

Acoustic detection of fin whales vocalizations offshore Eastern Sicily, Ionian sea.

V. Sciacca, F. Caruso, G. Pavan, for the SMO-NEMO, KM3NeT Italia and SN1 Teams

Virginia Sciacca

PhD student in *Marine environmental sciences*

University of Messina

INFN – LNS Catania

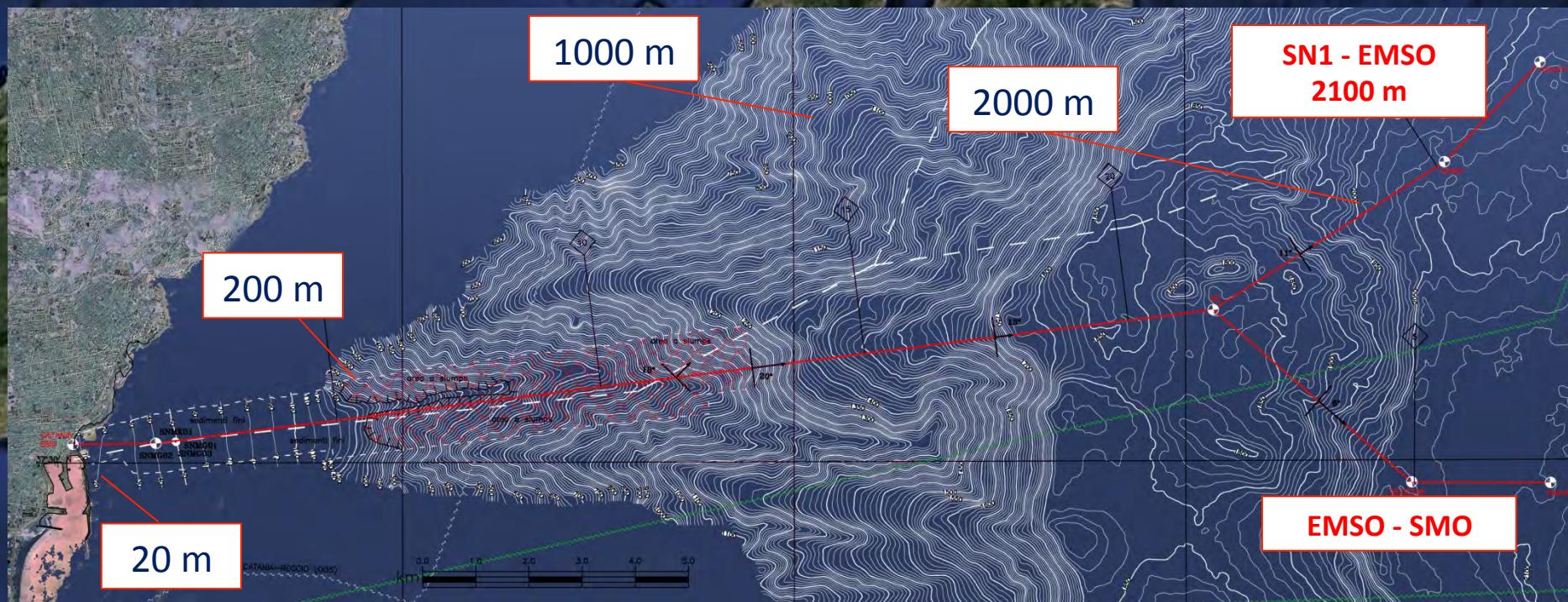
sciaccav@lns.infn.it



Erice International School of Ethology
CETACEAN ECOLOCATION – OUTER SPACE NEUTRINOS
Erice, Sicily (Italy) – October 18 - 21, 2013

«KM3NeT - Test Site»

Tyrrhenian Sea



Ionian Sea

SEE G.Pavan, C.Fossati talk

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

The fin whale (Mediterranean subpopulation)

Species: *Balaenoptera physalus*

Length: from 6 (new-born) to 27 m.

