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CLIC PROJECT

CETACEAN LISTENING INVESTIGATION FOR CONSERVATION

PRELIMINARY RESULTS

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Collaboration between MENKAB and KM3NeT

KM3NeT

Underwater neutrino telescope

Two sites:

- Offshore Toulon, France
- Offshore Porto Palo di Capo Passero, Italy

Several hydrophones deployed in strategic areas for cetacean detection

MENKAB

Italian research team involved in cetacean research in the Ligurian Sea since 2004

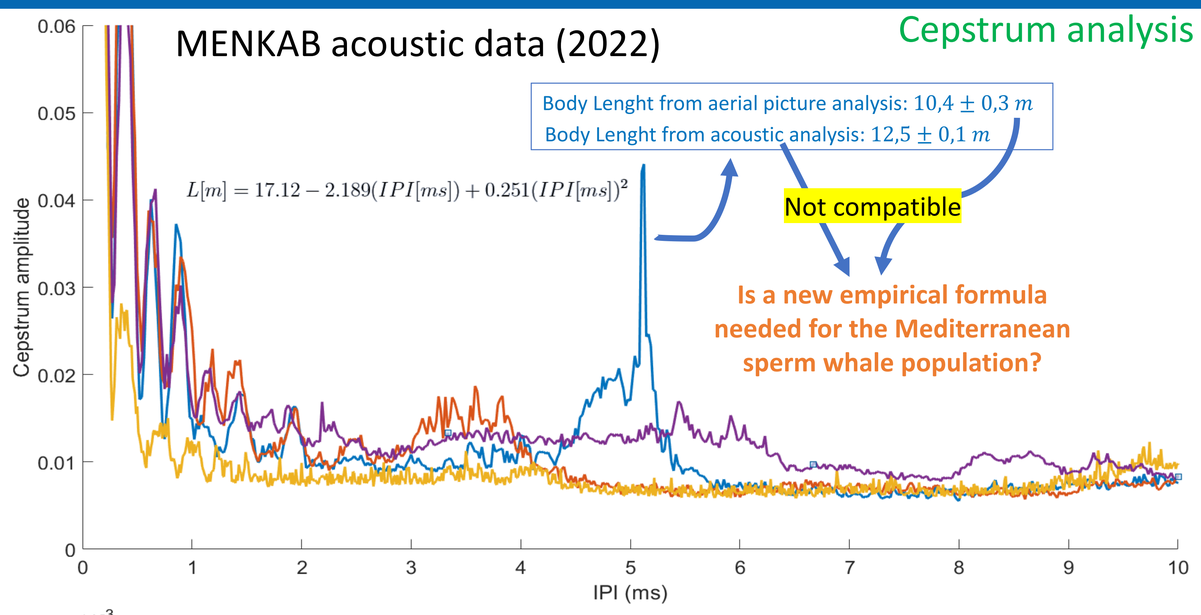
Possibility of frequent outings for visual and acoustic identification of cetaceans

CLIC goals

- Creation of a cetacean sounds catalog.
- Statistic study of cetacean presence/absence.
- Statistic study of several sperm whale parameters (presence/absence, ICI (Inter Click Interval), clicking and no clicking periods duration, IPI (Inter Pulse Interval) and Body Length estimation -> correlation between these parameters).
- Empirical formula for Body Lenght estimation from IPI for Mediterranean sperm whale population.

MENKAB acoustic data (2022)

