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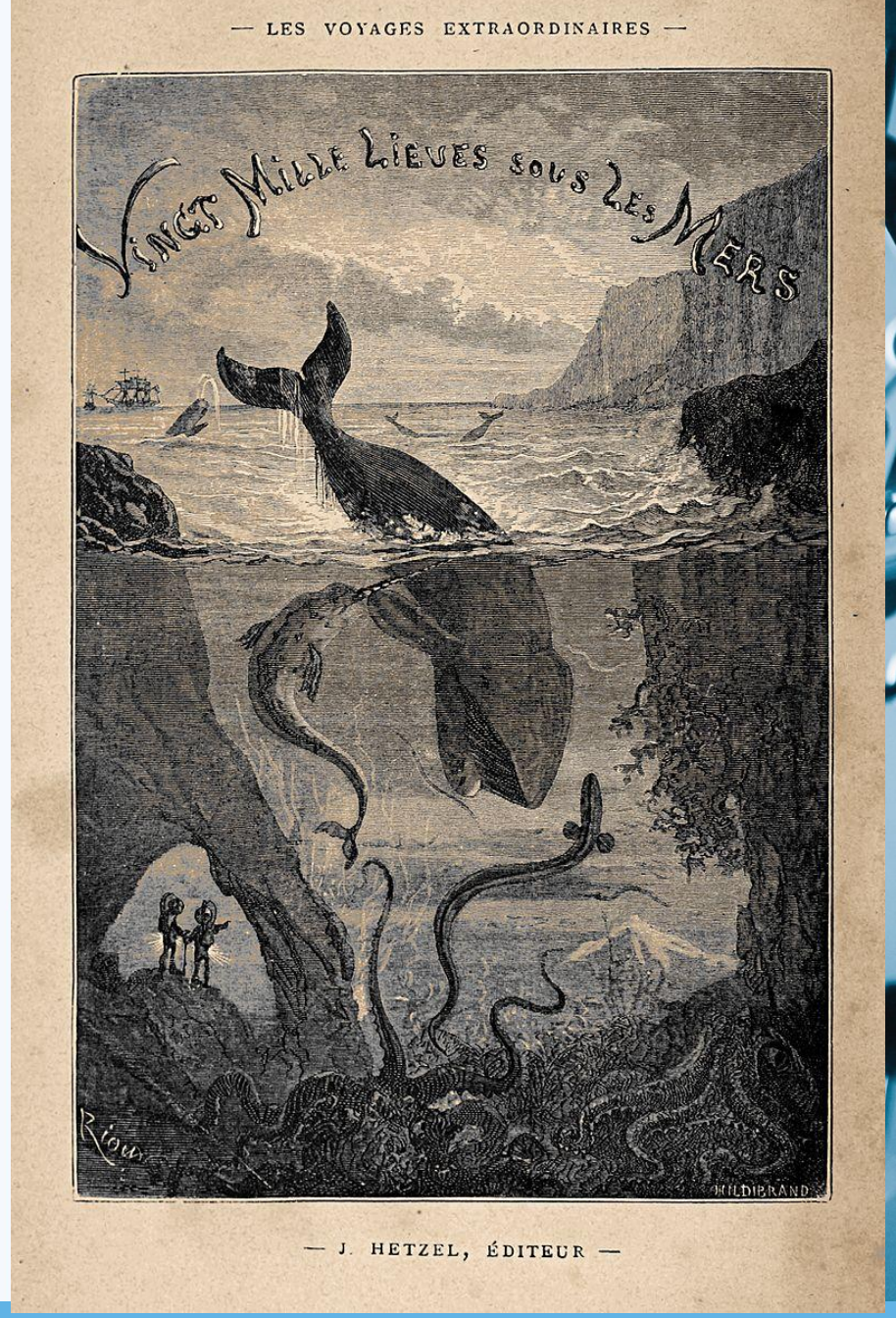
Discovering the unexplored deep marine environment



Submarine Intelligent Listening into KM3Env : Detect, Classify & Localize Cetaceans

Hervé Glotin & Dyni team
AI Chair in Bioacoustics
Computer Science & Systems Lab. LIS CNRS Toulon
glotin@univ-tln.fr

WEBINAR

February 26, 2021, 15:00 CET

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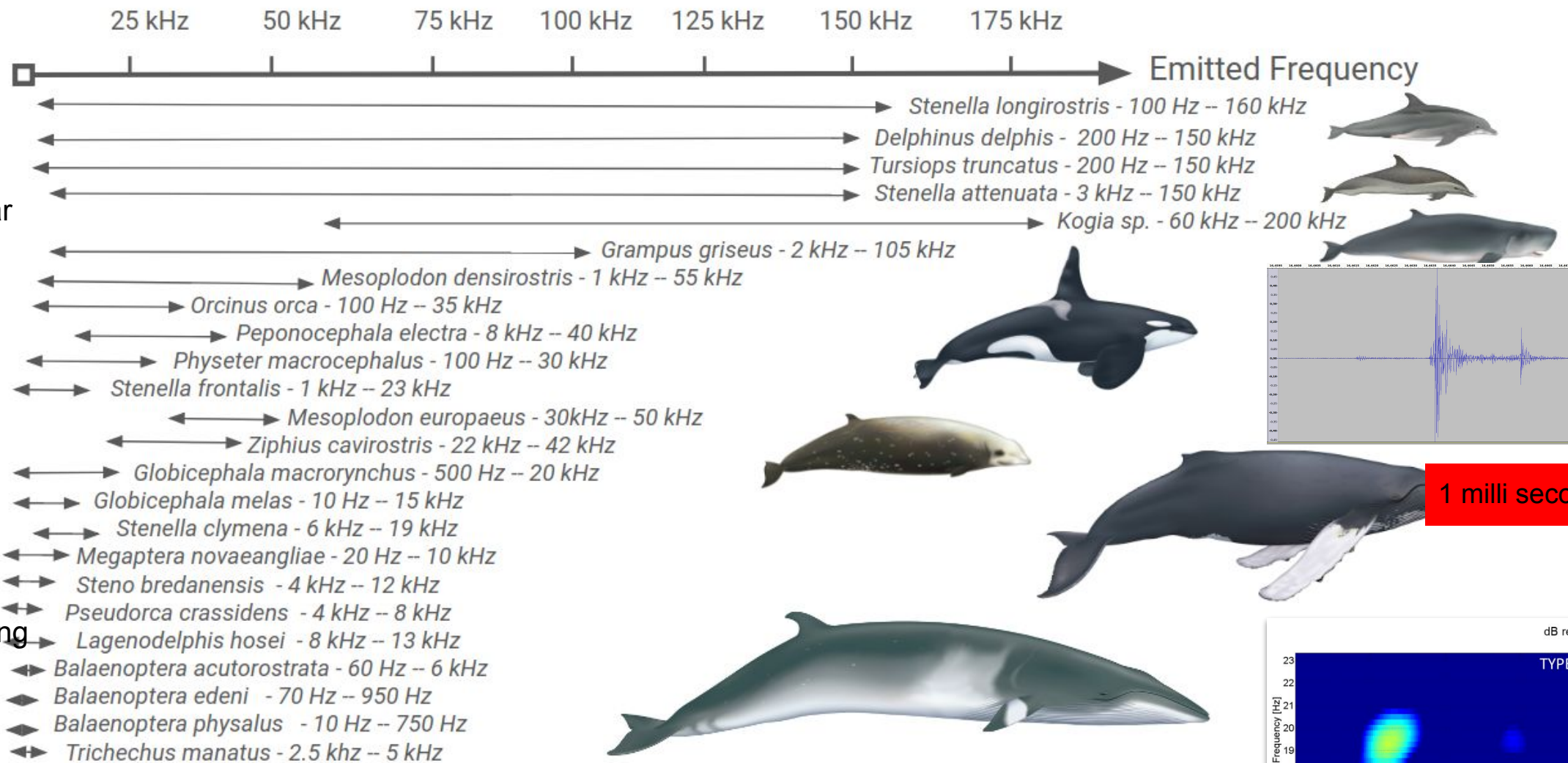
The cetaceans… are just here !