Social structure: group (3 – 7)

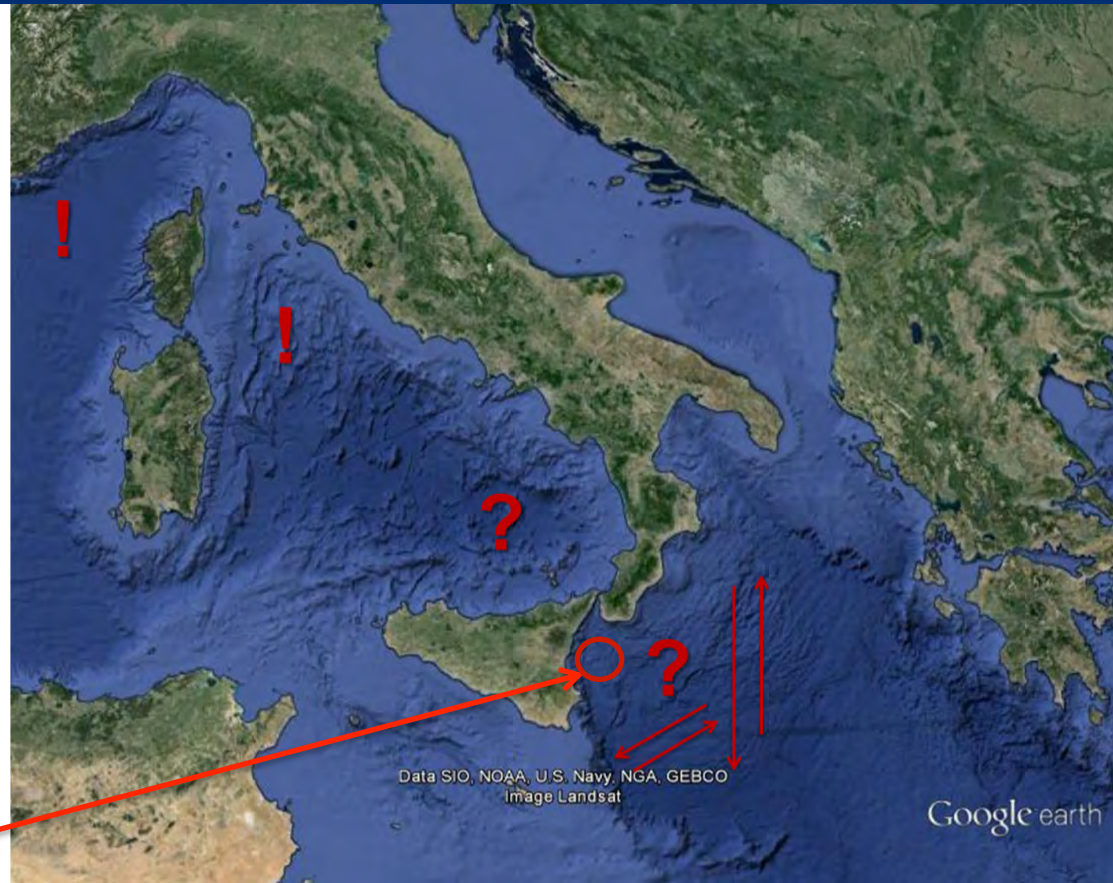
Habitat: pelagic (200 – 1500 m)

Diving depth: 50 -230 m

Feeding: plankton (*Meganyctiphanes norvegica*, *Nyctiphanes couchi*)

Mediterranean sea: widespread

Seasonal distribution and trends: ??



“The species also occurs rarely in the **eastern Mediterranean** (Notarbartolo di Sciara et al. 2003).”

www.iucnredlist.org

The species acoustic behaviour

The most common sounds are known as “20 Hz pulses”:

- **TYPE A:** downswept calls with variable frequency range (25 Hz to 17 Hz) lasting about 1-2 s
- **TYPE B:** calls with frequency range of 18 – 21 Hz, lasting about 0,8-1,5 s.