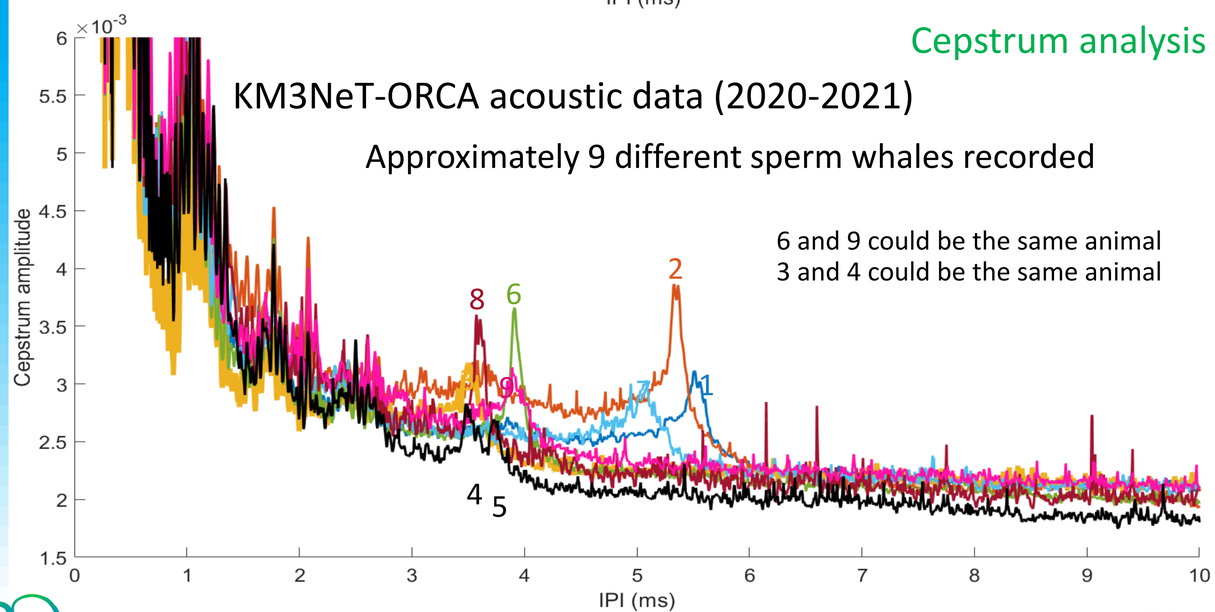
Cepstrum analysis

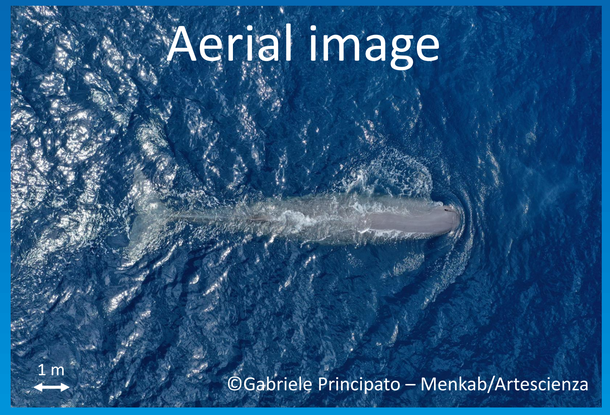


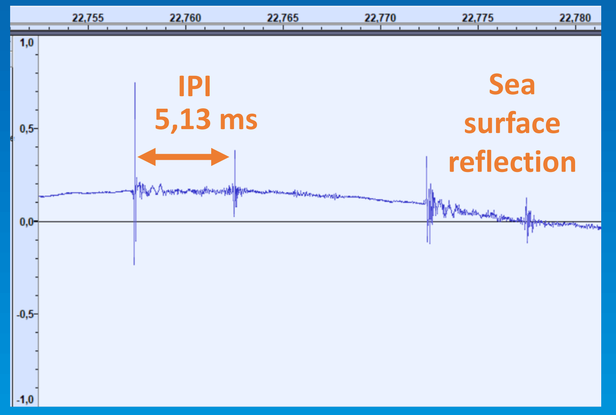
KM3NeT-ORCA acoustic data (2020-2021)

Cepstrum analysis

Approximately 9 different sperm whales recorded







CLIC first results

- **288** listening points in 2022 -> **55** positive detections: **41**(74.5%) **striped dolphin**, **12**(21.8%) **sperm whale** and **2**(3.7%) **Risso's dolphin**.
- **117** sightings -> **14**(12.0%) **fin whale**, **11**(9.5%) **sperm whale**, **14**(12.0%) **Cuvier's beaked whale**, **1**(0.8%) **pilot whale**, **1**(0.8%) **Risso's dolphin**, **72**(62.4%) **striped dolphin**, **3**(2.5%) **bottlenose dolphin**, **0 common dolphin**.
- On **11 sperm whales**, we get **body length** of **6** and **2** individuals respectively with **IPI** and **aerial images**.
- **Click identifier** based on Signal to Noise Ratio threshold and frequency filters **has been implemented** and **tested** on real data.
- Implementation of machine learning program to detect clicks based on spectrogram images in progress

Data collection of KM3NeT ORCA and ARCA is awaited
Offshore outings with MENKAB rising in Spring and Summer

Some of the references of IPI studies

Teloni et al., Consistent acoustic size estimation of sperm whales using clicks recorded from unknown aspects, 2023
Pavan et al., Improved signal processing techniques for measurement of the inter-pulse interval (IPI) of sperm whale clicks, 1999
Dawson et al., Measuring sperm whales from their clicks: stability of interpulse intervals and validation that they indicate., 2004