Influence of animal spatial distribution on passive acoustic density estimation from single sensors

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INTRODUCTION

Passive acoustics is increasingly being applied to estimate cetacean **population density**. Bottlenose dolphins *(T. truncatus)* produce very frequent and characteristic pulsed signals (**echolocation clicks**) which can be easily detected and recorded.

AIM

Estimating bottlenose dolphins population density around a **single hydrophone** located in the Sicily Strait, applying a **cue-based approach**.

METHODS

$$\hat{D} = \frac{n_c(1-\hat{c})}{K\pi w^2 \hat{P} T \hat{r}}$$

(Marques *et al.*, 2009)

D = animal density

n_c = number of clicks, obtained through automated detection

ĉ = false positive rate, obtained via manual analysis of a sample

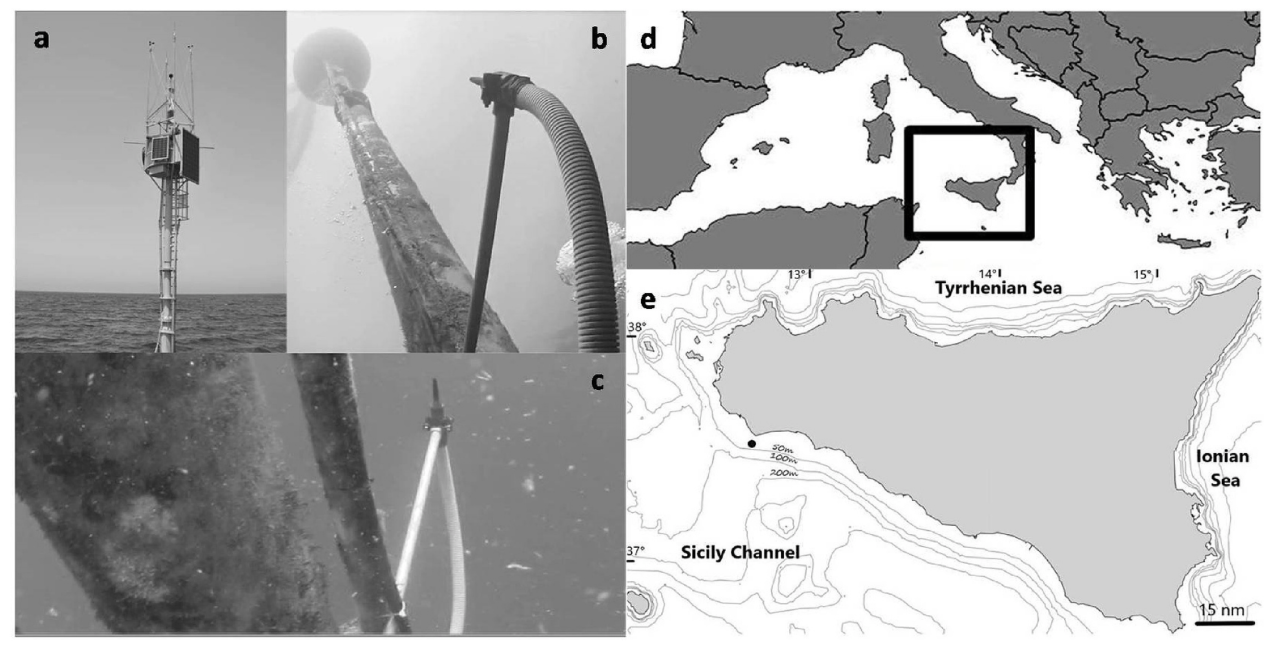
K = number of hydrophones

w = max detection distance

P = probability of detection

T = recorded time

r = average cue rate = obtained from an auxiliary dataset as 1/average Inter Click Interval



a) Photograph of the elastic beacon. The acquisition system is located upon the beacon, within a shock absorbent and waterproof case. b) and c) Underwater views of the hydrophone. d) Location of Sicily within the Mediterranean Sea e) Geographic location of the deployment site (black point).

RESULTS

n_c = 722,519 clicks

ĉ = 0.035

K = 1

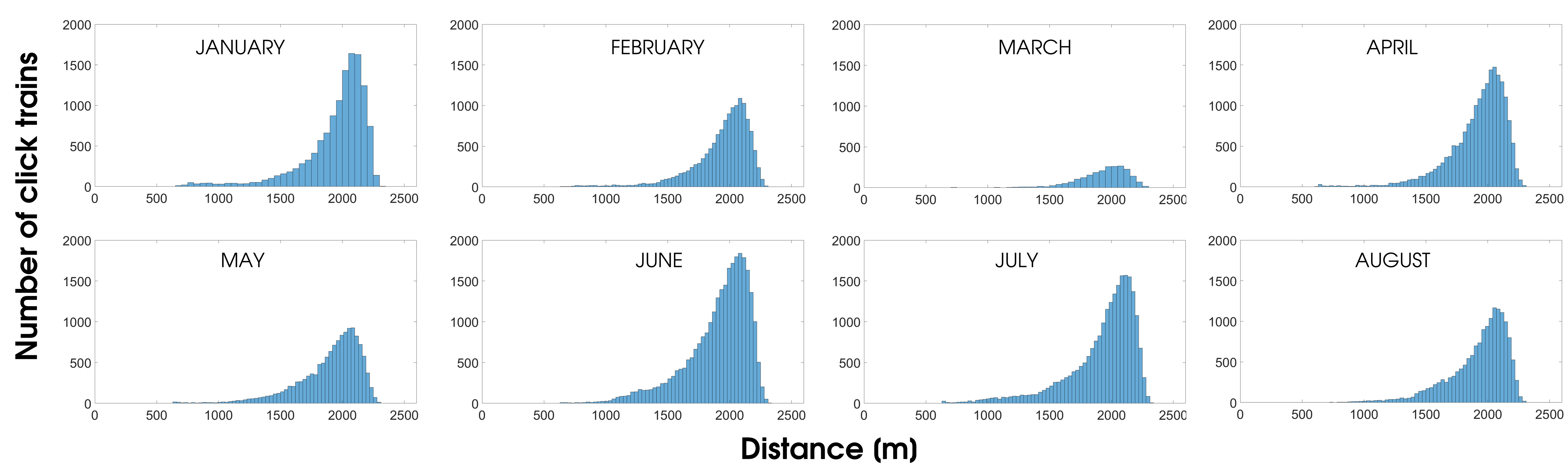
avg ICI = 0.126 s

r = 7.960 click/s

T = 8 months

w = 2551 m

Maximum detection distances obtained via sound propagation models estimating: cylindrical propagation, click source level of 200 dB, mean peak frequency of 57,67 kHz, water salinity 35‰, water temperature of 17°C, water pH 8, sensor depth 30m.



DISCUSSION

The **default assumption** when estimating the probability of detection P from single sensors is that animals are **uniformly distributed** in space around the sensor. We will evaluate **how departures to that assumption influence the probability** of detecting clicks and in turn the estimated density.

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