Monitoring Common Bottlenose Dolphins and anthropogenic noise using wideband acoustic bottom recorders, in the Pelagie Islands (Sicily - Mediterranean Sea)

Cadiz 2011
ECS Conference
A20

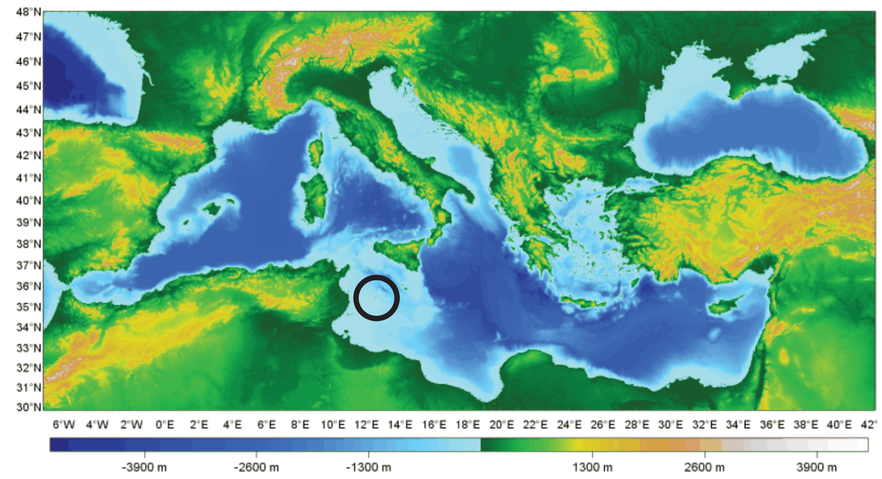
Michele Manghi[1], Gabriella La Manna[2,4], Francesca Lo Mascolo[3], Gianluca Sarà[3] and Gianni Pavan[5]
(1) NAUTA ricerca e consulenza scientifica, Italy. mmanghi@nauta-rcs.it.
(2) Università di Parma, Dipartimento di Biologia Evolutiva e Funzionale, Italy.
(3) Lab. di Ecologia Sperimentale, Dip. di Scienze della Terra e del Mare, Univ. di Palermo, Italy.
(4) CTS - Conservazione della natura, Italy.
(5) CIBRA - Università di Pavia, Italy.

Question

Is there an effect of shipping noise over bottlenose dolphin acoustic behavior?

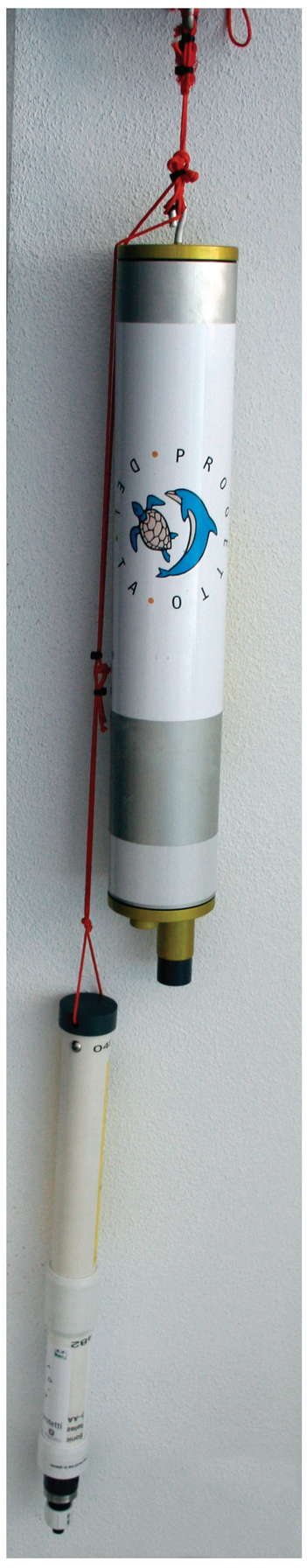
Where & When

This study was carried out in Cental Southern Mediterranean Sea, in the Pelagie Marine Protected Area.
The study area is 410km$_{sq}$.
Sea Bottom in the sampled area is at -50m on average.
The study period for this paper was from May to December 2006.



