Seabird bycatch in fisheries

What have we learned?

Results of the collaborative work with Mediterranean fishers

SEO BirdLife

Seabirds and bycatch

A sea for seabirds and fishers

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Seabirds and fishers spend many long hours together at sea, interacting in multiple ways. SEO/Birdlife works through its marine program to understand this relationship and to search for ways to make it as harmonious as possible, which is why we have spent years building connections with the fishing community. Working to involve the fishers in this endeavour with the goal of sharing knowledge and experiences and finding effective solutions to, above all else, the incidental capture of birds (bycatch).

_ ASUNCIÓN RUIZ
EXECUTIVE DIRECTOR OF SEO/BIRDLIFE

They share the same environment and you could even say, often, the same activity. The relationship between seabirds and fishers is so ancient that it would not be an exaggeration to say they have always co-existed: the birds, taking advantage of the opportunities that traditional fishing offers them for feeding; fishers, following the birds flight to locate shoals of fish. There are many other interactions and, unfortunately, some have negative impacts, as is the case with bycatch.

SEO/Birdlife, through its marine program, works on building connections between birds and fishers, working so that the relationship is as harmonious as it can be. This is achieved through dialogue, by encouraging the support and involvement of the fishing community to share experiences and knowledge and, finally, to maximise the mutual benefits and to avoid the negative interactions which nobody wants, particularly with reference to the death of birds which become accidentally caught by fishing gear.

Our organisation has a long-standing relationship working hand in hand with the fishers but, without doubt, in the last three years we have made a joint step forward. During this time 62 boats sailing from 21 ports in the Balearic Islands, Catalonia and the Valencian Community have collaborated with our organisation to enable us to quantify firsthand the problem of bycatch and to identify which factors prompt it. To achieve this, fishers have converted the classic field notes, a fundamental tool in ornithology, into sea notes in which they have logged each bycatch incident. Similarly, more than a hundred fishers responded to questionnaires addressed to collect information about fishing practices and their interaction with birds, as well as to know their own perception of these incidents.

All of this information has allowed us to move forward in terms of solutions. Some of those solutions, in fact, are currently being tested: eight boats based in four Catalan ports have tested on-board mitigation measures, converting their days at sea into a sort of testing laboratory to help achieve more sustainable demersal longline fishing. The satisfaction of these fishers, working as collaborators of a science citizenship program, is visible at the various meetings which took place over the years, as well as in their day-to-day work. It is also clear for those of us who form part of SEO/BirdLife, not just for the advances which we have made together in this time, but also, and in a very special way, the work and determination of our companions on this journey who are demonstrating that it is possible to combine a key economic activity with the preservation of the sea and its biodiversity, which in itself is fundamental if commercial fishing is to have a future.

The good results we have achieved during these years gives us the motivation to continue moving forward. At SEO/BirdLife we want to encourage the fishing communities of the whole country to work together, collaborating by keeping "sea-logbooks", sharing experiences via our questionnaires, or sending data on bycatch using the mobile app "Bycatch".

We are well on the road to ensuring that the relationship between fishers and seabirds becomes an alliance with a common goal: reducing the events that negatively impact the marine ecosystem.

What makes seabirds special?

© Marcel Gil

They have adapted to the hostile environment of the sea in diverse ways, some perfecting their diving ability in order to access deeper waters where their prey are more abundant, others improving their ability to fly long distances in search of the scarce opportunities to fish in the surface waters.

They play the role of top predators in the marine environment, where their sensitivity to environmental changes and their visibility, which facilitates their study, allow for the detection of changes which threaten the health of the ecosystem. This means that they may play an important role as “guardians of the sea”.

At the same time, they are the most endangered group of birds on the planet. In the last half century their populations have more than halved due to a multitude of causes linked to human activities, such as coastal development, introduced predators, pollution, interactions with fisheries and climate change.

Which threats are they faced with?

