SEABIRD BYCATCH IN CATALONIA: DEMERSAL LONGLINING

Figure 1. *Yelkouan shearwater bycaught during the setting of a demersal longline. Photo: Vero Cortés.*

01 Joint actions to solve the problem

As has been mentioned above/before, bycatch in fishing gears, not only entails losses and inconveniences for fishing activity, but also represents one of the most important threats to many seabirds. Therefore, all efforts aimed at resolving this interaction lead to a win-win situation. However, in order to achieve a common and successful solution, it is essential the exchange of knowledge and joint work between the different actors involved.

An example of joint work can be found in Catalonia, and specifically in demersal longlining, the fishery that has the greatest impact on seabirds in our country. Over the last few years, research centres (led by the University of Barcelona) and conservation organisations (mainly SEO/BirdLife) have worked closely with fishers, with the support of the Administration, to assess the problem and seek effective solutions compatible with the activity of demersal longliners. The common goal is to make this activity more sustainable and respectful of the marine environment.

02 Seabird bycatch in demersal longlining

In Catalonia, demersal longlining is used in two types of fishing: bottom longlining, where it is typical to use hanging or “pedra-bola” longlines, and small-scale polyvalent vessels, where a smaller longline called “palangró” is used. Although seabird bycatch occurs in both modalities, there are certain conditions there are certain conditions that prompt it, in particular those related to the fishing techniques and fishers’s habits, as well as the behaviour of the seabirds. It is therefore important to study on a case-by-case basis what changes could be introduced to reduce seabird bycatch.

02.01 Identifying and understanding the issue

Understanding how, when and under what conditions seabird bycatch occurs and which species are most affected is the first step to solving this problem. This prior information is essential, and helps us to identify the most dangerous situations for the birds and the most appropriate mitigation strategy for the fishing fleet studied. To achieve this, reliable data must be collected on the interactions between seabirds and fishing gears, as well as the particularities of the fleet, the fishing methods, the gears used and the distribution of the effort.

This information can be obtained through different methods which complement each other. The methods used in Catalonia and the conclusions reached with the information collected are described below.

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In Catalonia, demersal longlining has a particular impact on the 3 species of shearwater endemic to the Mediterranean, all of which are in decline: Scopoli’s shearwater, the Balearic shearwater and the yelkouan shearwater.

02.01.01 Questionnaires to fishers

The best way to obtain a global vision of the problem and understand the diversity of fishing practices and their interaction with birds is to carry out questionnaires to fishers.

Thus, questionnaires carried out in the sector have shown that longlining is the fishery with the greatest risk of catching seabirds in Catalonia (Figure 4).

In addition, it has demonstrated a higher level of seabird bycatch in demersal longliners, with exceptional cases of hundreds of individuals caught in a single setting. This could be explained by the fact that demersal longliners usually use smaller baits and hooks than surface longliners, which makes it easier for the birds to swallow the bait and become hooked. In addition, demersal longliners tend to fish closer to shore, where seabird abundance and diversity are higher.

According to questionnaires, demersal longlining particularly affects the 3 species of shearwaters endemic to the Mediterranean, all of which are in decline: Scopoli’s, Balearic and yelkouan shearwaters. These species are at high risk of bycatch, as they are good divers and can reach baits up to 30 metres deep. In addition, they are very gregarious birds so often often hundreds of birds are gathering behind the boats, which increases the probability of multiple captures.

Figure 2. *Seabird bycatch during demersal longline setting. The risk of capture is greater when fishers set the longline during the day, with low weights and using small pelagic fish as bait. Illustration: Martí Franch.*

Figure 3. *Bycatch of the 3 Mediterranean shearwater species. From left to right: yelkouan shearwater (1), Balearic shearwater (2-3) and Scopoli’s shearwater (4-5). Photo: Vero Cortés.*

02.01.02 Direct on-board observations

On-board observations expert personnel allow to obtain more accurate information on seabird interactions. However, to achieve a broad coverage and obtain sufficient information of the different fishing grounds and methods throughout the year, it is necessary to put in place an observer programme with, with sufficient personnel to cover an acceptable percentage of the fishing effort of the target fleet. Furthermore, in some cases, it is not possible to go onboard fishing vessels because the maximum legal number of crew members is exceeded. This is particularly the case of the small-scale polyvalent vessels, which hampers the collection of data in this fishery.

In Catalonia, this method has shown that seabird catches on longliners occur irregularly. Although seabird bycatch seems to be infrequent, occasionally could occur massive catches of dozens to even hundrends or hundreds of individuals in a single setting; especially affecting the 3 species of shearwater.