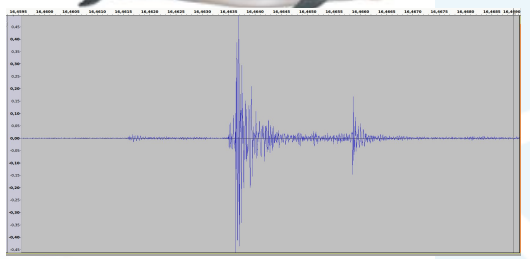
Sueur and Farina 2015

Which sound do they emit and why ?



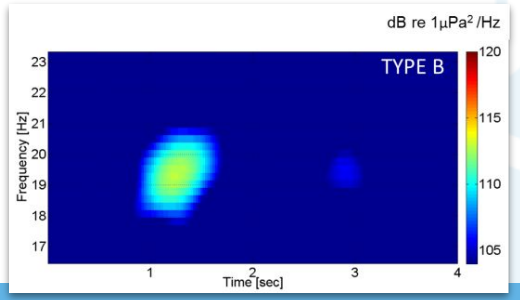
Sonar

Voicing



(t,a)

1 milli seconde



(t,f)

1 seconde

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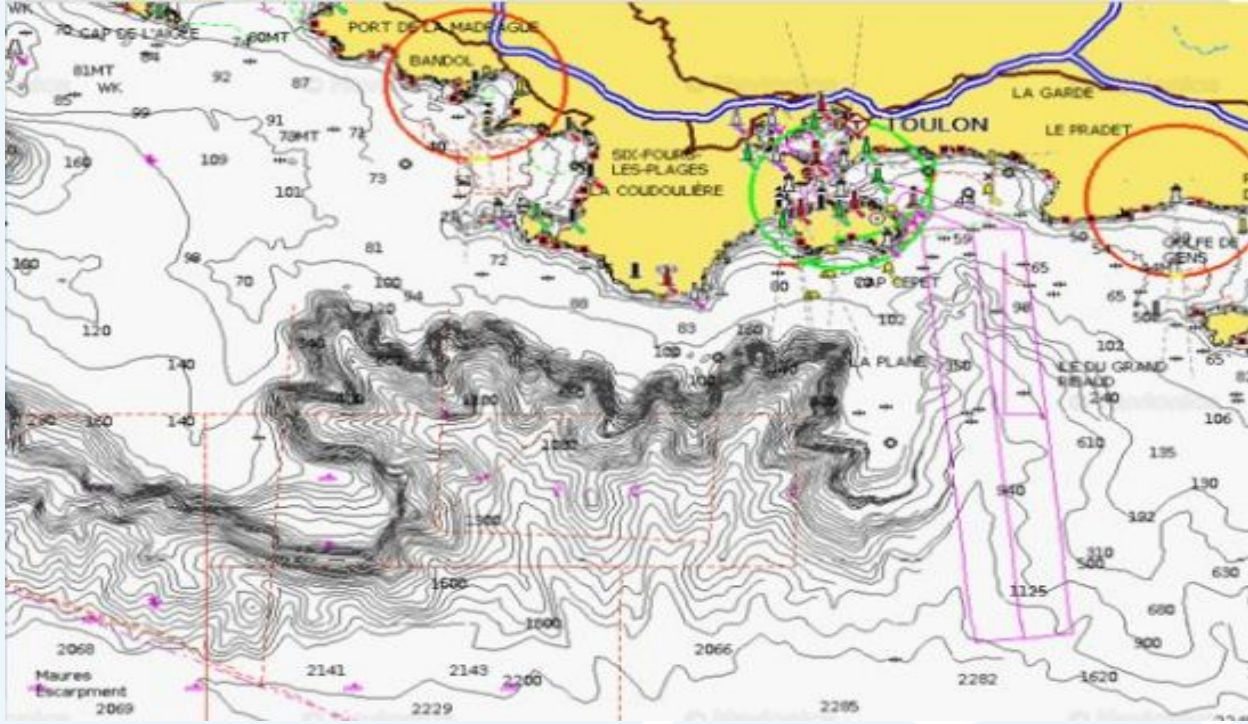
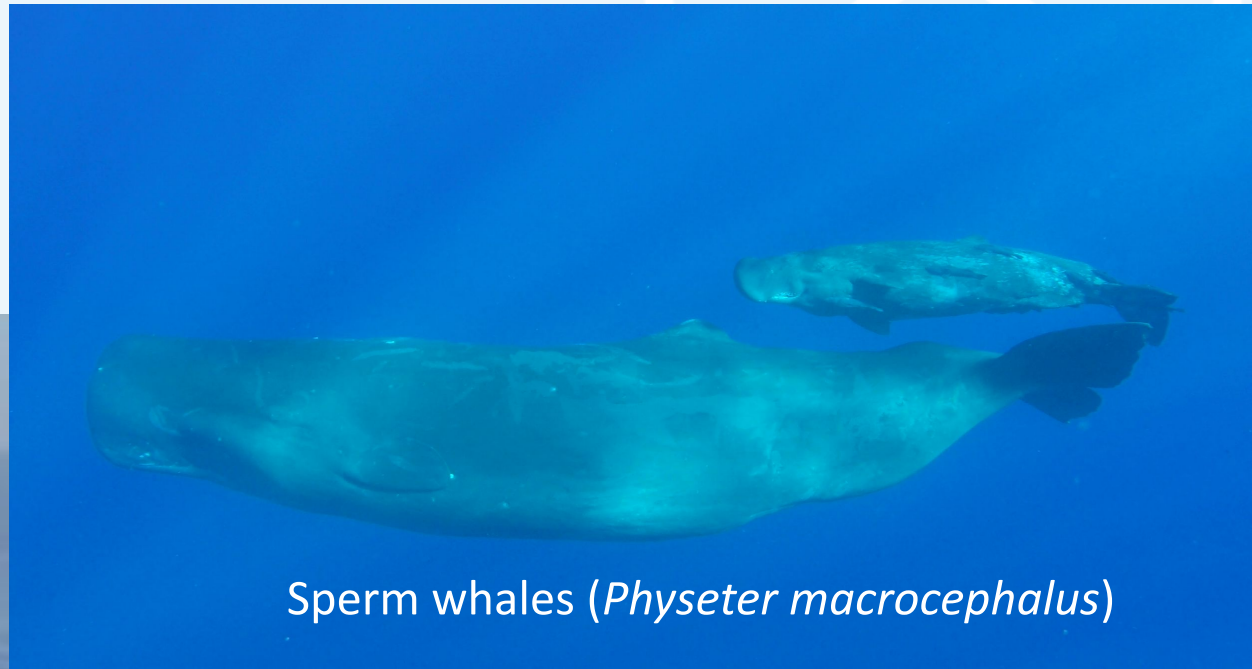
1. Motivation

- Endangered species
- Passive acoustics to study cetacean
- 3D tractography of deep dives from the surface : learn from what they listen to
- Monitoring of marine traffic to avoid collisions

