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First analysis of sperm whale (*Physeter macrocephalus*) vocalizations in the Aeolian Archipelago (Sicily, Italy)

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INTRODUCTION

Deep foraging dives are a significant part of sperm whales (*Physeter macrocephalus*) feeding behavior, spending approximately 62–72% of their lives underwater. Acoustics recordings, associated to behavior and environmental features, provide data on an unknow sperm whales population, such as diving profile, seasonality and behavior, crucial information for the implementation of specific management actions and conservation strategies. This study provides first data on acoustic vocalizations of sperm whale in the Aeolian Archipelago.

STUDY AREA

The study area is in the Aeolian Archipelago (Southern Tyrrhenian Sea), 40 km north-eastern from Sicily (Italy) north coast (38°34N 014°33E) (*Fig. 1*).

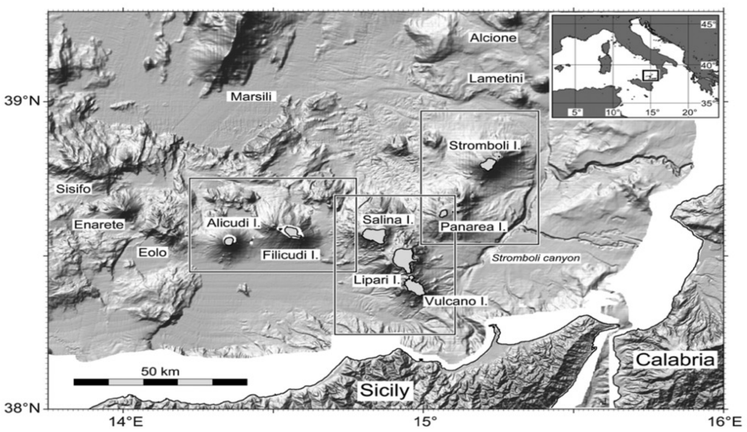

Fig. 1 Aeolian Archipelago, Sicily (Italy).

MATERIALS AND METHODS

Data were collected from a research boat during two field seasons spanning from June to November on 2019- 2020 period. Acoustic recordings form 9 solitary sperm whales (6 males and 3 unidentified sex) were collected using a simple hydrophone system (Aquarian Audio H2a, sensitivity -180 dB re: 1 V/µPa, state recorder's sound card sampling rate: 48 kHz). Two of the analyzed whales were sighted during the summer months, while the other 7 were observed during fall. Analyses of click sequences were conducted using Raven Lite 2.1.0 (Cornell Lab Center for Conservation Bioacoustics).

RESULTS

Totally 98 vocalizations, with an average duration of 88.03 ± 34s, were detected in summer months: Usual Clicks (ICI ≥ 0.5s) (71.8%), Transition Clicks (ICI 0.2-0.5s) (0.4%), and Creaks (ICI < 0.2s) (2.0%) (*Fig.2*). While 285 vocalizations, with an average duration of 59.23 ± 47s, were detected in fall months: Usual Clicks (63.41%), Transition Clicks (2.13%), Creaks (0.03%), Codas (0.02%) (*Fig.3*) and a single Trumpet sequence composed by seven units (*Fig.4*).

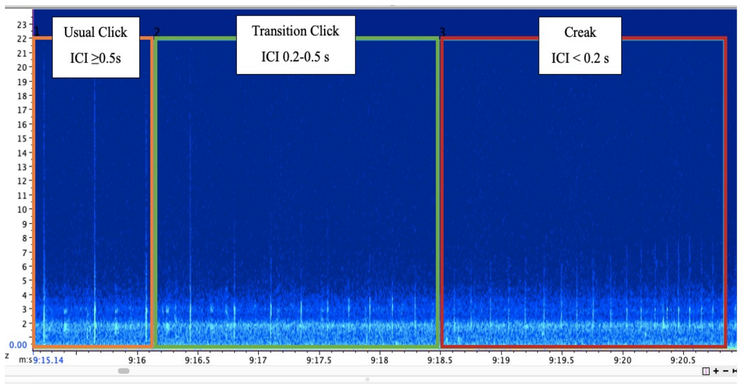

Fig. 2 Spectrogram of Usual Clicks,Transition Clicks and Creaks sequences (Raven Lite 2.1.0).