From data collected between 2011 and 2014, a minimum annual mortality of 126 to 642 seabirds has been estimated for the demersal longline fleet of Catalonia (Cortés et al., 2017). These estimates should be considered very conservative for several reasons: (1) information is not available for some areas and gears, (2) the irregularity of seabird catches makes their detection more difficult without a regular monitoring and good coverage, and (3) not all birds caught are retrieved (they may become unhooked or eaten by scavenging marine species, such as benthic amphipods)

02.01.03 Self-reporting logbook

The distribution of logbooks in which fishers collect information about seabird bycatch themselves allows to extend the coverage especially, in those vessels where it is not possible to carry out onboard observations due to space limitations. However, for fishers this represents additional work to fishing, additional work to fishing, so they don’t do it with the same dedication as an observer cannot do with the same dedication as an observer. However, the motivation of many fishers has allowed to collect interesting data.

During the spring of 2017, logbooks were distributed to demersal longline fishers in central-northern Catalonia for the first time. This experience was very positive, as the fishers were really involved in the study, which improved the information on the occurrence of bycatch and the factors that prompt it, at the same time this awareness

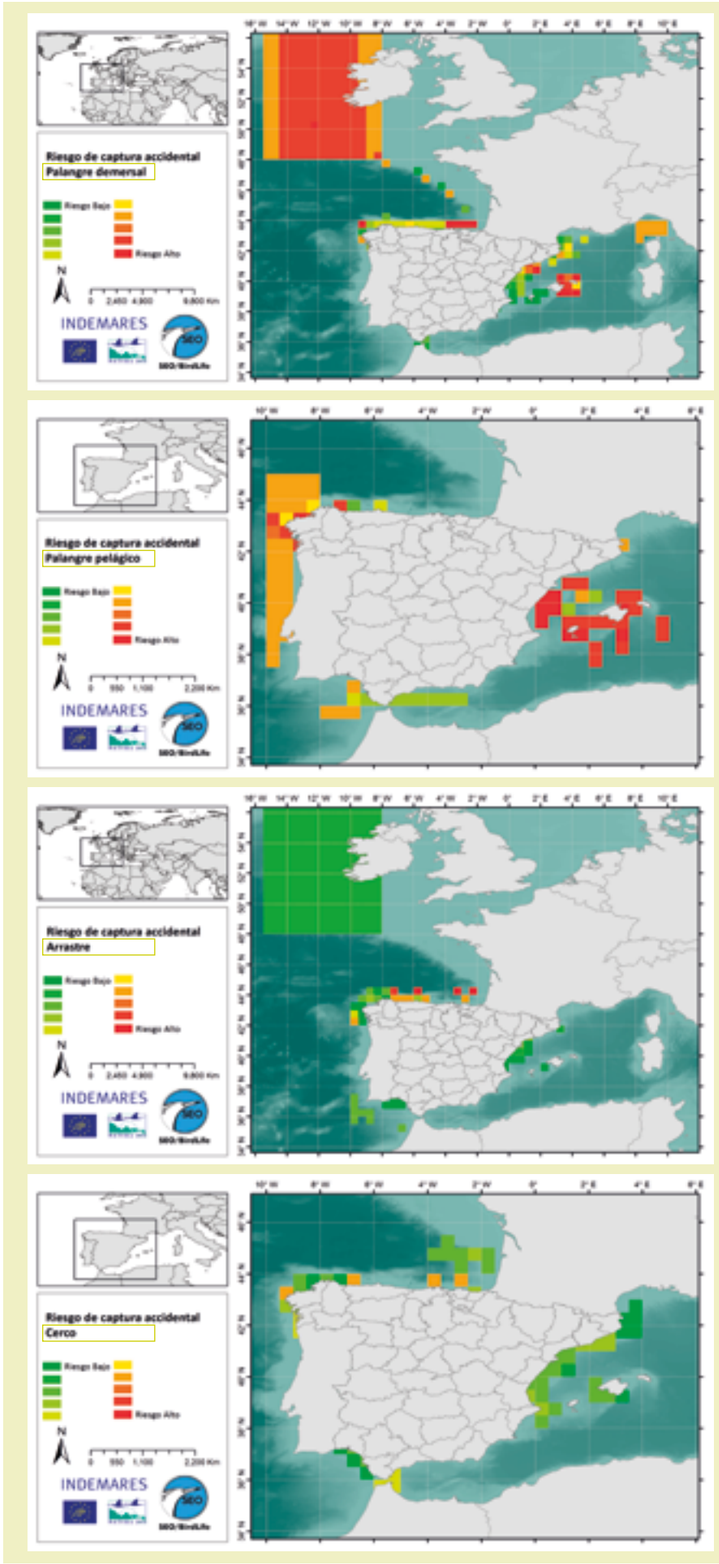

Figure 4. *Maps of the level of bycatch risk (from green, low, to red, high) in the Spanish fishing fleet's different fishing modalities, according to surveys of fishers carried out by SEO/BirdLife during the Interreg FAME and LIFE INDEMARES projects. Source: SEO/BirdLife (2014).*

of the problem. That is why this action was repeated in 2018, but increasing the coverage.