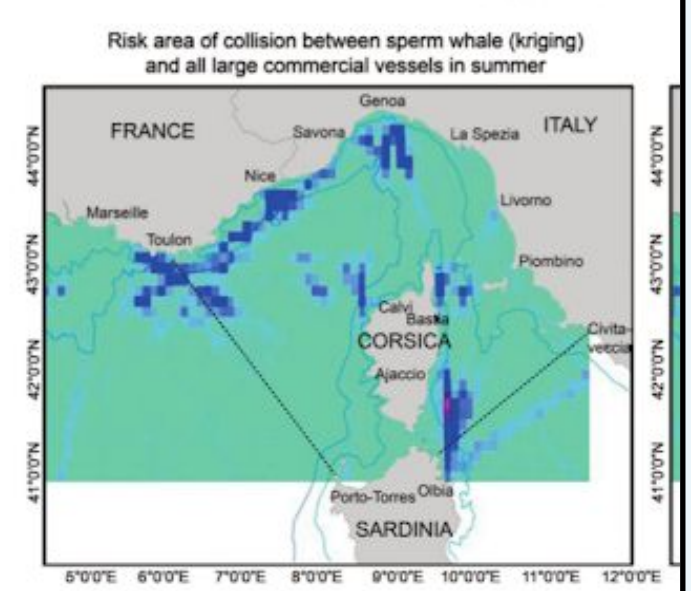


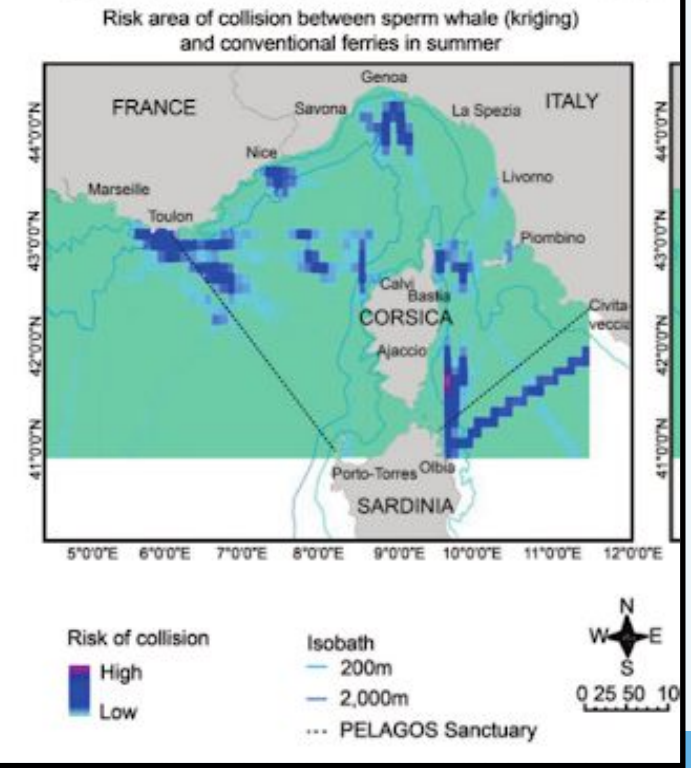
Sicié Canyon, Toulon, France

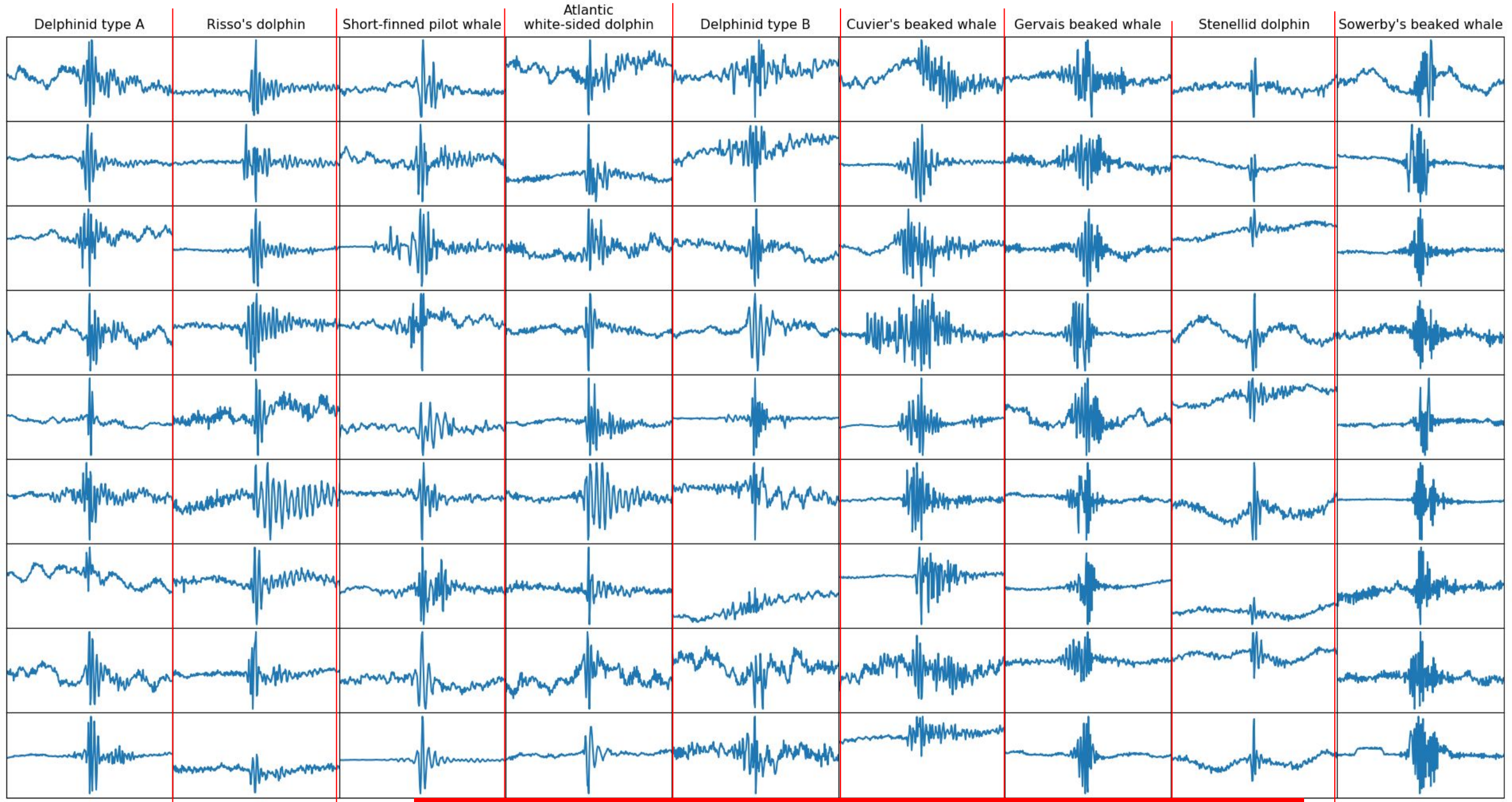


Sperm whales (*Physeter macrocephalus*)

The risk of collision : ~ 12 / year







Other BIOSONARS (Ferrari Glotin IJCNN2020)

