance surveys in the area. Logistical planning is still underway, second equipment is already prepared and deployment at second location site should be schedule for June 2019.

Based on previous experience with first location site, maintenance will occur each two months. During the retrieval process, the hydrophone undergoes maintenance where instrument batteries and memory card are

changed. During this time, it is also checked that the hydrophone is working and recording correctly. The equipment is then deployed and retrieved again.

The area near Antofagasta-Mejillones (northern Chile) has also been considered as a possibility of breeding area in the north of Chile and is being considered as third location site. Deployment should be scheduled at this area after final retrieval of the acoustic equipment from Isla de Chiloe (*i.e.* August-September). Logistical planning should start after the second acoustic equipment is deployed. The University of Antofagasta and the NGO Centro de Investigacion de Fauna Marina y Avistamiento de Cetaceos that work with cetaceans on this area will be approached and are likely potential good partners that could facilitate the implementation of the deployment and maintenance of the equipment at this third location site.

Selection of first to third location sites will enable us also to get good coverage from three regions (southern, central and northern) along all the coast of Chile.

In 2020-2021, it may be considered to explore areas, such as southern Peru, Gulf of Penas and/or Valparaíso.

DATA ANALYSIS

Southern right whales produce species-specific calls that help to identify them amongst other marine sounds. The most well-known vocalization of southern right whale is the ‘upcall’; a stereotypical call thought to be a contact call and therefore produced by both males and females of all ages-groups (Clark *et al.* 1982).

Currently there is 10 months of data available and it will continue to increase as the number of retrieval and sites increases.

It has been considered the possibility to involve PhD or MSc students from both Chile and Peru to analyze the data under Dr. Susannah Buchan supervision. A call will be made to receive CVs from students. Students may also be requested to apply for funding.

Due to the anticipated rarity of southern right whale vocalizations, acoustic recording data will be manually reviewed rather than using an automated detector. Using the software platform Raven Pro 2.0, every southern right whale call will be annotated across the 12-month period to outline seasonal presence. An intern has already started looking at the first few months of data and preliminary results will be made available when this work is further advanced.

In addition, it is envisaged that the students involved could conduct an in-depth apprenticeship at Woods Hole Oceanographic Institution (WHOI, USA) acoustic lab, in order to expand national/regional whale acoustics research capacities.

PERMITS REQUIREMENTS

Permit to deploy instruments on the seafloor to record this Critically Endangered population had already been granted by the Hydrographic and Oceanographic Service of Chile for first location site (SHOA #13270/24/178). For each location site a permit will need to be requested about one month in advance.

EDUCATION AND CAPACITY BUILDING

An educational and capacity building program to create public awareness along the coast off Chile and Peru has been proposed to be implemented under the PAM project at locations where the equipment will be deployed (Galletti Vernazzani *et al.* 2018).

The range of the ESP southern right whale extends more than 4,000km from Peru to Chile, therefore it is critical to have the support and involvement of coastal communities, government agencies and the IWC scientific committee for the success of the CMP and the recovery of this subpopulation. The involvement of communities could assist in reporting sightings along the range and help in the identification of aggregation areas.

From January to March 2019, meetings have already been held with local authorities and artisanal fishermen from northwestern Isla de Chiloe to inform about the project objectives. An in-depth workshop to train fishermen and tourist operators on species identification and its conservation status as well as educational lectures to local schools to inform about acoustic technologies, photography and the role of whales in the ecosystem are being developed and are scheduled to be conducted in May 2019.

FUNDING

During this period, the PAM project received support from the IWC Research Fund, Centro de Conservación Cetacea, COPAS Sur-Austral from University of Concepción, Patagonia Environmental Grants from Tides Foundation and the 'Whale and Dolphin Bharathi Viswanathan Award for Innovative and Non-Invasive Research'.

For 2019, the support granted to the PAM project by the IWC Research Fund (IWC 2018) was reduced by the Commission by 30% due to IWC financial limitations, affecting the implementation of field work.

However, Patagonia Environmental Grants from Tides Foundation already confirmed its continual support for 2019 to cover part of the activities of the Conservation Management Plan, including the PAM project. Therefore, costs associated to 2019 field work should be fulfilled.

Additional funding will be needed to cover field work for 2020 and data analysis. Applications to several funding sources are being considered.

FUTURE WORK PLAN

Data collection will be finalized at first location site in July 2019. Deployment at second location site is scheduled for June 2019 and logistical planning of third location site will follow immediately after deployment of second acoustic device.

Preliminary results of data analysis should become available later in 2019. PAM analyses generally require a considerable amount of time (analyst hours), especially when examining rare species, like southern right whales.

Depending on the results, devices will be deployed in the same or different location, to increase temporal or spatial coverage. It is expected that the occurrence and seasonality of southern right whale calls will provide insight into the behaviour of southern right whales in the areas and facilitate the identification of a breeding area.

Considering budget limitations, additional funding will be sought from external sources.

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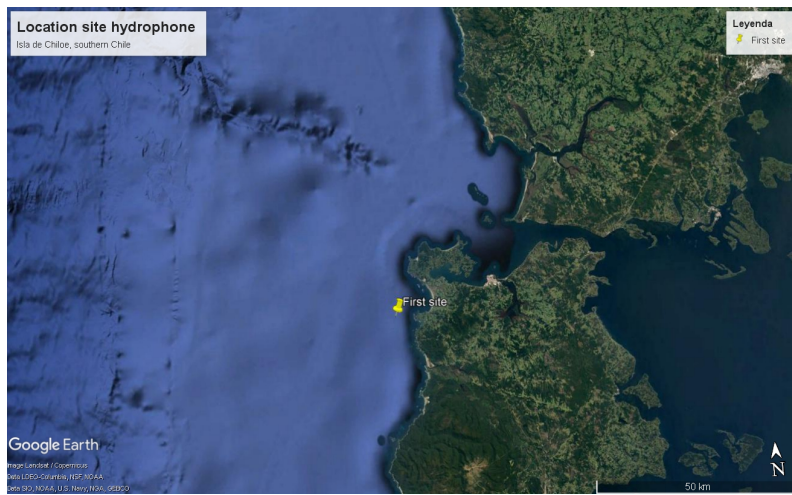


Figure 1 – Location site off northwestern Isla de Chiloe, southern Chile



Figure 2 – Hidrophone system (Hydrophone Soundtrap STD 300, battery pack and frame)



Figure 3 – Acoustic Release iXBlue Oceano 500



Figure 4 – Moorings used

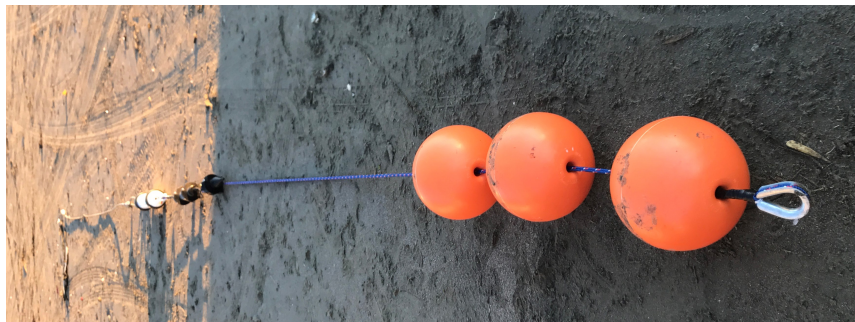


Figure 5 – Entire line (buoys, hydrophone system, acoustic release and moorings)