The logbooks distributed in 2017 allowed to register 685 birds bycaught (see Figure 5). Of these catches, 97% were shearwaters, especially Puffinus shearwater species (Balearic and yelkouan), as they were often caught in groups of up to a few dozen per setting. However, a large number of the shearwaters caught were released alive (59%), but is unknown how many of these survived following release. This release is only possible in the small-scale polyvalent vessels, as they tend to set the longlines more slowly, at shallower depths and with less weight, allowing to stop the setting and retrieve the line to release the bird caught, or even the birds hooked could reach the surface and survive until the hauling.

02.01.04 **Study of seabird carcasses**

The study of the seabird carcasses seabird due to bycatch allows to know the sex, age, reproductive status and, sometimes, the colonies of origin.

The results of these studies in Catalonia show that, although immature birds are captured at the end of the breeding season, adult males are the most affected by this interaction, especially at the beginning of the breeding season (when they are mating or incubating). In the case of Puffinus shearwaters, the females are captured more frequently during the period of chick-rearing. The mortality of breeding adults and the imbalances between sexes in bycatch aggravate the decline of these species.

Some recovered birds were ringed, which proved that most of the captures in Catalonia correspond to birds from the nearest breeding colonies (Balearic Islands), although other more distant colonies may also be affected, especially from France and Italy.

02.01.05 **Tracking birds**

Seabirds equipped with remote tracking devices such as GPS allows to learn about their behaviour, routes and foraging areas. Furthermore, if this information is combined with the distribution of fishing vessels, it is also possible to know when, where and in which fisheries the seabirds interact, which allows to identify bycatch risk areas.

The combined analysis of the Scopoli's shearwater's foraging trips and the daily movements of fishing vessels, have shown that the birds attend longliners with lower intensity when there are more trawler around them (Figure 6), as the latter provide to them more feeding opportunities (discards).

02.02 **Conditions that favour seabird bycatch**

Seabird bycatch varies according to season and setting time, meteorological conditions and the particularities of the fishing techniques. Previous studies indicate that there is a higher risk of bycatch when fishing early morning and during the breeding season (spring and summer). There is also an increased risk of bycatch when fishers use baits attractive to seabirds (such as sardines and anchovies), or set longline configurations with low weight that are light in weight and slow sinking.

Seabird bycatch may also increase on windy days and non-working days of trawlers. In strong wind conditions, birds find it more difficult to get food by themselves, so therefore they follow the trawlers more intensively. Moreover, during the weekends or trawl closures, when the discards provided by these boats are not available, the birds search other sources of food, such as longline baits, thus increasing the risk of being bycaught, as seen above (see Figure 6).

02.03 **Effects on bird populations**

Because of seabird bycatch occur irregularly and unevenly, some fishers are not aware of the importance of this problem. However, if all the longliners in the region are taken into account, along with the possible bycatch in other gears and regions, the mortality caused becomes unsustainable for some species, especially if they have small populations such as the Balearic shearwater.

In this latter species, the decline observed in their populations due to a high mortality of adults is of particular concern. Almost 50% of this mortality is attributed to fishing. Each year, the population of this shearwater is estimated to be declining by 14% and, if this rate continues, it will become extinct in less than 60 years. It must be remembered that seabird populations are very sensitive to increased mortality.

This negative population trend has also been detected in Scopoli's and the yelkouan shearwater, and all scientific evidence points to fishing mortality as the main cause of this situation. In the case of Scopoli's shearwater, moreover, it has been observed an uneven mortality between breeding colonies. These differences are caused by a variation in the distribution of the birds according to the colony of origin, and, linked to this, in the different degrees of overlapping with the fishing grounds.

02.04 **Effects on fishers**

It should not be forgotten that fishers also suffer direct effects when birds interact with their activity. During the setting, seabirds steal the baits that are thrown to the sea, which reduces the amount of bait available for their catch. In addition, when the birds are caught, the baits are rendered useless and, at the same time, they increase the buoyancy of the longline, which modifies the way of the line is settled on the bottom, ultimately affecting its efficiency. This reduces fishing opportunities and, as a consequence, has an effect on performance. Finally, catching birds can also lead to line entanglement and gear losses.

