

CO-OCCURRENCE OF BOTTLENOSE DOLPHIN AND FISHERIES ACTIVITIES WITHIN THE MARINE PROTECTED AREA OF CAMARGUE (SOUTHERN FRANCE)

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BACKGROUND

Bottlenose dolphins (*Tursiops truncatus*) have been studied along the French Mediterranean coast since the 1990s. However, there has never been a dedicated survey on this species within the **Marine Protected Area (MPA) of Camargue**, identified as a Special Area of Conservation.

The importance of this area for marine fauna is influenced by the biogeographic delta of the Rhône. These specific habitats in the Gulf of Lion are also favorable for fisheries, leading to the creation of **two highly protected areas for artisanal fishermen**.

Therefore, the main aim of this study was to investigate the **co-occurrence between bottlenose dolphins and fishing activities** (which can lead to competition and bycatch) in the waters of the Camargue MPA.

METHODS

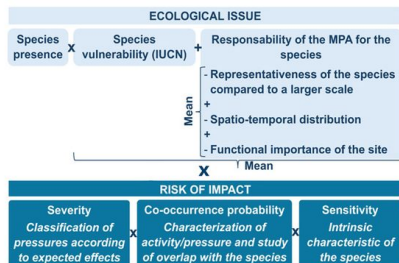
Monthly boat-based surveys were conducted between 2018 and 2023 on semi-inflatable boats.



Dolphin encounter rate: n/L with n the total number of sightings and L the total number of km travelled.

Fishing signal density: p/A with p the total number of fishing signals and A the area of each zone (km^2).

Assessment of conservation issue:



Summary schema of the steps followed to assess local conservation issues (Doney et al. 2023)

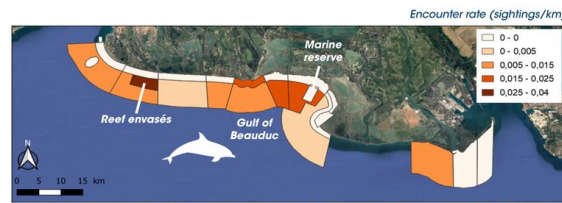
RESULTS

EFFORT: 131 survey days were completed (approx. 2130 km of survey effort) between January 2018 and December 2023. Survey effort varied depending on weather conditions.

ENCOUNTER RATE

17 bottlenose dolphin sightings were recorded, with a total of 160 estimated individuals. Group size ranged from 1 to 30 individuals (**mean 9.4 dolphins**).

The overall encounter rate (ER) in the study area was on average **0.005 (1 group per 200 km)**. The overall **Gulf of Beauduc and the area "Reef envasés" had the highest ER**, conversely the narrow coastal strip and the eastern part of the MPA had the smallest ER.

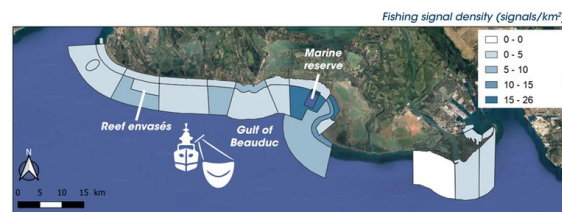


Encounter rate of the bottlenose dolphin in the Marine Protected Area of Camargue (2018-2023)

FISHING SIGNAL DENSITY

16 584 fishing signals were recorded in the study area. 2 signals indicate 1 fishing gear which can be a net, a line of octopus pots or trap lines for shells. The number of fishing signal ranged from 0 to 4688 per area (mean 614 fishing signals).

The overall density was on average **4.29 signals/km²**. The overall **Gulf of Beauduc has the highest density**.



Fishing signal density in the Marine Protected Area of Camargue (2018-2023)

CO-OCCURRENCE

The **overall co-occurrence is considered low and uneven** within the MPA. However, the area around the **marine reserve** highlights the **highest level of co-occurrence**.

Conversely, the **level of conservation issue is important** according to the methodology (**MEDIUM** level of ecological issue multiplied by **HIGH** level of risk of impact).



Co-occurrence of bottlenose dolphin and fisheries activities in Marine Protected Area of Camargue

CONCLUSION

Dolphin distribution within the MPA is uneven, the density of fishing signals highlights a hotspot for fishermen, namely the **Gulf of Beauduc**. This area **appears to hold significance for both dolphins and human activities**.

The assessment method shows a low likelihood of co-occurrence across the MPA scale, but it's **higher in specific areas like around the marine reserve**. Despite this, the risk of impact is deemed high by the method. Sensitivity of species to by-catch is considered in evaluating the impact. However, the **fishing gear type isn't factored** into this calculation.

This study underscores the significance of concurrently collecting data on fisheries activities and bottlenose dolphins. **These findings are crucial for effective management of MPAs.**

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