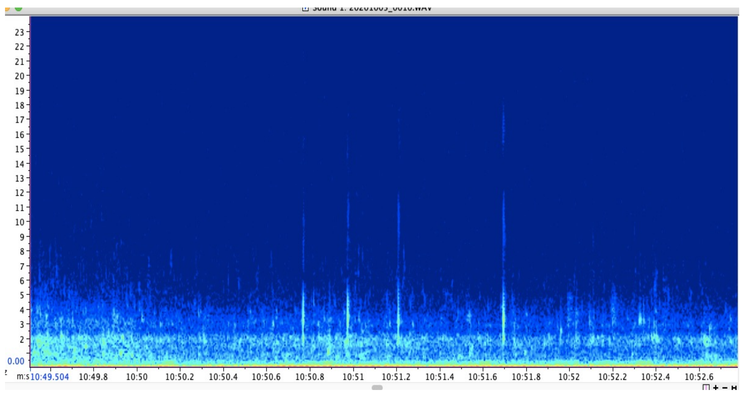

Fig. 3 Spectrogram of a Coda sequence (Raven Lite 2.1.0).

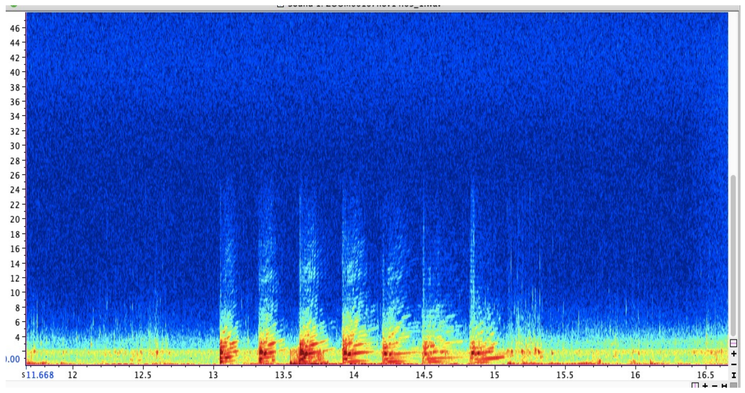

Fig. 4 Spectrogram of a Trumpet sequence (Raven Lite 2.1.0).

The mean dive duration was 21.48 ± 11 minutes (minimum = 7.56 minutes, maximum = 42.02 minutes), while the mean surfacing time was 15.06 ± 4 minutes (minimum = 9.14 minutes, maximum = 20.22 minutes). Non-strictly linear correlation between dive duration and number of vocalization sequences and between dive duration and water depth were found.

DISCUSSION

The analysis of the acoustic recordings has shown that sperm whales spent most of their time emitting orientation/searching/foraging click types (usual and transition clicks and creaks) both in summer (74.18%) and fall (85.02%) months (*Fig.5*). Usual Clicks were detected in every dive with some difference between seasons, suggesting that the Aeolian Archipelago represents an important feeding ground.

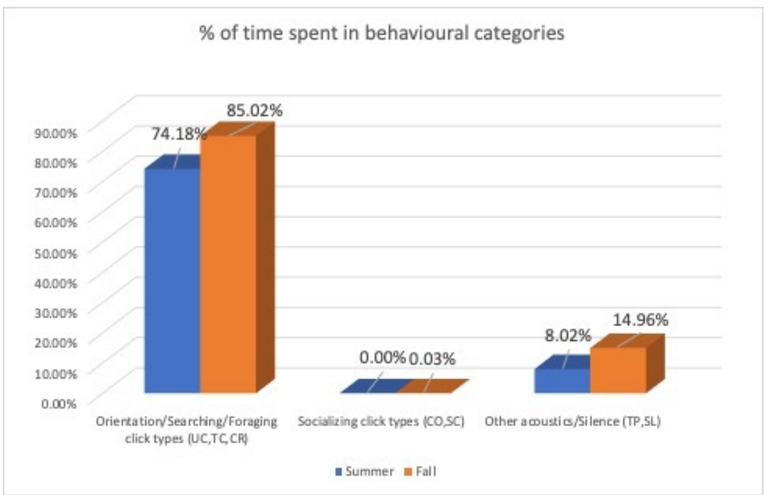

Fig. 5 Percentage of time spent in behavioral categories. Comparison between summer and fall.

References

Pace D.D., 2016. On the sperm whale (*Physeter macrocephalus*) ecology, sociality and behavior off Ischia Island (Italy): patterns of sound production and acoustically measured growth.