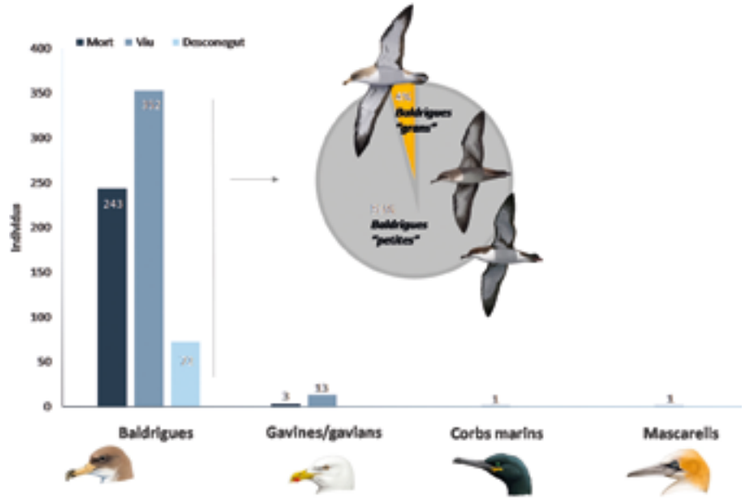

Figure 5. *Number of captured individuals of the different bird groups recorded in the logbooks distributed in 2017 (685 birds in total). It is also specified whether they were recovered dead or alive. For shearwaters, the circle indicates the proportion of Scopoli's shearwaters (large) in comparison with the Balearic/yelkouan shearwaters (small). Drawings by Martí Franch. Source: Tarzia et al. (2017).*

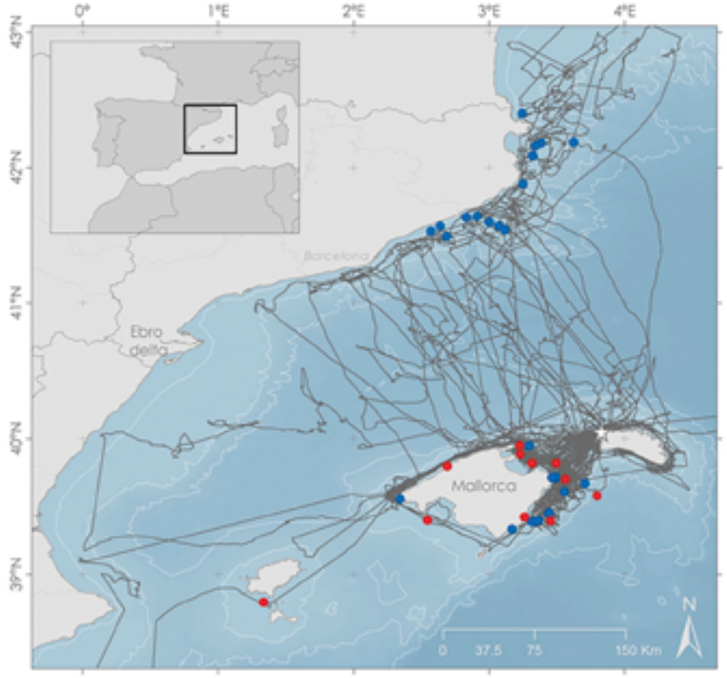

Figure 6. *Foraging trips of Scopoli's shearwater from the Cala Morell colony (Menorca) and interactions with trawlers (blue dots) and longliners (red dots) for which VMS locations are available. Source: Taken from Soriano-Redondo et al. (2016).*

03 Mitigation measures for demersal longlining in Catalonia

03.01 Studied mitigation methods

Seabird bycatch can be minimised if there is a good knowledge of the factors that cause it and if appropriate measures avoid it are implemented. According to the recommendations of the "Agreement on the Conservation of Albatrosses and Petrels" (ACAP), the most effective mitigation measures to reduce seabird bycatch in demersal longline fisheries are (1) the use of bird-scaring lines, (2) the addition of weight to longlines, and (3) night setting.

Both the University of Barcelona and SEO/BirdLife have developed and tested these potential mitigation measures, adapted to the characteristics and ways of working of the Catalan fleet. The results obtained in the tests carried out are presented below.

03.01.01 Bird-scaring lines

These lines consist of a rope with streamers that is dragged from a high part of the stern of the boat (see Figure 7). It is designed to keep birds away from the setting area, especially in the area where the baited hooks are more accessible.