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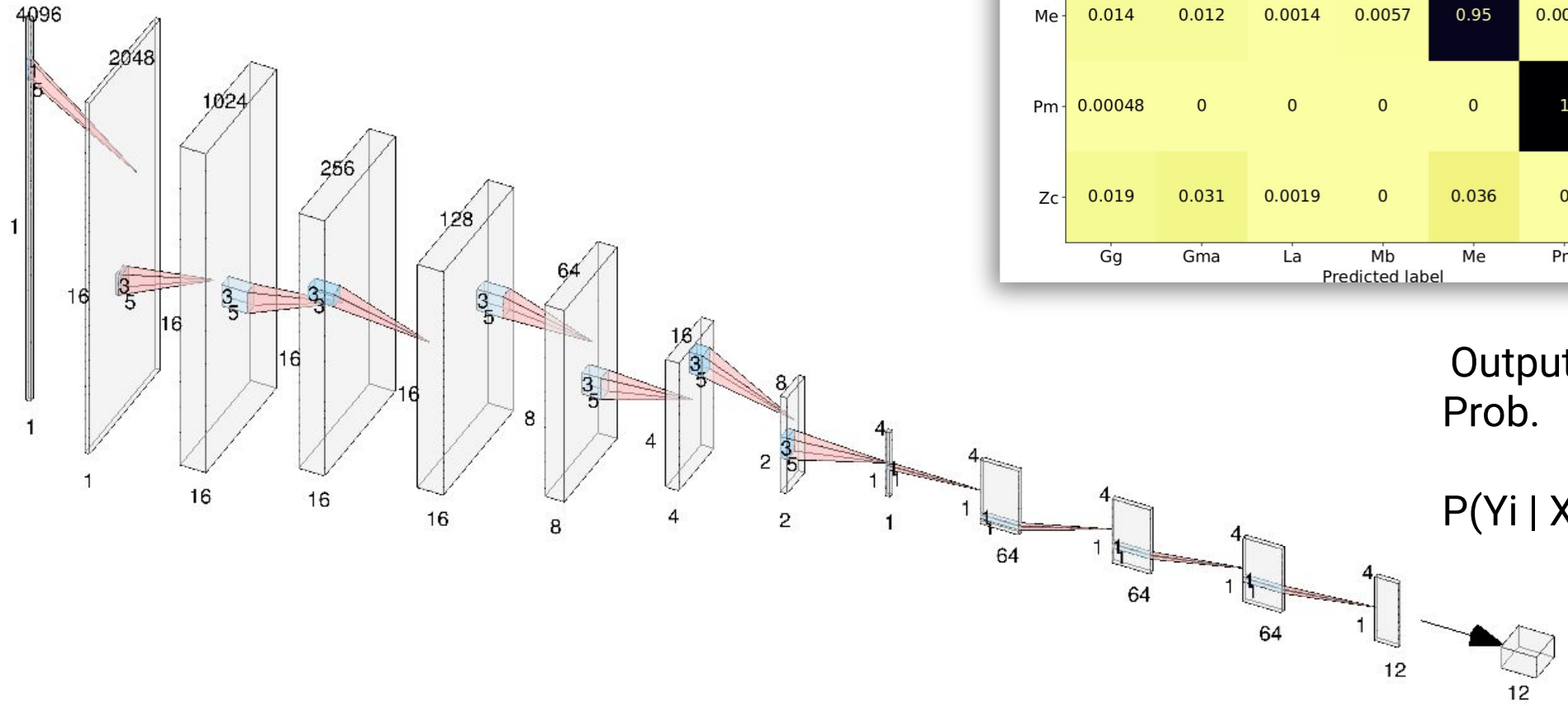
Detect and class Biosonar with AI Convolutional Deep Learning : 95% ok!

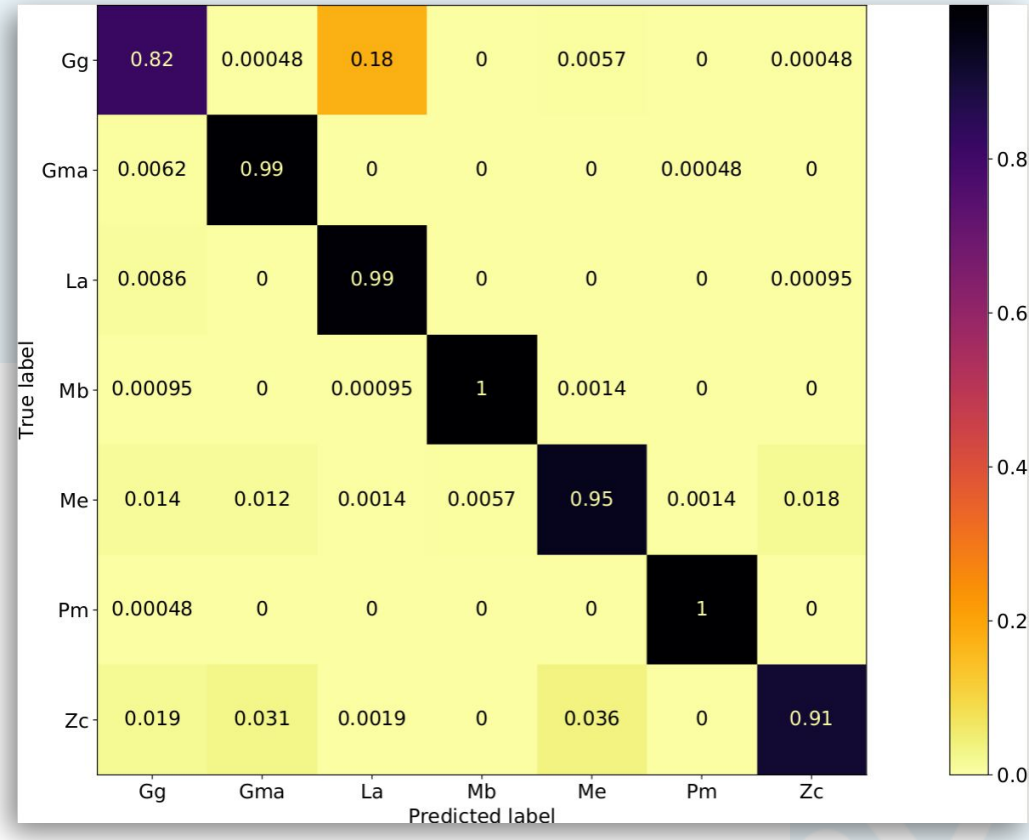
(Ferrari, Glotin et al. IJCNN 2020)

RAW
WAV
Input
signal



Output
Prob.

P(Yi | X)



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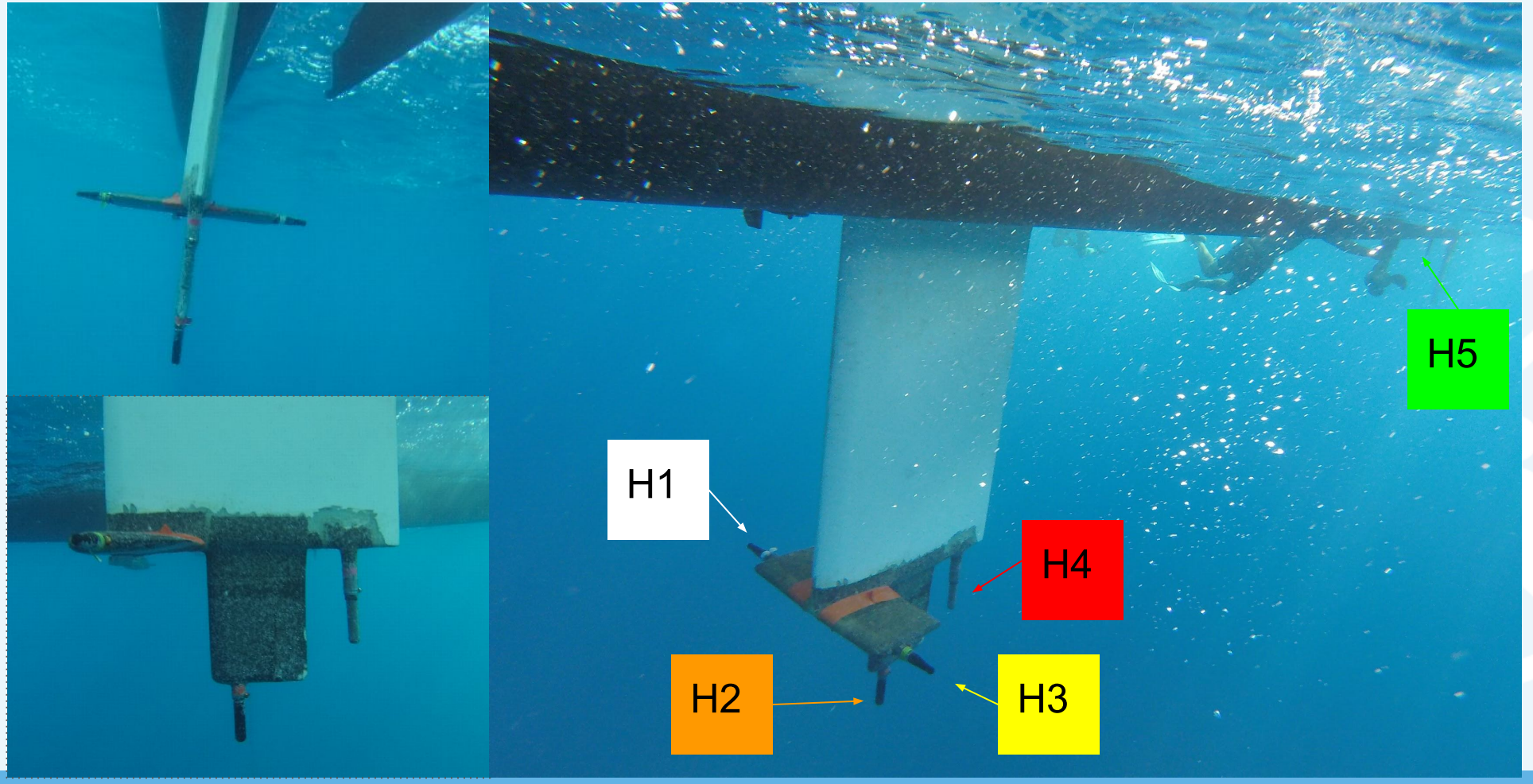
4. Design of the antenna