Higher frequency sounds → occasional > 30 Hz directed at nearby conspecifics

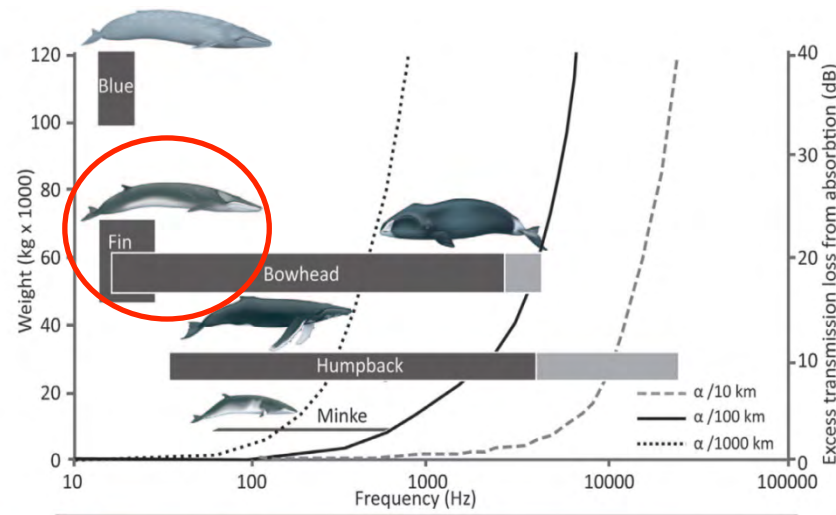
(Boisseau et al.,2008).

HIGH VARIABILITY IN FREQUENCY RANGE, DURATION AND PATTERNS OF THE “20Hz PULSES” → GEOGRAPHICAL AREAS AND SUBPOPULATIONS

Source Level: around 190 dB re 1 μ Pa RMS at 1 m

(Weirathmueller et al.,2012).

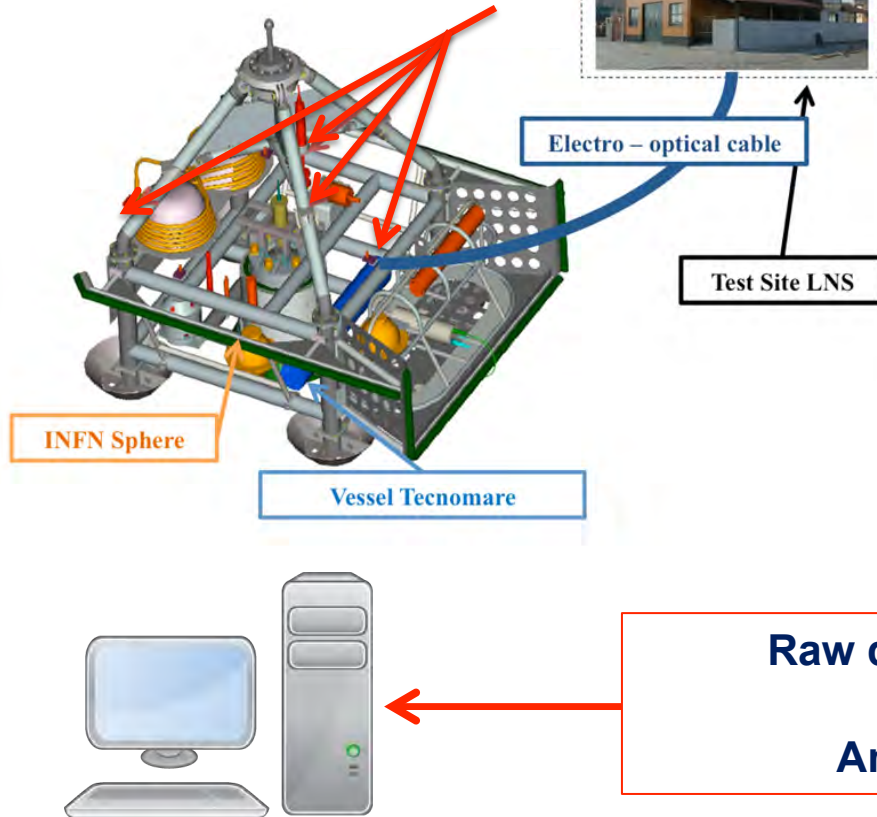
Biological function: intraspecific communication