During the trials, birds tried to steal the baits more frequently outside the area covered by the streamer line (about 50 m behind the stern). However, some seabird catches occurred, possibly because in calm conditions the streamers did not move and therefore did not deter the birds away.

On the other hand, it is found that on days with strong crosswinds there was a risk of entaglements between the bird-scaring line with the longline.

03.01.02 Additional weight

Increasing the sink rate of the longline by adding more weight to the line weight is one of the most recommended practices to reduce seabird bycatch (see Figure 8).

During the trials performed in Catalonia, 10 and 20 g weights were added above the hooks to to accelerate the sink rate. However, the sinking speed obtained was not high enough to avoid the bycatch of shearwaters, and also the weights could increased the risk of entanglement.

Therefore, alternative methods to increase the sink rate, such as adding heavier weights to the mainline and reducing the distance between them, should be sought.

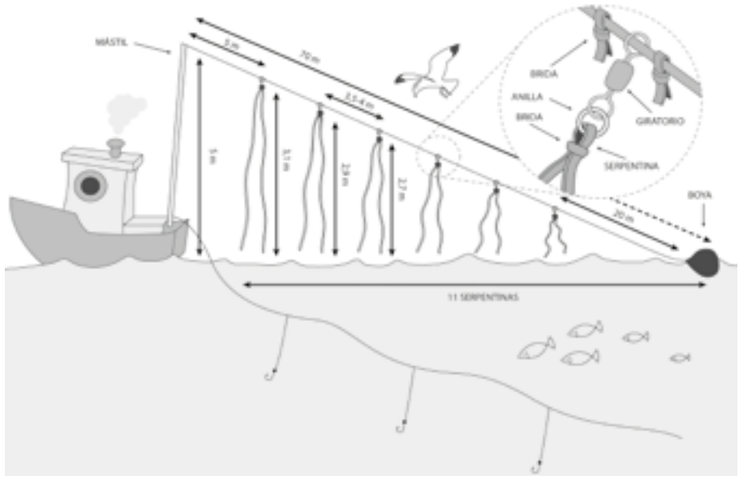

Figure 7. *Bird-scaring line to prevent birds from approaching the area where baits are most accessible. Illustration: Toni Mulet. Source: Taken from Cortés and González-Solís (2018).*

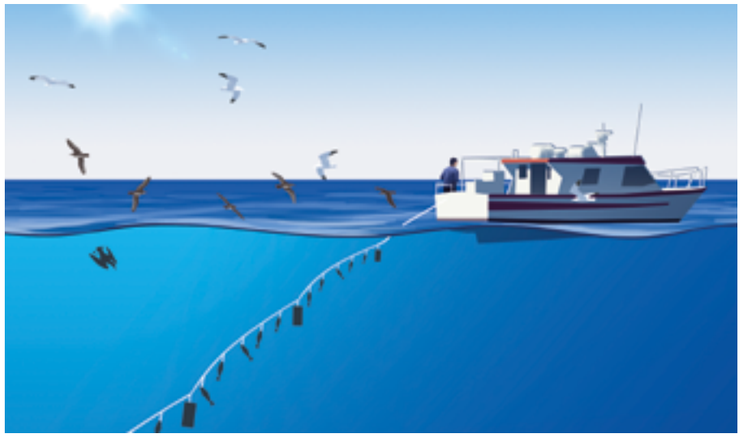

Figure 8. *Adding weight to the longline to reduce the sink rate of baited hooks. Illustration: Martí Franch.*

03.01.03 Night setting

Setting the longlines at night substantially reduces the risk of bycatch, as the birds present in the Mediterranean tend to be less active during the night (see Figure 9).

According to data from the logbooks distributed in 2017, the risk of catches was 10 times higher when line setting was performed during the day. However, some target fish species have different daily rhythms, so night setting could reduce the chances of catching them. In these cases, alternative methods should be used to reduce seabird bycatch.

03.01.04 Other methods

In addition to the above measures, we have tested other methods that could also reduce bycatch. These include the Chilean system, consisting in setting vertical lines consisting vertical lines or "espineles" joined with a horizontal line. This system may be suitable in special cases, but it is not an ideal substitute for conventional longlining, as the effort required to set the same number of hooks must be higher. Another method, currently being tested, is the NISURI system, that is a longline setting system used by artisanal longliners in Ecuador to avoid seabird bycatch. It consists of a PVC tube with a slot along its length through which the baited hooks are passed, so that the baits are hidden inside. The use of this tube allows to set the longline faster and safer, while at the same time it reduces the seabird interaction and thus the bycatch risk.