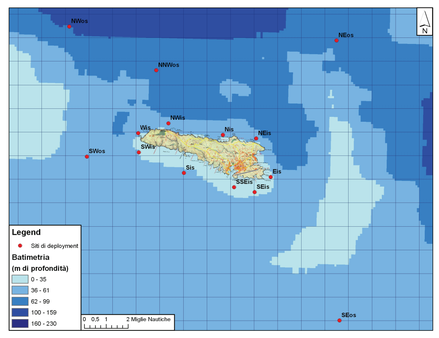
Method

Originally developed wideband acoustic bottom recorders were used. Named RASP - programmable underwater acoustic recorder, it is hand deployed from a Zodiac and it is featured with an acoustic release. The recorders have a programmable timer that can follow any desired schedule. The system bandwidth is 10Hz..48kHz and currently offers 32GB of memory per launch.



Collected data

This study returned 251 hours of non continous acoustic recordings over 7 months in 14 deployment sites.
The recordings cover day/night periods and almost any weather condition.
The files were divided into over 3000 units with 5' duration to create a uniform dataset to be statistically analyzed.



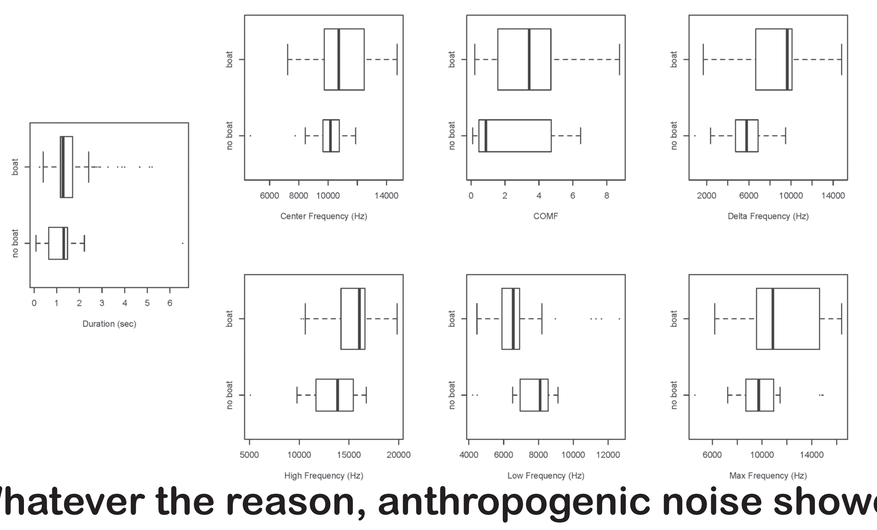
Analysis

All the 5' time units were spectrographically analyzed to verify the presence of anthropogenic noise (shipping and sonars) and biological signals (snapping shrimps, fish and dolphins).
All dolphins whistles with good Signal-to-Noise ratio have been marked. Duration, Min and Max frequencies and their timing, a frequency modulation coefficient have all been measured together with other parameters.

Resulting tables have been tested to check the relation of shipping noise with whistles characteristics.
Statistically significant differences between whistles recorded with/without shipping noise, resulted from an *Exact 2-Sample Permutation Test*. This method does not strictly require a nomally distributed dataset.
135 whistles were used for statistics, while 2249 poor quality whistles, 3343 clicks, 533 buzzes were identified.

Results

Out of 135 whistles, 106 include shipping noise. Statistically significant changes were identified on all but one parameters.
Duration (NO SIGNIFICANT CHANGES); Lowest frequency; Highest frequency; Max frequency; Central frequency; Frequency modulation (ALL WITH SIGNIFICANT CHANGES).
The presence of shipping noise do statistically influence the features of dolphin whistels.
This may be due to difference in behaviour with or without ships (net opportunistic predation) or an acoustic masking countermeasure (frequency shift to more silent spectra).



Whatever the reason, anthropogenic noise showed to influence the dolphin whistle features, and related additional energetic costs must be considered when designing conservation action plans.

This research was partially carried out within LIFE NATURE 2003 NAT/IT/000163 Del.Ta.