Introduced predators

Interactions with fisheries

Coastal development, pollution, energy exploitation, climate change

Audouin's gull
Larus audouinii

Scopoli's shearwater
Calonectris diomedea

Balearic shearwater
Puffinus mauretanicus

Balearic shearwater
On the road to extinction

The Mediterranean is home to a remarkable diversity of seabirds, some of which are exclusive to the region (endemic) and find themselves in a poor conservation status. The Balearic shearwater exemplifies this delicate situation, being considered the most endangered bird species in Europe:

- Only 3000 pairs remain, and it is estimated that their population shrinks over 10% every year.
- Due to its long life expectancy and low rate of reproduction, it is particularly sensitive to threats which directly cause deaths, such as bycatch in fishing gear.
- Current estimates predict that, if the current threats remain unchanged, this shearwater will disappear in less than 60 years.

The problem with bycatch is common with other endemic and endangered species of the Mediterranean, like the Mediterranean and Scopoli's shearwaters, the European shag and Audouin's gull.

Mediterranean shearwater
Puffinus yelkouan

European shag
Phalacrocorax aristotelis

©Pep Arcos

SEO/BirdLife has sought out the involvement of the fishers to address the relationship between birds and fisheries. Particular attention has been given to bycatch, collecting information about the occurrence of such events and promoting the search for solutions through various initiatives:

Questionnaires
They allow to reach out to many fishers, identifying fishing gears and zones with high risk of bycatch. Conversely, the level of detail achieved is low.

Self-reporting logbooks
These are logbooks that the fishers fill out each day themselves, recording detailed information about their activity and their interactions with birds.

Fishing effort
Information on fishing effort for small-scale polyvalent vessels is very limited. As some of the gears used by this fleet may cause significant bycatch, it is essential to assess their relative use in order to understand the implications for seabirds. Hence, logbooks data and fisheries landing statistics were cross-referenced, with the consent of the fishers and administrations.

Mitigation measures
To find solutions in the cases where bycatch turned out to be regular we worked closely with the fishers to develop and test various mitigation measures.

What information is included in this publication?

Work reported here was conducted in the Spanish Mediterranean (Catalonia, Valencian Community and Balearic Islands), paying special attention to areas included in the Natura 2000 network.

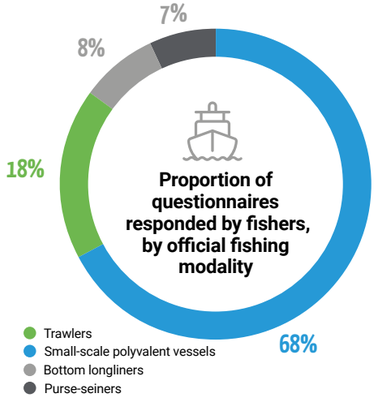
Various fishing types were studied: trawling, purse-seining, static nets, traps and, in particular, demersal longlining (which includes the modality officially called "bottom longline" and its small-scale variant, locally called "palangrillo"). Surface longlining was not included as there is an existing program at the Spanish Institute of Oceanography (IEO) which studies bycatch in this fleet.

The questionnaires to fishers and follow-up of logbooks were carried out by a network of observers who made frequent visits to ports and occasionally got onboard fishing vessels to better understand the day to day reality at sea and to help the fishers collect data correctly.

© Toni Mulet

Questionnaires and logbooks
What information is collected?

Questionnaires



2018

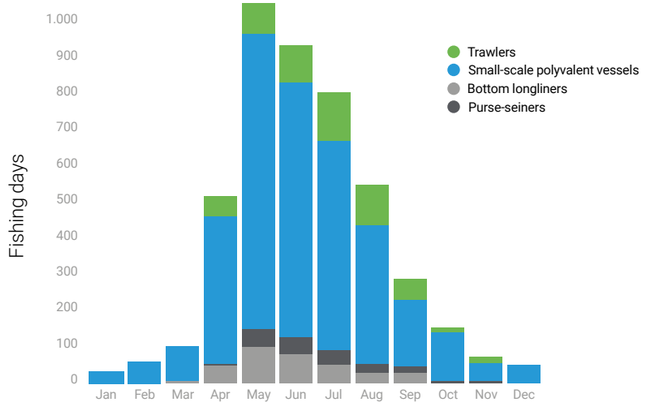
102 questionnaires, 23 ports in the Balearic Islands, Catalonia and the Valencian Community.

Aim

To understand the fishing techniques and their interactions with birds, and to know the personal experience of the fishers.