Beyond the measures tested, the measures tested, some of the operational measures mentioned initially should also be taken into account, such as the use of baits less attractive to seabirds (as long as they are efficient for fishing) or avoid throwing any type of discard overboard while setting or hauling the gear.

Figure 9. *Night setting to avoid the period when birds are more active. Illustration: Martí Franch.*

Best practices to reduce bycatch

Primary measures:

- Night setting (see Figure 9).
- Using baits less attractive to birds (octopus, shrimp, hermit crab, etc.).
- Increasing the sinking speed of the longline (heavier weights distributed at a shorter distance)
- The use of vertical lines, similar to the "pioc". (See Figure 2).
- Avoiding the use of longlines during the pick season of bycatch use longlines in the months when there are more bird catches, i.e. from April to June (in the case of smaller types of gear).

Complementary measures:

- Performing short and fast settings short, quick sets.
- Do not throw fish to the sea and keep the bait covered before the setting.
- Do not set the longline when there is a high concentration of birds on the fishing ground (wait for them to leave) or following other boats around (e.g. trawling or seining).
- Using olfactory bird repellents.

Table 1. *Set of primary and complementary measures for best practices to reduce bycatch. Source: own research.*

03.02 Recommendations for minimising seabird bycatch

Due to the complexity and dynamics of the Catalan longline fleet, the strategy to mitigate seabird bycatch should include a set of methods to suit the full variety of fishing practices (see Table 1). In this way, fishers could choose and implement those methods that are most compatible with their activity.

We can differentiate between two types of measure: (1) primary, which can be used alone, although in some cases they need to be combined with other measures to be effective, and (2) complementary, which are practices that reduce bird interaction but should be combined with a primary measure.

04 Further reading

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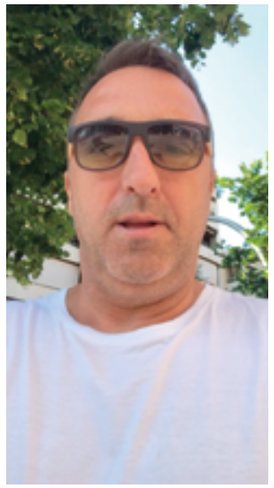
SEABIRDS: SOCIETY'S VIEW

The following is an outline of the views of different stakeholders representatives interviewed about the issue of seabird bycatch in Catalonia.

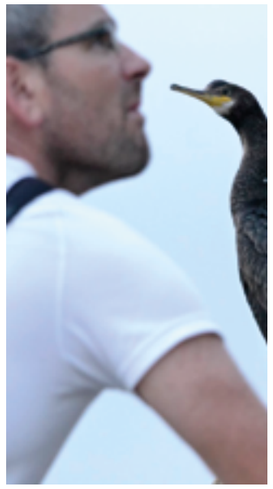
Thus, the vision of the professional fishing sector was expressed through the opinions of Fermín Masdeu Duch (FM) and Jaume Pagès Codina (JP), professional surface longline and demersal longline fishers respectively; the vision of recreational fishing was provided by Oriol Ribalta Aymami (OR), representative of the Catalan Association of Responsible Fishing; and, finally, the more conservationist view was provided by Joan Grajera Mela (JG), member of the European shag study group and of the Catalan Institute of Ornithology.



Fermín Masdeu Duch (FM), professional surface longline fisherman.

Jaume Pagès Codina (JP), professional demersal longline fisherman.

Oriol Ribalta Aymami (OR), representative of the Catalan Association of Responsible Fishing.



Joan Grajera Mela (JG), member of the European shag study group and of the Catalan Institute of Ornithology.

QUESTIONNAIRE

Do you think seabirds are important? If so, what aspects of them would you highlight or do you think make them important?

FM: Seabirds are important because they are part of my environment. In fact, I use them to see where the fish are, so I can locate them. Still, I don't know how they can be important.

JP: I think they are beneficial to the marine community and they also create a beautiful scene along with the landscape. Thinking about practical day-to-day fisheries issues, they have an important role to play in recycling fishing waste.

OR: I don't know if the word is "important", but they are part of the marine ecosystem, although the loss of their food is making them terrestrial or dependent on human activities at sea such as fishing or aquaculture. Seabirds are part of the delicate ecological balance of the sea and coasts, forming part of the environment and landscape. They are theoretical indicators of the state of their habitat, but lack of food has made them visitors to human landfill sites to obtain food that was not previously part of their diet, so some species are not good indicators of anything.

