Impact of fisheries on bottlenose dolphin behaviour in the Ría de Arousa (NW Spain)

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Introduction

The Ría de Arousa (Galicia, NW Spain) (**Fig.2**) is an important area for coastal fisheries and bottlenose dolphins are found year-round (Methion & Díaz López 2018). However, the effect of fishing nets and fishing cages on the behaviour of bottlenose dolphins *Tursiops truncatus* in the ría remains poorly studied.

This study is a first approach to analyze the interactions between bottlenose dolphins, nets and cages in the Ría de Arousa by coupling behavioral analyzes and bottlenose dolphin's groups composition analyzes.

Fig 1. BDRI's research vessel, TYBA III

Material and Methods

The objective of this work was to study the potential impact of fishing nets and fishing cages on bottlenose dolphins' group composition and behaviour.

Data collection: 15 daily observational boat surveys carried out from May to June 2017. Observation effort : 54 h - Total distance : 308.97 nm
Presence and GPS coordinate of fishing nets and fishing cages collected every 20 min.

Sightings: Group size, Group composition, Behavioural samples based on the "Predominant group activity sampling" method (Methion & Diaz Lopez, 2019).
The behavioural states were classified into four categories: feeding, resting, socializing, and travelling.

Mann-Whitney U test to identify link between nets and cages presence and group composition
Chi Squared test to compare the frequency of the 4 behaviours in presence and absence of fishing nets and fishing cages

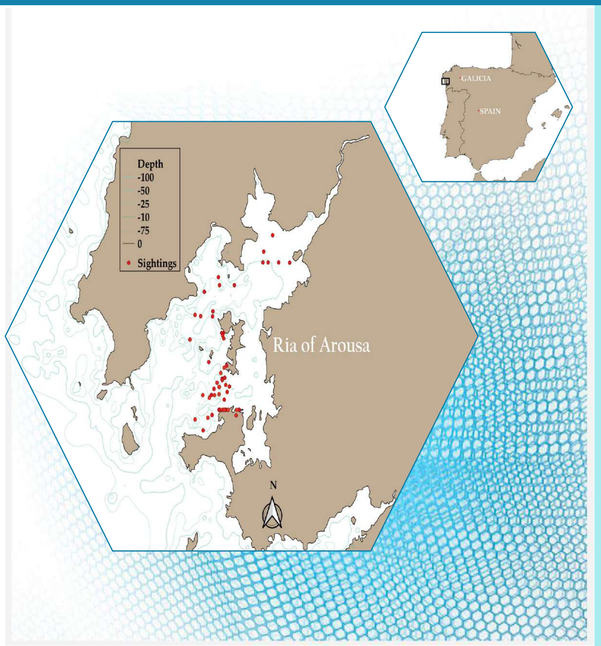


Fig 2. Study area & sightings location.

Results

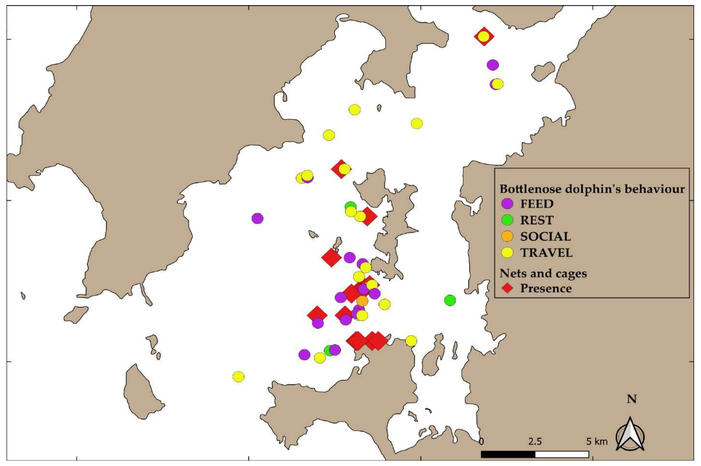


Fig 3. Map of dolphin's behaviour in presence of fishing nets and fishing cages in the Ria