Antenna video :
http://sabiod.org/seeabyss



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Example of Clear dolphin clicks, TDOA measures, recorded on 5 channels

Direct

Surface echoes

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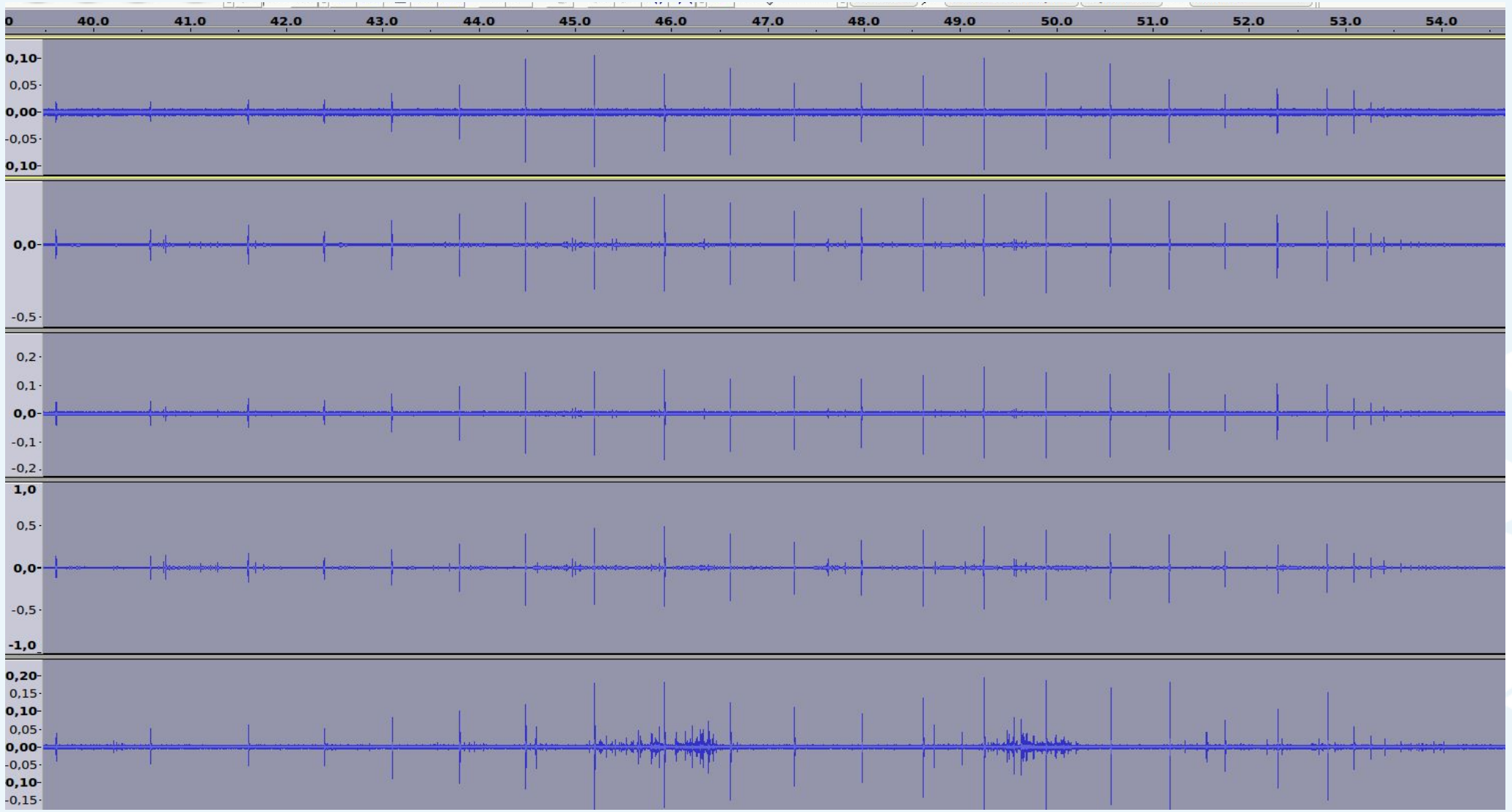

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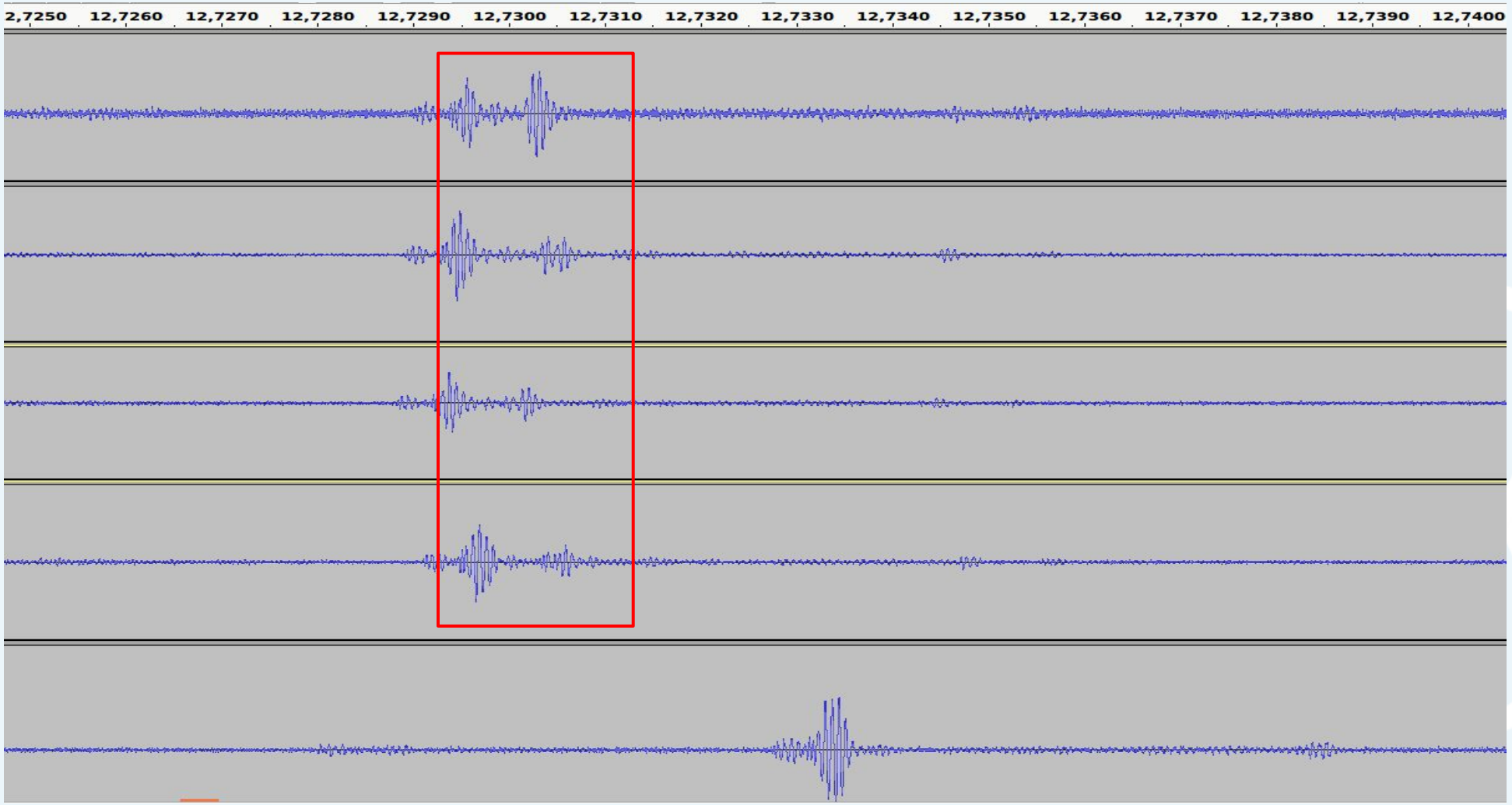
The time delays… tell us a lot