Logbooks

Seasonal variation of monitoring effort through logbooks, by official fishing modality



2017-2019

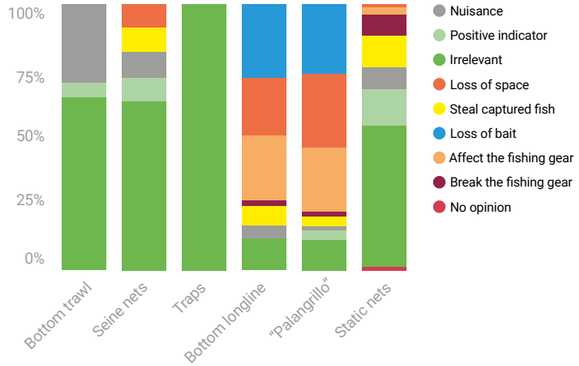
21 ports, 62 boats from the Balearic Islands, Catalonia and the Valencian Community, prioritising the periods of highest risk based on previous information.

Aim

To understand the bycatch occurrence and the factors that contribute to it, through information recorded by the fishers themselves.

What do the fishers think of the birds?

Effects of seabirds on fishing activity based on the gear used (Source: questionnaires)



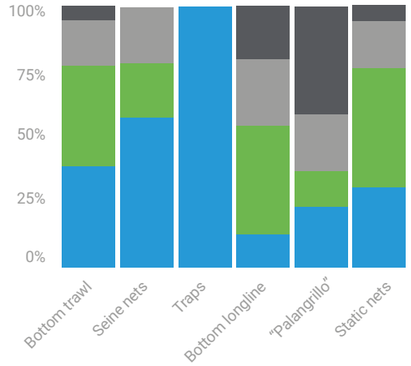
Nearly half of fishers do not consider birds to be a nuisance, and some consider them helpful, for example by indicating the location of fish shoals.

Demersal longline (bottom longline and "palangrillo") is the fishing gear with more problems reported (i.e. bycatch).

How often does seabird bycatch occur?

Annual seabird bycatch occurrence by fishing gear

(Source: questionnaires)



Bycatch frequency (events/year)

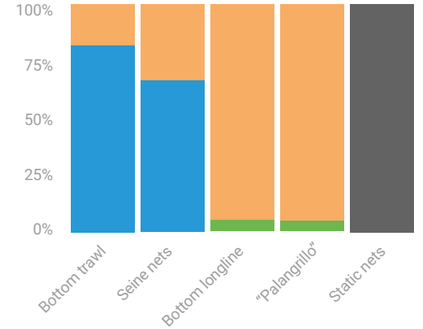
- Frequent (>5)
- Scarce (2-5)
- Rare (0-1)
- No bycatch

Fishing gears with the highest frequency and size of bycatch are **"palangrillo" and bottom longline** (here jointly referred to as demersal longline) which, on occasion, can capture dozens or even hundreds of birds in a single setting.

Interactions Birds / Fishing An overview

At which moment do bycatch occur?

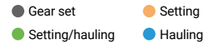
Fishing operation in which the captures of birds occur, by fishing gear (Source: questionnaires)



In **trawling** and **purse-seining** bycatch tends to occur when the gear is hauled aboard, as well as during setting.

In **demersal longline** (bottom longline and "palangrillo"), birds are mostly caught during setting, although bycatch can also occur during hauling.

Captures in static **nets** were only reported when the gear was in the water.

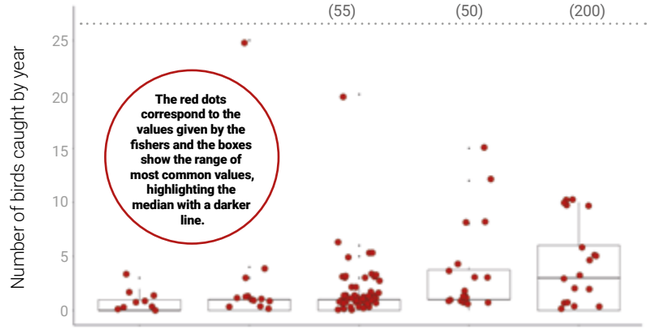


How many birds can be caught?

