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Using passive acoustic to better understand dolphins' behaviour around fishing nets in bycatch context

OSmOSE

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Introduction

Bycatch due to fishery interactions is considered as the main threat to common dolphins (*Delphinus delphis*) in European waters. Some solutions are being investigated such as the use of pingers to prevent incidental captures. However, little is known as for the nature of these interactions and more interestingly on the circumstances of captures. This lack of knowledge implies a more challenging implementation of appropriate and effective means for mitigation of small cetaceans. The **APOCADO** project uses Passive Acoustic Monitoring as a cost-effective and reliable solution to monitor how small cetaceans behave around nets using their acoustic behaviour[1].

Material & methods

Acoustic data collection

- Study area: Iroise Sea (Brittany, France)
- Data collected using **SoundTraps** ST400 HF deployed on the different type of fishing nets[2] (Figure 1)
  - Trammel: 57% of deployments
  - Gill: 43% of deployments
- Sampling frequency: 128 kHz
- Current deployment effort: **2400h** of collected data from 2 fishing vessels
  - Summer 2022: 1474h
  - Autumn 2022: 116h
  - Winter 2023: 869h
  - Spring 2023: ongoing

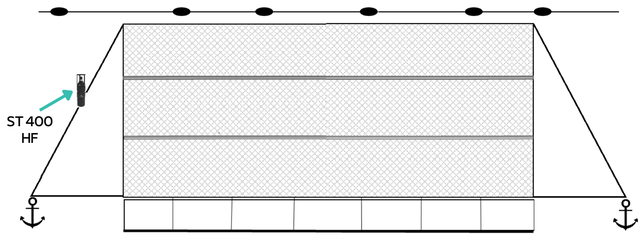

Figure 1. Outline of the SoundTrap position on a fishing net during a deployment

Detection range

- To determine the instrument's detection range, fishing nets were equiped with 2 appaired SoundTraps located at various distance depending on the net's length (200m to 1000m)
- Whistles hourly detection rates were compared for each appaired instrument through a correlation

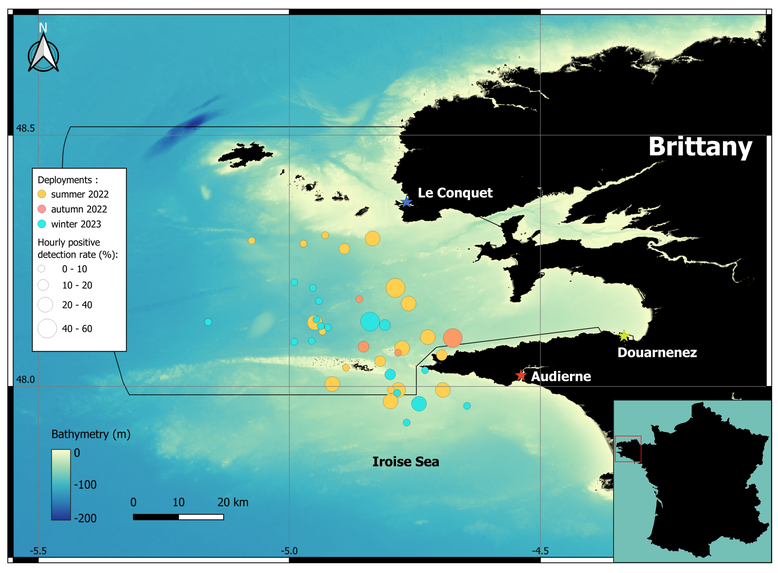

Figure 2. Study area of the APOCADO project with limits of the Iroise marine park and deployments positions. The size of the points are relative to the positive detection rate for whistles

Manual annotation and automatic detection

- Various whistles, clicks and buzzes are reported throughout the recordings (Figure 3). Whistles are typically associated with communication behaviour whilst clicks and buzzes are associated with foraging behaviour
- Manual annotation:
  - OSmOSE platform **Aplose**
  - Annotated data: 24h deployment (07/07/2022)
  - Labels: whistles / clicks / buzzes
  - Weak annotation on 10s spectrograms
- Whistle automatic detection:
  - **PAMGuard**
  - Precision: 61%
  - Recall: 79%
  - Performances mostly affected by false alarms caused by ships noise (echo sounder, motor...)
- Metric: **Hourly positive detection rate** calculated by season (Figure 2)

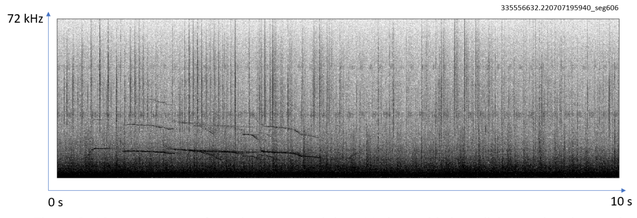

Figure 3. 10s spectrogram from the annotated data. Various whistles, clicks can be observed

Results

- Hourly positive detection rate for whistles:
  - Summer 2022: 16%
  - Autumn 2022: 18%
  - Winter 2023: 8%
- Based on whistle detection rates, delphinids are more present in summer/autumn than winter around fishing nets
- Whistle detection rate is similar for 2 appaired SoundTraps located 200m to 1000m apart (Figure 4)
  - 200m: 4% of deployments
  - 400m: 30% of deployments
  - 1000m: 66% of deployments

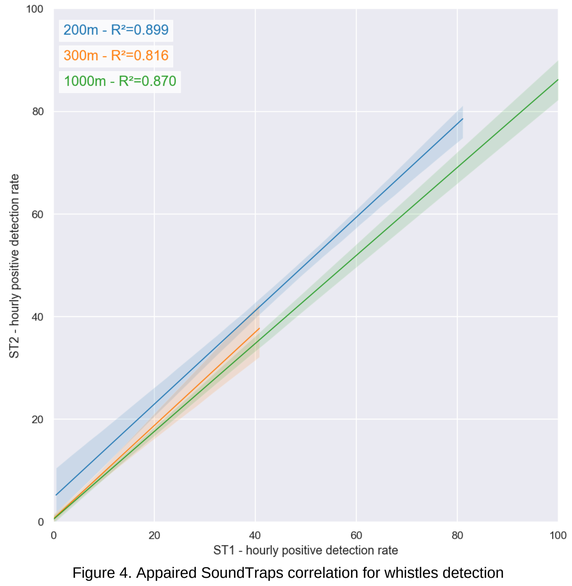

Figure 4. Appaired SoundTraps correlation for whistles detection

Discussion & perspective

- Delphinids seem to frequent fishing nets more often in summer/autumn than winter
- However, most of strandings and bycatches happen during winter[3]
- A more complete analysis will be done including clicks and buzzes once an effective detector is developped to confirm this trend/result
- The detection range for whistles is at least 1000 m

Acknowledgements & references

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