Tervo et al. 2012

Data acquisition

**4 LARGE BANDWIDTH
HYDROPHONES
($10 \text{ Hz} < f < 70 \text{ kHz}$)**



**1 LOW BANDWIDTH
SEISMIC HYDROPHONE
($1 \text{ Hz} < f < 1 \text{ kHz}$)**

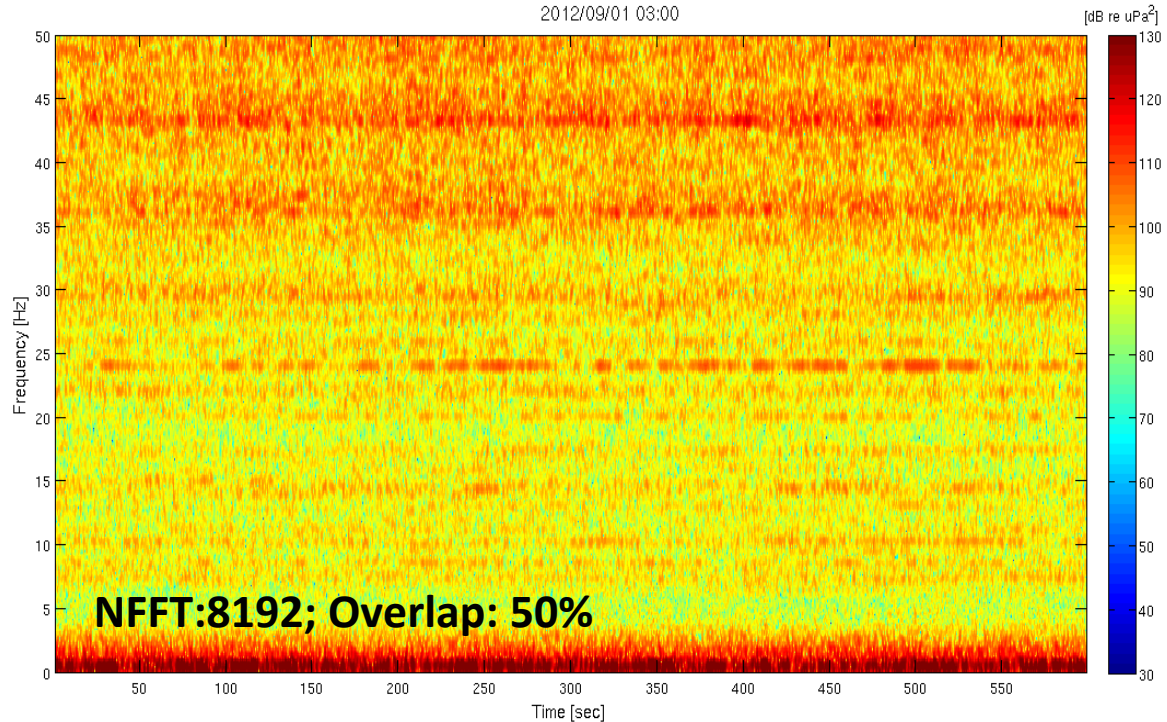
**Raw data collected 24 hours per day,
Saved in 10 min long files
And stored at the INFN – LNS.**

SEE P. Favali talk (<http://www.emso-eu.org>), F. Simeone and S. Pulvirenti talk

Data analysis method

MATLAB® software developed for the study

Plot and save the spectrogram of the band between 1 and 50 Hz.