Number of birds captured annually by fishing gear

(Source: questionnaires)

(Highest values reported by fishers in the questionnaires)



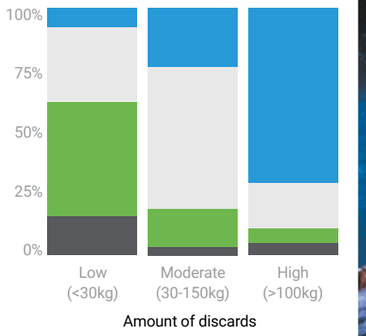
How do fishers react to bycatch?

Based on the questionnaires, 33% of fishers reported employing some type of method to avoid the capture of birds. This is particularly common for fishers using "palangrillo" (89%) and bottom longline (68%). The methods can vary greatly, the majority consisting of mechanisms to scare off the birds.

Seabird bycatch
An overview by fishing gears

© Paulo Lago

The relationship between the number of birds following the trawler and the amount of discards
(Source: logbooks)



© David Tarrason

Purse-seining

In the questionnaires, 43% of purse-seine fishers reported capturing birds scarcely o rarely, with a maximum of 3 individuals per day.

The most affected species are shearwaters, gulls and cormorants.

Based on the information recorded in the logbooks, birds were observed in 90% of hauls but no captures were reported.

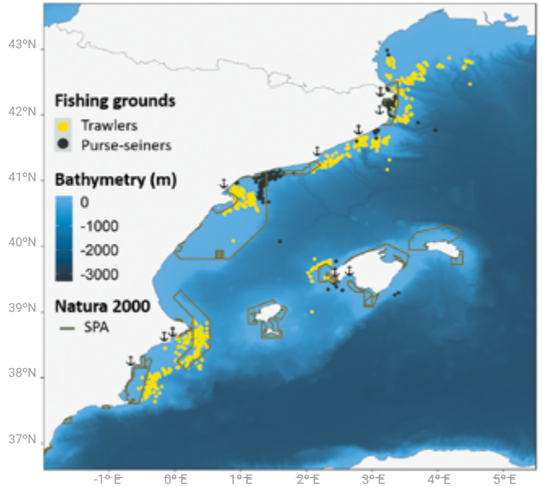
Yellow-legged gull

Trawling

61% of the trawler fishers responding to questionnaires reported collisions or captures of birds during their activity, although the majority (64%) considered this to be a rare occurrence. A median of one bird is caught per year and boat, and the maximum number of birds per day was 25. The affected species include gulls and shearwaters.

Data from the logbooks show that birds attended trawlers in search of discards in 87% of the monitored hauls. Only a single collision was recorded, corresponding to a Yellow-legged gull.

Location of the trawling and purse-seine fishing zones based on logbook data

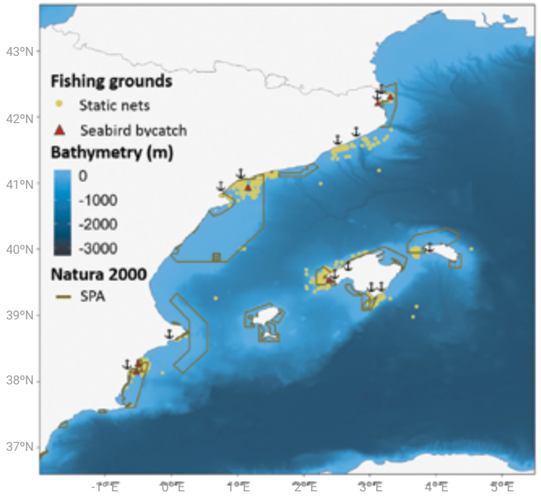


Purse-seiners: 3 boats and 212 fishing days
Trawlers: 10 boats and 572 fishing days

Seabird bycatch
An overview by fishing gears

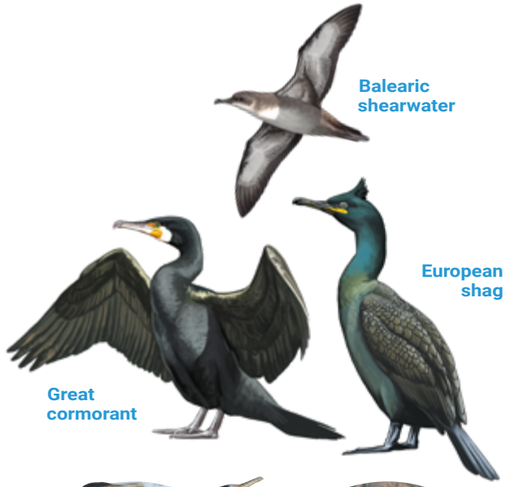
Static nets

Location of fishing zones by static nets monitored with logbooks, as well as seabirds bycaught



26 boats and 1637 fishing days

In the questionnaires, 68% of fishers reported captures of birds, particularly cormorants, although in most cases they were perceived as rare (45%) or scare (19%), and only some considered them frequent (5%). A median of one bird captured per year and boat was reported, with a maximum of 55 birds in a single day.