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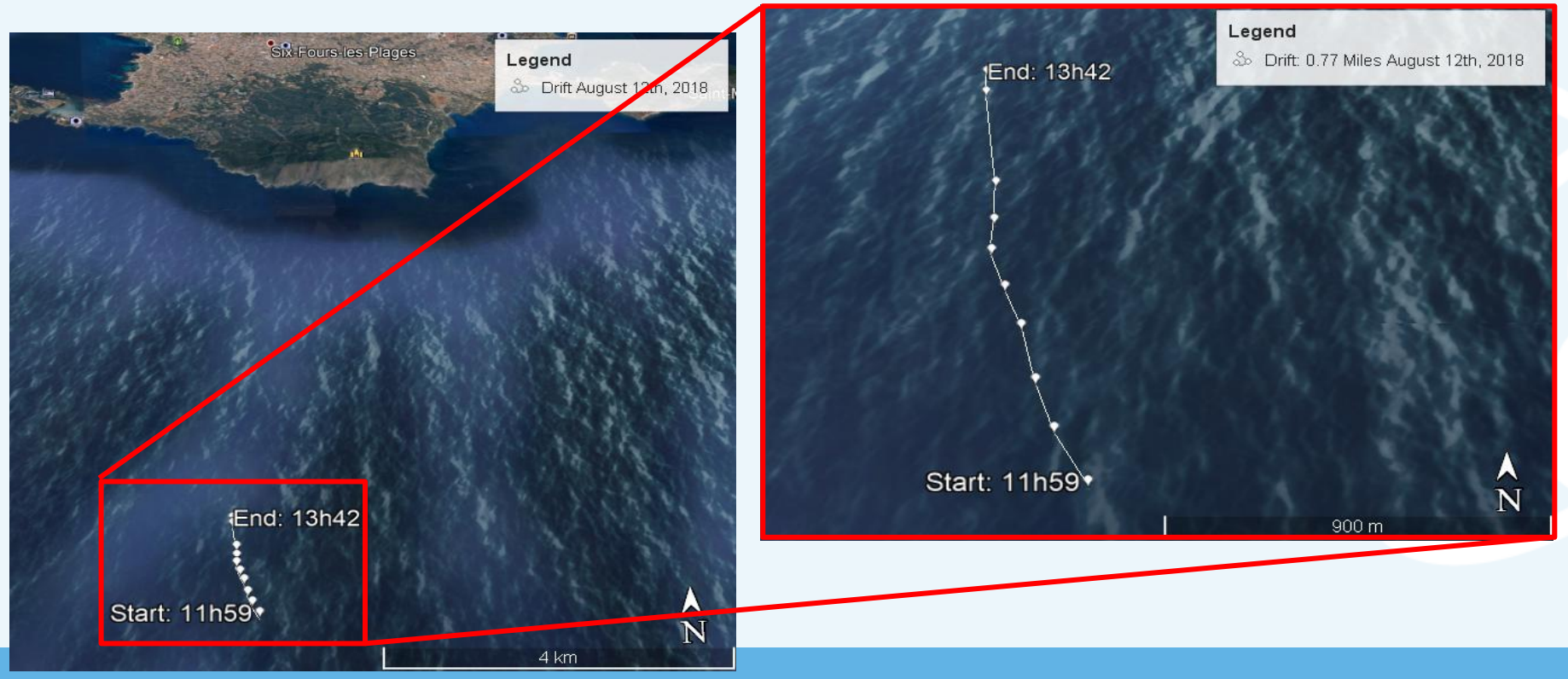
12th of august 2018 : 2 hours of recordings of a single sperm whales South of Toulon



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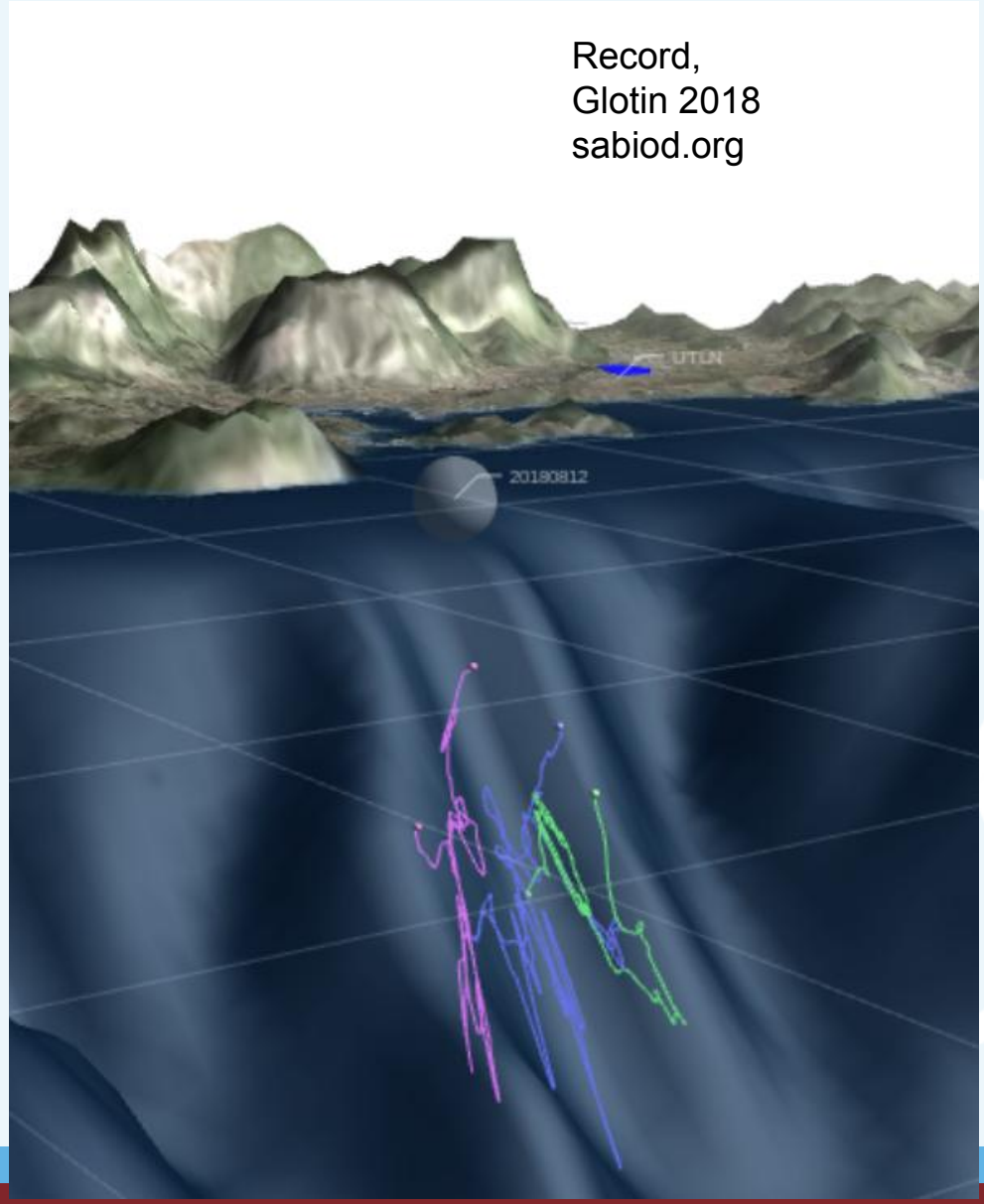
Example of 3 track in front of KM3Env