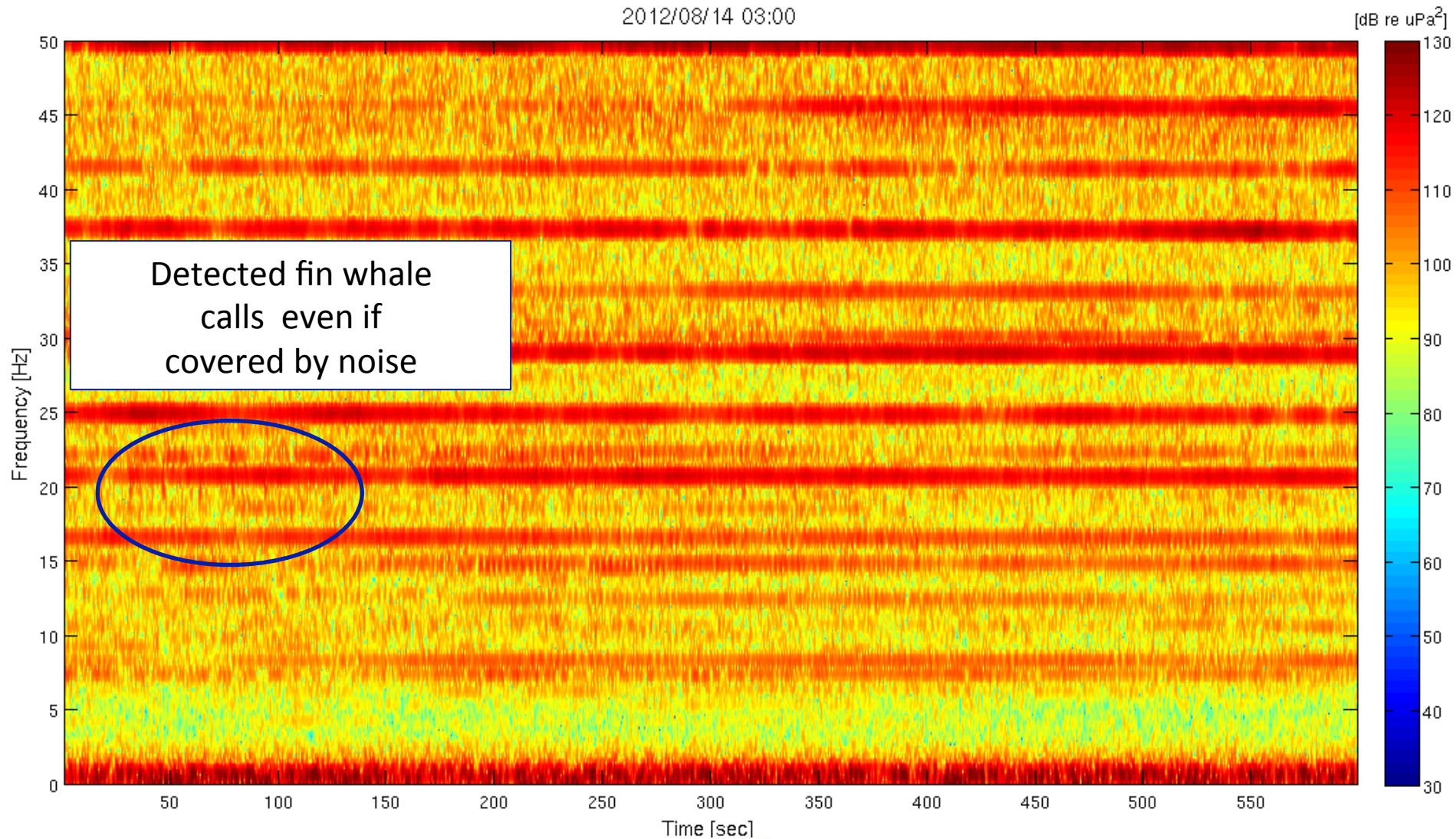


Spectrographic analysis to investigate fin whales calls presence.