Three groups can be distinguished among seabirds: those, such as gulls and the like, that have adapted to eating anything, cormorants that have had to supplement their marine diet with the food they find in rivers stocked with farmed trout and another group that are winter migrants like the Northern gannet, the Arctic puffin and the razorbill that come to spend the colder season in the Mediterranean. Therefore, we export poverty to seas in a better condition and perhaps better managed; global responsibility must not be forgotten.

JG: In the past, before the advent of new technologies such as radar, fishers used seabirds to detect shoals of fish. Today, in science, they are used as bio-indicators of the state of the oceans: by studying their diet, we can determine changes in fish stocks and, by determining the pollutants accumulated in their tissues, we can get an idea of the presence of these harmful agents in our seas. Finally, in recent years, there has been an increase in demand for marine wildlife watching trips, which generates income and is another option in the range of offers in the sustainable and nature tourism sector.

Did you know that most seabirds are protected, and that some are seriously endangered? Which pressures do you think that have contributed to their poor conservation status?

FM: My trade is longlining and that's what I know. I am aware that it has done a lot of damage, and this has affected the birds and some are threatened. But it's all a wheel: there is no food source or there is less, the tackle, the fishing gear, the air and marine pollution, etc.

JP: From my perspective and from all the years I have been at sea, I do get the feeling that some species are seen less than they used to be. There are probably various pressures that have affected their conservation status. Longline seabird bycatch, which is the issue at stake, may affect them significantly depending on how you work.

OR: Protection is not enough, since the very administration that protects them authorises the overfishing of small pelagic fish that have been the birds' food for millions of years. The reduction is due to the lack of food for these birds because of the overfishing of small pelagic fish. The Administration has created areas called SPAs, included in the Natura 2000 Network, which protect seabirds but does not foresee any action to recover the fish stocks that are their food and which, undoubtedly, are the source of the problems both for the birds and for the rest of the fish.

JG: We believe that the population trends of most seabirds are worrying. Bycatch in fishing gear, pressure from invasive predators such as cats and rats on breeding colonies, oil spills, the presence of plastics that can end up being ingested by seabirds and, finally, urban pressure and overtourism are the main causes of the decline of most species.

How does your activity interact with seabirds, both positively and negatively?

FM: On the negative side, it would be the risk of them getting caught on hooks. On the positive side, we provide them with easy food, but in the end it is also negative for the birds.

JP: The negative interactions are mainly due to attacks by birds during the setting of the longline. For us fishers, when this happens, it is a difficult and problematic time. In the best case scenario, they steal your bait and it is a hook that will no longer catch fish. However, when the birds get stuck on the hooks, the longline floats and no longer works properly and the gear can even break. All in all, it adds to the complication of the day, manoeuvring to free the birds and wasting time waiting for them to leave.

Apart from these stressful moments, there are positive aspects. I like to watch the birds at sea, and sometimes when pulling in the longline and a fish you have caught becomes unhoooked, the birds get excited and you can detect where it is. If you get there before they bite, you can take it.

OR: I don't see any negative interaction, recreational fishing uses seabirds as indicators of fish activity and they are very useful for locating where the marine predators are that chase small pelagic fish.

JG: Basically, our interaction with seabirds is focused on the study of the European shag. We try to assess what their diet is and how it varies throughout the year, where their feeding

Figure 1: *Demersal longline fishers setting in the absence of birds. Photo: Pep Arcos.*

Figure 2: *Yellow-legged gull watching fishers. Photo: Pep Arcos.*

areas are, what the main mortality factors are, how and when dispersal movements take place and how the population dynamics of the species evolve.

In your activity, do you think it is possible to reduce negative interactions with seabirds?

FM: Yes, I think it is possible to reduce these interactions.

JP: Yes, you have to take into account that these negative interactions do not occur all year round. In our area, the times when we tend to have problems with birds are limited to the period between the end of April and the beginning of June, a little bit also depending on the year. I think it is possible to reduce seabird bycatch, and in fact we have always tried different solutions, some with more success than others. But I also think that on days when there are a lot of birds it is difficult to do anything.

OR: For me there is nothing special to do, recreational fishing has no problem with seabirds, just the opposite.

JG: Our efforts are aimed at obtaining mitigation measures to reduce negative interactions with human activity. Therefore, our interest foresees the transfer of acquired knowledge to management proposals aimed at the Administration, land managers and the scientific community, as well as the dissemination to the general public and users who may interact with the species, with the aim of raising awareness.

In our particular case, we have been able to determine how recreational fishing from the coast has a direct impact on European shag individuals by collision with the lines and direct ingestion of bait and hooks. These birds make a very restrictive and specific use of the coast, grouping in nocturnal roosts and rocky diurnal resting places. Therefore, agreeing small exclusion or seasonal fishing zones with the recreational sector would quickly avoid this negative interaction for the birds and annoyance for recreational anglers.