In total, 7 captures of birds were recorded through the logbooks (trammel nets and "solta"): 5 European shags, 1 Great cormorant and 1 Balearic shearwater, all of them dead. These captures occurred when the gear was in the water, with the exception of one European shag which became trapped when the gear was being hauled aboard. The majority of the captures occurred in spring, in shallow waters less than 40m depth.

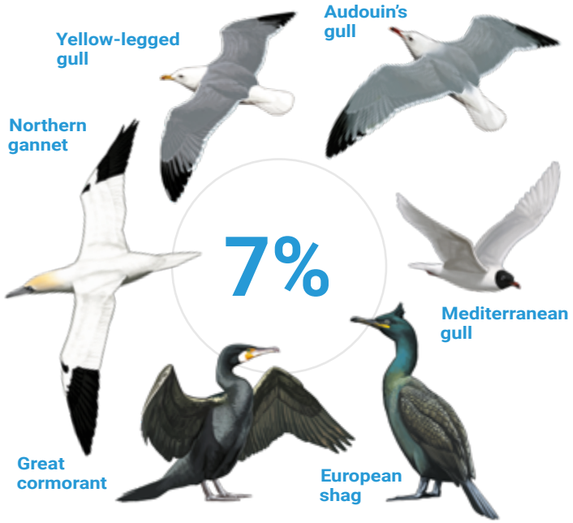
Demersal longlining

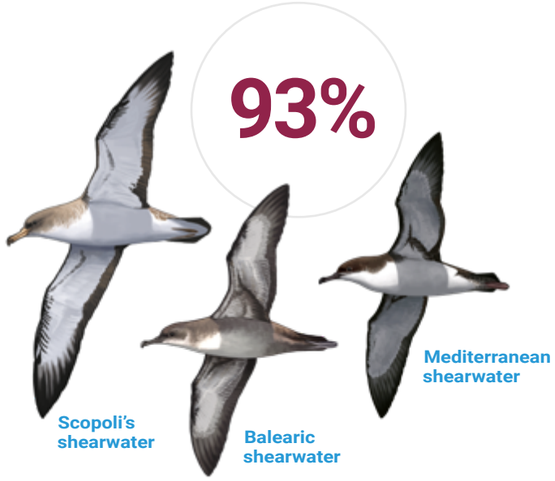
The logbooks also showed that demersal longline (which includes both the "official" modality of bottom longline and its small-scale variant locally called "palangrillo") is the gear with most captures and diversity of affected species. This led to pay special attention to this type of gear.

Based on the questionnaires, 82% of fishers reported captures of birds when using longlines, considered them as frequent (31%), scarce (25%) or rare (27%). The annual median estimated is 1-5 bird captures per boat, with a daily maximum of 50 and 200 birds when fishing with bottom longline and "palangrillo", respectively.

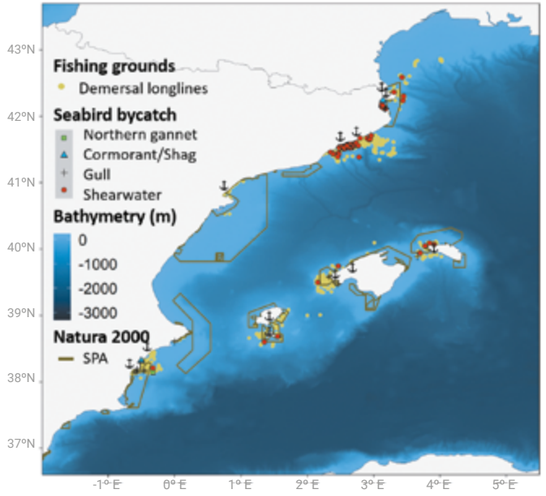
A total of **868 seabird captures** were recorded in the logbooks. Many of these captures involved multiple individuals at the same time (up to 43 birds in a single event). Most captures corresponded to shearwaters, but gulls, cormorants, shags and gannets were also affected.