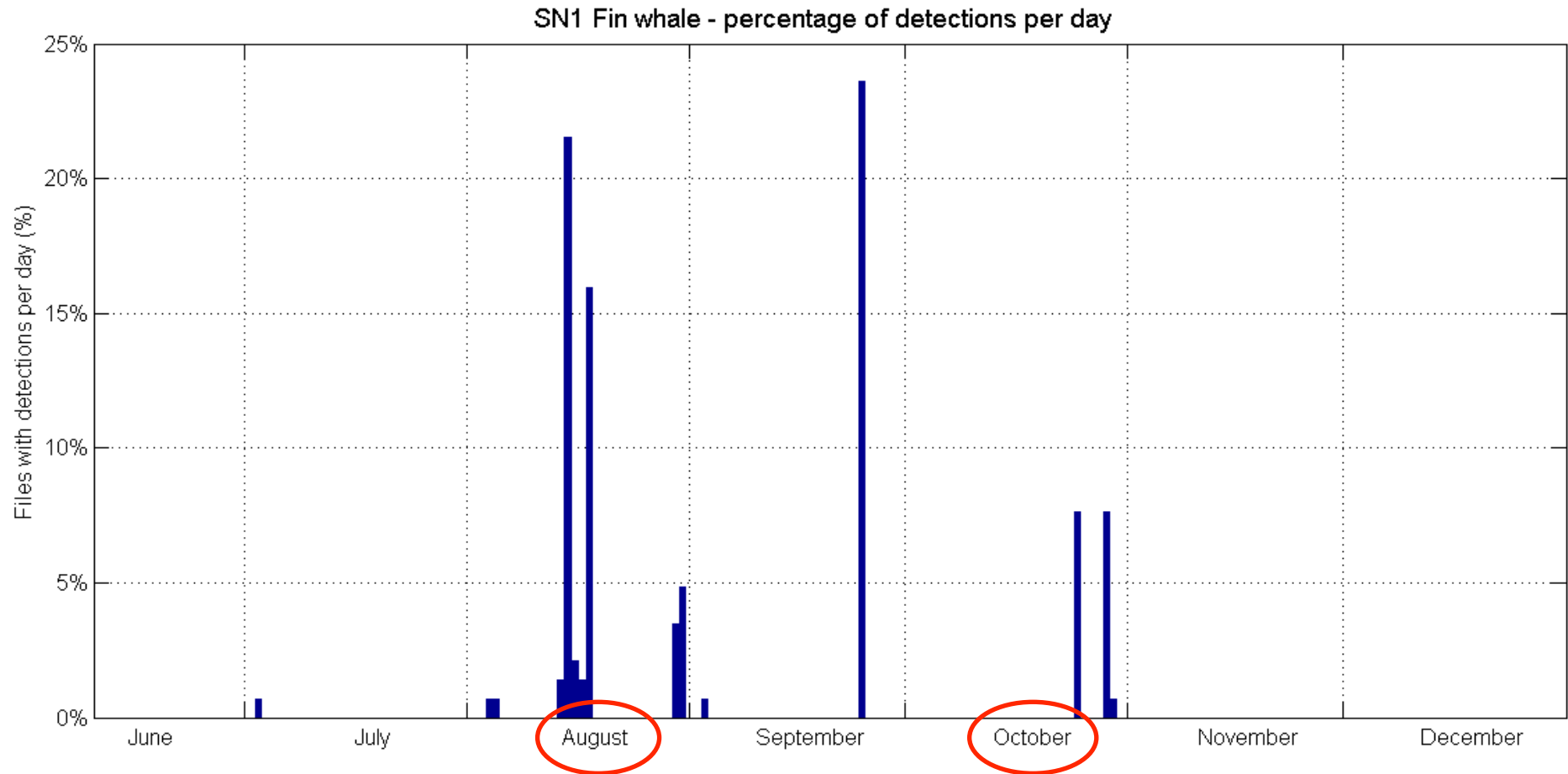
Files with unknown signals further checked acoustically with the SeaPro software for bioacoustics analysis developed by CIBRA.