- 3 tracks (green, blue, pink) of the Cachalot,
- 50 minutes each, getting to -1000 m

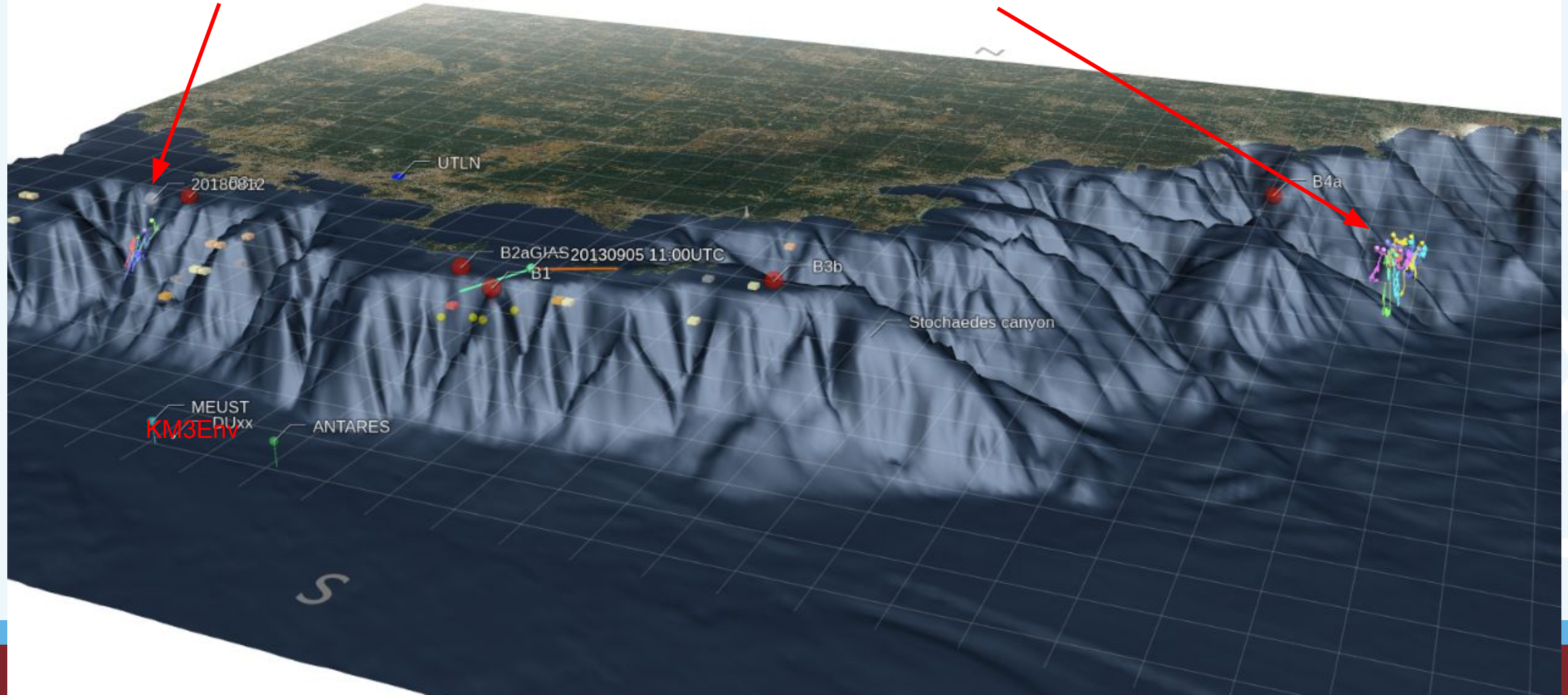
Same species
Other record,
Glotin 2008
sabiod.org

Record,
Glotin 2018
sabiod.org

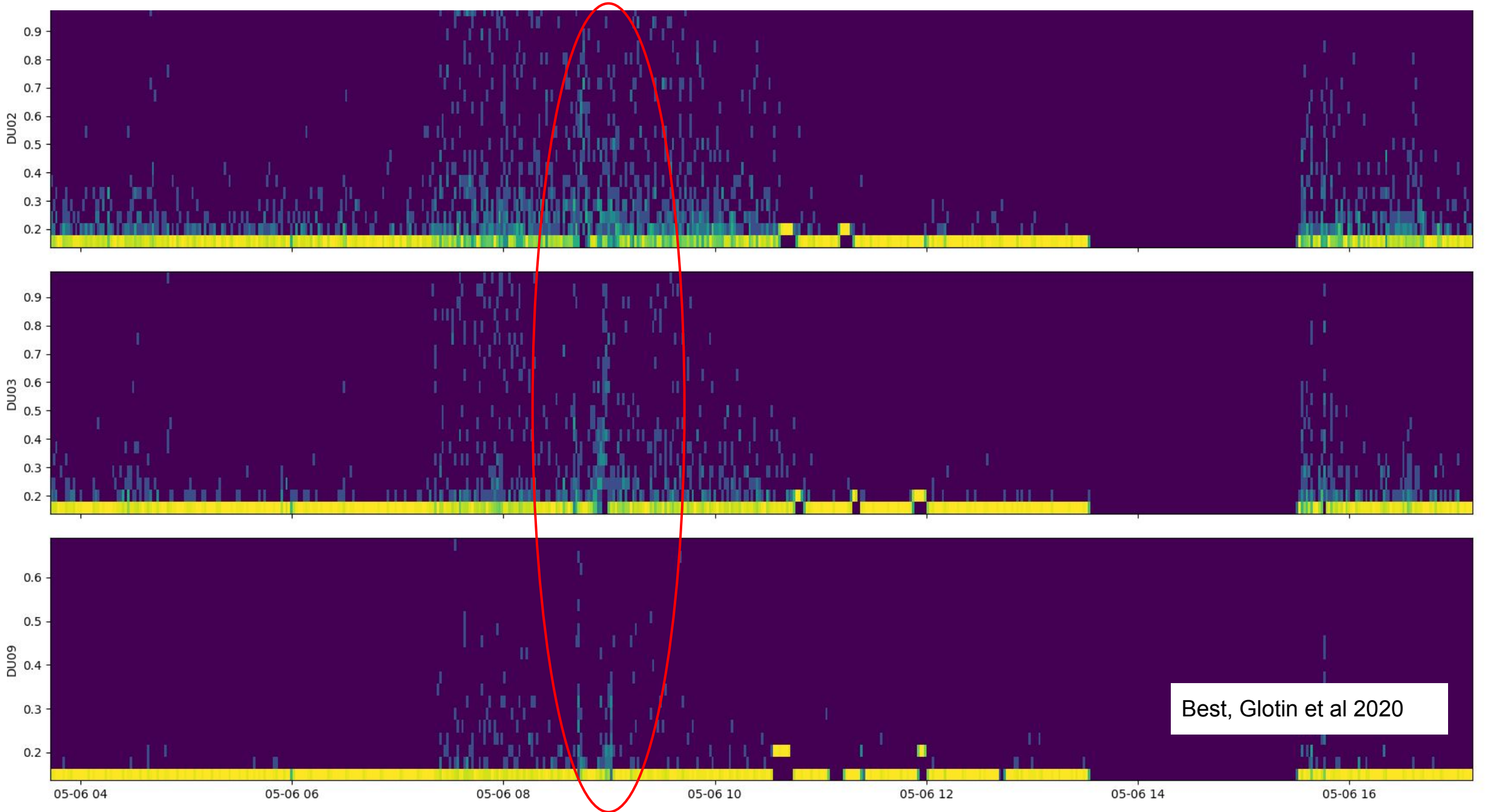


Poupard … Glotin, Real-time passive acoustic 3d tracking of deep diving cetacean by small non-uniform mobile surface antenna, ICASSP 2019

A global overview of what we can discover here…
The biggest hunters of the earth, in group...