With "palangrillo", 61% of birds were captured alive, but it is unknown how many of these survived following release.





Areas of bottom longline and "palangrillo", and location of bycatch events, monitored with the logbooks.



33 boats and 1,931 fishing days

Conditions enhancing the risk of seabird bycatch in demersal longlining

There are diverse factors which influence the probability of bird captures, related with both the environmental conditions and the specific way of fishing.

Factors related to geographical and seasonal variability

The risk of captures varies greatly between areas, seasons and years, for various reasons:

- Birds use some areas more intensely than others, depending on the availability of food and the location of their breeding colonies.
- These distribution patterns change throughout the year (breeding season, migration, winter) and between years.
- Fishing practices employed also vary depending on the zone, season and year.

Factors related to the fishing technique

Birds are attracted to longline bait during setting, and can become trapped in the line or caught on the hooks while these are sinking. Therefore, **any factor that attracts birds or increases access to the bait increases the risk of bycatch**. For example:

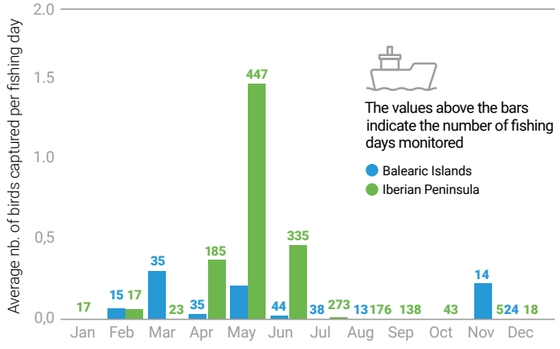
The time of day: Most seabirds are most active during daylight hours, particularly just after dawn; hence setting at night reduces the risk of bycatch, particularly when there is not a full moon.

Type of bait: The use of fish (particularly sardines and anchovies) or squid increases the risk of bycatch, while other invertebrates (like shrimp or octopus) rarely attract seabirds.

Configuration of fishing gear: The faster the gear sinks, the lower is the risk of bycatch, as hooks and bait are accessible to seabirds for a shorter period. Thus configurations in which few or no weights are used to drag the lines below the surface are those that present the greatest risk.

© Vero Cortés

Monthly variations of bycatch in demersal longlining according to the region (Source: logbooks)



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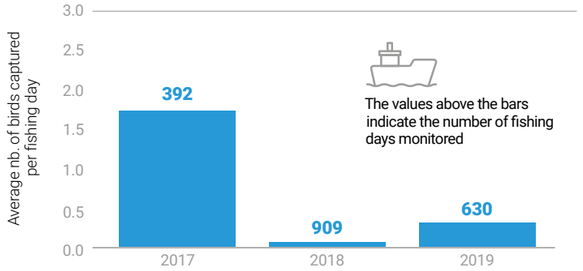
Annual variation of bycatch in demersal longlining
(Source: logbooks)



Fishing effort of small-scale polyvalent vessels and bottom longliners in Catalonia

Data from fish landings 2004-2005 and 2016-2018

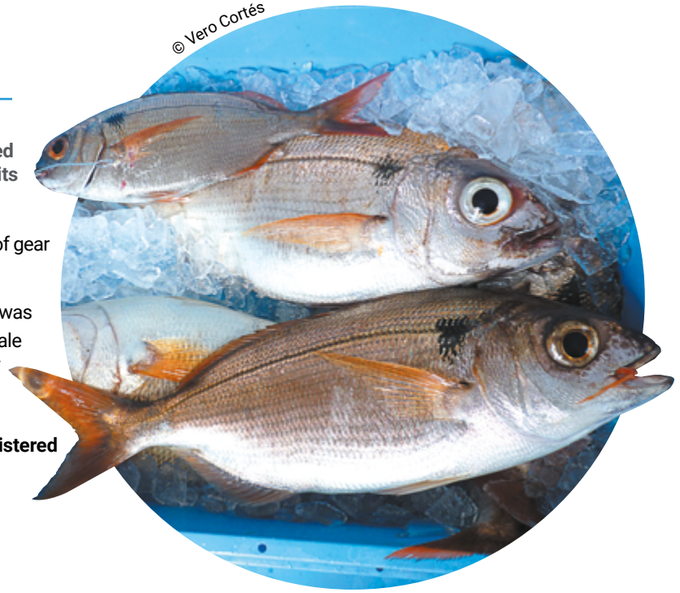
only available for Catalonia (GENCAT)

Aim

Understanding when and where demersal longline is used (including the "official" modality of bottom longline and its small-scale version, the locally called "palangrillo").

