# Seabird Bycatch in Portuguese mainland <br> waters: fisheries, season and species of concern in the case studies in Algarve and Aveiro-Nazaré regions 

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## Introduction

Bycatch resulting from fishing activity is one of the most serious threats to marine megafauna (i.e., seabirds, cetaceans and sea turtles) (Lewison et al., 2014; Dias et al., 2019). Particularly with regard to seabirds, around the world, annually hundreds of thousands of individuals of various species are bycaught in different fishing gears (Lewison et al. 2004; Dias et al., 2019). This phenomenon has different intensity and depends on the type of fishing, area and time of year. Even knowing this problem, for Portuguese continental waters there are no estimates of the bycatch rate and average removal values for specific species (Žydelis et al., 2013) (but see Oliveira et al. 2015; Oliveira et al., 2020).

## Methods

The study involved interviews to boat skippers to evaluate bycatch in terms of type of gear and seabird species. Interviews covered 7 fishing ports in Algarve and took place from February 2020 to
July 2022.888 interviews were performed to skippers operating gillnets/trammel nets and purse seine. For the Special Protection Area (SPA) Aveiro-Nazaré, 3 fishing ports were covered between February 2021 and December 2022. 311 interviews were performed to skippers operating bottom trawling, pelagic longline, demersal longline, gillnets, trammel nets and purse seine.
Skippers were quarterly interviewed mainly after a fishing trip after arriving at the fishing harbour. All interviews were carried out in person, by an experienced interviewer with extensive knowledge of the fishing sector and experience in seabird identification, following a standardized questionnaire and a list of photos of the most common seabird species. Questions were related to operation characterization, fish target species, sightings of seabirds on the fishing grounds, interactions between seabirds and fishing operations and related problems, incidence of seabird bycatch, species involved and the frequency/seasonality of such interactions. Skippers were asked to report occurrence of bycatch during the last quarter (three months), in totals or in average per month.

## Results

## Eastern Algarve

In the Algarve, there were 109 seabirds reported as bycatch, among the most affected was the northern gannet Morus bassanus, the great cormorant Phalacrocorax carbo and gulls Larus spp (figure 1). Most catches were recorded in winter and autumn (bycatch rate $=0.006$ and (bycatch rate $=0.007$ birds/fishing day) (bycatch rate $=0.007$ birds/fishing day).


## SPA Aveiro-Nazaré

In the SPA, there were 1112 seabirds reported as bycatch, among the most affected was the northern gannet, the common murre/razorbill Uria aalge/A/ca torda, gulls and the Balearic shearwater Puffinus mauretanicus (figure 3). Most catches were also recorded in winter and autumn (bycatch rate $=0.21$ and 0.09 birds/fishing day, respectively) (figure 4) and in trammel nets (bycatch rate $=0.17$ birds/fishing day).
 Figure 4 - Bycatch rate (number of seabirds bycaught divided by the fishing days in the corresponding
quarter of the year). Quarter: 1 - January to March; 2 - April to June; 3 - July to September; $4-$ October

## Final considerations

For both areas of this study, the most concerning seasons for seabirds are autumn and winter, this is explained by the fact that there is a greater abundance of these birds at this time of year, making the probability of bycatch events occurring much greater.
The SPA Aveiro-Nazaré, presented a greater number of captured seabirds, despite the number of interviews being much lower than those carried out in the Algarve, which leads us to believe that the problem in this area is more concerning, especially in trammel nets, which may have a higher fishing effort. This area is particularly important for the Balearic shearwater (Austin et al., 2019) that is classified as Critically Endangered by IUCN (Birdlife International, 2023)
All this work with fishermen allows us to create a relationship of trust for the subsequent implementation of an onboard monitoring program and mitigation measures tests that help decrease this problem and ensure the conservation of these sensitive species.

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