Do you think that minimising these negative interactions could be beneficial in any way? If so, how?

FM: Reducing the interactions is of no benefit to me but, if it were possible for them not to get stuck on the hooks, they would take less of our bait.

JP: Undoubtedly, for fishers, minimising these negative interactions would mean being able to get on with the work without problems. In short, we would avoid economic damage, which may be high if we add up the loss of time, the theft of bait, the misplacement of the line and the damage of the gear.

OR: If measures were taken for the recovery of fishing, there would be benefits for society in general, everyone would win. It would recover a public good such as the fish in our sea, which form part of our wealth and our health and are a basic part of the Mediterranean diet.

JG: For us / From our side, reducing negative interac-tions would be a very important milestone and would allow us to devote more time to understanding more biological aspects of the European shag.

Bycatch in some fishing gear is one of the problems for these protected species, but also for the activity itself. How do you think these negative interactions should be tackled and resolved?

FM: By working closely with the biologists and looking for economic compensation that would come from Europe based on the days that a fishers decides not to set the hooks because of the risk of killing a lot of birds. Also to include any devices that encourage non-interactions.

JP: As I mentioned earlier, in the longline sector, for years each individual angler has been trying different methods to avoid bycatch, such as dragging a buoy, making noise.... For me, what has worked well is to make short sets and stop setting and cover the bait when the birds are approaching. Wait for them to leave or change fishing grounds and continue working. Night setting also works, but is not a good option depending on the type of fishing you want to do. It works for hake fishing but not for dentex fishing, which is a more inshore form of longlining, and during the spring when we coincide with the birds.

OR: In general, if there were food for the birds at sea, we would not have so many problems with accidentally caught birds, or it would be a lesser evil. This issue has been solved elsewhere; so, it is not the source of the problem.

JG: It is important to remind that bycatch is a problem that harms seabird populations but also negatively affects fishing. It is a problem that can be recurrent and that ranges from simply being a nuisance to causing significant economic losses.

We therefore believe that there is a need for cooperative work between the fisheries sector, the Administration, NGOs and the scientific community. Bycatch should be approached as a problem with many different aspects and, therefore, with different solutions for each mode, in both the professional and recreational sectors. We must try to find the key to regulating coexistence and avoid outdated management based on direct prohibition, which only strains the position of the different agents involved. Therefore, the only option is to work together, understand the problem and manage it on a firm cooperative basis.

Throughout your life, do you consider that there have been changes in your environment in relation to seabirds? In what way?

FM: Yes, a lot. There are fewer shearwaters and there were not so many cormorants before. I think the main change is that they don't have any food.

JP: I think yes, some birds, such as cormorants or gannets, are seen less frequently than they used to be; for example, very few shearwaters have been seen this year. On the other hand, there have always been seagulls in the harbour and at sea, but now they are everywhere.

OR: Simply put, a slow but steady reduction in the number of birds.

JG: Undoubtedly, there has been a marked decline in most seabird populations in recent decades. Perhaps one of the most extreme cases is the Balearic shearwater, a species endemic to the Mediterranean, and one of the most endangered birds in Europe; If we do not manage to curb its main threat factors, it is doomed to extinction in a few decades. On the other hand, some species have acquired inverse trends, such as the yellow-legged gull, which has been able to take advantage of the indirect resources provided by human activity, mainly landfills and discards from fishing.

What do you think the Mediterranean Sea would be like without birds?

FM: A disaster, we have no right to annihilate a species and damage its habitat, a habitat that is also ours. Everyone is to blame.

JP: I don't see it, I can't conceive of the Mediterranean without its birds. They are important and must be conserved. That is why I think it is a good idea to work together with the fishing community, the Administration and biologists, and to share experiences and possible new technical solutions.

OR: This is the path we seem to have decided to take together. We are slowly reducing the fish stocks and, consequently, the populations of seabirds that feed on these fish. We all want to fool ourselves, both politicians and managers, and we will end up with a blue sea but without fish and without seabirds.

JG: Seabirds have contributed historically and evolutionarily to shaping the fish community of the Mediterranean Sea. Undoubtedly, a complex natural system that loses a part of its mechsnism will never be able to function in the same way again, and therefore the consequences are difficult to foresee.

Apart from the more ecosystemic relationships, another reason of a more social nature could be highlighted. That is to say, without this fauna, or with this group reduced to a few specimens, we would lose natural heritage of great value. Therefore, we have a responsibility to let future generations enjoy an ecosystem at least in the same way as we found it.

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