The composition of species landed was related to the type of gear used thanks to the logbooks.

This information on species composition according to gear was combined with commercial landing statistics from small-scale and bottom longline vessels, allowing to infer the number of fishing days per year in which each gear was used.



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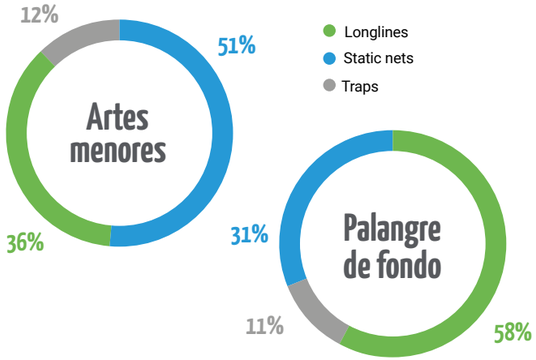
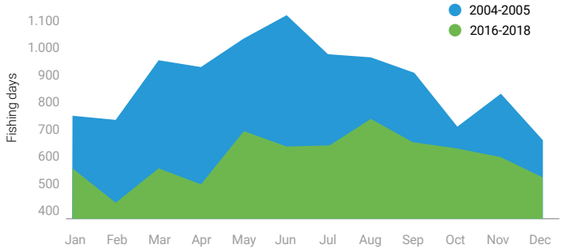
Proportion of fishing days by fishing gear of vessels registered as small-scale polyvalent vessels ("artes menores") and bottom longliners (Source: fish landing statistics 2018)



At present at least 83 boats would use demersal longlines in Catalonia, of which 68 are registered as small-scale polyvalent vessels and 15 as bottom longliners.

The small-scale polyvalent vessels by definition may use multiple fishing gears. However, the alternation of gears does also occur in bottom longliners, subject to specific license requests.

Evolution of fishing effort (by month) of demersal longline fishing (Source: fish auction)



The number of vessels using bottom longline, and their fishing effort, decreased by a third in the last 15 years, particularly in the case of bottom longliners.

Combining the information collected about accidental captures (bycatch rates) with the data on fishing effort, it may be inferred that nowadays some 2500 seabirds are bycaught annually by demersal longliners in Catalonia, taking into account only the period of highest risk (April-July).

If the reduction in fishing effort by demersal longliners is taken into account, the capture of birds should have decreased by 25% between 2004 and 2018. This decrease is mostly attributed to the reduction in bottom longliners, while at the same time there has been a slight increase in longline effort by small-scale vessels ("palangrillo").

Of the birds caught in "palangrillo", more than half were freed alive (61%), and therefore the mortality is expected to be lower than the total number of captures. However, these birds are injured in the process, and often they are freed with hooks and fishing line still attached, so it can be expected that many might die shortly after release. Current work is conducted to provide training and tools to fishers to help these birds and maximise their survival chances once freed.

In addition to the overall decrease of bycatch expected from a decrease in the fishing activity, many fishers also perceive a decrease in their seabird captures, which could be related to the decline of seabird populations.

© Vero Cortés

Estimates of bycatch and seabird mortality (April-July) (Source: logbooks and landing statistics)

	Bycatch rate[1] (birds/fishing day)	2004-2005	2016-2018	Difference
Bottom longline	0.35	2.015	822	-59%
"Palangrillo"	0.69	1.405 (548*)	1.730 (675*)	+23%
Total	–	3.420 (2.563*)	2.555 (1.496*)	–25%

*** Mortality in "palangrillo" fishing when only considering birds captured dead (39%)**

1 Bycatch rates were estimated from the logbooks data for the small-scale vessels ("palangrillo", present study), and from observers data for the bottom longliners (University of Barcelona 2011-2015, see Cortés et al. 2018).

