SUMMARY SHEET
OF THE INTERNATIONAL RESEARCH PROJECT (IRP)

« **Detection and AI Classification of the Biosonar of dolphins and porpoises in the Southern Cone** »

(DCBD)

Duration : 2025-2029
French scientific coordinator's name : Hervé Glotin, Laboratoire d'Informatique et des Systèmes , (LIS) – UMR 7020 (CNRS, Aix Marseille Université)

1) Project summary, main goals and expected results

Since 2016, the DYNI team has worked to build collaboration with the Southern Cone on rare delphinid species through the BRILLAM project supported under the STIC AmSud program .
Since 2021, the DYNI team has been working, once again in the Southern Cone, on the Chilean and Argentinian aspects, notably with the co-organization of colloquia (Lamla, Listening to aquatic mammals in Latin America) and École thématique signal / bioacoustique (little developed in the Southern Cone).

Hence, the collaboration between the DYNI team and the team of the University of Mar del Plata has begun in 2021,with a workshop organized during the on-line conference "acústica marina" (1-3 november 2021, Argentina,organized by CONICET, UNTREF, Cethus foundation, FRD, UBA). The collaboration comes from a common interestin the conservation of small cetaceans using passive acoustic monitoring (PAM), and a wish for the development ofnew techniques for recording and analyzing data based on the experience of each group.

Small odontocetes, such as small dolphins or porpoises, are discreet species, very often threatened and sensitive to human occupation. Passive acoustics is a good way to monitor these populations, but this monitoring comes up against various technical and theoretical problems. The acoustic productions of some of these species are high-frequency, narrow-bandwidth clicks (NBHF), which need to be recorded at very high sampling rates, by dedicated devices. Theoretical and computer tools are lacking to discriminate between species that sometimes coexist in the same area and whose behavior and spatial occupation are not well known. We propose, in this project, to record the acoustic productions of dolphins and coastal porpoises present on the Argentine coast, in the province of Buenos Aires and in other important zones of the American south cone, such as Patagonia (Chilean and Argentine) and the Chilean coast. We will develop mathematical models for describing these signals and then, thanks to these models, we will refine their detection and classification, using tools related to artificial intelligence (convolutional neural network for example). The classification of clicks according to species would allow longer-term monitoring through dedicated detectors of the sound productions of these species whose conservation status needs to be clarified.

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ADDED VALUE OF THE INTERNATIONAL COOPERATION TO FULFILL THE AIMS OF THE PROJECT

Very few species of small dolphins or porpoises are present on the French coasts and, when they are present, the densities there are very low, which makes their study particularly difficult (Jung et al. 2009). Extremely few passive acoustic studies of porpoises or dolphins emitting NBHF clicks have been conducted. In the American South Cone, on the contrary, this type of cetacean is more frequent. The teams from the University of Mar del Plata (Argentina) and UACh and USC (Chile) are mainly composed of marine biologists and ecologists with extensive experience in the study of these marine mammals and with a very good knowledge of the ecosystems in which they live. The DYNI team at the LIS of the University of Toulon, supported by the SMIoT platform, is an expert in the analysis of transient click-type signals, developing for many years computer and mathematical devices and techniques to detect and classify these signals. The two project teams are therefore very complementary. Our international collaboration will make it possible to better understand what are the appropriate protocols for the study of these fauna, and in particular the behavior of marine mammals (including vocal behavior) and their density, over the longer term.

2) List of Participants

a) in France

Name	Laboratory	Institutional affiliation (employer)
Hervé Glotin, Prof. Coordinator, PI	Laboratoire d'informatique et des systèmes (LIS) – UMR7020	UNIVERSITE DE TOULON
Adeline PAIEMENT , MC	LIS	UNIVERSITE DE TOULON
Sébastien PARIS , MC	LIS	AIX-MARSEILLE UNIVERSITE
Julie PATRIS , MC.	LIS	AIX-MARSEILLE UNIVERSITE
Franck MALIGE, Chercheur associé	LIS	UNIVERSITE DE TOULON
Nicolas DELOUSTAL (ex master science de la mer, Doctorant	LIS	UNIVERSITE DE TOULON
Loïc LENHOFF, ex Doctorant	LIS- MARBEC (Biodiversité Marine, Exploitation et Conservation (UMR9190)	UNIVERSITE DE Montpellier in future contract
Valentin GIES , Prof.	Institut matériaux microélectronique nanosciences de Provence (IM2NP) - UMR7334	UNIVERSITE DE TOULON
Sébastian MARZETTI, Post-doc	IM2NP	UNIVERSITE DE TOULON
* Master's student in marine science or computer math, 1 each year at LIS		

b) in Argentina

Name	Laboratory	Institutional affiliation (employer)
Gisela Vanina GIARDINO, Prof. **Coordinator, PI**	Instituto de Investigaciones Marinas y Costeras (IIMyC)	Universidad Nacional de Mar del Plata (UNMdP)-CONICET
Diego Horacio RODRIGUEZ, chercheur	Instituto de Investigaciones Marinas y Costeras (IIMyC)	UNMdP -CONICET
Agustina Camila MACCHI , doctorante	Instituto de Investigaciones Marinas y Costeras (IIMyC)	UNMdP -CONICET
* * Master's student		

c) in Chili

Name	Laboratory	Institutional affiliation (employer)
Mauricio SOTO, Prof. **Coordinator, PI**	Laboratoire d'écologie comportementale et de conservation, institut de sciences de l'environnement et de l'évolution	Université australe du Chili (UACh)
Margherita SILVESTRI, doctorante	Laboratoire d'écologie comportementale et de conservation, institut de sciences de l'environnement et de l'évolution	Université Australe du Chili (UACh)
Ivan HINOJOSA, Prof. **Coordinator, PI**		Université Catholique de la Santisima Concepción (UCSC)