Fin whale calls spectrogram

Recordings with high noise level in the 20 Hz band due to ship traffic



Spectrographic analysis results

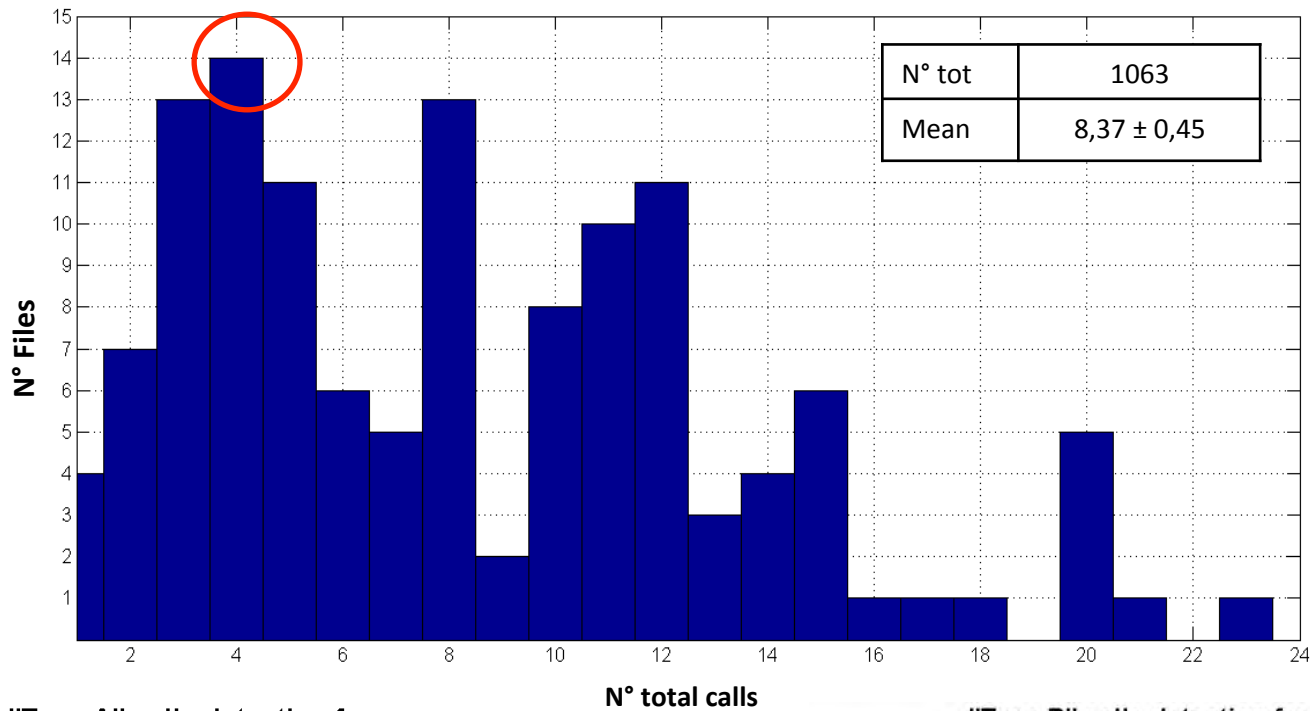


Analyzed Time period : 9th of June - 31st of December 2012 (~ 7 months)