¿How to avoid the capture of birds in demersal longlining?

© David García

The collaboration of the fishers provided a better understanding of the interaction of their activity with seabirds, and to evaluate a diversity of measures to minimize problems when they were detected, specifically regarding bycatch. These measures range from simple recommendations regarding how to fish to technical adaptations developed and tested at sea, the latter requiring greater effort and commitment.

Studied mitigation measures

2017-2020

8 boats, 3 ports in Catalonia

Aim

Adapt the mitigation methods recommended by the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and BirdLife International to the local fleet and confirm which are the most effective and suitable in the study area.

Various mitigation methods were tested with the collaboration of fishers of the bottom longline and small-scale polyvalent vessels ("palangrillo"). This work was reinforced through workshops that allowed the exchange of experiences between experts and fishers from different regions across the World.

Increasing the longline sinking rate

© Vero Cortés

To measure the speed at which the line sinks, Time-depth recorders (TDRs) were attached to the lines.

Different weight combinations (varying both their mass, shape and distribution) were tested to improve sinking rates, always avoiding adverse effects on the fishing activity.

Automatic line setting with an "ocultacebos" hook box

© Irene Álvarez

Adaption to the local fleet of a hook box with a bait cover, which allows for quick and safe setting while reducing the number of birds attracted.

Reducing the visibility of the bait and decreasing setting time.

Olfactory bird repellent

© Pep Arcos

Test of an olfactory repellent to keep birds away during the setting.

Its effectiveness deserves further verification under different wind conditions, and potential toxicity must be assessed.

Taking into account the tests carried out, the analysis of the risk factors, the conversations with the fishers and the recommendations of ACAP and BirdLife International, for now it is recommended to apply a series of methods to minimise seabird bycatch:

Primary measures, the most effective

Night setting

Finish setting at least one hour before dawn or start one hour after sundown.

Use less attractive bait

Avoid sardines/anchovies and squid.

Increase the weight of the longline

Use heavier weights and/or increase their number across the line.

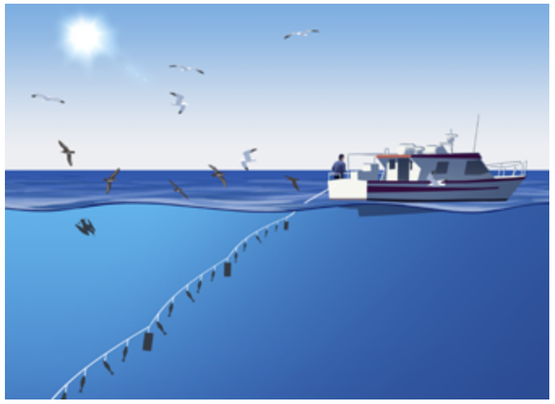
The combination of various primary methods helps reducing seabird bycatch more effectively.

© Pep Arcos

Complementary measures

- Perform short and fast settings
- Avoid throwing either discards or offal overboard before setting
- Wait to start or interrupt setting when there are large numbers of birds present

The system of automatic setting with "ocultacebos" hook boxes could become a good primary method, but the design still needs to be perfected and validated with tests at sea.



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Zepamar project

The aim of this project is to involve fishers of the Iberian and Balearic Mediterranean, as well as Galicia, in a study of the relationship between seabirds and fisheries and to look for solutions to the bycatch problem, giving special attention to the areas within the Natura 2000 network. The project counts with the collaboration of the Fundación Biodiversidad from the Ministerio para la Transición Ecológica y el Reto Demográfico through the Programa pleamar, co- financed by the EMFF, and is complementary to LIFE IP INTEMARES project.

Work prior to Zepamar (2020) was supported by the Fondation Segré (STF; 2014-2017) and previous projects of the Programa pleamar (ZEPAMED and ZEPAMED II; 2018-2019). All this work also counted with the collaboration of the MAVA Foundation and BirdLife International.

SEO BirdLife

Thanks to all of the fishers collaborating in this work!

Do you want to be one of them?

You can help:
Collaborating with any of the ongoing activities
(questionnaires, logbooks, trials of mitigation measures)
Recording any seabird bycatch event via the mobile app BYCATCH

Google Play

BYCATCH

Contacting us at seo@seo.org / +34 914340910

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