PRELIMINARY STUDY OF BOTTLENOSE DOLPHIN (*Tursiops truncatus*) COASTAL PATTERN USING AN ECOLOGICAL ACOUSTIC RECORDER (EAR)

Fulvio Fossa [1], Marc O. Lammers [2], Guido Gnone [1]

E-mail: ffossa@acquariodigenova.it

(1) Acquario di Genova, Area Porto Antico, Ponte Spinola, 16128 Genova (Italy)
(2) Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe, HI 96744 (USA)

INTRODUCTION – Bottlenose dolphins presence along East Ligurian coastal waters is widely documented[1]. Establishing bottlenose dolphin long-term patterns of occurrence is fundamental to better understand relationships between dolphins and their habitat, including human activities such as fishing and vessels traffic. Here we describe the experimental use of an Ecological Acoustic Recorder (EAR) to monitor the presence of bottlenose dolphins in front of Tino Island, Gulf of La Spezia, Easter Ligurian Sea.

MATERIALS & METHODS – The study area presents shallow water features with muddy sea bed. Bottlenose dolphins are regularly present all around the year and human activities are intense as well at any time. Fishing boats (trawlers and artesanal nets), cargo, ferries and pleasure boats are daily crossing the area (Fig. 1).

The EAR is a long-term monitoring system for biological and anthropogenic sounds that is widely used around the world in both shallow and deep waters[2]. The EAR is a microprocessor-based, autonomous recorder that periodically samples the ambient sound field and also automatically detects sounds that meet specific criteria. Four principal components make up the EAR hardware: the environmental interface module, the signal conditioning/analog-to-digital conversion module, the central processing unit CPU/storage module and the power supply module. Figure 2 shows a schematic of how the different components are integrated.

For this study, one shallow water unit was used to record at a sample of 50 kHz and a duty cycle of 30 seconds every 5 minutes. The EAR was deployed between 15 July and 2 September 2009 abut half a mile off Tino Island at a depth of 24.9 meters.

A custom algorithm developed in MATLAB™ was used to analyze the data. The variables that were extracted from each recording are: the sound pressure level (SPL) and its variance, and the frequency of occurrences of tonal sounds. All detections were classified in four categories: dolphin calls (including both whistles and echolocation clicks), motor vessels, other biological sounds (different from cetaceans) and other sounds.

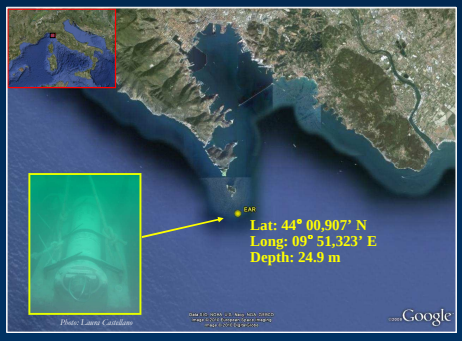

Fig. 1: the study area and the EAR position

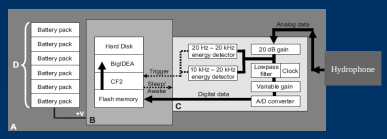

Fig. 2: a schematic representation of the EAR showing (A) the environmental interface module, (B) the CPU, (C) the AD converter and (D) the power supply module[2]

RESULTS – Data were collected during 49 days and 14.174 acoustic files were analyzed. The majority of detections were of motor vessels (73%), followed by other biological sounds (22%), dolphin calls (3%) and others (2%). Between dolphin calls, click trains were the most commonly represented (61.86%), then whistles (22.34%) and whistles & clicks (15.81%) (Fig. 3).

Dolphin detections occurred during 33 of the 49 days and over the 7 week period. Dolphin presence was detected a minimum of 3 days/week (2nd week) to a maximum of 6 days/week (6th week) (Fig. 4).

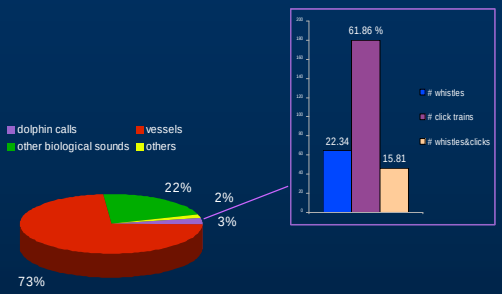

Figure 3: percentage of occurrence for each of the four sounds category. In the purple box, dolphin calls are considered in terms of click trains, whistles and whistles & clicks detections

The occurrence of dolphin calls, other biological sounds and motor vessels was averaged over 24 hours, grouped in 3-hour intervals (Fig. 5).

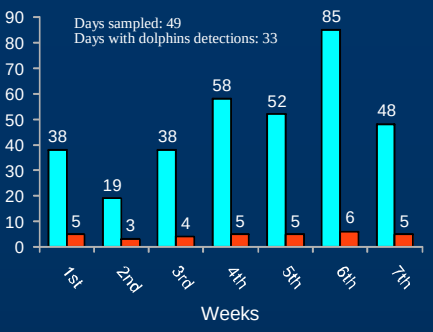

Fig. 4: on the x-axis there is the time (in weeks) and on the y-axis the number of detections. Cyan bars represent the total number of detections for each week; the orange bars represent dolphins detections

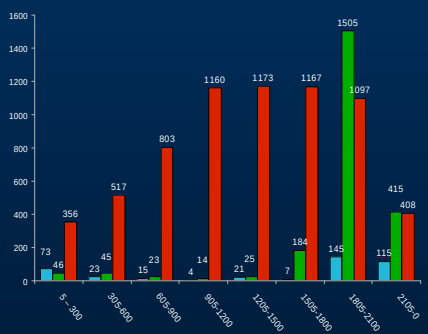

Fig. 5: The number of detections by time of day/night. Time periods are on the x-axis. Cyan bars represent "dolphin calls", green ones "others biological sounds" and red ones "motor vessels"

Dolphin presence during the night (18:05 – 03:00) was significantly different when compared with the rest of the day (χ^2 test; $p<<0.01$).

DISCUSSION – Results reveal a different use of the habitat, when comparing day and night hours, with a peak of dolphins presence during the night. This pattern has never been described before in this area and could be due to interactions between bottlenose dolphins and human activities, including vessel traffic and fishing.

Biological sounds not produced by cetaceans were detected throughout the day but a single typo of sound contributed to a large peak in the hours between 6 and 9 pm and secondary peaks during the adjacent time intervals (3-6 pm and 9-12 pm).

These preliminary results add new data about bottlenose dolphins coastal use patterns in this area and demonstrate the efficiency of passive acoustic methods for monitoring cetacean populations and their habitat over extended periods.

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