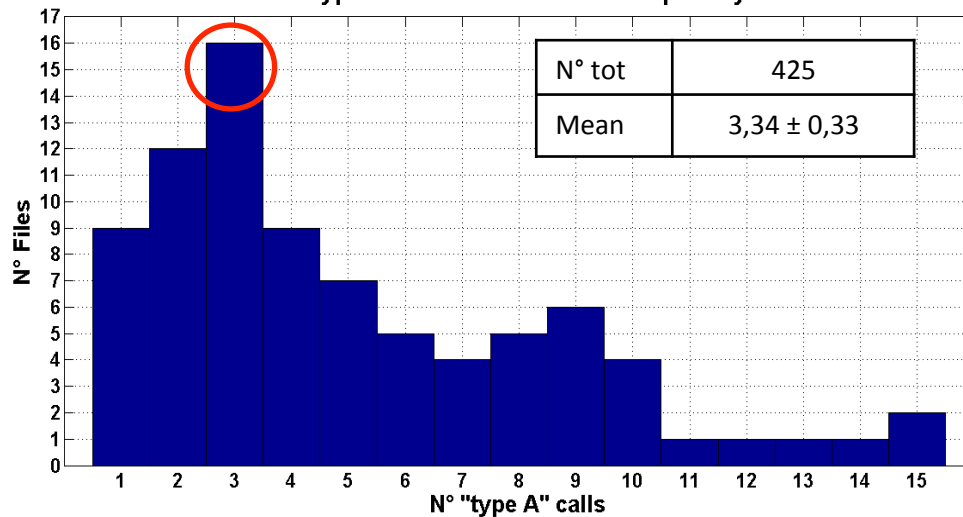
Analyzed files : 29.520

Files with fin whale calls: 127

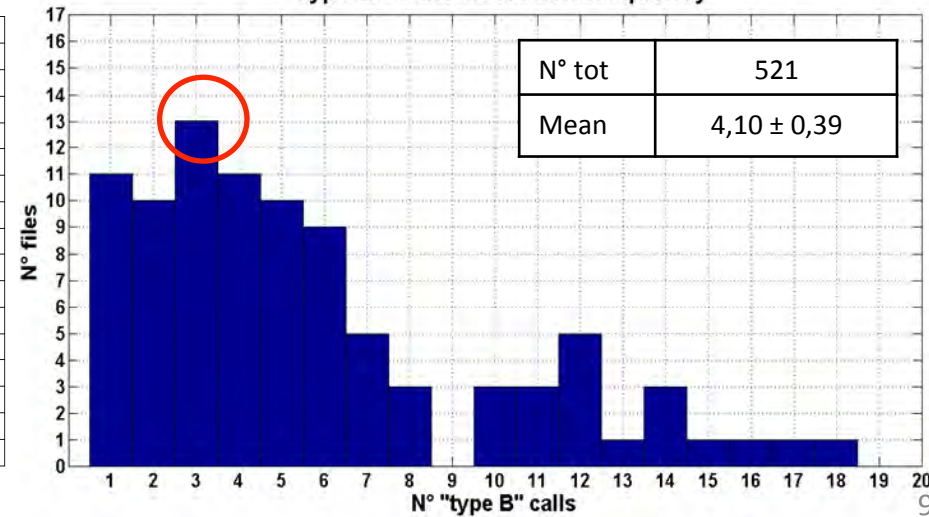
Calls detection frequencies



"Type A" calls detection frequency

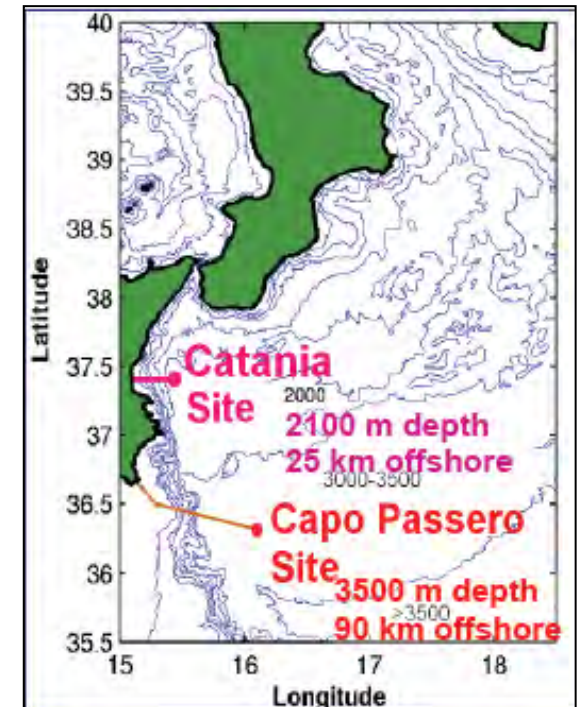


"Type B" calls detection frequency



Conclusions and future goals

- These results confirm that it is possible to detect fin whale calls through the deep sea multidisciplinary observatories of the EMSO – SMO and KM3NeT projects.
- Acoustic analysis confirmed the presence of fin whales offshore the Catania coast.
- Vocalizations have been found in 4 of the 7 months analyzed (from July to October 2012).
- Are they present in the area regularly, accidentally or traveling seasonally?
- Which are the characteristic calls patterns of this population?
- Could noise pollution mask their signals?
- Long term monitoring projects could give answers:
Catania and Capo Passero sites: large datasets
→ working on automatic detection methods!



Thanks for your kind attention...



**...any comments and suggestions
would be appreciated!**

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