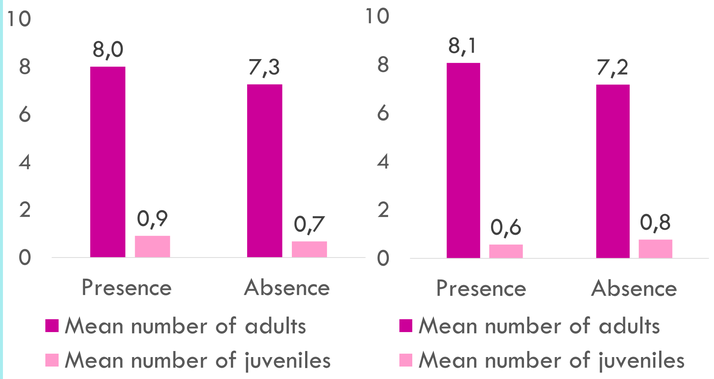


Fig 4. Mean group size in presence and absence of fishing cages

Mann-Whitney U-test
U = 219, Z = 0.59, p > 0.05

Fig 5. Mean group size in presence and absence of fishing nets

Mann-Whitney U-test
U = 219, Z = - 0.36, p > 0.05

A total of 54 sightings and 288 behavioural samples were collected.

The map (**Fig.3**) shows that the feeding behaviour has been observed mainly in the ría's inner area, where mussel farms are present. On the contrary, travel patterns were observed almost everywhere in the ría.

No variation in group size and group composition in presence of nets and cages (**Fig. 4 & 5**)

In presence of nets or cages, bottlenose dolphins tend to **decrease their social and feeding behaviors,** and to adopt **more displacement behaviors** (**Fig. 6,7,8,9**)

Discussion

- Dolphins are present in the ria despite nets and cages

Assumptions :

- The increase of zooplankton levels in the Ría de Arousa during summer compared to winter (Alvarez-Salgado et al., 1996) and the upwelling event may influence the increase of prey's abundance, decreasing efficiency of depredation as feeding technique

- These results coincide with previous studies in the area suggesting that the **mussel culture platforms** present in the ría would play **a key role in the feeding behavior** of the *Tursiops truncatus*. (Díaz López & Methion., 2017)

Fig 6. Behaviour in absence of fishing nets

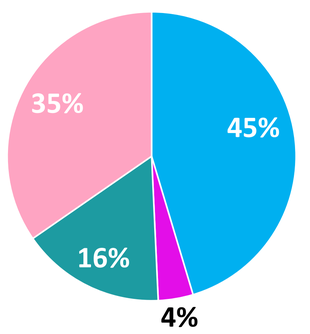
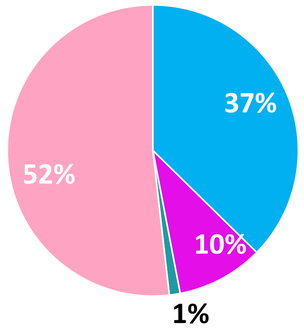


Fig 7. Behaviour in presence of fishing nets



χ^2= ***, p < 0.05

Fig 8. Behaviour in presence of fishing cages

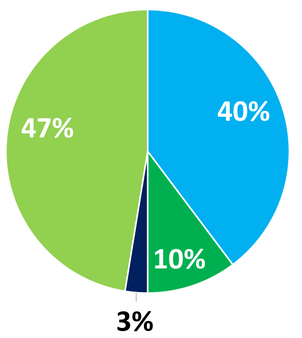
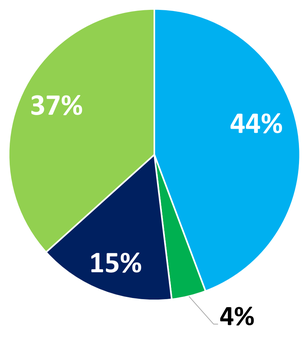


Fig 9. Behaviour in absence of fishing cages



χ^2= ***, p < 0.05

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