Deep learning listening 10 hours on KM3Env hydrophones, spring 2020 show



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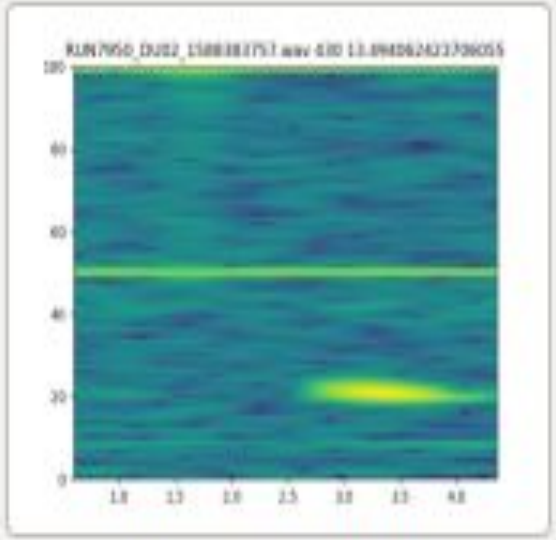
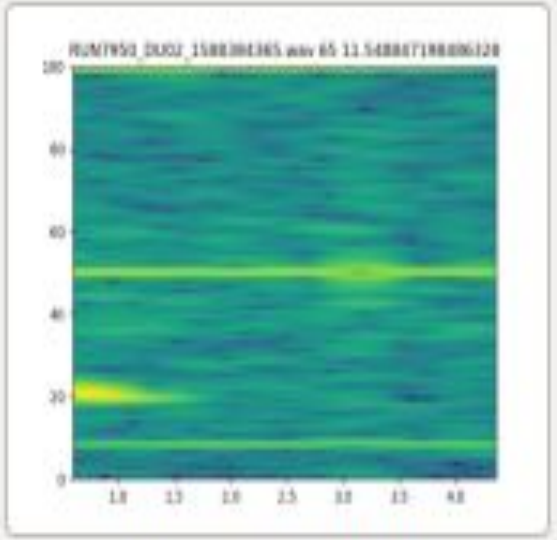
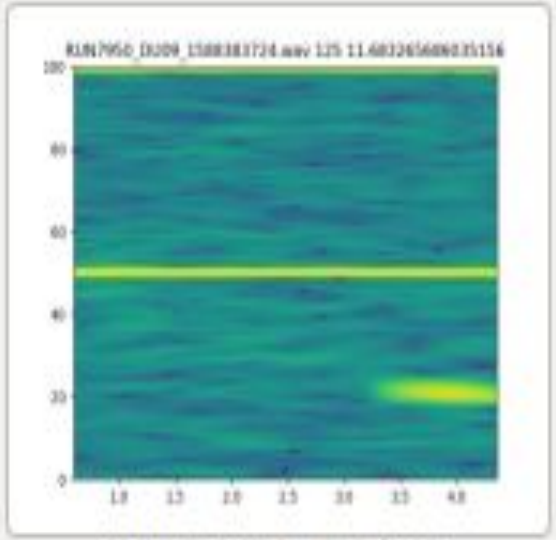
automatically detected
(CNN at LIS Toulon)

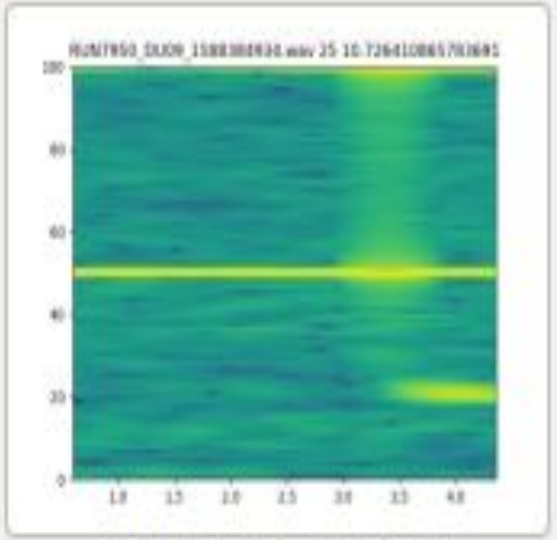
Fin whale pulses
(Rorqual)

from KM3Env









Best, Glotin et al 2020

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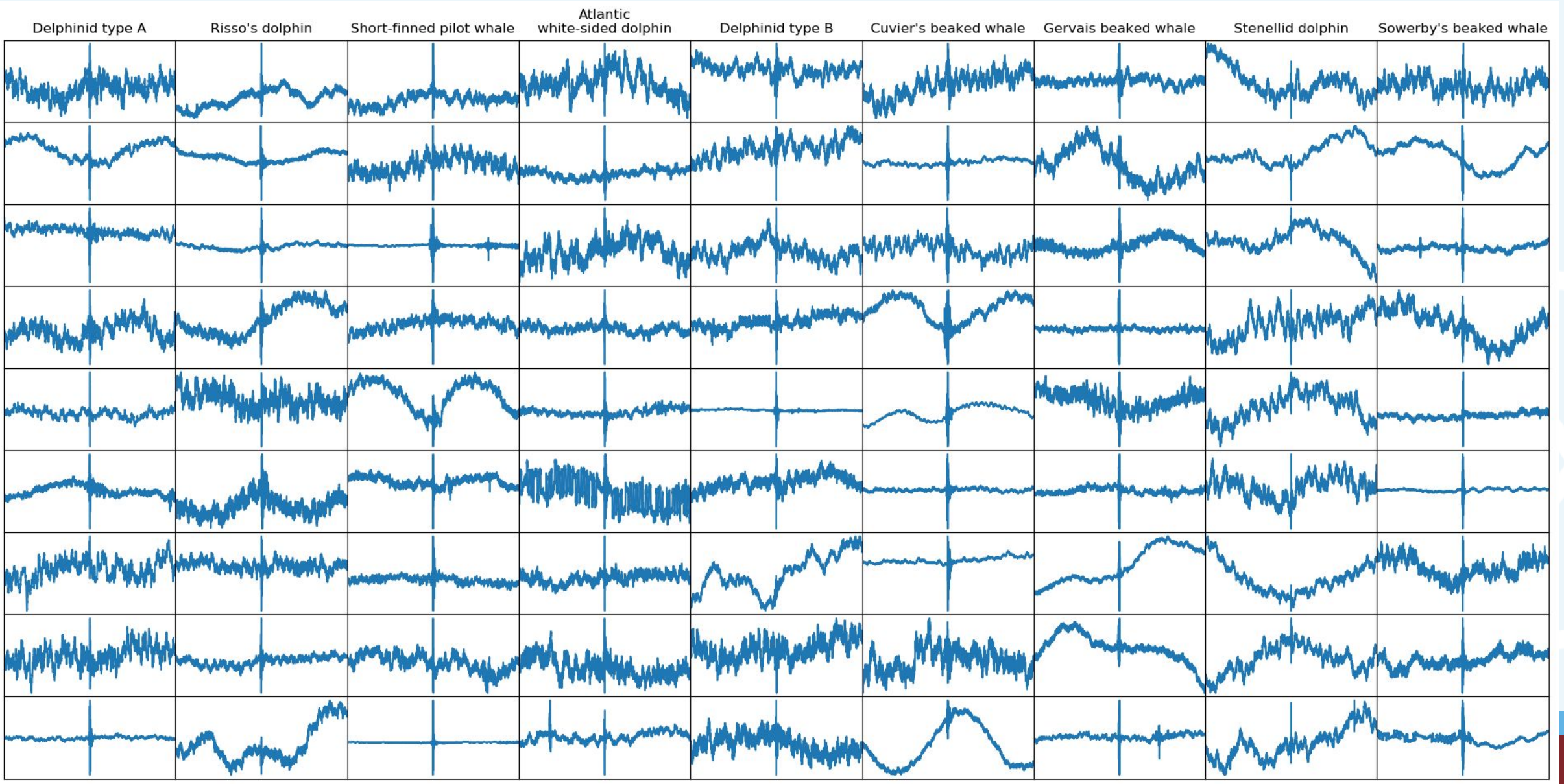
From which is this Biosonar ?
Help us with Reinforce to follow cetaceans !



more ? = http://bioacoustics.lis-lab.fr

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